

GROTON, MA Hazard Mitigation Plan DRAFT

September 21, 2026

Prepared by:



ACKNOWLEDGEMENTS

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[Placeholder for resolution of adoption, see example language below]

A Town of Groton Resolution in Recognition of

Groton, Massachusetts Hazard Mitigation Plan

WHEREAS, A Town Hazard Mitigation Plan preserves the health, safety, and welfare of the citizens of Groton and their property; and

WHEREAS, The 2026 Groton, Massachusetts Hazard Mitigation Plan is an update to the Groton Hazard Mitigation Plan—Municipal Vulnerability Preparedness Plan adopted by the Groton Select Board on December 24, 2020; and

WHEREAS, The Town of Groton Local Hazard Mitigation Committee, and along with its contractor, the Horsley Witten Group, Inc. composed the plan and held a series of advertised and noticed public meetings from March 2026 through [MONTH] 2026 on drafting the plan; and

WHEREAS, Adoption of this plan is a federal requirement for the Town to be eligible for federal hazard mitigation grants as a result of a disaster or major mitigation planning project; and

WHEREAS, FEMA Region 1 has completed its review of the 2026 Douglas, Massachusetts Hazard Mitigation Plan and approved it subject to approval by the Select Board; and

WHEREAS, Select Board approval will allow the Town to meet its local hazard mitigation planning requirements pursuant to 44 C.F.R. Section 201 (the Disaster Mitigation Act),

NOW, THEREFORE, BE IT RESOLVED that the Select Board of the Town of Groton do hereby accept and approve the Town of Groton 2026 Hazard Mitigation Plan as presented.

IN WITNESS WHEREOF, we have hereunto set our hands and caused the Seal of the Town of Groton to be affixed on this _____.

Peter Cunningham, Chair

Rebecca Pine, Vice Chair

Nick Degaitas, Clerk

John Reilly, Member

Matthew Pisani, Member

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ABBREVIATIONS & ACRONYMS

%g	Percentage of gravity
ACS	American Community Survey
BFE	Base Flood Elevation
CEMP	Comprehensive Emergency Management Plan
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CRS	Community Rating System
DCR	Massachusetts Department of Conservation Resources
DPW	Groton Department of Public Works
EAP	Emergency Action Plan
EF	Enhanced Fujita
EMAC	Emergency Management Assistance Compact
EOEEA	Massachusetts Executive Office of Energy and Environmental Affairs
EOC	Emergency Operations Center
F	Fujita
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GELD	Groton Electric Light Department
GIS	Geographic Information Systems
G. L.	General Laws
H&H	Hydrologic and Hydraulic
HHPD	High Hazard Potential Dam
HMP	Hazard Mitigation Plan
HW	Horsley Witten Group
I&I	Infiltration and Inflow
IDDE	Illicit Discharge Detection and Elimination
IEMAC	International Emergency Management Assistance Compact
LHMC	Local Hazard Mitigation Committee
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MBTA	Massachusetts Bay Transit Authority
MEMA	Massachusetts Emergency Management Agency
MIPAG	Massachusetts Invasive Plant Advisory Group
MRPC	Montachusett Regional Planning Commission
MS4	Municipal Separate Stormwater Sewer System
MVP	Massachusetts Municipal Vulnerability Preparedness Program
MWRA	Massachusetts Water Resources Authority
NAACC	North Atlantic Aquatic Connectivity Collaborative
NCEI	National Centers for Environmental Information
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flood Insurance Program

NID	National Inventory of Dams
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
O&M	Operations and Maintenance
OWTS	Onsite wastewater treatment systems
ODS	Massachusetts Department of Conservation Resources, Office of Dam Safety
OSRP	Open Space and Recreation Plan
PFAS	Per- and Polyfluoroalkyl Substances
PMF	Probably Maximum Flood
SAFE	Student Awareness of Fire Education
SFHA	Special Flood Hazard Area
SPIA	Sperry-Piltz Ice Accumulation Index
STIP	State Transportation Improvement Program
TORRO	Tornado and Storm Research Organisation
USGS	U.S. Geological Survey
WLCD	Water level control device
WUI	Wildland Urban Interface

SECTION 1. INTRODUCTION

A. Overview and Plan Purpose

“Hazard mitigation” is defined by the Federal Emergency Management Agency (FEMA) as:

Any sustained action taken to reduce or eliminate long-term risk to life and property from hazards.¹

Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from natural disasters. Hazard mitigation planning is a proactive process used to systematically identify policies, actions, and tools that can be used to reduce the dangers to life and property from natural hazard events. The process of hazard mitigation planning involves participation from various stakeholders to:

- Define local hazards,
- Assess vulnerabilities and risks,
- Review current mitigation measures, and
- Develop priority action items.

Hazard mitigation saves lives and money. For every dollar spent on federal hazard mitigation grants, an average of six dollars in costs is saved through avoided future disaster losses.² Further, hazard mitigation planning increases public awareness of natural hazards that may affect communities, encourages intergovernmental collaboration, and encourages the integration of hazard risk reduction activities with other community goals and plans. HMPs focus resources and attention on the community’s greatest vulnerabilities.

By preparing a hazard mitigation plan (HMP), communities can become eligible for certain federal funding programs and clearly synthesize local priorities for funding agencies. Federal hazard mitigation funding is available through FEMA. To be eligible for FEMA hazard mitigation grant programs, local governments are required to prepare an HMP that meets the requirements established in the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000.

B. Plan Purpose

The Town of Groton prepared this HMP to create a strategy to reduce the impacts of natural hazards and climate change within the community and the region. This plan identifies natural hazard impacts on Groton, assesses the vulnerabilities of the Town’s critical facilities, infrastructure, and population, and presents recommendations for hazard mitigation. This effort draws from the knowledge of local municipal officials and residents, and the mitigation actions identified herein are intended to be realistic steps to foster resilience to natural hazards.

The Town is dedicated to implementing the findings of this plan and documenting the process. Groton will continue to work to secure resources and work with various stakeholders to implement its identified

¹ Mitigation Planning, Definitions, 44 CFR 201.2 (2021), [https://www.ecfr.gov/current/title-44/part-201#p-201.2\(Hazard%20mitigation\)](https://www.ecfr.gov/current/title-44/part-201#p-201.2(Hazard%20mitigation)).

² National Institute of Building Sciences, [Natural Hazard Mitigation Saves: 2019 Report](#) (2019), 1-2.

hazard mitigation actions. The Town will also continue to document hazard impacts and needed improvements to the Town’s capacity to mitigate and adapt. Lastly, the Town will proactively incorporate the hazard mitigation and climate adaptation goals into municipal planning, budgeting, and operations. By doing so, the Town will be ready to update this plan in five years to maintain its eligibility for FEMA hazard mitigation program grant funding.

C. History of Disaster Declarations

Middlesex County communities, including Groton, have experienced significant losses during various floods, storms, and other events, prompting FEMA to declare these events as disasters. Table 1-1 summarizes significant federal emergency and major disaster declarations that have affected Middlesex County since 2000. The two disaster declarations that have occurred since the 2020 HMP are described in the following subsections.

Table 1-1. Significant Federal Emergency & Major Disaster Declarations, Middlesex County, 2000 – 2026

Disaster Number	Date	Disaster Name
DR-1364	March 5 – April 16, 2001	Severe Storms and Flooding
DR-1512	April 1 – 30, 2004	Flooding
DR-1614	October 7 – 16, 2005	Severe Storms and Flooding
DR-1642	May 12 – 23, 2006	Severe Storms and Flooding
DR-1813	December 11 – 18, 2008	Severe Winter Storm and Flooding
DR-1895	March 12 – April 26, 2010	Severe Storm and Flooding
DR-1959	January 11 – 12, 2011	Severe Winter Storm and Snowstorm
DR-4051	October 29 – 30, 2011	Severe Storm and Snowstorm
DR-4110	February 8 – 9, 2013	Severe Winter Storm, Snowstorm, and Flooding
DR-4214	January 26 – 28, 2015	Severe Winter Storm, Snowstorm, and Flooding
DR-4379	March 13 – 14, 2018	Severe Winter Storm and Snowstorm
DR-4496	January 20, 2020 – May 11, 2023	COVID-19 Pandemic
EM-3599	September 15 – 17, 2023	Hurricane Lee

Source: FEMA, <https://www.fema.gov/disaster/declarations>.

1. DR-4496: COVID-19 Pandemic (January 20, 2020 – May 11, 2023)

The COVID-19 pandemic disaster declaration extended across three years and vastly changed the way that many people live and work. Over the course of the pandemic, Massachusetts reported more than 2.2 million cases and more than 24,000 deaths. Nearly 20% of the cases and the deaths were from Middlesex County, slightly under the county’s share of the state’s population (23%) at the time. The hospitalization and death rates spiked in spring of 2020. In April 2020, Massachusetts saw death rates from COVID-19 reach more than 170 deaths a day.³

During the pandemic, many workplaces and schools halted in-person events and transitioned to virtual environments to maintain social distancing, which had major impacts on community life. Many community events shifted outdoors or to virtual platforms to reduce the spread of the COVID-19 virus.

³ Johns Hopkins University of Medicine, Coronavirus Resource Center, “Massachusetts,” accessed August 21, 2026, <https://coronavirus.jhu.edu/region/us/massachusetts>.

The pandemic also exposed issues in public health infrastructure, as well as the importance of indoor air quality and circulation and outdoor spaces to meet and recreate safely.

2. EM-3599: Hurricane Lee (September 15 – 17, 2023)

Hurricane Lee formed in the tropical Atlantic Ocean in September 2023. The storm quickly intensified, peaking as a Category 5 storm and becoming the third-fastest growing hurricane on record. It declined in intensity as it moved northward toward the East Coast, eventually passing far offshore as an extratropical storm.^{4 5} However, it still brought strong winds and rain, with impacts primarily felt by coastal communities in the form of coastal flooding and erosion.⁶

D. Planning Process Summary

This 2026 HMP involved updating the previous 2020 HMP, which was developed as a joint HMP and Massachusetts Municipal Vulnerability Preparedness (MVP) plan.⁷ To do so, the Town of Groton, with the assistance of a consultant team (Horsley Witten Group) convened a Local Hazard Mitigation Committee (LHMC) comprised of Town staff and board and committee members to oversee the plan update.

The LHMC analyzed the potential impacts of climate hazard, assessed the Town’s capacity for hazard mitigation, and provided essential local knowledge to inform the development of mitigation actions. Additional public engagement was conducted through in-person public meetings and an online survey.

1. Core Team

A Core Team comprised of Town staff and the consultant team was established to coordinate on the development of Groton’s 2026 HMP update. The Core Team held a project kickoff meeting in December 2025 and met approximately once per month virtually thereafter for the duration of the project. The project kickoff meeting materials are provided in Appendix A. Members of the Core Team are listed below:

- **Rachael Mead:** Deputy Police Chief/Emergency Management Director, Groton Police Department/Groton Emergency Management Agency
- **Kellie King:** Project Manager/Environmental Planner, Horsley Witten Group (HW)
- **Craig Pereira:** Senior Environmental Planner, HW

The Core Team coordinated on the day-to-day initiatives for the project, often strategizing data collection, public outreach and engagement, and coordination with various local stakeholders, Town

⁴ NOAA, “Historical Hurricane Tracks: Lee 2023,” accessed August 21, 2026, <https://coast.noaa.gov/hurricanes/#map=4/32/-80>.

⁵ Masters, J. and B. Henson, “Hurricane Lee peaks as a Cat 5 with 165-mph winds,” Yale Climate Connections, last updated September 8, 2023, <https://yaleclimateconnections.org/2023/09/hurricane-lee-peaks-as-a-cat-5-with-165-mph-winds/>.

⁶ WBZ-News Staff, “Remnants of Hurricane Lee pass of Massachusetts coast, bringing winds, rain to Cape Cod,” last updated September 16, 2023, <https://www.cbsnews.com/boston/news/hurricane-lee-boston-cape-cod-massachusetts-new-england-storm-path/>.

⁷ The Massachusetts MVP grant program was initiated in 2017 to help communities build resilience to climate impacts. The original phase of MVP (“MVP 1.0”) included a stakeholder-led planning process to conduct a vulnerability assessment and develop prioritized resilience actions that was well-aligned with the development of HMPs. Communities that completed this planning process were then eligible for MVP Action Grant funding. The Commonwealth has since introduced the MVP 2.0 program, which does not seek to produce or update prior MVP plans. For more information on the MVP program, see <https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program>.

departments and boards and committees, public schools, and utilities. This coordination included requests for various stakeholders to provide information or input to inform the plan's content.

2. Local Hazard Mitigation Committee (LHMC)

The Town of Groton convened the LHMC to act as a steering committee for the development of the 2026 HMP update. The LHMC established goals for the plan update, provided information on hazards affecting the Town, identified critical infrastructure and vulnerable populations, reviewed the status of existing mitigation measures, assessed the Town's capacity to mitigate hazards, and developed proposed mitigation measures for this plan. The LHMC was comprised primarily of Town officials, staff, or board and commission members, with representation from local private academic institutions as well. Members of the LHMC are listed below:

- **Art Cheeks:** Fire Chief, Groton Fire Department
- **Brian Callahan:** Director, Groton Department of Public Works (DPW)
- **Charlotte Steeves:** Conservation Administrator, Groton Conservation Department
- **Dan Stoneking:** Water Superintendent, Groton Water Department (from July 2026)
- **Frank Mastrangelo:** Security Director, Lawrence Academy
- **Jonathan Patterson:** Manager, Groton Electric Light Department (GELD)
- **Mark Haddad:** Groton Town Manager
- **Michael Luth:** Police Chief, Groton Police Department
- **Mike O'Donnell:** Assistant Head of Residential Life, Groton School
- **Rachael Mead:** Deputy Police Chief/Emergency Management Director, Groton Police Department/Groton Emergency Management Agency
- **Rob Maloney:** Interim Water Superintendent, Groton Water Department (December 2025 – June 2026)
- **Takashi Tada:** Land Use Director/Town Planner
- **Terry Gardner:** Deputy Fire Chief/Deputy Emergency Management Director, Groton Fire Department/Groton Emergency Management Agency
- **Veronica O'Donnell:** Member, Sustainability Commission

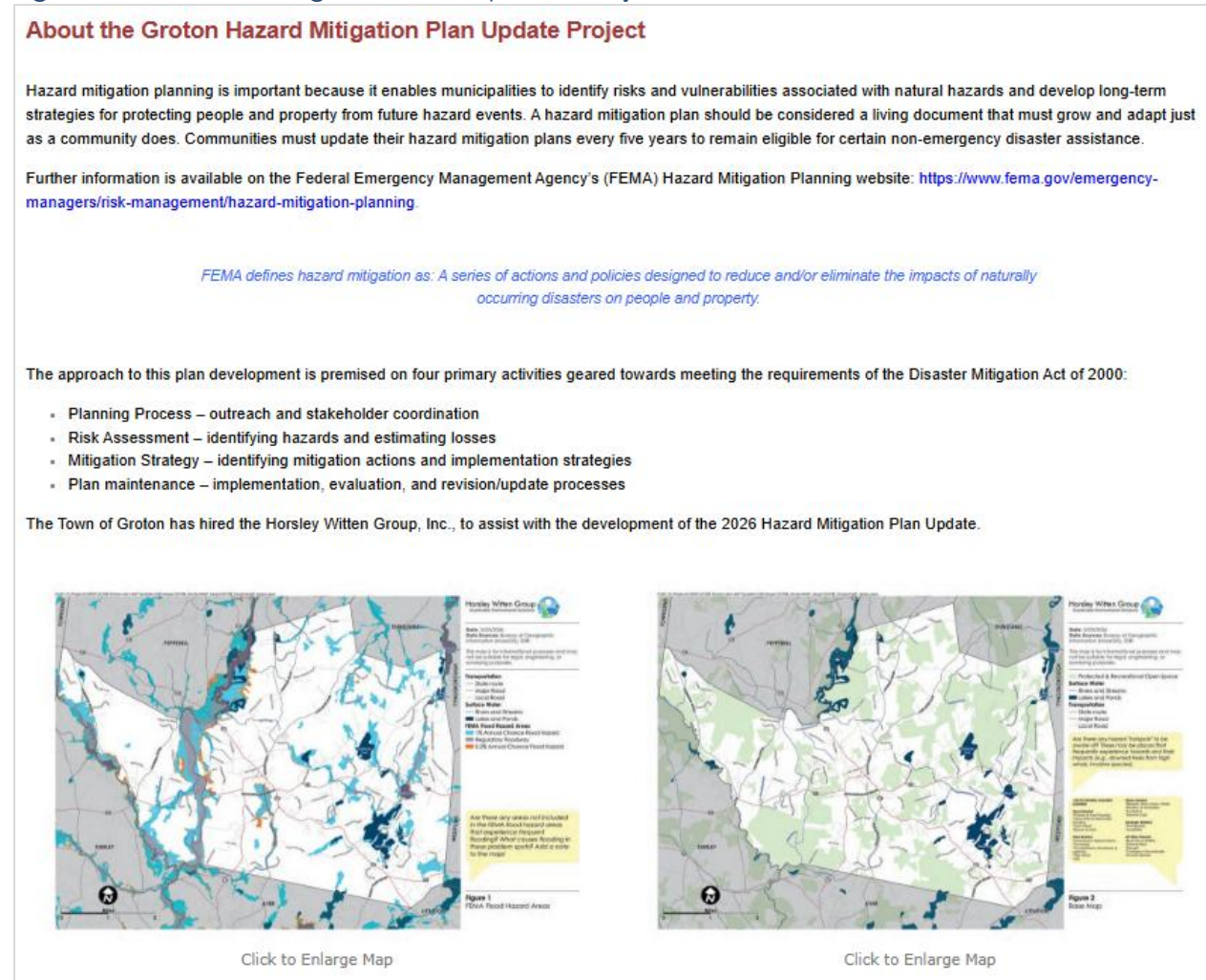
The LHMC met in-person on four separate occasions at project milestones throughout the plan development process as noted below. Meeting materials are provided in Appendix A.

- **LHMC Meeting #1, February 11, 2026:** Initiate the planning process, review project logistics, evaluate implementation progress on mitigation actions from the 2020 HMP, and evaluate potential impacts from identified natural hazards.
- **LHMC Meeting #2, April 7, 2026:** Coordinate on information requests, review locally identified areas of hazard concern (e.g., locally identified areas of flooding), and assemble the list of critical facilities and vulnerable populations.
- **LHMC Meeting #3, June 8, 2026:** Review the Town's current capabilities for hazard mitigation and develop draft mitigation actions.
- **LHMC Meeting #4, August 18, 2026:** Finalize and prioritize mitigation actions.

3. Project Website

A project webpage was designed and hosted on the Town's municipal website to announce the project, provide updates on opportunities for public engagement, and serve as a repository of project documents. See <https://www.grotonma.gov/hazard-mitigation-plan/>.

Figure 1-1. Hazard Mitigation Plan Update Project Website



Partial screenshot of the project website. Source: Town of Groton

4. Public Survey

An online public survey was conducted to understand the community's familiarity with natural hazards, perspectives on household and the Town's level of hazard mitigation preparedness, information needs, and personal needs regarding hazard and disaster response and recovery. The public survey was available online from March to August 2026. The Core Team advertised the public survey on the project website, via Town social media channels, and in the Groton Herald, the local newspaper. The Core Team also asked the LHMC to advertise the public survey via their networks and social media channels. The Core Team also included information on requesting accommodation to access and complete the public survey as part of outreach and within the survey, though it did not receive any such requests.

A total of 18 responses were collected. A brief summary of the public survey responses is included below. The full survey summary is included in Appendix B.

- Half or more of respondents noted they were moderately or extremely concerned about changes in groundwater (72%); heavy rain and stormwater flooding (56%); high winds (56%); blizzards, heavy snow, winter weather, and Nor'easters (50%), ice storms (50%), and drought (50%).
- A majority of respondents considered electrical utility infrastructure (89%), drinking water utility infrastructure (67%), transportation infrastructure (61%), groundwater resources (56%), and stormwater infrastructure (56%) as most vulnerable to natural hazard impacts.
- Respondents were most supportive of mitigation projects to improve the resiliency of utilities (61%) and to retrofit public infrastructure to make them more resilient (50%).
- Only 35% of respondents felt their household or business was moderately or extremely prepared to deal with a natural hazard event.
- A majority of respondents reported that they found the Town's mass notification system (i.e., Smart911) (76%) and the Town's social media (59%) as most helpful for obtaining up-to-date information during a natural hazard event.

5. Public Workshop #1

The first public workshop was held in-person at Town Hall on March 24, 2026. As with Groton's other public meetings and meetings of its various boards and commissions, the workshop was streamed live via the Groton Channel, the Town's public and educational access television channel. The public workshop was advertised via the project webpage, Town social media channels, and in the Groton Herald. Additionally, the Core Team contacted Town boards and commissions to encourage participation.

The workshop included a presentation that provided an overview of the purpose of hazard mitigation planning, relevant federal and state guidance, and highlighted accomplishments that the Town has achieved since the 2020 HMP. The presentation introduced the LHMC, reviewed the project timeline and plan elements, and discussed how the Town's 2026 HMP aligns with local and state planning, including the 2023 *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*, better known as the *ResilientMass Plan*. Finally, the presentation presented the LHMC's initial hazard index assessing relative risk and impacts of natural hazards affecting Groton. The workshop included a question and answer component to allow attendees an opportunity to provide feedback and ask questions of the Core Team and LHMC.

The Groton Channel posted a recording of the workshop to its on-demand online video programming. The project webpage included a link to this recording. Workshop materials are included in Appendix C.

6. Public Workshop #2

The second public workshop was held...

Workshop materials are included in Appendix C.

7. Public Notifications

With this information, the project consultant prepared the draft Hazard Mitigation Plan update, which was available for public comment from [DATE] through [DATE] on the Town's website. [#] individual

comments were received (see Appendix G for the notice of availability of the draft plan for public comment and comments received).

This plan update was also forwarded to the following officials in neighboring communities:

- **Ayer:** Daniel Ruiz, Land Use Director – Town Planner
- **Dunstable:** Jon Crandall, Emergency Management Director
- **Littleton:** Maren Toohill, Town Planner
- **Pepperell:** Jason Cleghorn, Town Planner
- **Shirley:** Mark Archambault, Town Planner
- **Townsend:** Beth Faxon, Planning Board Administrative Assistant and Zoning Board of Appeals Administrative Assistant
- **Tyngsborough:** Benjamin McClure, Town Planner
- **Westford:** Jeffrey Morrisette, Assistant Town Manager – Land Use & Economic Development

All received notice of the draft update availability on the Town of Groton’s website, with [neighboring communities] returning comments. The draft was then submitted to the Massachusetts Emergency Management Agency (MEMA) for consideration. It is the intention of the Groton LHMC that the 2026 HMP be an available and pertinent source of information to a wide variety of individuals and interests. The 2026 HMP also has a specific and pragmatic function. By identifying and prioritizing local mitigation needs, the 2026 HMP update has served, and will continue to serve, as a basis for amendments to local policies and regulations. Further, a well-prepared and locally adopted plan can demonstrate understanding and commitment, two important variables when vying for limited, high-demand resources.

State authorities will incorporate information compiled in this document into the State Hazard Mitigation Plan to strengthen the statewide knowledge and idea base for mitigation planning.

E. 2020 Hazard Mitigation Plan Report Card

The Town of Groton has proactively implemented mitigation strategies identified in the 2020 HMP. As part of the plan update, the LHMC created a “2020 HMP Report Card” to document the Town’s accomplishments in implementing its previous mitigation strategies. Table 1-2 details the status of all 2020 HMP mitigation strategies, including why certain mitigation strategies were not completed or why they are no longer relevant. Table 1-2 also indicates how relevant mitigation strategies were carried forward into this 2026 HMP update.

Table 1-2. 2020 HMP Report Card

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
<i>Roadways, Bridges, Culverts, and Stormwater Drainage Related Actions</i>		
Address flooding and improve drainage on Broadmeadow Road and Route 119.	Partially Completed. The Town is exploring partnerships with the Nashua River Watershed Association to address flooding on Broadmeadow Road. Route 119 is a state road that the Town does not have control over.	Yes. Combine with other road and drainage related mitigation activities. See Section 6, Actions 2 and 3.
Develop new regulations to ensure roadways, culverts, bridges, and stormwater infrastructure design consider climate change.	Partially Completed. The Town has adopted a stormwater enterprise fund and utility to provide a better funding stream for stormwater improvements. The Town informally uses some higher stormwater regulatory standards, but it needs to officially codify these best practices.	Yes. See Section 6, Action 30.
Upgrade existing culverts and stormwater infrastructure where necessary using future precipitation data. Develop a priority list of undersized culverts.	Partially Completed. The Groton DPW upgrades culverts and other stormwater infrastructure on an as needed basis and maintains a stockpile of materials to facilitate this process. In 2020, Town voters approved the creation of a Stormwater Utility Enterprise Fund to provide a sustainable funding stream for the Town's stormwater management program. The Groton Conservation Commission has conducted culvert assessments across the community using the North Atlantic Aquatic Connectivity Collaborative methodology. The Town informally uses some higher stormwater regulatory standards, but it needs to officially codify these best practices.	Yes. See Sections 6, Actions 2 and 30.
Increase maintenance and drainage ditch cleaning. Update O&M Plan with climate change considerations.	Partially Completed. The Groton DPW conducts regular inspections across the community and undertakes maintenance work on an as needed basis. DPW does not have a specific Operations & Maintenance Plan.	Yes. Update and combined with other road and drainage related mitigation activities. See Section 6, Actions 2 and 3.
Elevate roads and bridges to reduce flooding. Bridge design should reduce storm debris collection.	Partially Completed. Repairs to the Island Road Bridge are expected to begin in Fall 2026. However, all bridges in Groton are owned by the state, so the Town does not have direct control over upgrades or work.	Yes. Update and combine with other road and drainage related mitigation activities. See Section 6, Action 2.
Create alternative plans for evacuation routes if flooded.	Partially Completed. Not fully completed due to a lack of staff and funding. The Town is currently updating its Comprehensive Emergency Management Plan, which will include evacuation protocols, though evacuation routes can be flexible and situation specific.	Yes. See Section 6, Action 23.
Assess the latest emerging pavement technology to reduce buckling and potholes under new climate trends.	Completed. The Town has a pavement management plan that it uses to guide its road improvement projects and regularly access state funding for road re-paving projects. This will be maintained as an ongoing capability.	No. Maintain as an ongoing capability.
Continue to install beaver deceivers as needed to mitigate flooding caused by beaver dams.	Completed. The Town has many beaver deceivers in place and continuously inspects and maintains these systems. However, in recognition of beaver activity related flooding as a high concern hazard and the mobile and active nature of beavers (leading to new areas of flooding concern), the Town has chosen to highlight and update this action for the 2026 HMP.	Yes. See Section 6, Action 3.
Maintain current plows to facilitate snow removal.	Completed. The Groton DPW continues to maintain its fleet of vehicles, and the Fire and Police Departments also have backup vehicles. The Town will continue to maintain its vehicles as an ongoing capability.	No. Maintain as an ongoing capability.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
<i>Water Supply and Distribution Related Actions</i>		
Evaluate water supply demand projections under drought conditions and current supply's ability to meet future needs. Evaluate options for additional storage or emergency supply.	Partially Completed. At the time of this HMP development, the Groton Water Department is developing a Drought Management Plan.	Yes. See Section 6, Action 11.
Extend water line and increase cisterns in the Lost Lake neighborhood.	Not Completed. There are two water cisterns that are actively maintained by the Groton Fire Department. However, further extensions of the water main have not been completed primarily due to other priorities (i.e., extending service along Chicopee Row to address immediate PFAS contamination concerns).	Yes. See Section 6, Action 15.
Increase access to water in places without hydrants that are also more vulnerable to brushfires.	Partially Completed. The Groton Water Department is extending water service along Chicopee Row, with water extensions planned for several side streets in the near future. That work involves adding hydrants for fire response. However, there are other areas in Groton that are also potentially at risk of fire. Water access has not been increased in these areas primarily due to other priorities (i.e., extending service along Chicopee Row to address immediate PFAS contamination concerns).	Yes. See Section 6, Action 15.
Develop a water conservation program that may include regulating irrigation systems or developing a water conservation rate pay system.	Completed. The Groton Water Department and the West Groton Water Supply District enact seasonal water use restrictions and provide public education about these activities.	No. Maintain as an ongoing capability.
Increase public education about water restrictions and lawn sprinklers, and health risks related to pollutants of concern.	Completed. The Groton Water Department and the West Groton Water Supply District enact seasonal water use restrictions and provide public education about these activities. Both public water systems also provide information on their respective websites about water restrictions and health risks related to pollutants of concern, as well as via their annual Consumer Confidence Reports. The Groton Water Department also actively responds and provides information about pollutants of concern, including PFAS.	No. Maintain as an ongoing capability.
Build a resilient water treatment facility outside of the floodplain with green infrastructure stormwater controls.	Completed. The Groton Water Department brought its Whitney Pond Wells Water Treatment Facility online in 2024, which is designed to remove iron and manganese below state maximum contaminant levels for drinking water.	No. Action is completed.
Assess inter-basin wastewater transfers and impact on groundwater levels.	Not Completed. Not completed, as the Groton Water Department is still within its permitted withdrawal limits for drinking water and thus there has not been an immediate need to assess the extent to which inter-basin wastewater transfers are affecting groundwater levels.	Yes. See Section 6, Action 14.
Develop a fertilizer management plan to minimize contaminants that could be spread by floods.	Not Completed. Not completed due to a lack of staff capacity.	Yes. See Section 6, Action 35.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Address PFAS and elevated iron and manganese.	Partially Completed. The Groton Water Department brought its Whitney Pond Wells Water Treatment Facility online in 2024, which is designed to remove iron and manganese below state maximum contaminant levels for drinking water. PFAS is still a concern, though the Town is working on extending water service to areas of known PFAS contamination and coordinating with the state and private property owners on contaminated sites.	Yes. See Section 6, Action 12.
Bylaws, Regulations, and Planning Related Actions		
Revise stormwater management regulations and wetland regulations to require or recommend the use of climate data and to encourage stormwater infiltration.	Partially Completed. The Town has revised its stormwater management regulations to incorporate some best practices, but additional revisions are desired. In 2020, Town voters approved the creation of a Stormwater Utility Enterprise Fund. Wetland regulations have not been revised due to a lack of staff capacity.	Yes. See Section 6, Actions 30 and 31.
Develop and adopt Smart Growth zoning and development regulations. Use Smart Growth policies to provide a range of housing types, including affordable housing	Partially Completed. The Town revised its Zoning Bylaw to allow for accessory dwelling unit development and cluster zoning. It also adopted revisions to allow for multi-family residential development by-right pursuant to the state MBTA Communities Law (Section 3A of the Zoning Act). As part of its <i>Master Plan</i> (2025) process, the Town identified further land use regulatory strategies for implementation to encourage Smart Growth, which were incorporated into this HMP.	Yes. See Section 6, Action 32.
Include climate change considerations and hazard mitigation recommendations in Town planning efforts, including updates of the OSRP and Master Plan.	Completed. The Town adopted its <i>Master Plan</i> in 2025, which include discussion of climate change and hazard mitigation considerations; relevant recommendations are incorporated into this 2026 HMP update. No Longer Relevant. The Town's <i>Open Space and Recreation Plan</i> (OSRP) was not required to be updated during the prior HMP's five-year validity period. Massachusetts has since revised its OSRP Handbook, with consideration of climate change impacts now a required part of the OSRP planning process. Thus, Groton will incorporate climate change considerations as it updates its OSRP (the OSRP update process was initiated in 2026). As a best practice, the Town will integrate the findings and recommendations from this HMP into its OSRP update.	No. Action is completed related to the <i>Master Plan</i> . As a best practice, the Town will continue to integrate the findings of its various plans, including the HMP, into new planning processes, such as the OSRP.
Assess municipal properties for Low Impact Development or green infrastructure opportunities.	Completed. Many of the Town's facilities are newer and have been constructed to current stormwater management standards, and the Town assesses opportunities for green infrastructure during its projects as a best practice. However, in recognition of stormwater flooding as a high concern hazard and the collective impact of impervious surfaces on stormwater runoff, the Town has chosen to highlight this action again for the 2026 HMP, with a focus on demonstration projects that can help educate private property owners on the multiple benefits of green infrastructure.	Yes. See Section 6, Action 44.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Update FEMA FIRM and continue Groton's participation in the NFIP.	Completed. The Town completed required updates to its Floodplain District regulations in its Zoning Bylaw to incorporate the new FEMA Flood Insurance Rate Maps (which became effective July 2025) for the community and also has incorporated new model language developed by the state. Groton continues to participate in FEMA's National Flood Insurance Program (NFIP), which it will maintain as an ongoing capability.	No. Action is completed. Maintain participation in the NFIP as an ongoing capability. However, see also Section 6, Action 40 related to the NFIP Community Rating System program.
<i>Invasive Species Related Actions</i>		
Design standards and management plans that are wildlife friendly and protect at risk species (native and endangered).	Partially Completed. The Town complies with state requirements that development applicants be required to undergo an evaluation by the Massachusetts Natural Heritage and Endangered Species Program to determine ecological impacts if a proposed project is within Priority or Estimated Habitats of rare species. Additionally, the Town is working on land management plans for several priority conservation areas.	Yes. See Section 6, Actions 34 and 37.
Conduct public education and outreach on emerging threats. Leverage volunteers and work with neighbors, including Pepperell.	Completed. This is an ongoing practice for the Town's Stewardship Committee. One of their ongoing activities includes monthly committee-led walks at conservation areas so residents can learn more about nearby resources.	No. Action is completed.
Assess best practices for invasive plant removal. Consider mechanical strategies, training volunteers, and creating a "Rent a Goat" program to remove invasive plants. Conduct outreach to private landowners.	Partially Completed. The Town's Invasive Species Committee provides guidance on removal and management species, though the Town can only directly manage its own resources. Two of the Invasive Species Committee members have become licensed herbicide applicators for invasive species removal. More specific outreach to private landowners is needed on best practices for removal and management.	Yes. See Section 6, Actions 34 and 37.
Increase measures to control mosquitos and ticks and raise public awareness related to vector-borne diseases. Create a fact sheet, trail signage, and publicize local locations that sell DEET and Permethrin.	Completed. The Groton Board of Health has posted signage at trailheads to raise public awareness related to vector-borne diseases and provides educational materials via its webpage. No Longer Relevant. DEET and Permethrin products are widely sold online and at outdoor retailers. Further publication from the Town is unnecessary.	No. Action is completed or no longer relevant.
<i>Emergency Response Plan Related Actions</i>		
Educate people on the need to sign up for Smart911 and to sign up for the COA database of vulnerable populations.	Completed. This is an ongoing practice for the Groton's Emergency Management Agency, Police Department, and Council on Aging. However, this action is continuously needed as the population and their needs change; thus, the Town has chosen to highlight it again as an action in the 2026 HMP.	Yes. See Section 6, Action 24.
Enhance emergency response planning, practice, and maintenance. Coordinate with partners through Mutual Aid Agreements.	Completed. This is an ongoing practice for the Emergency Management Agency and Local Emergency Planning Committee.	No. Maintain as an ongoing capability.
Utilize interactive mapping application prepared by MRPC/CMRPC to update critical infrastructure and simulate real time evacuation scenarios to mitigate hazards to the public.	No Longer Relevant. Mapping of critical infrastructure and vulnerable populations was completed as part of this HMP development. The Town will continue to maintain this data.	No. Maintain as an ongoing capability.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Create an Emergency Action Plan for local farms and livestock.	Not Completed. This was not completed due to a lack of staff and funding.	Yes. See Section 6, Action 23.
Recruit and train volunteers for the CERT program, Fire Department, and emergency shelter staffing.	Partially Completed. The Town continuously looks to recruit and train volunteers, though staffing is still a challenge. The Town has not implemented a CERT program, though there is community interest.	Yes. See Section 6, Action 26.
Provide pet-friendly shelters with specialized equipment, including cages and carriers.	Partially Completed. The Town has secured some pet equipment, but more supplies are needed. A lack of funding has prevented additional procurement to date.	Yes. See Section 6, Action 25.
Increase shelter space. Consider the new Elementary School as an option.	Not Completed. Shelter space has not been increased due to a lack of staff and funding.	Yes. See Section 6, Action 25.
Review shelters for needed facility updates, including storage needs. Storage may be available at the Indian Hill Music Center (now known as the Groton Hill Music Center).	Partially Completed. The Town periodically evaluates its shelter spaces. At the time of this HMP development, the Town is installing a generator at one of its shelters. A lack of funding has prevented further facility upgrades to date.	Yes. See Section 6, Action 25.
Inventory shelter supplies and develop a needs list.	Partially Completed. At the time of this HMP development, work is ongoing at inventorying shelter supplies.	Yes. See Section 6, Actions 25.
Improve communication related to shelter locations and availability, evacuation plan, and accessibility to resources.	Partially Completed. The Town conducts regular drills related to emergency response, but there are opportunities to expand the scope of drills and improve communication with the public.	Yes. See Section 6, Actions 24 and 25.
<i>School Related Actions</i>		
Develop or coordinate emergency response plans with public and private schools.	Completed. This is an ongoing practice for the Emergency Management Agency and Local Emergency Planning Committee.	No. Maintain as an ongoing capability.
Install air conditioners in parts of the schools, for example in the gyms.	Partially Completed. Some school facilities have cooling capabilities. At the time of this HMP development, the Town is conducting a feasibility assessment of heat pump systems for the Groton-Dunstable Regional Middle School complex to improve heating and cooling capabilities.	Yes. See Section 6, Action 20.
Develop climate change curriculum, including information on green infrastructure and water conservation.	Partially Completed. Climate and climate change related topics are integrated into state curriculum standards; local private educational institutions also integrate climate change related topics. However, the Town has not collaborated on curriculum development, including on local topics of relevance.	Yes. See Section 6, Action 46.
<i>Electric Grid and Energy Related Actions</i>		
Identify priority locations (critical facilities and town property/buildings) for solar and battery backup.	Partially Completed. The Groton Electric Light Department (GELD) has installed two battery energy storage systems and has plans to install a third at the time of this HMP development. The new Regional Energy Manager adds to the Town's capacity to find funding for these systems and help identify additional locations.	Yes. See Section 6, Action 21.
Relocate power lines underground during the construction of new roads or infrastructure.	Completed. The Town's regulations require undergrounding of utilities for all new development. Existing overhead power lines are relocated underground if requested and paid for by the property owner.	No. Action is completed.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Incentivize energy efficiency and explore peak demand pricing.	Completed. GELD implemented time-of-use rates with peak pricing in 2023, which incentives reductions in energy usage by customers.	No. Action is completed.
Expand GELD's renewable energy portfolio. Purchase eight-megawatt storage batteries for power.	Completed. GELD maintains a diverse power portfolio of more than 68% carbon-free and 24% renewable sources. GELD continuously evaluates its power portfolio as an ongoing capability. GELD has installed two battery energy storage systems and has plans to install a third at the time of this HMP development.	No. Maintain as an ongoing capability. However, see Section 6, Action 21 for another battery energy storage system related action.
Install seamless switch for generators during peak hours to promote energy saving and reduce demand.	No Longer Relevant. GELD has implemented time-of-use rates with peak pricing to incentive reductions in energy usage. At the time of this HMP development, this action is no longer needed.	No. Action is no longer relevant.
Wastewater Related Actions		
Conduct educational outreach on sewer best management practices including what not to flush.	Completed. The Groton Sewer Commission conducted an information campaign in 2025 and sent educational flyers to all customers.	No. Action is completed.
Assess options for an onsite wastewater management system or program.	No Longer Relevant. Prior wastewater studies were completed in the early 2000s and did not move forward due to a lack of interest, including as indicated by a negative Town Meeting vote. This is not a current need for the Town.	No. Action is no longer relevant.
Communication Related Actions		
Improve cell coverage.	Partially Completed. A development application to add a cell tower at the Groton-Dunstable Regional High School is ongoing at the time this HMP development.	Yes. See Section 6, Action 24.
Dam Related Actions		
Pursue funding for dam removal. Coordinate with Shirley. Remove RiverCourt Dam (referred to herein as the Squannacook River Dam) when funding is available.	Partially Complete. The Town completed a dam removal feasibility study and basis of design study in 2024 and 2025, respectively. Residents did not approve of repairs to the Squannacook River Dam at the Spring 2026 Town Meeting; thus, the Town plans to pursue outside funding for dam removal.	Yes. See Section 6, Action 6.
Increase public outreach and education on dam safety.	Completed. The Town has conducted recent public engagement education on dam safety as part of the studies evaluating the feasibility of removing the Squannacook River Dam.	No. Maintain as an ongoing capability. However, see Section 6, Actions 6-10 for other dam-related actions.
Public Transit Related Actions		
Create a carpooling platform and more sidewalks to decrease car usage.	Partially Completed. The Town installs sidewalks as part of roadway projects. The Complete Streets Committee and its <i>Prioritization Plan</i> help guide these efforts. Creating a carpooling platform is no longer seen as a viable initiative for the Town due to other priorities taking precedence.	No. Maintain sidewalk installation as an ongoing capability. Creating a carpooling platform is no longer relevant.
Install electric charging stations and prepare regulations for electric vehicles.	Completed. The Town has installed four electric charging stations. Lawrence Academy also has two publicly accessible electric charging stations on its campus.	No. Action is completed.
Offer a bus service connection from Lowell to the Indian Hill Music Center (now known as the Groton Hill Music Center).	No Longer Relevant. The action does not have relevance to hazard mitigation. A bus service connection via the Lowell Regional Transit Authority has not been offered between these destinations.	No. Action does not have relevance to hazard mitigation.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Increase parking spaces at the Ayer commuter rail for more access to commuter rail.	No Longer Relevant. The action does not have relevance to hazard mitigation. The Town does not have control over activities at the Ayer MBTA Commuter Rail Station. Additionally, a new parking garage was constructed at the station recently, such that there is not a need to further increase parking.	No. Action is no longer relevant.
<i>Open Space and Forested Land Related Actions</i>		
Develop a fire prevention and vegetation management plan to include controlled burns, cleaning debris, and creating a wood bank of recently downed trees.	Partially Completed. The Town has not created a fire prevention and vegetation management plan, though it has developed management plans for some conservation sites. The Fire Department and Conservation Commission coordinate on an annual controlled burn at Nipmuc Meadows.	Yes. See Section 6, Action 34.
Identify critical land around reserves and assess options for easements or land acquisition.	Completed. It is an ongoing practice for the Town to evaluate property acquisition for various benefits (e.g., flood storage, habitat protection, outdoor recreation). The Conservation Commission asks for Community Preservation Act funding on an annual basis to acquire land and conservation easements.	No. Maintain as an ongoing capability.
Create detailed trail signage and conduct public education about staying safe on trails.	Partially Completed. The Town regularly conducts public education through the Conservation Commission, which also hosts regular walks at Town conservation properties. Trail signage has not been installed due to other priorities taking precedence. The Groton Board of Health has posted signage at trailheads to raise public awareness related to vector-borne diseases and provides educational materials via its webpage. Additional signage and/or public education could be completed as part of efforts to develop responsible management plans and increase knowledge about invasive species.	Yes. See Section 6, Actions 34 and 37.
Work with volunteers to maintain open space and trails. Partner with schools and universities.	Completed. It is an ongoing practice for the Town to work with volunteer groups, including school groups.	No. Maintain as an ongoing capability.
<i>Wetland Related Actions</i>		
Pursue land acquisition to protect wetlands from encroachment.	Completed. It is an ongoing practice for the Town to evaluate property acquisition for various benefits (e.g., flood storage, habitat protection, outdoor recreation). The Conservation Commission asks for Community Preservation Act funding on an annual basis to acquire land and conservation easements.	No. Maintain as an ongoing capability.
Increase groundwater infiltration near wetlands.	Completed. It is an ongoing practice for the Town to eliminate catch basins and install stormwater best management practices during work near wetlands.	No. Maintain as an ongoing capability.
<i>Land Use and Development Related Actions</i>		
Educate homeowners on fire safety.	Partially Completed. The Town has paused its public outreach efforts related to fire safety, which primarily occurred through the school system, due to a lack of staff and funding.	Yes. See Section 6, Action 45.
Develop and maintain a database of areas at high fire risk.	No Longer Relevant. The entirety of the Town is heavily forested; as such, the Town considers the entire community as potentially at risk of fire. The Fire Department already maintains a database of historical fire incident records and logs.	No. Maintain use of the fire incident database as an ongoing capability.

Mitigation Action	2026 Status Update	Include in 2026 HMP Update?
Create a resiliency plan specific to the Lost Lake neighborhood	No Longer Relevant. A resiliency plan was not completed due to other Town priorities. A standalone resiliency plan is no longer relevant, as the Town has identified specific mitigation actions to address primary natural hazard concerns in the Lost Lake neighborhood.	No. However, see Section 6, Actions 3, 4, 10, 15, and 37 for mitigation actions related to natural hazard concerns (e.g., flooding, brush fire and wildfire, invasive species) in the Lost Lake neighborhood.
Conduct outreach to residents in the 100-year floodplain regarding options for flood mitigation.	Not Completed. The Town provided general notifications to residents following updates to the FEMA Flood Insurance Rate Maps (and subsequent updates to its floodplain management regulations), but it has not conducted public outreach specific to flood mitigation strategies.	Yes. See Section 6, Action 41.
Agriculture Related Actions		
Reduce the use of pesticides/herbicides/insecticides, especially on farms near rivers.	Not Completed. The Town often conditions the use of pesticides, herbicides, and insecticides as part of the development review and approval process, but work has not been completed to address their usage at existing sites due to a lack of staff and funding capacity.	Yes. See Section 6, Action 35.
Follow best management practices for long-term planning and diversification.	Completed. The Town adopted its <i>Master Plan</i> in 2025, which presents a long-range vision for the Town's growth. The Town is now working on integrating the recommendations of the <i>Master Plan</i> .	No. The Town will continue to monitor progress on implementation of the <i>Master Plan</i> ; relevant recommendations are also integrated into this HMP.
Vulnerable Residents Related Actions		
Migration/Climate Refugees: Scale emergency services as population increases.	Not Completed. Lack of funding has constrained efforts to scale emergency services as needed.	Yes. See Section 6, Action 22.
Equip all assisted living facilities with air conditioning.	No Longer Relevant. Assisted living facilities are not under the control of the Town.	No. However, see Section 6, Actions 21 and 36 for actions related to building retrofits to Town facilities.
Assist seniors with snow removal.	Not Completed. The Town provides free sand and salt to residents in advance of winter weather, but it does not have the staffing capacity to assist with snow removal for private residents. Snow removal on private property is more appropriately addressed through commercial snow removal services.	No. Maintain provision of sand and salt to residents as an ongoing capability.
Seven Hills Hospital and Group Home: Ensure open communication and coordination with town.	Completed. The Town participates in annual emergency response drills and quarterly inspections (the Town also conducts annual inspections at public schools and several assisted living facilities and housing complexes).	No. Maintain as an ongoing capability.
Contaminated Sites Related Actions		
Cut trees growing on site at Nod Landfill and cap the landfill adequately because it is located on floodplain.	Partially Completed. The Town has maintained vegetation at the Nod Road Landfill and obtained a third-party inspection in 2025 to identify further corrective actions, including work needed to determine the extent and condition of the existing cap.	Yes. See Action 6, Action 30.
Continue ongoing remediation with Conductorlab.	Partially Completed. The Town has established an Oversight Committee to represent the Town's interest in state-mandated hazardous material contamination reporting and remediation processes. Those processes are ongoing.	Yes. See Section 6, Action 48.

Source: Groton LHMC

SECTION 2. MISSION & GOALS

A. Mission Statement

The Town of Groton's Core Team affirmed the following mission statement for the 2026 HMP:

The Town of Groton will protect public health, property, infrastructure, the environment, and cultural resources through a hazard mitigation and climate adaptation program that involves increased coordination, planning, education, and capital improvements.

B. Hazard Mitigation Goals

The Town of Groton's Core Team identified the following hazard mitigation goals:

1. **Shelters:** Provide adequate shelter, water, food, and basic first aid to displaced residents in the event of a natural disaster.
2. **Coordination:** Increase coordination between departments, surrounding communities, regional efforts, and state agencies in pre-disaster planning and the implementation of hazard mitigation and climate adaptation projects.
3. **Education:** Increase awareness of hazard mitigation and climate adaptation among Town officials, private organizations, businesses, and the general public.
4. **Notification:** Provide adequate information to residents in the event of a natural disaster.
5. **Infrastructure:** Protect public infrastructure, buildings, and essential services such as electric power, drinking water, and the sewer system from climate change and hazard mitigation impacts.
6. **Vulnerable Populations:** Build community and individual resilience, with a special focus on vulnerable populations.
7. **Natural Environment:** Develop hazard mitigation and climate adaptation measures that employ nature-based solutions and protect the natural environment.
8. **Development:** Ensure that future development meets federal, state, and local standards for preventing and reducing the impacts of natural hazards under climate change projections.
9. **Finance:** Identify potential funding sources to support the implementation of climate adaptation and hazard mitigation strategies.

SECTION 3. COMMUNITY PROFILE

Groton recently completed its *Master Plan* (2025), which is a guidance document that communities use to manage growth and change and coordinate implementation efforts across Town government.⁸ Much of Section 3 adapts content from the *Master Plan* in an intentional effort to be consistent with recent Town planning processes and documents.

A. Community History

Groton occupies land that was originally home to the Nipmuc and Nashaway Indigenous nations. At the time, the area was known as *Petapawag*, meaning “swampy land.”⁹ Like many New England communities, Groton experienced familiar periods of colonial settlement, agricultural expansion, industrialization, and suburbanization.¹⁰

- **Colonial Settlement:** European colonialists settled in the area in the 17th century. The town was incorporated in 1655 as the Plantation of Groton, which included the modern Massachusetts municipalities of Groton and Ayer and parts of Pepperrell, Shirley, Dunstable, Littleton, Hazard, Westford, as well as small portions of the New Hampshire municipalities of Nashua and Hollis. Colonial settlers established homesteads and farms in the area, following the traditional New England town layout, with a town civic center and dispersed farmsteads. While the region was affected by King Philip’s War and the French and Indian War in the late 17th and early 18th centuries, Groton continued to grow following these conflicts. A historic village center, known as Groton Center, would develop as a hub for residential and commercial activity.
- **Agricultural Expansion:** Agricultural activities continued throughout the 18th and 19th centuries, and many families established farms in the surrounding countryside. The rural landscape was characterized by dispersed farmsteads and open fields and orchards.
- **Industrialization and Mill Villages:** In the 19th century, small mill villages developed primarily in West Groton near the Nashua and Squannacook Rivers. Industrial activities included a soapstone quarry, hop-growing industry, brick factory, sawmill, grist mill, and pewter mill. Human activity continued to alter the landscape, including the formation of Lost Lake through damming.
- **Suburban Expansion:** In the 20th and 21st centuries, Groton has experienced suburban expansion with the construction of modern residential developments and subdivisions and the growth of the road network, including the Interstate 495 corridor. Agricultural and open space areas have been converted for development purposes, though the Town and private groups have also undertaken significant land conservation and preservation initiatives.

Today, Groton is a bedroom community within the Greater Boston metropolitan areas characterized by its diverse natural landscapes, historical New England charm, and easy access to nearby urban centers. The Town has experienced consistent population growth in the past several decades, and it is known as a desirable place to live.¹¹

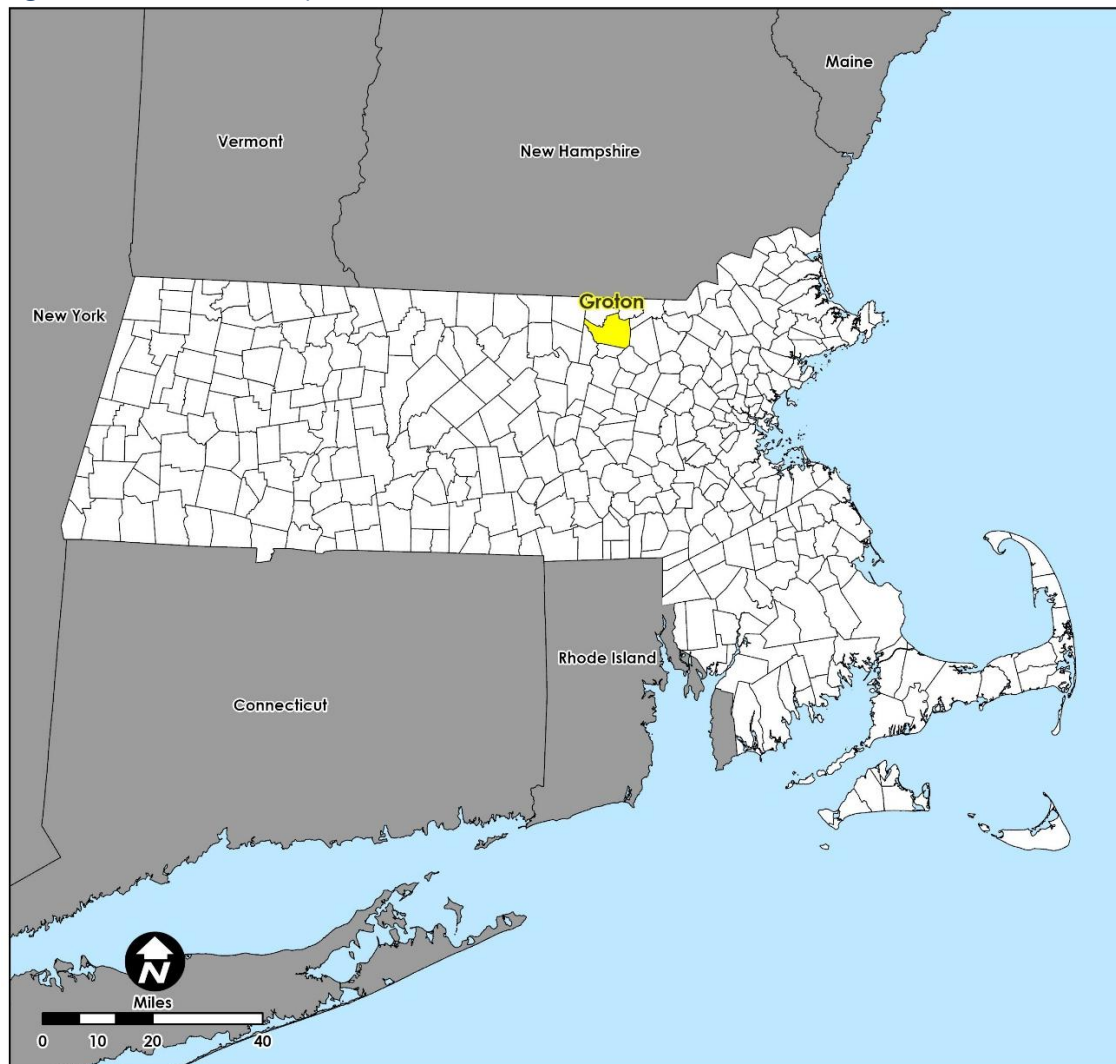
⁸ The *Groton Master Plan* was prepared with the support of a consultant team consisting of the Barrett Planning Group LLC, Nitsch Engineering, and FXM Associates.

⁹ Town of Groton, “Groton History,” accessed January 19, 2026, <https://www.grotonma.gov/community/about/groton-history/>.

¹⁰ Barrett Planning Group LLC et al., *Groton Master Plan* (2025), 38-39.

¹¹ *Groton Master Plan* (2025), 21 and 33-34.

Figure 3-1. Community Location



Data Credit: MassGIS (Bureau of Geographic Information)

B. Governance Structure

Groton is governed by a Town Manager and a five-member elected Select Board. The Town Manager is elected by the Select Board for three-year terms and is the Town's chief administrator. Responsibilities of the Town Manager include day-to-day operations and nominating and appointing individuals to the Town's Boards and Committees.¹² The Town Select Board is directly elected by voters and has decision-making authority for all items not specifically delegated in the Town's Charter.¹³ The Town also has various Boards, Committees, and Commissions that are made up of elected and appointed members that provide forums for more specialized discussion and decision-making on town matters.¹⁴

¹² *Groton Master Plan* (2025), 113.

¹³ *Ibid*, 114.

¹⁴ *Ibid*, 113.

The Town operates under the open Town Meeting system, with two Annual Town Meetings held per year, once each in the spring and fall, and Special Town Meetings held as called by the Select Board or by resident petition. The Town maintains a website at <https://www.grotonma.gov/>.

C. Demographics

While every person in Groton has their own individual capabilities and needs, evaluating broad demographic information is helpful for understanding whether there may be any groups that may require special attention or planning related to hazard mitigation. For example, certain natural hazards are associated with different risks of health impacts across different populations groups (e.g., age groups). Social vulnerabilities may be associated with different demographic characteristics, such as those that live alone or that are linguistically isolated, while financial vulnerabilities may be reflected in income, poverty, and other related measurements.

Unless otherwise stated, demographic data in Section C reference the 2020 Decennial Census.¹⁵

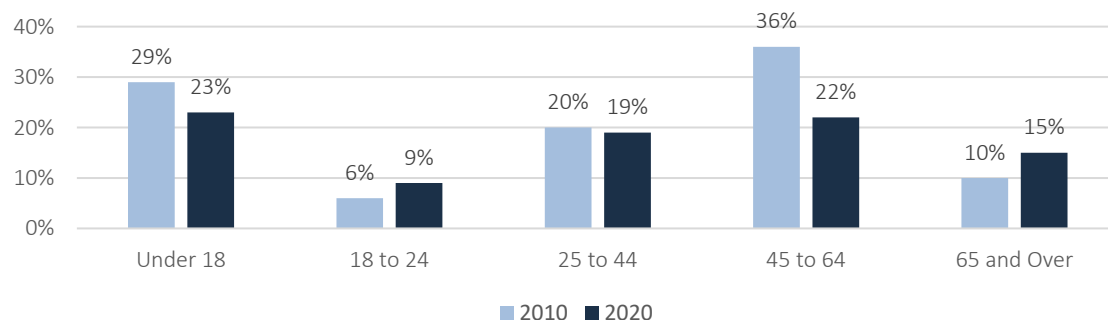
1. Population

According to the 2020 Decennial Census, Groton is home to 11,315 residents, with an estimated population of 11,580 as of July 2024.¹⁶ Like other communities in the region, the Town has experienced steady growth in the past several decades. The University of Massachusetts Amherst Donahue Institute's population projections estimate that the Town will continue to grow steadily, reaching 12,494 residents in 2030, 13,622 residents in 2040, and 13,955 residents in 2050.¹⁷

2. Age and Sex

The median age in Groton is 43.5, which is slightly higher than that of Middlesex County (38.6) and Massachusetts (39.9). The Town's population is nearly split between males (49%) and females (51%). Figure 3-2 shows the share of population across different age groups between 2010 and 2020. Notably, the children under 18 years age group declined six percentage points between 2010 and 2020, while the adults aged 65 and over age group increased by five percentage points.

Figure 3-2. Population by Age Group, 2010 and 2020



Source: Adapted from *Groton Master Plan* (2025).

¹⁵ See U.S. Census Bureau, Decennial Census (2020), *Table DP1: Profile of General Population and Housing Characteristics*.

¹⁶ U.S. Census Bureau, "Quick Facts, Groton town, Middlesex County, Massachusetts," accessed February 15, 2026, <https://www.census.gov/quickfacts/fact/table/grotonmiddlesexcountymassachusetts/PST045224>.

¹⁷ *Groton Master Plan* (2025), 21-22.

3. Race, Ethnicity, and Language

Compared to Middlesex County and Massachusetts, Groton is less racially diverse. Nearly all of Groton's residents identify as one race (94%), with 86% identifying as White. Comparatively, about 68% and 70% of the populations of Middlesex County and Massachusetts identify as White, respectively.

The next largest racial group in Groton is Asian (6%), followed by Black or African American (1%) and American Indian and Alaskan Native (<1%). The rest of the population identified as two or more races (6%). Approximately 4% of the Town's population identifies as Hispanic or Latino (of any race).

According to the American Community Survey (ACS) Five-Year Estimates for 2020-2024, approximately 11% of Groton's population aged five years and over speaks a language other than English. Only 2% of the population reported speaking English less than "very well." Of those individuals, 10% speak Spanish, 45% speak a different Indo-European language, 35% speak an Asian and Pacific Island language, and 10% speak another language.¹⁸

4. Education, Income, Poverty, and Employment

Educational attainment is positively associated with higher income levels. Groton's population is highly educated. According to the ACS Five-Year Estimates for 2020-2024, of adults age 25 years and older in Groton, 98% are high school graduates or higher, and 70% have bachelor's degrees or higher.¹⁹

Groton has a median household income of \$192,958 and per capita income of \$79,915 (both in 2024 dollars). Both these income measures are significantly higher than the respective median household income and per capita income for Middlesex County (\$130,847 and \$69,556) and Massachusetts (\$103,960 and \$57,897).²⁰

Groton also has a much lower poverty rate (4%) compared to Middlesex County (8%) and Massachusetts (10%). However, the poverty rate for adults age 65 years and old in Groton (8%) is similar to that of Middlesex County (9%) and Massachusetts (11%).²¹

Approximately 70% of Groton's civilian labor force aged 16 years and older are employed. According to the Town's *Master Plan*, there are approximately 3,650 jobs in Groton, which is less than the estimated number of employed residents. This mismatch in job availability indicates that many of Groton's residents are commuting outside of the community for employment.²²

5. Disability

The ACS Five-Year Estimates (2020-2024) report that approximately 7% of Groton's population has a disability. Nearly half of those that report a disability are aged 75 years and over (48%).²³ The ACS asks

¹⁸ U.S. Census Bureau, ACS Five-Estimates (2020-2024), *Table S1601: Language Spoken at Home*.

¹⁹ U.S. Census Bureau, "Quick Facts, Groton town, Middlesex County, Massachusetts," accessed February 15, 2026, <https://www.census.gov/quickfacts/fact/table/grotontownmiddlesexcountymassachusetts/PST045224>.

²⁰ Ibid.

²¹ U.S. Census Bureau, ACS Five-Estimates (2020-2024), *Table S1701: Poverty Status in the Past 12 Months*.

²² *Groton Master Plan* (2025), 26.

²³ U.S. Census Bureau, ACS Five-Estimates (2020-2024), *Table S1810: Disability Characteristics*.

questions about six different disability types (all of which are represented in Groton), related to hearing, vision, cognitive, ambulatory, self-care, and independent living difficulties.²⁴

6. Households

There are 3,972 households in Groton. Just over a quarter of households are comprised of householders living alone (28%). Over a third of households include children under 18 years old (35%), and just under a third include adults aged 65 years and older (31%).

Compared to Massachusetts and Middlesex County, Groton has a much higher rate of owner-occupied housing units. Approximately 86% of housing units are owner-occupied in Groton, compared to only 60% in Middlesex County and Massachusetts.

7. Environmental Justice Populations

“Environmental justice” refers to the principle that all populations have a right to “live in and enjoy a clean and healthy environment” free from pollution, regardless of individual demographic and socioeconomic characteristics (e.g., race, income, handicap, national origin).²⁵ In Massachusetts, environmental justice populations are identified based on whether a neighborhood (delineated by census block boundaries) meets one or more of the following four criteria:²⁶

1. The annual median household income is not more than 65% of the statewide annual median household income.
2. Minorities comprise 40% or more of the population.
3. 25% or more of households lack English language proficiency.
4. Minorities comprise 25% or more of the population, and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.

There are no environmental populations located within Groton. However, this does not mean that there are not minority populations or individual households that may satisfy one or more of the criteria noted above in Groton. The Town remains committed to environmental justice principles such that all people have opportunities for meaningful involvement in planning processes and environmental benefits and burdens are equitably distributed.

D. Land Use, Infrastructure, and Environmental Features

1. Land Use

The Town of Groton encompasses approximately 34 square miles of land and water and is a semi-rural community. Approximately 36% of land area is categorized as single-family residential use, and over 40%

²⁴ U.S. Census Bureau, “How Disability Data are Collected from The American Community Survey,” last updated November 21, 2021, <https://www.census.gov/topics/health/disability/guidance/data-collection-acr.html>.

²⁵ MA Office of Environmental Justice & Equity, “What is Environmental Justice?” accessed February 15, 2026, <https://www.mass.gov/info-details/what-is-environmental-justice>.

²⁶ MA Office of Environmental Justice & Equity, “Environmental Justice Populations in Massachusetts,” accessed February 15, 2026, <https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts>.

of land area is protected open space or public land. Commercial development is centered around Groton Center, West Groton, Four Corners, Mill Run Plaza, and South Groton.

The *Groton Master Plan* (2025) provides a breakdown of land use by area, adapted in Table 3.1.

Table 3-1. Land Use by Area (2024)

Land Use Category	Acres	% of Total Area
Single-Family Residential*	7,722.42	35.72%
Multi-Family Residential	301.42	1.39%
Mixed Use	260.26	1.20%
Commercial	99.61	0.46%
Institutional/Nonprofit (Education, Religious, & Other Nonprofit)	1,409.96	6.52%
Agriculture	582.92	2.70%
Open Space (Conservation, Recreation, & Public Land for Recreation)	5,761.00	26.65%
Public Land (Federal, State, & Municipal Land/Structures)	2,224.69	15.43%
Industrial/Utility	446.52	2.07%
Water	496.94	2.30%
Total Acres	21,616.65	

Source: *Groton Master Plan* (2025) (MassGIS and Town of Groton Tax Assessor's Database (2024))

*Includes parcels with multiple single-family dwellings

Development Trends

Like many communities in Massachusetts, Groton is balancing challenges of housing affordability, development pressure, and natural resource protection. A limited amount of new housing development has occurred in the past few decades. The Town's current housing stock consists overwhelmingly of detached single-family dwellings (82% of all housing units).²⁷ As noted in the *Groton Master Plan*, between Fiscal Year 2020 and 2025, the number of property tax parcels classified as single-family grew by nearly 8%, while those classified as condominiums grew by approximately 184%. In that same period, property tax parcels enrolled in the Chapter 61 program, a tax-advantaged program for forest, agricultural, and open space lands, fell by nearly 50% and the number of vacant lots decreased by approximately 25%. These declines indicate that these parcels previously classified as Chapter 61 or vacant have since been developed.²⁸

2. Transportation Infrastructure

Groton's transportation network primarily comprises roads designed for cars. The Town of Groton has 109 miles of roadway, of which 100 are accepted by the Town, 5.5 miles are under the jurisdiction of the Massachusetts Department of Transportation (MassDOT), and another 3.5 miles are private ways. State highways, including Route 119, run northwest-southeast through the center of town and provide strong connections between residential neighborhoods, Town Center, the commercial district, and the regional transportation network in the neighboring towns of Pepperell and Littleton. Locally accepted minor arterials, including Route 111 and Route 40, connect Groton neighborhoods and to neighboring communities of Ayer and Westford.²⁹

²⁷ *Groton Master Plan* (2025), 77.

²⁸ *Ibid*, 85.

²⁹ *Ibid*, 77.

On-road bicycle infrastructure is limited. The Nashua River Rail Trail is a 12.5-mile shared use path that runs between Nashua, NH and Ayer, MA, with the southern end terminating at the Ayer Commuter Rail Station.³⁰ The Squannacook River Trail is a 3.7-mile shared use path that connects Townsend Center to the Bertozzi Wildlife Management Area in the northwestern corner of Groton; local trail advocates and the communities of Townsend and Groton also continue to seek funds to extend the Squannacook River Trail in both directions.^{31 32}

There are no public transportation routes within Groton, though the Massachusetts Bay Transit Authority (MBTA) Fitchburg Commuter Rail line is accessible via the Ayer, Littleton, and Shirley Commuter Rail Stations. The Fitchburg Commuter Rail line provides connections to the local MBTA transit station via North Station in downtown Boston. Additionally, Boston Express bus service also provides access from Tyngsborough to both Logan Airport and the MBTA system at South Station.³³ The Groton Council on Aging offers a reservation-based van service for seniors, available for a small fee per trip (additional fees may apply for longer rides).³⁴

3. Utility Services

Stormwater

The Town's stormwater infrastructure consists of the various catch basins, storm drainage, curbs, pipes, and other infrastructure that captures, conveys, and discharges stormwater to surface waters. The Town is a regulated Municipal Separate Storm Sewer System (MS4) community.

The Groton Department of Public Works manages the Town's stormwater program, with the Earth Removal and Stormwater Advisory Committee also helping to ensure compliance. Town voters approved the creation of a Stormwater Utility Enterprise Fund in 2020, which is funded through an annual fee charged to developed public and privately owned properties and supports stormwater management costs.³⁵

Drinking Water

Public water service is provided by the Groton Water Department and the West Groton Water Supply District to approximately 78% of households in Groton, while the remaining 22% of households rely on private wells.³⁶ Both public water suppliers also serve non-residential customers. Drinking water is sourced entirely from groundwater resources in the area. The Town's four groundwater wells are located near Baddacook and Whitney Ponds, while the West Groton Water Supply District's two groundwater wells are located along the Squannacook River.³⁷

³⁰ *Groton Master Plan* (2025), 66.

³¹ Squannacook Greenways, Inc., "Squannacook River Rail Trail," accessed January 19, 2026, <http://sqrrt.org/>.

³² MA Office of Grants and Technical Assistance, "2023 MassTrails Grant Awards," accessed January 19, 2026, <https://www.mass.gov/guides/masstrails-grants#-masstrails-grant-awards-by-year->.

³³ *Groton Master Plan* (2025), 67.

³⁴ The Groton Center, "Transportation," accessed March 9, 2026, <https://thegrotoncenter.org/wp/transportation/>.

³⁵ Town of Groton, "Stormwater Utility Enterprise Fund Frequently Asked Questions," accessed February 1, 2026, <https://www.grotonma.gov/2020/10/27/stormwater-utility-enterprise-fund-frequently-asked-questions/>.

³⁶ *Groton Master Plan* (2025), 140.

³⁷ *Ibid*, 122 and 140.

In 2024, the Groton Water Department completed construction of a water treatment facility to address manganese in its drinking water source. The Groton Water Department is also currently in the construction phase of a water main extension project to extend public drinking water service to the area around the Groton-Dunstable Regional High School in response to per- and polyfluoroalkyl (PFAS) contamination in private wells.

Wastewater

Public wastewater service is limited in Groton. The Groton Sewer Commission oversees the provision of wastewater service to the Four Corners Sewer District (comprised of certain properties around the Sandy Pond Road, Boston Road, and Forge Village Road intersection) and the Groton Center Sewer District (comprised of certain properties along Main Street, Boston Road, Old Ayer Road, and Partridgeberry Woods, in addition to the Groton-Dunstable Regional High School). Properties outside of the Town's sewer districts rely on private septic systems.

The Town has two inter-municipal agreements with the adjacent towns of Ayer and Pepperell to convey 40,050 and 275,000 gallons per day, respectively, to their wastewater treatment plants. Wastewater from the Four Corners Sewer District is conveyed to Ayer, with wastewater from the Groton Center Sewer District conveyed to Pepperell. Effective 2023, the Groton Sewer Commission has implemented a policy of "no expansion of Districts" to its wastewater system due to limited capacity.³⁸

Electricity

The Groton Electric Light Department (GELD) provides electrical power services to the Town. GELD maintains a diverse power portfolio and is more than 68% carbon-free and 24% renewable.³⁹ GELD is publicly owned by Town residents, with profits reinvested into system improvements and lower rates.⁴⁰ Overhead wires make up the bulk of GELD's transmission infrastructure.

Broadband and Internet Access

Broadband and internet access is provided privately, with most properties utilizing Verizon or Spectrum services.⁴¹

4. Natural Resource Areas

Geology, Topography, and Soils

Groton's landscape was formed by glacial movement, leaving it with a surface pockmarked by drumlins, kettle hole ponds, braided streams, and other typical glacial landforms. Soils in floodplain areas around the Squannacook and Nashua Rivers are sandy loam and moderately to excessively drained. Glacial outwash soils and shallow bedrock dominate the eastern half of Groton, with areas of glacial outwash generally being excessively drained. In western Groton, shallow bedrock and moraine soils predominate, with varied drainage characteristics.

³⁸ Town of Groton, "Groton Sewer Commission," accessed February 1, 2026, <https://www.grotonma.gov/government/boards-and-committees/groton-sewer-commission/>.

³⁹ *Groton Master Plan* (2025), 124.

⁴⁰ *Ibid.*

⁴¹ *Ibid.*, 125.

Groton's topography is varied, with a hillier eastern side and a flatter western side. Groton is unusual in that it is home to a "swarm" of drumlins (i.e., a large assemblage of drumlins, which are elongated hills formed by glacial movement).⁴² These drumlins are oriented generally north-south, with steeper slopes on the southern edge, and are clustered in a band that also runs north-south across central Groton.

Water Resources

Groton is within the Nashua River and Merrimack River watersheds and is home to a variety of surface water features. The Squannacook River forms the Town's western boundary, while the Nashua River forms part of the northern boundary before meandering southward through the community. There are ten formally named brooks and numerous ponds, including five Great Ponds (defined as a pond or lake that contained more than 10 acres in its natural state).⁴³ The Great Ponds are Baddacook Pond, Cow Pond (also known as Whitney Pond), Lost Lake/Knops Pond, Martins Pond, and Massapoag Pond. Approximately 12% of the town is comprised of wetland areas, including Reedy Meadow in north-central Groton and resources in eastern Groton.⁴⁴

Vegetation

Groton has a diversity of habitat types, and much of the community is wooded. Habitat categories include upland forest, forested wetland, scrub-shrub wetland, emergent wetland, and aquatic habitats. Four large forests are partially and/or primarily located in Groton: Groton Town Forest (505 acres), J. Harry Rich State Forest (506 acres), Rocky Hill Wildlife Sanctuary (441 acres), and Wharton Plantation (717 acres).

⁴² Community Opportunities Group, Inc., *Town of Groton 2019 – 2026 Open Space and Recreation Plan* (2019), 39.

⁴³ MA Office of Coastal Zone Management, "Chapter 91, The Massachusetts Public Waterfront Act," accessed February 1, 2026, <https://www.mass.gov/guides/chapter-91-the-massachusetts-public-waterfront-act>.

⁴⁴ *Groton Master Plan* (2025), 44.

SECTION 4. HAZARD PROFILES & RISK ASSESSMENT

Identifying potential natural hazards is the first step in any effort to reduce overall vulnerability to harm. Understanding the Town's exposure and vulnerability to different hazards, and thus, overall hazard risk, allows decisionmakers to better understand how which hazards merit special attention, what actions might be taken to reduce the impacts of those hazards, and what resources are likely to be needed to facilitate mitigation.



This section is intended to be consistent with the Commonwealth of Massachusetts' hazard mitigation planning efforts, including the 2022 *Massachusetts Climate Change Assessment* and the 2023 *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*, known as the *ResilientMass Plan* (and hereafter referred to as such). Parts A and B of this section provide an overview of hazard mitigation and climate adaptation planning across the Commonwealth and the Central Massachusetts region, respectively. Part C summarizes the Town's hazard risk assessment and identifies top priority hazards, while Part D presents detailed hazard profiles. Finally, Part E provides an overall summary of the Town's vulnerability to the natural hazards discussed herein.

A. Massachusetts State Hazard Mitigation & Climate Adaptation

The 2023 *ResilientMass Plan* examined natural hazards that have the potential to affect the Commonwealth. Like the previous 2018 iteration of the plan, the 2023 *ResilientMass Plan* continues to integrate climate adaptation and hazard mitigation strategies. For its 2023 *ResilientMass Plan*, the Commonwealth assessed 14 natural hazards, which were organized based on their primary climate change interactions (Table 4-1). The primary climate change interaction is that interaction anticipated to have the largest effect on the severity and frequency of each assessed hazard, though there may also be secondary climate change interactions that also shape how natural hazards affect communities.

The Commonwealth of Massachusetts defines climate change in the *ResilientMass Plan* as:

*A statistically significant variation in climate data or patterns over a given period of time, due to either natural climate variability or human activity.*⁴⁵

Understanding how and when current and future impacts of climate change will alter hazard risk is essential as decisionmakers evaluate different hazard mitigation choices over time.

⁴⁵ Eastern Research Group, Inc. (ERG) et al., [ResilientMass Plan: 2023 MA State Hazard Mitigation and Climate Adaptation Plan](#) (2023), 1.2.

Table 4-1. Climate Change and Natural Hazard Taxonomy

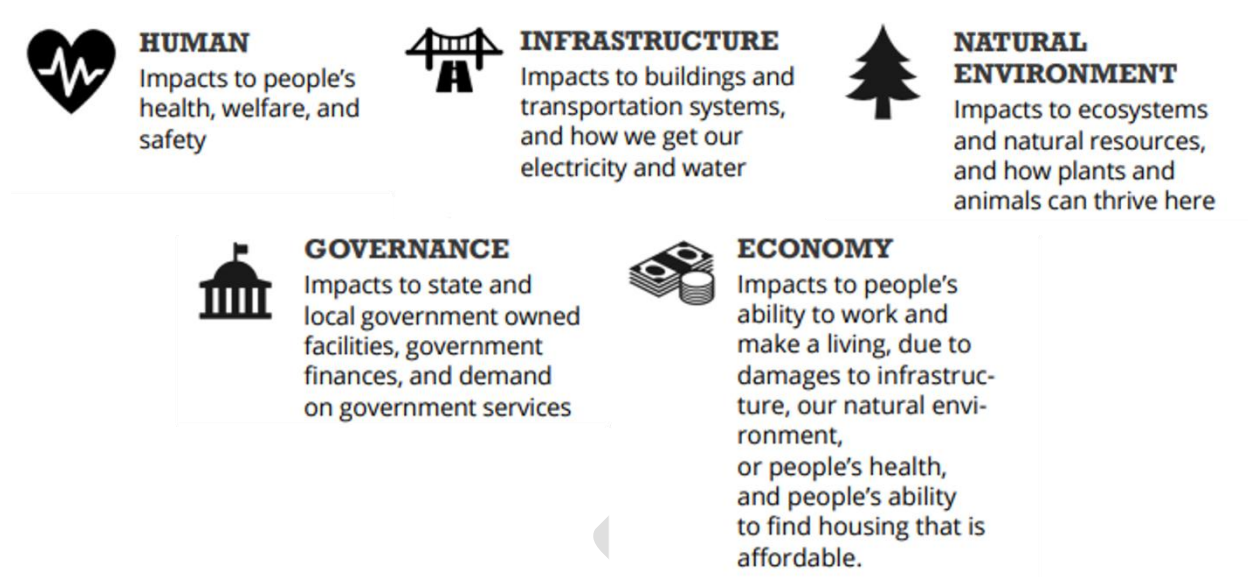
Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions
Changes in precipitation	Inland flooding	• Extreme weather
	Drought	• Rising temperatures • Extreme weather
	Landslide	• Rising temperatures • Extreme weather
Sea level rise	Coastal flooding	• Extreme weather
	Coastal erosion	• Changes in precipitation • Extreme weather
	Tsunami	• Rising temperatures
Rising temperatures	Average/extreme temperatures	• N/A
	Wildfires	• Changes in precipitation
	Invasive species	• Changes in precipitation • Extreme weather
Extreme weather	Hurricanes/tropical storms	• Rising temperatures • Changes in precipitation
	Severe winter storm/Nor'easter	• Rising temperatures • Changes in precipitation
	Tornadoes	• Rising temperatures • Changes in precipitation
	Other severe weather (including strong wind and extreme precipitation)	• Rising temperatures • Changes in precipitation
Non-climate influenced hazards	Earthquake	• N/A

Source: Adapted from *ResilientMass Plan* (2023).

Note that not all hazards included in the 2023 *ResilientMass Plan* apply to the Town of Groton. Given Groton's inland location, coastal hazards are unlikely to directly affect the Town.

The 2023 *ResilientMass Plan* also includes an updated risk assessment that evaluates the exposure and vulnerability of state assets, human populations, lifelines, critical facilities, economic activity, natural resources, and other infrastructure or resources to each hazard across the five sectors defined in the 2022 *Massachusetts Climate Change Assessment* (Figure 4-1).

Figure 4-1. Massachusetts Climate Change Assessment Sectors



Source: Adapted from *Massachusetts Climate Change Assessment: Volume I – Executive Summary* (2022)

B. Climate Change in Central Massachusetts

The Town of Groton is within the Central Massachusetts climate assessment region, an area that is particularly vulnerable to increasing temperatures and more extreme precipitation patterns and resulting drought and flooding events. Table 4-2, adapted from the *Massachusetts Climate Change Assessment*, provides a snapshot of the climate outlook for this region through the end of the century.

Table 4-2. Regional Climate Outlook: Central Massachusetts

2030	2050	2070	2090
NEAR TERM The summer mean temperature could increase by 3.6°F from the historical period (1950 – 2013), worsening stress on electric transmission and utility distribution infrastructure.	MID-CENTURY The 1% annual chance river flood could be two times more likely to occur, increasing Blackstone River and other river flood risk.	MID-LATE CENTURY There could be 38 more days above 90°F, contributing to extreme heat health impacts.	END OF CENTURY The historical 10% annual chance daily rainfall event (2.8 to 4 inches) could occur five times more frequently.

Source: *Massachusetts Climate Change Assessment: Volume III – Regional Reports* (2022).

The *Massachusetts Climate Change Assessment* also identifies the top two climate change impacts to each sector, adapted in Table 4-3. The Commonwealth analyzed potential impacts based on the following three factors, whose scores were then aggregated to rank the most urgent impacts by sector:

1. **Magnitude of consequence:** How large of a climate effect is expected from this impact?
2. **Disproportionality of exposure:** Will populations living in environmental justice areas be disproportionately affected more than the rest of the population?

3. **Need for effective adaptation:** Is enough currently being done to adapt to this impact, or are there gaps in effective adaptation actions?

Table 4-3. Most Urgent Impacts by Sector: Central Massachusetts

Sector	Urgent Impacts
<i>Human</i>	Reduction in food safety and security due to production and supply chain issues, as well as spoilage during power outages.
	Health and cognitive effects from extreme heat, including premature death and learning loss.
<i>Infrastructure</i>	Damage to electric transmission and utility distribution infrastructure associated with heat stress and extreme storms.
	Loss of urban tree cover due to heat, drought, and increased pests.
<i>Natural Environment</i>	Freshwater ecosystem degradation due to warming waters, drought, and increased runoff.
	Forest health degradation from warming temperatures, changing precipitation, extreme storms, and increasing pest occurrence.
<i>Governance</i>	Increase in costs of responding to climate migration , including planning for abrupt increases in local populations.
	Increases in demand for state and municipal government services , including emergency response, food assistance, and state-sponsored health care.
<i>Economy</i>	Reduced ability to work , particularly for outdoor workers during extreme heat, as well as commute delays due to damaged road infrastructure.
	Decrease in agricultural productivity as crop yields are impacted by precipitation patterns, extreme weather, pests, and other climate factors.

Source: *Massachusetts Climate Change Assessment: Volume III – Regional Reports* (2022).

C. Hazard Identification

The federal regulation at 44 Code of Federal Regulations (CFR) 201.6(c)(2)(i) requires that communities include a description of all natural hazards that may affect the jurisdiction. Local communities are required to profile all hazards from the state hazard mitigation plan (see Table 4-1), unless a hazard is not applicable. As such, while the *ResilientMass Plan* profiled coastal flooding, coastal erosion, and tsunamis, these natural hazards are not included in the Town’s 2026 HMP. As stated previously, Groton is an inland community approximately 30 miles away from the coast and is thus not at risk of coastal hazards. It would not be economical to devote resources to researching the impacts of coastal hazards on the Town. All other hazards addressed in the *ResilientMass Plan* are incorporated in the Town’s 2026 HMP. See Table 4-4 for a listing of hazards evaluated in the 2026 HMP.

The LHMC evaluated the natural hazards included in this HMP and collectively determined each hazard’s likely extent, frequency and severity to develop a Hazard Index. To do so, the LHMC considered impacts from past hazard events and data from the 2022 *Massachusetts Climate Change Assessment* and 2023 *ResilientMass Plan*. Additional research and assessment, including a review of the National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Environmental Information (NCEI) Severe Events Database (a catalog of past natural hazard event information, including severity and damages), informed this discussion. The scoring methodology utilizes language from the FEMA State and Local Mitigation Planning How-to-Guide Series and is described below:

Location / Land Area Affected Scoring

1. **Small/Local (1):** Less than 10% of the municipality is affected.
2. **Medium/Regional (2):** Between 10 to 50% of the municipality is affected.
3. **Large/Multiple Communities (3):** More than 50% of the municipality is affected.

Frequency Scoring

1. **Unlikely (1):** Occurs less frequently than once in 100 years (less than 1% annual chance occurrence)
2. **Possible (2):** Occurs at least once in the next 100 years (1 to 10% annual chance occurrence)
3. **Likely (3):** Occurs at least once in the next 10 years (10 to 100% annual chance occurrence)
4. **Highly Likely (4):** Occurs at least once in the next year (near 100% annual chance occurrence)

Severity Scoring

1. **Negligible (1):** Injuries and/or illness are treatable with first aid; minor quality of life loss; shutdown of critical facilities and services for 24 hours or less; and less than 10% of property is severely damaged.
2. **Limited (2):** Injuries and/or illness do not result in permanent disability; complete shutdown of critical facilities and services for more than a week; and between 10 to 25% of property is severely damaged.
3. **Critical (3):** Injuries and/or illness result in permanent disability; complete shutdown of critical facilities and services for at least two weeks; and between 25 to 50% of property is severely damaged.
4. **Catastrophic (4):** Multiple deaths; complete shutdown of critical facilities and services for a month or more; and more than 50% of property is severely damaged.

Higher Hazard Index values, represented by the summed Frequency and Severity scores, indicate those natural hazards deemed to have the greatest impact on Groton. Table 4-4 presents the Hazard Index.

Table 4-4. Hazards Index

Natural Hazard	Location / Land Area Affected	Frequency	Severity	Hazard Index (Frequency + Severity) 1-3 = lower concern 4-5 = medium concern 6-7 = highest concern
<i>Flood Related</i>				
Riverine and Flash Flooding	1	4	2	6
Heavy Rain and Inland/Urban (Stormwater Flooding)	2	4	2	6
Dam Failure	1	1	4	5
Beaver Activity	2	4	3	7
<i>Wind Related</i>				
Hurricanes and Tropical Storms	3	4	3	7
Tornadoes	1	1	2	3
Thunderstorms, Lightning, and Microbursts	3	4	3	7
High Winds	3	4	2	6

Natural Hazard	Location / Land Area Affected	Frequency	Severity	Hazard Index (Frequency + Severity) 1-3 = lower concern 4-5 = medium concern 6-7 = highest concern
Hail	2	4	1	5
<i>Winter Related</i>				
Blizzards, Heavy Snow, Winter Weather, and Nor'easters	3	4	2	6
Ice Storms	3	3	2	5
Extreme Cold	3	4	1	5
<i>Geologic Related</i>				
Earthquakes	1	1	1	3
Landslides	1	1	1	3
<i>All Other Hazards</i>				
Brush Fire and Wildfire	1	4	2	6
Extreme Heat	3	4	1	5
Drought	3	4	3	7
Changes in Groundwater	3	3	2	5
Invasive Species (multiple)	3	4	3	7

D. Hazard Profiles

Each hazard profile in this section includes information on vulnerable areas, documentation of historical events, related climate change projections, and an overview of people and property at risk. Feedback from the LHMC also helped provide local accounts related to each hazard where data may be scarce or unavailable. Where appropriate, a Geographic Information System (GIS)-based estimate of potential financial impacts from hazard damage is presented.

1. Flood-Related Hazards

Flooding can be caused by various weather events including hurricanes, extreme precipitation, thunderstorms, nor'easters, and winter storms. Flooding can include riverine and flash flooding (topping the banks of streams, rivers, ponds) and heavy rain and stormwater flooding (rainwater that does not properly infiltrate into the ground). Groton has significant topographic variations including lowland areas around wetlands, forests in the east, and flat terrain and floodplain deposits in the west separated by a range of barrier hills. The elevation varies from mean sea level to 500 feet in the hills. Topographical variations and the prevalence of impervious surfaces both contribute to runoff and flooding in Groton.

FEMA delineates special flood hazard areas to show areas expected to experience flooding during the 1% annual chance flood (the flood that has a 1% chance of occurring each year). FEMA also delineates areas expected to experience flooding during the 0.2% annual chance flood (the flood that has a 0.2% chance of occurring each year). See Maps 1A and 1B (Appendix D). The special flood hazard area is used by federal agencies and most states as a regulatory area of jurisdiction to administer floodplain management programs. It is also used by FEMA's National Flood Insurance Program (NFIP) as the basis for flood insurance requirements for properties holding a federally backed mortgage. FEMA recently revised its flood mapping for Middlesex County, including the Town of Groton, with revisions effective in July 2025. The Town also maintains information on repetitive flood loss sites (including those NFIP-insured

structures that are considered “repetitive loss properties”) and locally identified flood prone areas. These areas are considered most vulnerable to flooding, though flooding may also occur elsewhere. The LHMC used information from FEMA’s flood mapping (the Flood Insurance Study (FIS) and associated Flood Insurance Rate Maps (FIRMs)) and local knowledge of flood prone areas to assess flood risks in Groton.

Riverine and Flash Flooding

Riverine and flash flooding occurs when precipitation events exceed the natural drainage capacity of surface waterbodies within a watershed, causing them to overflow their banks and inundate surrounding areas. While flooding may not occur until an extended period of precipitation falls, other factors such as topography, vegetation, precipitation intensity, soil saturation, impervious surfaces, and frozen ground conditions can affect the speed at which flooding occurs. Flash flooding refers specifically to flooding “that begins within six hours, and often three hours, of the heavy rainfall.”⁴⁶ While this HMP presents riverine and flash flooding separately from heavy rain and stormwater flooding, flooding is influenced by land use patterns across the entire watershed. Increasing development and impervious areas are a major contributing factor to flooding across many Massachusetts communities, and land use patterns in Groton affect the likelihood of riverine and flash flooding occurring.

The National Weather Service (NWS) Northeast River Forecast Center provides forecasts and classifies flood events based on expected or experienced impacts:⁴⁷

- **Minor Flooding:** Flooding may cause road closures and inundation of recreational areas and farmland.
- **Moderate Flooding:** Flooding may inundate land with buildings.
- **Major Flooding:** Flooding is widespread and threatens human safety.

The NWS also issues the following advisories to alert people to riverine and flash flooding hazards:⁴⁸

- **Flash Flood Watch or Flood Watch:** Flash flooding or flooding is possible within the designated watch area. People are advised to be alert to the potential hazard.
- **Flash Flood Warning or Flood Warning:** Flash flooding or flooding has been reported or is imminent. People are advised to take immediate action to move to a safer location.

History and Location

The average annual precipitation in Merrimack and Nashua watersheds (where Groton is located) based on observed values from 1950-2013 is 40.9 and 45 inches, respectively. In the same baseline period, the average maximum precipitation event had 1.7 and 1.9 inches of rainfall, and there was an average of four and five days per year with precipitation events of more than 1 inch of rainfall for the Merrimack and Nashua watersheds, respectively.⁴⁹ In addition to precipitation-driven changes in water levels, higher water levels are typical in spring due to seasonal snowmelt and ground thawing. This is the period when flood hazards are normally expected, while flood hazards are considered less likely in summer due to high

⁴⁶ NOAA National Weather Service, “Flash Flooding Definition,” accessed February 22, 2026, <https://www.weather.gov/phi/FlashFloodingDefinition>.

⁴⁷ ERG, *ResilientMass Plan: 2023 MA State Hazard Mitigation and Climate Adaptation Plan Appendices* (2023), 5.8-3.

⁴⁸ NOAA National Severe Storms Laboratory (NSSL), “Severe Weather 101 – Floods,” accessed February 22, 2026, <https://www.nssl.noaa.gov/education/svrwx101/floods/>.

⁴⁹ MA Executive Office of Energy and Environmental Affairs, “ResilientMass Maps and Data Center,” accessed February 27, 2026, <https://resilientma-mapcenter-mass-eoeaa.hub.arcgis.com/>.

evaporation and plant transpiration. However, severe precipitation events may create flooding conditions at any time of year.

Flooding may occur at any of Groton's many waterbodies. Groton is within the Nashua River and Merrimack River subwatersheds (within the larger Merrimack River watershed). In addition to the larger Nashua and Squannacook Rivers, Groton has several smaller brooks and several ponds located entirely or partially within its municipal boundaries:

- **Brooks:** Baddacook Brook, Cow Pond Brook, Flat Pond Brook, Gay Brook, James Brook, Martins Pond Brook, Nod Brook, Reedy Meadow Brook, Tuity Brook, Unkety Brook, and Wrangling Brook
- **Ponds:** Lost Lake/Knops Pond, Whitney Pond (Cow Pond), Baddacook Pond, Martins Pond, Duck Pond, Massapoag Pond (shared with Dunstable and Tyngsborough), Long Pond (shared with Ayer)

Based on FEMA flood mapping, the Town's largest floodplains are around the Nashua River. However, floodplains are present across the community, particularly in eastern Groton. From an emergency response and access perspective, many of Groton's major roadways (Routes 40, 111, and 225) are crossed by floodplains due to their proximity to the Nashua River, Squannacook River, Baddacook Brook, Cow Pond Brook, and Wandering Brook.

No flash flood or flood events were recorded in Groton in the NOAA NCEI Severe Storm Events database for the period between 2019 – 2025. However, flooding events are not infrequent in Groton, including seasonal flooding along the Nashua River caused by the spring snowmelt and flooding caused by precipitation events around various surface water and wetland resources (e.g., Martins Pond and Baddacook Pond). Not all flooding impacts people or property, and the Town's network of protected open space helps provide beneficial flood storage.

Across Middlesex County, there have been 21 flash flood events (across eight days) that caused \$400,200 in property damage and 54 flood events (across 22 days) that caused \$18,800 in property damage since 2019.⁵⁰ While significant riverine or flash flooding has not occurred in Groton since 2019, the following events remain as relatively recent examples:

- **April 2007, Nashua River and Squannacook River:** The 2007 Patriots' Day Nor'easter brought about three to five inches of rainfall which, combined with wet spring season conditions, resulted in widespread riverine flooding. A U.S. Geological Survey (USGS) stream gage on the Squannacook River near West Groton indicated that the river was above flood stage for nearly a day, peaking about 1.5 feet above flood stage.⁵¹ In East Pepperell, upstream along the Nashua River, moderate flooding was observed, with the river peaking about 3.1 feet above flood stage. Flooding caused an estimated \$25,000 in property damage.⁵² Flooding in Groton damaged local roads.
- **March 2010, Squannacook River:** A spring storm brought three to six inches of rainfall to the region, resulting in widespread major flooding across eastern Massachusetts and Rhode Island. A Massachusetts state of emergency and federal disaster declaration were issued for seven Massachusetts County, including Middlesex County. Flooding caused an estimated \$26.43 million

⁵⁰ NOAA National Centers for Environmental Information (NCEI), "Storm Events Database," accessed February 22, 2026, <https://www.ncei.noaa.gov/stormevents/>.

⁵¹ USGS, *Characteristics of the April 2007 Flood at 10 Streamflow-Gaging Stations in Massachusetts* (2009), 1-2 and 20-25.

⁵² NOAA NCEI, "Storm Events Database, Event Details, 2007-04-16," accessed March 15, 2026, <https://www.ncei.noaa.gov/stormevents/eventdetails.jsp?id=27770>.

in property damage.⁵³ A USGS stream gage on the Squannacook River near West Groton indicated that the river peaked about 1.03 feet above flood stage.⁵⁴ Flooding closed Routes 119 and 225, resulting in access to West Groton being cut off.

Probability of Future Occurrence

Riverine and flash flooding is of high concern to the Town, especially given its high frequency of occurrence. While the Town has not experienced major flooding in recent years, minor flooding frequently occurs and causes road closures.

Heavy Rain and Stormwater Flooding (Inland and Urban Flooding)

Heavy precipitation events can cause flooding even in areas away from surface waterbodies. Known as stormwater flooding, this type of flooding occurs when the amount of precipitation (i.e., stormwater) falling exceeds the capacity of natural and human drainage systems. While stormwater flooding is influenced by natural conditions (e.g., topography, soil drainage class), human development patterns and changes in land use have reduced natural pervious areas and increased impervious surfaces. Additionally, many stormwater management systems in Massachusetts are aging or designed with now outdated precipitation data. Commonly, Massachusetts municipalities experience stormwater flooding associated with undersized culverts and pipes, blockages, and generally high rates of impervious surfaces across the landscape. When the stormwater management system becomes overwhelmed and is unable to convey stormwater effectively, flooding may inundate roadways and properties.

The NWS may issue an Urban and Small Stream Advisory when “flooding of small streams, streets, and low-lying areas, such as railroad underpasses and urban storm drains” occurs to alert people to the hazard.⁵⁵

History and Location

No heavy rain events were recorded in Groton in the NOAA NCEI Severe Storm Events database for the period between 2019-2025, though the Groton LHMC reports that stormwater flooding occurs frequently during heavy precipitation events. Some low-lying areas are prone to flooding even during less intense precipitation events. Stormwater flooding can occur anywhere in Groton, and it is not limited to areas in proximity to surface waterbodies. The Town has identified the following locations that are most prone to stormwater flooding caused by heavy precipitation events and/or required recent interventions to mitigate stormwater flooding:

- Route 40 (Lowell Road) crossing at Whitney (Cow) Pond
- Broadmeadow Road
- Station Avenue

⁵³ NOAA NCEI, “Storm Events Database, Event Details, 2010-03-14,” accessed March 15, 2026, <https://www.ncei.noaa.gov/stormevents/eventdetails.jsp?id=217617>.

⁵⁴ USGS, “Monitoring Location: Squannacook River Near West Groton, MA – USGS-01096000,” accessed March 15, 2026, <https://waterdata.usgs.gov/monitoring-location/USGS-01096000/#dataTypeId=continuous-00065-0&period=P7D&showFieldMeasurements=true>.

⁵⁵ NOAA NSSL, “Severe Weather 101 – Floods,” accessed February 22, 2026, <https://www.nssl.noaa.gov/education/svrwx101/floods/>.

Probability of Future Occurrence

Per the Groton LHMC, heavy rain and stormwater flooding is a high concern hazard to the Town, especially given its high frequency of occurrence. While the Town is aware of areas prone to stormwater flooding, mitigation and response are an ongoing process. As the Town continuously replaces parts of its stormwater system, it upgrades infrastructure to reflect current precipitation trends.

Dam Failure

Dams are artificial barriers that impound water (or other liquids) for storage and water control purposes. Dam failure is defined as “an uncontrolled release of impounded water from a dam.”⁵⁶ In Massachusetts, dam failures are a concern given the number of dams across the landscape and their age, as many date to the 19th century. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) is responsible for monitoring the condition of dams in the Commonwealth.

This HMP update includes information on high hazard potential dams (HHPD) required for eligibility for FEMA’s Rehabilitation of HHPD Grand Program.

Lost Lake Dam and Squannacook River Dam are the only HHPDs within Groton. Supplemental information on these dams is included in Appendix E.

Dams can fail due to overtopping caused by floods that exceed the capacity of the dam, deliberate acts of sabotage, structural failure of materials used in dam construction, movement and/or failure of the foundation supporting the dam, settlement and cracking of concrete or embankment dams, piping and internal erosion of soil in embankment dams, and inadequate maintenance and upkeep. Many dam failures in the United States have been secondary results of other hazards, including earthquakes, landslides, extreme storms, and massive snowmelt.

As an example of cascading impacts of natural hazard events on dams, consider that wildfires often occur during periods of drought and high temperatures when the environment is at its driest. Wildfires can cause losses of vegetative cover and changes in soil composition that would otherwise help mitigate impacts from extreme precipitation events or the likelihood of landslides. A subsequent heavy precipitation event can trigger flooding, erosion, and landslides in the altered landscape, which can affect typical conditions at dams, increasing overtopping and breaching potential, especially in dams with a history of poor maintenance.

Dam failure events have the potential for a range of impacts on people and the built environment, including the potential for injury and loss of life, short- and long-term displacement, emotional and psychological trauma, and financial costs associated with damage, cleanup, and repair of structures. Dam failure may also affect a community’s critical facilities and infrastructure, which may cause short- and long-term interruptions of normal operations (e.g., to water supply, wastewater conveyance and treatment, communications) and transportation disruptions. Depending on the area inundated, there is also potential for the release and spread of pollutants and hazardous materials. Dam failure events can also significantly affect the natural environment, including by causing direct damage to habitat, displacing wildlife, introducing pollutants and hazardous materials, and disrupting natural ecological processes.

⁵⁶ 302 Code of Massachusetts Regulations 10.00, Dam Safety.

While impacts on all dams are a concern, particular attention should be paid to high hazard potential dams, or dams where failure or mis-operation will probably cause loss of life, given the potential consequence of a breach or failure.

While dam failures are rare, expected impacts can be severe depending on the dam and include injury and potential loss of life, as well as significant disruption and damage to infrastructure. Dams are classified based on size and by hazard impacts, or the potential for harm should a failure occur, including the potential for loss of human life. Based on size, dams that impound less than 15 acre-feet of water and are under six feet tall are non-jurisdictional, with all other dams being jurisdictional. Non-jurisdictional dams are not typically classified by hazard impacts. Massachusetts uses the following dam hazard classifications for jurisdictional dams:⁵⁷

- **Low Hazard Dam:** A dam located where structural failure may cause minimal property damage and loss of life is not expected.
- **Significant Hazard Dam:** A dam located where structural failure may cause loss of life and damage to homes, industrial and commercial facilities, secondary highways or railroads or interruption of use of service of relatively important facilities.
- **High Hazard Dam:** A dam located where structural failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, essential public utilities, main highways or railroads.

As of February 2017, Massachusetts requires all dams classified as high hazard potential or significant hazard potential to have an Emergency Action Plan (EAP). EAPs are intended to identify potential emergency conditions and correction actions that should be taken by dam owners to mitigate the potential for dam failure and subsequent loss of life and other impacts.⁵⁸ EAPs must be updated annually by the dam owner and submitted to ODS and MEMA; EAPs should also be retained by the dam owner and the Town in which the dam is located. Additionally, dam owners must ensure a Phase I Formal Dam Safety Inspection is conducted by a qualified engineer every two years for high hazard dams, every five years for significant hazard dams, and every 10 years for low hazard dams. The findings of the inspection are documented in a Phase I Formal Dam Inspection Report (hereafter referred to as “Phase I Inspection Report”). If poor and unsafe conditions are observed, a follow-up Phase II Inspection and Investigation is required (along with an accompanying “Phase II Inspection Report”) to provide more detailed study and recommendations for corrective action.⁵⁹

There are five dams located in Groton, listed in Table 4-5. A description of each jurisdictional dam in Groton (four total), as well as a summary of materials reviewed and identified corrective actions follows. All referenced Phase I Inspections and EAPs in this section were obtained via a public records request to ODS. EAPs for Lost Lake Dam and Squannacook River Dam were also provided by the Town of Groton.

⁵⁷ MA General Laws, Chapter 21 § 65, Emergency action plans for high and significant hazard dams; inspection schedule; review of hazard classification.

⁵⁸ FEMA, *FEMA 64: Federal Guidelines for Dam Safety* (2013), I-1.

⁵⁹ MA Department of Conservation & Recreation, “Dam Safety Inspection Requirements,” accessed February 22, 2026, <https://www.mass.gov/info-details/dam-safety-inspection-requirements>.

Table 4-5. Dams Located in Groton

NID #*	Name	Location	Ownership	Regulatory Authority	Hazard Class
MA00808	Lost Lake Dam	Lost Lake/Knops Pond	Town of Groton, Highway Department	ODS	High
MA00442	Squannacook River Dam	Squannacook River	Co-owned: Town of Groton, Board of Selectmen and Private	ODS	High
MA00443	Hollingsworth & Vose Company Dam	Squannacook River	Private	ODS	Low
MA01547	Woods Mill Pond Dam	Woods Mill Pond/Baddacook Brook	Private	ODS	Low
MA03537	Groton School Dam	Tributary to James Brook	Private	Non-Jurisdictional	N/A

Source: MassGIS (Bureau of Geographic Information), [Dams](#).

*"NID #" refers to each dam's unique National Inventory of Dams identification number.

A description of the Groton School Dam is also included in this section—while non-jurisdictional, the dam has experienced a recent breach. Finally, a brief overview of information considered to review the hazard risk of dam failures outside of Groton that may still affect the community is also included in this section.

Lost Lake Dam (NID # MA00808)

Lost Lake Dam is owned by the Town of Groton, Highway Department. The dam impounds Lost Lake, which is used primarily for recreational purposes. The dam consists of an approximately 100-foot-long earthen embankment, with a stone and concrete wall on its upstream side. The crest of the dam is paved concrete and asphalt. The dam spillway is comprised of 3-foot-wide stoplogs in the center of the dam.⁶⁰

Type: Concrete gravity with stone wall

Height: 10 feet

Last Inspection: May 2023

EAP: April 2023

Tributary: Martin's Pond Brook

Storage Capacity: 1,960 acre-feet

Hazard Classification: High

O&M Manual: April 1990

Available plans reviewed related to Lost Lake Dam are as follows:

- *Lost Lake Dam Phase I Inspection/Evaluation* (May 5, 2023), prepared by Haley & Aldrich, Inc.
- *Emergency Action Plan, Lost Lake Dam* (April 14, 2023), prepared by Dillis & Roy Civil Design Group, Inc.

During the May 2023 Phase I Inspection, Haley & Aldrich, Inc. judged the dam to be in satisfactory condition, meaning minor operational and maintenance deficiencies were observed. The following deficiencies were documented in the Phase I Inspection report:⁶¹

- Isolated cracking on the downstream side of the concrete headwall, some up to ¼- to ½-inch in width.
- Concrete is susceptible to flaking and additional cracking if left unrepaired.

⁶⁰ Haley & Aldrich, Inc., *Lost Lake Dam Phase I Inspection/Evaluation* (2023), 2.

⁶¹ Ibid, i.

- An approximately 3-foot-deep void between the asphalt crest and right concrete headwall that should be filled to help mitigate the growth of the void and excessive dam movement.
- Excessive vegetation.

The following recommendations were noted in the Phase I Inspection report:⁶²

- Studies and Analysis
 - The hydrologic and hydraulic study completed in 1900 should be updated and include the updated design storm in accordance with current Dam Safety Regulations. The 1900 study used the 500-year event as the design storm. Current regulations require the 1/2 Probable Maximum Flood (PMF) to be used as the design storm.
 - The dam is classified as a large size, high hazard dam, and the regulations require an Emergency Action Plan (EAP) be prepared. The existing EAP is outdated.
- Yearly Recommendations
 - Maintenance of the dam is required and should include cutting/ mowing of vegetation, checking for and repairing cracks, checking for erosion and wet areas and monitoring any seepage.
- Recommendations, Maintenance, and Minor Repairs
 - Continue to clear woody growth from the dam and establish grass vegetation less than 12 inches in height. The vegetation should be maintained at less than 12 inches in height.
 - The cracks in the downstream side of the concrete wall and at the concrete headwall should be sealed and the wall should be monitored for additional cracks.
 - The void between the right spillway headwall and the asphalt crest should be filled with a lean concrete to help prevent additional loss of ground and to mitigate the effects of water infiltration within the dam. Other ruts and depressions along the asphalt crest should also be repaired.
 - Backfill a small area along the right abutment where signs of erosion were noted.
 - The stoplogs should be installed as designed so that they properly function in a flood event.
- Remedial Measures
 - If a hydrologic and hydraulic study is completed and indicates that the spillway is undersized for the design flow and the dam will be overtopped, additional capacity should be considered.

The Phase I Inspection report states that there are no feasible alternatives (to the recommendations noted above) for this dam.⁶³

The most recent EAP was completed in April 2023 by Dillis & Roy Civil Design Group, Inc. Related to the downstream flood path, the EAP notes that “there are about 15 dwellings that might be threatened by flooding that would result from a failure of the dam or a large operational release” in the 2.5 miles of waterways downstream of Lost Lake Dam.⁶⁴ The EAP uses the extent of the FEMA 0.2% annual chance floodplain to represent the areas of inundation in the downstream flood path. Topography and the

⁶² *Lost Lake Dam Phase I Inspection/Evaluation* (2023), 9-10.

⁶³ *Ibid*, 10.

⁶⁴ Dillis & Roy Civil Design Group, Inc., *Emergency Action Plan: Lost Lake Dam, Groton, Massachusetts* (2023), 6.

presence of wetland and surface waterbodies limit and dampen the effect of a dam failure here. Historically, development has occurred in higher elevation areas in this area, also reducing the number of properties in the downstream flood path. There are no identified critical facilities or vulnerable populations within the downstream flood path.⁶⁵

The EAP notes that a limited breach of the dam would likely fill the impoundment between Lost Lake Drive and the downstream face of the dam, though overtopping of Lost Lake Drive would be unlikely. However, a catastrophic failure would overtop Lost Lake Drive. Flow in the unnamed stream between Lost Lake Drive and Whitney Pond would overtop its banks and is likely to result in flooding to dwellings on the east side of Valley Pond. The expected downstream flood path continues into Whitney Pond, which is expected to raise pool elevations 6.5 feet above normal elevation, inundating dwellings at Valley Road and potentially impacting dwellings at Whitney Pond Road and Lowell Road. After crossing Hoyts Wharf Road, the downstream flood path continues along Cow Pond Brook, passing through a culvert under an abandoned railroad bed at the municipal boundary before reaching Upper Massapoag Pond in Tyngsborough. The EAP does not expect that a failure at Lost Lake Dam would cause a subsequent failure at the Upper Massapoag Dam impoundment (Cow Pond Brook Dam) in Tyngsborough.⁶⁶ There are no other downstream dams identified within the inundation area (in either Groton or in other communities).

Streets inundated/impacted in order of anticipated flood arrival time:

- Lost Lake Drive
- Valley Road
- Whitney Pond Road
- Lowell Road
- Hoyts Wharf Road
- Culvert at abandoned railroad bed

Excerpts from the 2023 EAP to support the findings identified above, representing the best available data, are included in Appendix B and comprise the following information:

- Downstream Residents Requiring Emergency Notification
- Downstream Flood Path and Flow Capacities
- Inundation Map

A mitigation action has been included in Section 6 as Action 5, which directs the Town to complete an updated Phase I Inspection and implement recommended actions for improvement (see earlier in this section for recommendations identified in the 2023 Phase I Inspection), as well as to update the EAP on an annual basis. Further, Action 5 also states that the Town reduce risk to and from this high hazard potential dam by evaluating opportunities to rehabilitate or remove the dam, adopt and enforce land use ordinances in the inundation zone, elevate structures in the inundation zone, and add flood protection (e.g., berms, floodwalls, or floodproofing) in the inundation zone.

[Squannacook River Dam \(NID # MA00442\)](#)

Squannacook River Dam impounds the Squannacook River, which is the municipal boundary between the Towns of Groton and Shirley. The Town of Groton, Board of Selectmen owns the section of the dam located in Groton. The section located in Shirley is owned by a non-resident private owner, though it is held under tax title by the Town of Shirley. The dam is an approximately 150-foot-long concrete structure

⁶⁵ See Tables A-1 and A-2 and Maps 6A and 6b in Appendix D for locations of critical facilities and vulnerable populations.

⁶⁶ *Emergency Action Plan: Lost Lake Dam, Groton, Massachusetts* (2023), 6-7.

and includes a concrete spillway.⁶⁷ Squannacook River Dam is approximately one mile downstream of the Hollingsworth & Vose Company Dam.

Type: Concrete, run-of-the-river
Height: 18 feet
Last Inspection: May 5, 2023
EAP: April 2023

Tributary: Squannacook River
Storage Capacity: 110 acre-feet
Hazard Classification: High
O&M Manual: None exists

Available plans reviewed related to Squannacook River Dam are as follows:

- *Squannacook River Dam Phase I Inspection/Evaluation* (May 5, 2023), prepared by Haley & Aldrich, Inc.
- *Emergency Action Plan, Squannacook River Dam* (April 14, 2023), prepared by Dillis & Roy Civil Design Group, Inc.

During the Phase I Inspection in May 2023, Haley & Aldrich, Inc., judged the dam to be in fair condition, meaning there are significant operational and maintenance deficiencies, though no structural deficiencies. The “fair” condition rating was assigned based on repairs still needed on the Shirley side of the dam to address loose and deteriorated portions of the concrete structure; repairs were completed on the Groton side in 2013.⁶⁸ The following recommendations were noted in the Phase I Inspection Report:⁶⁹

- Studies and Analysis
 - A detailed hydrologic and hydraulic study should be completed for the dam, accounting for the series of dams (including the Hollingsworth & Vose Co. Dam upstream of the Squannacook River Dam).
- Yearly Recommendations
 - The condition of the spillway and dam should be monitored several times per year. The low-level outlet gate should be exercised several times per year.
- Recommendations, Maintenance, and Minor Repairs
 - Implement remedial measures developed for the Shirley Side of the dam.
 - Conduct a hydraulic and hydrologic study, including the effect of the upstream dam on the flow over the Squannacook River Dam, for the dam configuration after implementation of the remedial measures
 - Repair the training wall on the Shirley side of the dam.
 - Remove vegetation and debris from downstream areas, auxiliary spillway, and along crest.
 - Remove debris on the spillway including the log/tree present on the spillway during the site visit.
- Remedial Measures
 - Implement remedial measures developed for the Shirley side of the dam.
 - Conduct a hydraulic and hydrologic study, including the effect of the upstream dam on the flow over the Squannacook River Dam, for the dam configuration after implementation of the remedial measures.

⁶⁷ Haley & Aldrich, Inc., *Squannacook River Dam Phase I Inspection/Evaluation* (2023), i.

⁶⁸ Horsley Witten Group, Inc., [Squannacook River Dam Removal Feasibility Study](#) (2024), 5.

⁶⁹ Haley & Aldrich, Inc., *Squannacook River Dam Phase I Inspection/Evaluation* (2023), 9-10.

- Repair the training wall on the Shirley side of the dam.
- Remove vegetation and debris from downstream areas, auxiliary spillway, and along crest.

The Phase I Inspection Report identified taking the dam out of service and removing the structure as an alternative to the above recommended repairs. The Shirley co-owner has indicated no interest in repairing the dam.⁷⁰ In response, Groton pursued funding from the Massachusetts Division of Ecological Restoration for a preliminary design study for dam removal in 2023 and completed its study in 2024.⁷¹ Subsequently, the Town completed a basis of design study in 2025 to summarize the pre-permit-level design phase work conducted for removal of the Squannacook River Dam and conduct further investigations on sediment quality, potential scour risk, and potential impacts to drinking water wells near the dam impoundment. At the Spring 2026 Town Meeting, voters rejected an article that would have appropriated approximately \$780,000 to fund repairs to the Squannacook River Dam. As the article was voted down, the Town intends to seek grant funding through ODS to remove the dam instead. This planning process for the Squannacook River Dam aligns with best practices for hazard mitigation planning around high hazard dams, which calls for communities to evaluate a range of actions to reduce risk to or from high hazard dams, including through dam removal.

The most recent EAP was completed in April 2023 by Dillis & Roy Civil Design Group, Inc. Related to the downstream flood path, the EAP observes that there is very little development in the 2.5 miles between the Squannacook River Dam and the Squannacook River's confluence with the Nashau River. There are two buildings immediately downstream of the dam that are vulnerable to flooding from a dam failure in this area, with more residential and commercial buildings located nearby at a higher elevation than the area of expected inundation. The EAP uses the extent of the FEMA 0.2% annual chance floodplain to represent the areas of inundation in the downstream flood path. Topography, surface waterbodies, and adjacent wetlands limit and dampen the effect of a dam failure here. RiverCourt Residences, a residential complex with independent living, assisted living, and memory care apartments for seniors, has been identified by the Town as a vulnerable population and is immediately downstream of the dam and within the downstream flood path. There are no other identified critical facilities or vulnerable populations within the downstream flood path.⁷²

In the event of a dam breach, flooding is expected at RiverCourt Residences, which has some floors below flood elevation, and its associated parking area. Additionally, Groton Road would be flooded (affecting one dwelling), and some power lines on utility poles below the dam are also expected to be inundated and potentially damaged. The EAP notes that the segment of Groton Road between West Main Street and Squannacook Road would likely need to be closed. Some flooding is expected in the rear of residential properties at Moore Drive in Shirley, though the dwellings are outside of the expected

Streets inundated/impacted in order of anticipated flood arrival time:

- Groton Road
- Abandoned MBTA Rail
- Great Road/Fitchburg Road

⁷⁰ Town of Groton, "Squannacook River Dam Information," accessed February 2, 2026, <https://www.grotonma.gov/2024/02/08/squannacook-river-dam-information/>.

⁷¹ MA EOEEA, *Healey-Driscoll Administration Awards \$350,000 to Support Dam Removal Studies in 7 Municipalities* [Press release], December 12, 2023, <https://www.mass.gov/news/healey-driscoll-administration-awards-350000-to-support-dam-removal-studies-in-7-municipalities>.

⁷² See Tables A-1 and A-2 and Maps 6A and 6b in Appendix D for locations of critical facilities and vulnerable populations.

inundation area. As the flood surge continues downstream, it encounters wetlands and topography that limit flooding across a wider area. Next, the downstream flood path flows onto the abandoned MBTA rail and associated powerlines parallel to the east bank of Squannacook River. Parallel to the Squannacook River's west bank, the downstream flood path impacts a portion of Kittredge Road and properties, including the rear of the Shirley Road and Gun Club. Herco Inc., a manufacturing facility, is within the inundation area along Great Road/Fitchburg Road. At the confluence with the Nashua River, flows will begin to move northward with the Nashua River. Properties in Ayer along the east bank of the Nashua River are above the expected inundation zone. The Groton School Boathouse may be exposed to flooding, but larger-scale damage is not expected based on topography and building locations in this area. There are no downstream dams identified within the inundation area (in either Groton or in other communities).

A mitigation action has been included in Section 6 as Action 6, which directs the Town to pursue removal of the Squannacook River Dam, inclusive of pursuing funding and coordinating with the private property co-owner and the Town of Shirley. Until the dam is removed, Action 6 directs the Town to update the EAP on an annual basis and implement applicable recommended improvements identified in the Phase I Inspection, including monitoring the condition of the spillway and dam several times per year, exercising the low level outlet gate periodically, and removing debris from the spillway as needed.

Hollingsworth & Vose Company Dam (NID # MA00443)

Hollingsworth & Vose Company Dam impounds Mill Pond (Squannacook River Reservoir) along the Squannacook River in Groton, approximately one mile upstream of the Squannacook River Dam. The Hollingsworth & Vose Company Dam is privately owned by the Hollingsworth & Vose Company and is within the company's manufacturing complex at 219 Townsend Road, where it is used for industrial water supply purposes. The dam is thought to date to the time of construction of the original manufacturing facility in the 1840s. The dam is a 225-foot-long earthen structure and includes a stepped granite spillway.⁷³

Type: Earthen
Height: 17 feet
Last Inspection: October 2024
EAP: N/A

Tributary: Squannacook River
Storage Capacity: 350 acre-feet
Hazard Classification: Low
O&M Manual: None exists

Available plans reviewed related to Hollingsworth & Vose Company Dam are as follows:

- *Hollingsworth & Vose Company Dam Phase I Inspection/Evaluation* (October 31, 2024), prepared by Pare Engineering

The dam was rated in fair condition, meaning there are significant operational and maintenance deficiencies but no structural deficiencies, during its most recent Phase I Inspection, completed in October 2024 by Pare Corporation. The following deficiencies were documented in the Phase I Inspection Report:⁷⁴

⁷³ Pare Corporation, *Hollingsworth & Vose Company Dam Phase I Inspection/Evaluation Report* (2024), 1.2-3 and 1.7.

⁷⁴ Ibid, i.

- A five-foot-long by 3-inch-deep depression is located on the crest adjacent to the downstream left training wall.
- An overgrown embankment and downstream slope to the right of the spillway; developing vegetation within components of the downstream left channel wall.
- A 4-foot-wide by 2.5-foot-deep erosion channel along the downstream right groin.
- Minor separation between the steel sheet piles and the concrete infill along the upstream walls.
- Surface cracking and efflorescent staining on the concrete walls throughout the dam system.
- Scoured concrete along the waterline at the piers and training walls throughout the spillway.
- A deteriorated downstream left training wall.
- Missing stones from the downstream right training wall.
- A leaking low-level outlet gate.
- Insufficient capacity to accommodate the spillway design flood.
- Additional maintenance deficiencies and potential dam safety concerns as documented in the report.

The following recommendations were noted in the Phase I Inspection Report:⁷⁵

- Studies and Analyses
 - Complete an underwater inspection of the dam system to evaluate the current condition of the low level outlet and auxiliary intake gates, underwater conditions along the upstream side of the dam, and conditions of the steel sheet piling along the upstream walls.
 - Complete inspections of the mill intake overflow pipe conduit and low-level outlet culvert to evaluate their conditions. The goal of the inspection is to determine whether the pipe's condition has any role in the propagation of the depression located on the dam crest above the discharge. After the inspection, determine the need to rehabilitate or replace the pipe and concrete.
 - Develop a formalized O&M Manual to document currently performed activities and procedures.
 - Develop a program for monitoring area of noted deficiencies at the dam, including depressions, areas of erosion and sloughing on the downstream right slope, concrete and stone masonry deficiencies noted throughout the wall systems, and other areas.
 - Update the existing Flood and Hurricane Emergency Protection Plan to include emergency contacts and remedial measures in the event of a pending or occurring dam failure.
 - Complete an initial feasibility study to develop conceptual options to increase the spillway capacity, which should include an updated hydrologic and hydraulic analysis. The completion of a subsurface investigation program to evaluate soil conditions in areas of potential expansion/improvement may also be warranted at this level of study.
 - Complete a site-specific safety assessment to further identify potential safety hazards at the dam.

⁷⁵ Hollingsworth & Vose Company Dam Phase I Inspection/Evaluation Report (2024), 3.2-5.

- Yearly Recommendations
 - Perform regular monitoring and inspection of the dam and appurtenant structures. Complete routine inspections after all significant rainfall events and formal inspections in accordance with current state regulations.
 - Regular maintenance activities should be continued and expanded to control and prevent further growth of unwanted vegetation along the right embankment and downstream slopes and from the downstream left training wall. Remove accumulated debris from the spillway approach and downstream face and continue to exercise the low-level outlet and auxiliary gate operators. Clearing of brush and removal of vegetation should be performed at least twice per year. Exercising and greasing of the low-level outlet and auxiliary gates should be completed at least once per year. When exercised, the gates should be raised and lowered across their full range to confirm that the gates are fully operable.
- Recommendations, Maintenance, and Minor Repairs
 - Clear the dam embankment of all trees, brush, and other vegetation.
 - Clear the training walls of all trees, brush and other vegetation.
 - Fill in the depressions along the dam crest.
 - Re-grade the embankment right of the spillway.
 - Loam and seed exposed portions of the embankment.
 - Seal cracks and repair areas of scour within the concrete along the waterline.
 - Repair the observed scour, spalling, and cracking of the downstream left training wall.
 - Repair the downstream right stone masonry channel wall.
- Remedial Measures
 - Modify the spillway system to accommodate the spillway design flood through widening of the spillway. Alternatives include raising the height of the top of the dam elevation, lowering the spillway crest, providing an auxiliary spillway to accommodate overtopping flow, or a combination of these items.

The Phase I Inspection Report identified breaching the dam as an alternative to addressing the above safety and stability concerns at the dam. However, this is not considered viable because the dam is needed for water supply purposes for Hollingsworth & Vose Company's ongoing manufacturing activities.

The area downstream of the Hollingsworth & Vose Company Dam has a defined river channel and limited development. Groton Road and Squannacook River Dam are also downstream of the dam. As the upstream "dam in series," the Hollingsworth & Vose Company Dam may have a different hazard potential classification from Squannacook River Dam (the downstream dam) so long as its failure flood wave would not cause failure at the downstream dam.⁷⁶ The Phase I Inspection does not indicate any concerns that a failure would cause subsequent overtopping, breach or failure at Squannacook River Dam.⁷⁷

A mitigation action has been included in Section 6 as Action 7, which directs the Town to coordinate with the private dam owner (Hollingsworth & Vose Company) to ensure the completion of recommended improvements identified in the 2024 Phase I Inspection, detailed in this section above.

⁷⁶ 302 Code of Massachusetts Regulations 10.00, Dam Safety.

⁷⁷ *Hollingsworth & Vose Company Dam Phase I Inspection/Evaluation Report* (2024), 1.4.

Woods Mill Pond Dam (NID # MA01547)

Woods Mill Pond Dam impounds Woods Mill Pond at Baddacook Brook. The impoundment, Woods Mill Pond, is used for recreational purposes by adjacent residents. The dam is privately owned and maintained. It is an approximately 40-foot-long concrete structure with three spillways.

Type: Concrete

Height: 7 feet

Last Inspection: October 2015

EAP: N/A

Tributary: Baddacook Brook

Storage Capacity: 24 acre-feet

Hazard Classification: Low

O&M Manual: None exists

Available plans reviewed related to Woods Mill Pond Dam are as follows:

- *Woods Mill Pond Dam Phase I Inspection/Evaluation* (October 8, 2015), prepared by Comprehensive Environmental, Inc.

The most recent Phase I Inspection was completed in October 2015 by Comprehensive Environmental Inc., at which time the dam was judged to be in good condition. Notable deficiencies documented in the Phase I Inspection comprise minor erosion at the dam crest, spalling on spillways and the downstream face, separation between the training wall and splashboards, cracks or holes in the splashboards, intrusive vegetative growth on the downstream embankments, and limited vehicular access to the dam.⁷⁸ The following recommendations were noted in the Phase I Inspection Report:⁷⁹

- Studies and Analysis
 - Complete a more detailed hydrologic and hydraulic study within the next 10 years to confirm if the dam is sized appropriately for the required design storm in accordance with dam safety regulations.
- Yearly Recommendations
 - Clear and trim vegetation and brush once per year.
 - Clear the spillway and downstream channel of debris on an as-needed basis.
 - Continue to monitor cracks, erosion, and concrete deterioration, and repair any deficiencies before they become too large or problematic.
- Recommendations, Maintenance, and Minor Repairs
 - Repair worn and deteriorated sections of concrete along the spillway training walls and crest of the dam as needed.
 - Repair eroded and deteriorated sections of concrete along the base of the downstream dam face as needed.
 - Monitor the joints between abutment walls and the earth and/or patio blocks continually for signs of erosion or separation. Repair eroded sections immediately.
 - Seal, repair, or replace wooden stop logs and splashboards as needed.
 - Continually monitor, clean, and repair the wood boards used for alignment of stop logs and the metal anchors.
 - Continually monitor the sediment level behind the dam and remove as needed.
 - Trim or clear vegetation as needed to maintain adequate access to the crest of the dam and clearance at the spillways and downstream culvert.

⁷⁸ Comprehensive Environmental Inc., *Woods Mill Pond Dam Phase I Inspection/Evaluation Report* (2015), Executive Summary.

⁷⁹ Ibid, 10-12.

- Remove any large, woody vegetation from the downstream toe of the dam if impacts to hydraulic capacity or structural integrity of the dam are detected.
- Continually clear the spillways of debris and adjust the stop logs as necessary. Install and properly secure the stop logs, including installing handles on the stop logs or wooden anchoring brackets.
- Remedial Measures
 - If an updated hydrologic and hydraulic study indicates that the spillway is undersized for the design storm resulting in an overtopping event, adding additional armoring and/or spillway capacity to the dam should be considered.

The Phase I Inspection Report does not provide any alternatives to repairing the Woods Mills Pond Dam, noting that the proposed recommendations for repair are appropriate to its current size, hazard, classification, and use.⁸⁰

The area downstream of Woods Mill Pond Dam is heavily vegetated, and the stream channel was judged to have sufficient space to contain a flood wave if the dam were to breach. The direction of flow follows Baddacook Brook, which discharges into Whitney Pond.

A mitigation action has been included in Section 6 as Action 8, which directs the Town to coordinate with the private dam owner to ensure the completion of recommended improvements identified in the 2024 Phase I Inspection, detailed in this section above.

Other Dams in Groton

Groton School Dam (NID # MA03537)

The Groton School Dam is a privately owned, non-jurisdictional breached dam located on the grounds of the Groton School. The dam was a concrete structure dating back to 1986 and was originally constructed along a distributary stream channel (originating from James Brook) to form the Groton School Pond, which was used for ice skating.

The dam was breached in September 2023 during a thunderstorm event with 2-4 inches of precipitation following earlier rainstorms that had led to saturated ground conditions. At the time of the breach, a beaver dam was also present at the site, constructed in front and on top of the concrete dam. During the thunderstorm, the heavy precipitation caused the surface water level in the Groton School Pond to rise quickly. The beaver dam first washed out, and the Groton School Dam was breached thereafter. Following the breach, the Groton School installed a pond leveler device to address continued beaver activity in the pond and mitigate the risk of beaver activity resulting in flooding. The pond leveler device consists of a piping system (with a fenced, protected intake) that allows for continual water flow past the beaver dam. The Groton School conducts regular visual inspections of the device and contracts with the device installer to conduct a detailed inspection once annually. No further issues have been reported at Groton School Pond. The Groton School has no plans to rebuild a dam at this site.⁸¹ The dam was verified as non-jurisdictional following a 2024 inspection by the Dillis & Roy Civil Design Group submitted to ODS,

⁸⁰ Comprehensive Environmental Inc., *Woods Mill Pond Dam Phase I Inspection/Evaluation Report* (2015), 12.

⁸¹ M. O'Donnell, Groton School (personal communication, April 26, 2026).

which noted that the water surface elevation was being maintained through the use of a beaver deceiver and siphon.⁸²

Upstream Dams Located in Other Communities

In addition to the inventoried dams located in Groton, there are several upstream dams located in adjacent communities. Information on these dams was obtained via a public records request to the DCR ODS and the Federal Energy Regulatory Commission (FERC) to review the various inundation area descriptions and determine if the Town of Groton was at risk of being impacted by a dam breach or failure in an adjacent community.

There are two upstream dams in Pepperrell that are regulated by FERC: Pepperrell Paper Company Dam (NID # MA00373) and Nashua River Dam (NID # MA02959). As confirmed by the FERC Regional Engineer for the New York Region, neither of the two upstream FERC-regulated dams have the potential to impact Groton in the event of a dam failure.⁸³

In response to a July 2026 records request, DCR ODS provided information on the Hickory Hills Dam, Farm Pond Dam, and Townsend Harbor Dam, all located in adjacent communities.

Hickory Hills Dam (NID # MA00851)

Located in Lunenburg impounding Hickory Hill Lake, this privately owned dam is classified as high hazard. The current EAP indicates that, in the event of a dam breach, the inundation path follows Mulpus Brook to its confluence with the Nashua River, south of Groton, and does not impact the Town of Groton. The following information was reviewed:

- *Emergency Action Plan, Hickory Hills Dam* (2025), Hickory Hills Landowners, Inc.

Farm Pond Dam (NID # MA01574)

Located in Lunenburg along Mulpus Brook, this privately owned dam was reclassified as non-jurisdictional in 2014. The ODS reclassification letter found that there is no threat of downstream damage in the event of a dam failure. The following information was reviewed:

- Letter Report Jurisdictional Inspection Form (2014), prepared by ODS
- Reclassification Letter (2014), prepared by ODS

Townsend Harbor Dam (NID # MA00138)

Located in Townsend impounding Harbor Pond along the Squannacook River, this dam is classified as significant hazard. The dam is privately owned by the Hollingsworth & Vose Company and was originally constructed for industrial purposes, though Harbor Pond is now primarily used for passive recreation purposes. The following information was reviewed:

- *Emergency Action Plan, Townsend Harbor Dam* (November 2022), prepared by Pare Corporation

Per the most recent EAP, there is a potential for limited impact to Groton in the event of a dam failure, with more properties affected during wet weather conditions (i.e., the 100-year storm). In the event of a dam failure, the inundation path follows the contours of the Squannacook River, with the inundation area

⁸² Dillis & Roy Civil Design Group, *Jurisdiction Verification Form, Groton School Pond Dam* (2024), 1.

⁸³ J. Spain, FERC (personal communication, April 13, 2026).

largely contained within the FEMA 1% and 0.2% annual chance flood hazard areas (as revised in the current FIRMs for the area, effective July 2025). Much of the land within the inundation path in Groton is conservation land, though six properties were identified as having structures potentially impacted. This includes three warehouses (two owned by the Hollingsworth & Vose Company and one owned by the West Groton Water Supply District), two residential properties, and an MBTA property. The inundation path is modeled to terminate at Mill Pond (Squannacook River Reservoir) in western Groton, which is impounded by the Hollingsworth & Vose Company Dam and owned by the same private dam owner as the Townsend Harbor Dam.

A mitigation action has been included in Section 6 as Action 48, which directs the Town to coordinate with the private dam owner to ensure the completion of an updated EAP, as well as the completion of any recommended improvements identified in its Phase I Inspection.

History and Location

There is not a history of dam failure in Groton. However, should a dam breach or failure occur at any of the inventoried dam structures discussed in this subsection, property damage, injuries, and loss of life may occur. Within Groton, the expected flood paths and impacts of a flood surge of all four inventoried dams are expected to be mitigated by local topography and the presence of adjacent wetlands or downstream waterbodies that can help confine the flood path and contain floodwaters. Additionally, while there are some structures within the expected flood paths of the dams, development has generally occurred in higher elevation areas outside of the floodplain. The RiverCourt Residences is one notable facility with vulnerable populations that is within the expected flood path of the Squannacook River Dam.

Probability of Future Occurrence

Although Groton has not experienced dam failure in the past, a failure could be potentially catastrophic in terms of injuries and potential loss of life. Thus, the Town is considered to be at moderate risk for future dam failure events.

Beaver Activity

Beavers are common and abundant throughout much of Massachusetts, including Groton. Often referred to as “nature’s engineers,” beavers are large, semiaquatic rodents that are unique in their ability to alter their habitat by damming small waterways to form ponds. This pond-forming activity creates wetlands, which are often hotspots of wildlife and habitat diversity; wetlands also confer important ecosystem benefits including flood storage, sediment filtration, and nutrient removal. Given their ability to modify the landscape and impact biodiversity, beavers are generally considered a keystone species. Beaver colonies typically consist of a breeding adult pair, that year’s offspring (known as kits), and subadults (the previous year’s offspring). Beavers reach sexual maturity around two years of age, after which they disperse from their original colony.⁸⁴

The maximum extent of beaver activity can be equated to the size of a colony’s territory. The typical established beaver colony’s territory includes several hundred feet of stream and shoreline around their

⁸⁴ MA Division of Fisheries and Wildlife, “Learn about beavers,” accessed February 15, 2026, <https://www.mass.gov/info-details/learn-about-beavers>.

lodge, the reach of their construction projects (i.e., dams, lodges, canals), and their food and building material foraging area, which can extend several hundred feet inland.

Conflicts with beavers may occur when human development is co-located in areas subject to their influence. Beavers' instinct to stop flowing water often leads to culvert blockages (resulting in flooded roadways), and development in floodplains and low-lying areas may be subject to flooding caused by dammed waterbodies. Drinking water may become contaminated, including if nearby pollutant sources (e.g., septic systems) are flooded. As with any wild animal, there is also a possibility of disease transmission, including of giardiasis, an intestinal infection caused by *Giardia* parasites that is often transmitted via contaminated water. Additionally, beaver activity can also occasionally lead to downed trees on property and infrastructure. The Massachusetts Division of Fisheries and Wildlife describes five main options for human-beaver conflict resolution.⁸⁵

1. **Tolerance:** Learn to coexist with beaver activity, particularly when their activity is merely inconvenient and does not lead to property damage or risks to public health and safety.
2. **Exclosures:** Install fences of heavy-duty material at least several feet tall and flush with the ground around specific trees and shrubs. Beavers are poor climbers and rarely burrow, so properly installed fencing is typically sufficient to protect trees and shrubs.
3. **Breaching and removing the dam:** Breach and remove the beaver dam, which provides immediate relief to flooding issues. However, if beavers remain at the site, their instincts will usually prompt them to quickly rebuild the damaged dam.
4. **Water level control devices (WLCD):** Install WLCDs, often referred to as “beaver pipes” or “beaver deceivers,” which can regulate water at desirable levels behind beaver dams and maintain flows in culverts. WLCDs must be maintained regularly, and water depth, stream flow, and wetland size are important considerations to determining if an WLCD will be successful.
5. **Lethal removal:** Remove “problem beavers” where property damage or threats to public health and safety occur using a licensed trapper or Problem Animal Control agent. Beavers may not be relocated per Massachusetts law.

Massachusetts General Laws (G. L.) c. 131 §80A establishes procedures to obtain approval for options 3, 4, and 5 listed above in situations where beaver (or muskrat) activity is threatening human health and safety and grants permitting authority to local Boards of Health for the issuance of “emergency permits.”⁸⁶ The law provides examples of types of beaver conflicts that may constitute a threat to human health and safety, including but not limited to flooding of drinking water wells, septic systems, or public or private roads and flooding that affects the public use of certain critical facilities. If the conflict is related to a potential threat to a public water supply, MassDEP must determine the threat exists. Related to options 3 and 4, an emergency permit issued by the Board of Health is also subject to any conditions issued by the local Conservation Commission. Related to option 5, only a licensed trapper or Problem

⁸⁵ MA Division of Fisheries and Wildlife, “Learn about beavers,” accessed February 15, 2026, <https://www.mass.gov/info-details/learn-about-beavers>.

⁸⁶ Note that the use of the word “emergency” in “emergency permit” is intended to imply the short-lived nature of the permit (i.e., 10 days). It does not imply that the threat related to beaver (or muskrat) activity constitutes a public health or safety emergency.

Animal Control agent may place traps, and the use of traps is subject to Massachusetts Division of Fisheries and Wildlife regulations.⁸⁷

History and Location

Groton is crisscrossed by many surface waterbodies that have proven to be attractive habitat for beavers. Areas susceptible to flooding caused by beaver activity are well known to DPW, and the Town has 15 WLCDs in place. Roadway flooding is the primary impact caused by beaver activity. Local beavers are extremely active, requiring DPW to clean and clear the WLCDs on a daily to weekly basis to ensure that flooding does not occur. WLCDs maintained by DPW are in the following locations:

- Townsend Road at Nutting Stream crossing (outlet from Flat Pond)
- Route 225 (West Main Street) at Wrangling Brook crossing
- Hill Road at Wrangling Brook crossing
- Broadmeadow Road at James Brook crossing
- Old Ayer Road at James Brook crossing
- Old Ayer Road/Worthen Drive at James Brook crossing
- Nashua Road at Reedy Meadow Brook
- Raddin Road at Unkety Brook
- Radding Road at wetlands west of Dan Parker Road
- Hemlock Park Drive at wetlands west of Baddacook Pond
- Old Dunstable Road at Baddacook Brook crossing
- Hoyts Wharf Road at Cow Pond Brook crossing
- Cow Pond Brook Road at wetlands north of Cow Pond Brook Park
- Lost Lake Drive at Cow Pond Brook crossing
- Hayden Road at eastern edge of Carmichael Swamp Conservation Area

MassDOT also maintains a WLCD on Route 119 (Boston Road) at wetlands around Cady Pond. The Groton Board of Health has records of 14 permits issued since 2019 for lethal removal and breaching or modification of beaver dams. This includes 9 permits for lethal removal. The Board of Health reports that the most common locations associated with these permits are the Groton School and the Groton Country Club golf course.

Since 2020, there have been two beaver dam breaches near the Groton School Pond that caused flooding. The first occurred in July 2023 when a large beaver dam at the outlet of Groton School Pond on a private residential property failed, resulting in flooding across nearby roads and the Nashua River Rail Trail. In September 2023, another beaver dam located in front of and on top of the Groton School Dam at Groton School Dam washed out, with the subsequent rush of water also destroying the concrete Groton School Dam. The Groton School has no plans to repair the dam. To address continued beaver activity in the pond, the school has installed a pond leveler device to allow for water flow past the rebuilt beaver dam. The Groton School reports no issues with beaver-related flooding since installing the pond leveler.

⁸⁷ MA Executive Office of Health and Human Services, Department of Public Health, [*Guidance for Boards of Health Implementing M.G.L.c.131, S.80A Threats from beaver and Muskrat-Related Activities*](#) [Memorandum], February 14, 2001.

Probability of Future Occurrence

It is extremely likely that beaver activity will continue to impact Groton. While the Groton DPW has been able to mitigate flooding caused by beaver activity by routinely maintaining WLCDs and monitoring for further impacts, this represents a significant drain on staff time and resources.

Climate Change Impacts on Flood-Related Hazards

The *ResilientMass Plan* observes that flood risk is increasing across the Commonwealth based on continued changes in land use patterns that are increasing density and development and changes in the frequency and intensity of precipitation caused by climate change.⁸⁸ As riverine and flash flooding and heavy rain and stormwater flooding are primarily driven by precipitation, it is thus expected that the frequency and intensity of flood events will also change.

Forecasting specific changes in precipitation can be difficult. Generally, more annual precipitation is expected in Massachusetts, but climate change is expected to make precipitation more variable, with more intense precipitation occurring over fewer days overall.⁸⁹ The current 10% annual chance precipitation event (an event that has a 10% chance of occurring each year) is an approximately three-inch rainfall event. The intensity of 10% annual chance precipitation event is expected to increase over time. By 2090, it is projected to be a four-inch rainfall event. Additionally, precipitation events equivalent to today's 10% annual chance precipitation event are expected to be four times more frequent in the Central Massachusetts region by 2090.⁹⁰

Table 4-6 indicates annual average precipitation projections for Groton in 2030 and 2050 compared to a current baseline; the lower and upper bounds (10th and 90th percentiles) are shown for each projection year.⁹¹

Table 4-6. Annual Precipitation Projections: Merrimack and Nashua River Watersheds

Climate Metric	Baseline 1950 - 2013	Projection 2030	Projection 2050
<i>Total Precipitation</i>			
Merrimack Watershed	40.9 inches	38.7 to 48.4 inches	39.5 to 49.9 inches
Nashua Watershed	45 inches	42.6 to 52.8 inches	43.3 to 54.3 inches
<i>Maximum Precipitation Event</i>			
Merrimack Watershed	1.7 inches	1.8 to 1.9 inches	1.8 to 2.1 inches
Nashua Watershed	1.9 inches	2.0 to 2.2 inches	2.1 to 2.3 inches
<i>Days Above 1 Inch Precipitation</i>			
Merrimack Watershed	4 days	4 to 5 days	5 to 6 days
Nashua Watershed	5 days	5 to 6 days	6 to 7 days

Source: MA EOEEA, [ResilientMass Climate Change Projections Dashboard](#).

⁸⁸ *ResilientMass Plan: Appendices* (2023), 5.8-2.

⁸⁹ *Ibid*, 5.8-7-8.

⁹⁰ *Ibid*, 5.8-9-10.

⁹¹ MA EOEEA, "ResilientMass Maps and Data Center," accessed January 20, 2026, <https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/>.

Related to dams, changes in the frequency and severity of other hazards (e.g., landslides, wildfire, drought) in addition to those associated with extreme precipitation can cause cascading impacts that increase the likelihood of dam failure.

Related to beavers, the “engineered” landscapes that beavers help create can increase communities’ ability to adapt to hazards and climate impacts, including flooding, drought, and wildfire. River systems with beaver dams can store more water during storms (behind the impoundment) and slowly release it later in the year, helping reduce flood peaks and prolong water availability during periods of heat and drought stress. Wet, saturated soils and meandering stream channels can help serve as firebreaks, slowing the spread of fire. Healthier, less stressed environments are also less susceptible to invasive species. Continued thoughtful management of human-beaver conflicts is thus essential to retaining the beneficial ecosystem services that beaver-engineered landscapes provide while mitigating potential harm to people and property.

People and Property at Risk from Flood-Related Hazards

Groton experiences flooding within designated FEMA floodplains, as well as at more isolated locations due to significant precipitation events. This subsection identifies areas that have been locally identified as flood hotspots and summarizes the results of a GIS-based analysis to understand what properties, critical facilities, and vulnerable populations are located within designated FEMA floodplains.

Locally Identified Areas of Flooding

Locally identified areas of flooding are identified in Table 4-7. These areas may or may not overlap with designated FEMA flood zones. These areas tend to flood during significant precipitation events, and their locations vis-à-vis key transportation routes in Groton means that flooding can disrupt daily travel or emergency access. Also see the list of sites with WLCDs maintained by the DPW to mitigate flooding caused by beaver activity in that hazard profile discussion.

Table 4-7. Locally Identified Areas of Flooding

Location	Notes
Route 40 (Lowell Road) crossing at Whitney (Cow) Pond	Flooding occurs when the culvert backs up.
Route 119 (Boston Road)	Flooding related to beaver activity can occur across the Groton Country Club golf course (adjacent to wetlands around Cady Pond) if the WLCD is not adequately maintained. MassDOT is responsible for maintenance, and DPW contacts the agency if there are issues. Flooding at this site has been under control for the past few years.
Route 225 (West Main Street) / Hill Road	Flooding may occur seasonally when the Nashua River overtops its banks as a result of spring snowmelt. Heavy precipitation events are also known to cause flooding at this location.
Broadmeadow Road	Flooding can occur during even minor precipitation events. The road is at a low point crossing a wetland complex around James Brook. The Town is exploring funding opportunities for culvert installation and invasive species removal.

Location	Notes
Townsend Road / Cherry Tree Lane	The crossing at Nutting Stream (outlet from Flat Pond) has been upsized and an WLCD has been installed to mitigate beaver activity, but this location requires frequent monitoring. Flooding has impacted the roadways and the Squannacook River Rail Trail in the past.
Station Avenue	Flooding frequently occurred via a drainage pipe when surrounding wetland areas backed up; the Town has not experienced recent flooding after clearing out the pipe.

Source: Town of Groton

The Town also notes that flooding occurs in several undeveloped areas across the community without impacts to people or property, including around Martins Pond and Baddacook Pond. The Conservation Commission and Water Department have been active in acquiring land for general open space and water supply protection purposes around surface water and groundwater resources. These land acquisitions help protect the natural flood storage function of various open space and wetland resources.

FEMA Flood Zones and Repetitive Loss Sites

Mapped FEMA flood zones are identified on Maps 1A and 1B (Appendix D). Areas within these flood zones are considered most vulnerable to flooding from a regulatory perspective. Within Groton, FEMA flood zones are adjacent to the community's many surface waterbodies, including wetland areas. FEMA Flood Insurance Rate Map (FIRM) definitions are noted below:⁹²

- **Zone A:** The flood insurance rate zone that corresponds to the 1% annual chance flood area determined in the Flood Insurance Study (FIS) by approximate methods. Detailed hydraulic analyses are not performed for such areas; therefore, no Base Flood Elevations (BFEs) or flood depths are shown within this zone. Mandatory flood insurance purchase requirements apply for properties with federally backed mortgages.
- **Zone AE and A1-A30:** The flood insurance rate zones that correspond to the 1% annual chance flood area determined in the FIS by detailed methods. In most instances, BFEs derived from detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply for properties with federally backed mortgages.
- **Zone X:** The flood insurance rate zone that corresponds to the 0.2% annual chance flood area determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or flood depths are shown within this zone. There are no mandatory flood insurance purchase requirements for properties with federally backed mortgages within this zone.

Additionally, FEMA identifies "repetitive loss properties" for the purpose of the NFIP, which is defined as any insured property which has received two or more flood claims of \$1,000 or more in any given 10-year period since 1978 through the NFIP. "Severe repetitive loss properties" are insured property which has four or more floodplains of more than \$5,000 each, or a structure with two or more building claim payments where the total of the payments exceeds current market value of the property. There are no repetitive or severe repetitive flood loss properties in Groton. It is important to remember that repetitive loss data does not fully represent the damage that Groton sustains from flooding. Repetitive loss data

⁹² FEMA, "Flood Zones," last updated July 8, 2020, <https://www.fema.gov/about/glossary/flood-zones>.

only includes properties that are insured through the NFIP and have received insurance payouts, which does not necessarily reflect all properties that have incurred flood damage.

Table 4-8 identifies the number of properties by land use that are within a FEMA flood zone. Table 4-9 identifies critical facilities and vulnerable population sites that are within the FEMA 1% annual chance flood hazard area. There are no critical facilities or vulnerable population sites located in the FEMA 0.2% annual chance flood hazard area. Exposed locations were identified using a GIS-based analysis.

Critical facilities are public or private facilities that possess added value to a community and deserve additional consideration when determining mitigation strategies to protect these facilities from natural hazard impacts. Generally, critical facilities include municipal facilities, lifeline infrastructure, and sites that are important for emergency response. Vulnerable populations sites are public or private facilities that may host populations (permanently or at certain times during the day) that may require special considerations for emergency response or are vulnerable to the impacts of natural hazards. For example, vulnerable population sites may include schools, daycare facilities, and congregate care facilities. The list of critical facilities and vulnerable populations was updated in consultation with the LHMC. See Tables A-1 and A-2 and Maps 6A and 6b in Appendix D for locations of critical facilities and vulnerable populations.

Table 4-8. Assessed Properties Located in FEMA Flood Zones

Land Use	Zone A and AE 1% annual chance flood area	Zone X 0.2% annual chance flood area
<i>Commercial</i>		
General Commercial	2	2
Storage Warehouses & Distribution Facilities	5	-
Vacant Developable Land	2	-
<i>Residential</i>		
Single Family	511	48
Non-Transient Congregate Housing	1	-
Other Residential	87	2
Vacant Developable Land	15	1
Vacant Potentially Developable Land	4	-
Vacant Undevelopable Land	87	4
<i>Industrial</i>		
Industrial	4	-
Vacant Developable Land	1	-
Vacant Undevelopable Land	1	-
<i>Exempt Property</i>		
Charitable, Conservation	68	-
Charitable, Other	7	1
Commonwealth of Massachusetts Lands	23	-
District Lands (Improved)	4	-
District Lands (Vacant)	1	-
Housing Authority Lands	2	-
Open Space Lands	11	-
Private Education Lands (Improved)	4	1
Private Education Lands (Vacant)	2	-

Land Use	Zone A and AE 1% annual chance flood area	Zone X 0.2% annual chance flood area
Public Education Lands (Improved)	2	-
Public Education Lands (Vacant)	1	-
Religious Group Lands	8	-
Town of Groton Lands (Improved)	1	-
Town of Groton Lands (Vacant)	102	2
Utility Authority Lands	11	1
<i>Other Property</i>		
Chapter 61, 61A & 61B Lands	19	-
Total (All Assessed Properties)	986	62

Source: Town of Groton, MassGIS (Bureau of Geographic Information), and MA Department of Revenue/Division of Local Services, Bureau of Local Assessment, *Property Type Classification Codes* (2019)

Table 4-9. Critical Facilities & Vulnerable Populations Located in FEMA 1% Annual Chance Flood Area

Site	Critical Facility	Vulnerable Population
Hollingsworth & Vose Company	✓	✓
Hollingsworth & Vose Company Dam	✓	
Hollingsworth & Vose Tower	✓	
Lost Lake Dam	✓	
Nashua River Bridge (at Route 225)	✓	
Nod Road Sewer Pump Station	✓	
RiverCourt Residences		✓
Squannacook River Dam	✓	
Townsend Road Wellfield #1	✓	
Townsend Road Wellfield #2	✓	
Townsend Road Wellfield #3	✓	
Townsend Road Wellfield #4	✓	
West Groton Pumping Station	✓	
Woods Mill Pond Dam	✓	

Source: Town of Groton, MassGIS (Bureau of Geographic Information)

Summary of Anticipated Impacts from Flood-Related Hazards

Flood-related hazards can result in direct threats to life safety and property. Additionally, flooding in Groton tends to be especially disruptive to the Town's transportation network, making some roadways impassable. A summary of anticipated impacts from flood-related hazards most relevant to Groton are noted by sector:

- **Human:** Potential for injury or loss of life, particularly for those in high hazard areas (e.g., FEMA Zone A or AE areas, dam downstream flood paths) who may have difficulty evacuating or limited warning time. Inundated roadways may delay emergency service response and evacuation. Potential for adverse health effects from exposure to contaminated floodwater and mold. Potential for temporary or permanent displacement.
- **Infrastructure:** Direct damage to infrastructure by floodwater and debris. Potential contamination of drinking water supplies, and inundation of onsite wastewater treatment systems may also

cause contamination. Inundated roadways may disrupt transportation. Increased risk of dam overtopping and failure. Certain structures (e.g., structures that predate modern building codes) may be more vulnerable to flood damage.

- **Economy:** Potential losses associated with business interruptions and structural damage, as well as clean up, debris management, and recovery costs. Potential for temporary and permanent displacement, reduced ability to work, and loss of wages. Recovery and clean up costs may be severe, particularly for structures that are significantly damaged by flooding.
- **Governance:** Potential for damage to public safety infrastructure, as well as public health facilities. Increased service demands. Potential for disruption to local- and state-owned and/or maintained roadways, conservation and recreation areas, and facilities.
- **Natural Environment:** Flooding can lead to ecosystem degradation and water quality impacts due to sedimentation, increased nutrients, and contamination from stormwater runoff. High flood flows can cause erosion within waterways. Potential for water quality issues from contaminated sediment once impounded by dams, particularly those used for manufacturing and industrial purposes.

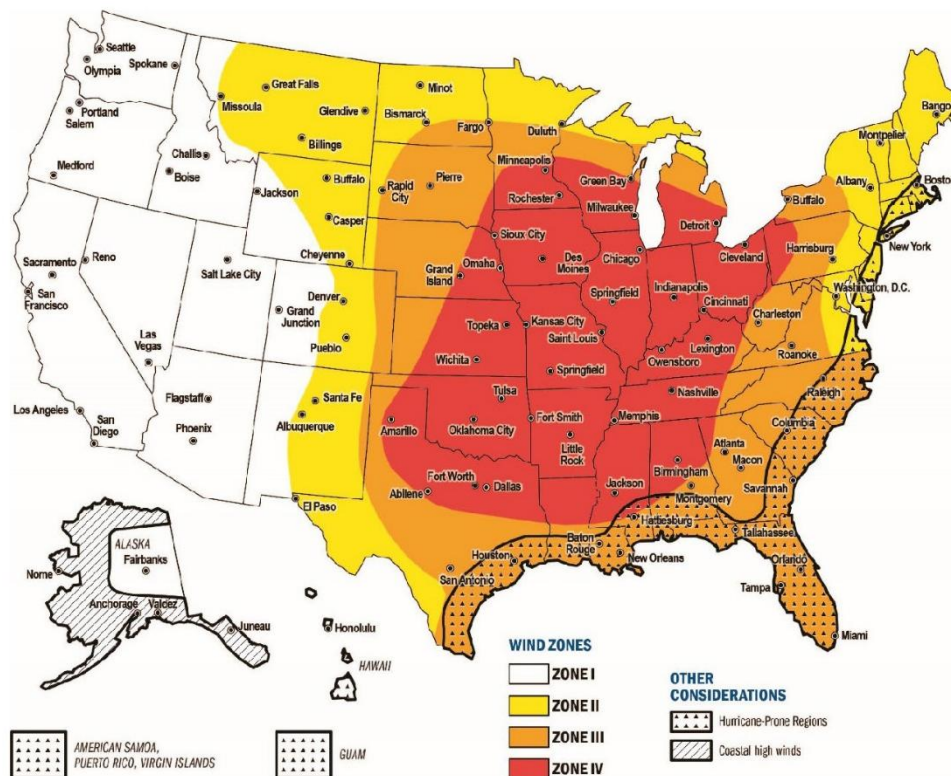
2. Wind-Related Hazards

Wind is the movement of air caused by differences in atmospheric pressure, which is largely driven by differences in temperature. Wind speed and the change in air pressure (i.e., the “pressure gradient”) are directly proportional, so wind speed increases as the difference in pressure between high and low atmospheric pressure areas increases. Wind direction is affected by air pressure and the earth’s rotation (i.e., the “Coriolis force”). Local topography and landforms, such as mountains, valleys, and large waterbodies, can also impact temperature, pressure, and the relative smoothness of the earth’s surface, thereby affecting wind speed and direction.⁹³

High winds themselves are a natural hazard, and additional wind-related natural hazards can be further defined by their unique formation, wind direction, and wind speed characteristics. All of Groton is vulnerable to the impacts of high winds and other wind-related hazards, and typical impacts include downed trees and powerlines, property damage, and personal injury caused by blowing debris. The entire Commonwealth is located within Wind Zone II, which delineates the geographic area where the maximum sustained wind during an extreme event is expected to be up to 180 miles per hour (mph) (Figure 4-2). Additionally, Groton is located within the hurricane-prone region.

⁹³ NOAA, “Origin of Wind,” accessed February 16, 2026, <https://www.noaa.gov/jetstream/synoptic/origin-of-wind>.

Figure 4-2. Wind Zones in the United States



Source: FEMA, [Taking Shelter from the Storm, FEMA P-320](#) (2024).

High Winds

High winds are “sustained winds of over 40 mph or any gusts of over 58 mph.”⁹⁴ The National Weather Service (NWS) issues wind advisory events once sustained winds of 31 to 39 mph are observed for at least one hour, or gusts of 46 to 57 mph over land are observed. During wind advisory events and as high winds occur, the NWS recommends that people secure outdoor objects, take caution when driving, and seek shelter. High winds are commonly associated with downed trees and power lines, and unsecured outdoor objects can often become damaged or turn into projectiles.⁹⁵

History and Location

Groton is uniformly exposed to high wind events. Since 2019, there have been 16 strong and high wind events in Northwest Middlesex County, where Groton is located (Table 4-10).

Table 4-10. Significant Strong and High Wind Events, Northwest Middlesex County

Date	Wind Speed	Damages	Notes
4/3/2019	45 knots (52 mph)	\$1,500	N/A
2/27/2020	43 knots (49 mph)	\$1,000	N/A
5/9/2020	49 knots (56 mph)	\$800	N/A
12/25/2020	43 knots (49 mph)	\$1,500	N/A
3/1/2021	48 knots (55 mph)	\$500	N/A

⁹⁴ *ResilientMass Plan: Appendices* (2023), 5.12-2.

⁹⁵ *ResilientMass Plan: Appendices* (2023), 5.12-2.

Date	Wind Speed	Damages	Notes
3/26/2021	43 knots (49 mph)	\$500	N/A
3/29/2021	48 knots (55 mph)	\$12,000	N/A
10/26/2021	46 knots (53 mph)	\$500	In Groton at 1103 PM EDT (1003 PM EST) on the 26th, a tree was down on Main St. near Thorndike St. Report relayed by amateur radio.
12/6/2021	43 knots (49 mph)	\$500	N/A
11/20/2022	35 knots (40 mph)	\$5,000	N/A
11/30/2022	46 knots (53 mph)	\$800	N/A
11/30/2022	65 knots (75 mph)	\$8,000	N/A
12/23/2022	48 knots (55 mph)	\$1,000	N/A
2/3/2023	39 knots (45 mph)	\$500	In Groton at 6 AM EST, a tree was down on Route 119 at the Littleton town line.
2/28/2024	43 knots (49 mph)	\$100	N/A
3/7/2025	48 knots (55 mph)	\$2,000	N/A

Source: NOAA NCEI, [Storm Events Database](#). Data is current through October 2025.

Probability of Future Occurrence

Wind events are considered a higher concern hazard in Groton, driven primarily by their frequent occurrence. The severity of high wind events is considered limited, with most damage and disruption associated with downed trees and powerlines.

Hurricanes and Tropical Storms

Tropical cyclones (including tropical depressions, tropical storms, and hurricanes) are large, circulating windstorms that form over the warm waters of the Atlantic Ocean, Caribbean Sea, and the Gulf of Mexico. They are characterized by a low-pressure, warmer center and bands of thunderstorms. Tropical cyclones are fueled by warm, moist air that rises as wind passes over the ocean surface, forming cloud columns. As air cools at the top of the cloud column, it begins to fall even as more warm air continues to rise. Winds begin spinning in a circular motion in response to changes in air pressure and the natural rotation of the earth. As tropical cyclones move inland, they typically weaken because they are no longer fueled by the energy from warm ocean waters (though they can still cause substantial damage before dissipating).⁹⁶ Tropical cyclones are categorized based on sustained wind speed:

- **Tropical depression:** Low-pressure center event with sustained wind speeds of 38 mph or less.
- **Tropical storm:** Tropical cyclone with sustained winds from 39 to 73 mph. These events are named.
- **Hurricane:** Tropical cyclone with sustained winds that reach 74 mph or greater.

Hurricanes are further categorized based on sustained wind speed according to the Saffir-Simpson hurricane wind scale (Table 4-11). Major hurricanes are those rated Category 3 and higher.

⁹⁶ NOAA National Environmental Satellite, Data, and Information Service, "How Does a Hurricane Form?", accessed February 16, 2026, <https://www.nesdis.noaa.gov/about/k-12-education/severe-weather/how-does-hurricane-form>.

Table 4-11. Saffir-Simpson Hurricane Wind Scale

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

Source: NOAA NWS, [Saffir-Simpson Hurricane Wind Scale](#).

While coastal areas are vulnerable to high waves and damaging storm surges, inland areas may also experience flooding due to heavy precipitation during hurricanes of all categories. Hurricanes may also produce tornadoes, and damaging wind gusts that exceed maximum sustained wind speeds may also occur. While loss of life may occur during any hurricane regardless of category, major hurricanes' wind speeds can be extremely catastrophic.

The official hurricane season runs from June to November, when air and sea surface temperatures are warm enough for their formation. In Massachusetts, tropical cyclones occur most frequently in August, September, and the first half of October.⁹⁷

History and Location

All of Groton is considered uniformly exposed to hurricanes and tropical storms. Groton is heavily wooded and has extensive floodplains around its many surface waterbodies. Properties within or in proximity to low-lying areas and floodplains may be most vulnerable to inland flooding. Groton is heavily wooded, so there are similar levels of vulnerability related to downed trees.

NOAA's NCEI Severe Events Database does not document any hurricane or tropical storm events that have impacted Groton or the region since 2019, though they have impacted the Commonwealth overall in the same period. See Map 2 (Appendix D). NOAA's Historical Hurricane Tracks tool identifies seven hurricanes or tropical storms that occurred within 65 nautical miles of Massachusetts between 2019 and 2025.⁹⁸ Historically, Massachusetts has not experienced a Category 4 or 5 hurricane, but Category 3

⁹⁷ *ResilientMass Plan: Appendices* (2023), 5.9-3.

⁹⁸ NOAA, "Historical Hurricane Tracks," accessed March 15, 2026, <https://coast.noaa.gov/hurricanes/#map=4/32/-80>.

hurricanes (still considered a major hurricane) and lesser tropical cyclones still occur somewhat frequently.⁹⁹

Probability of Future Occurrence

The *ResilientMass Plan* observes that hurricanes and tropical storms occur near the Commonwealth about once every two years on average, and that a Category 3 hurricane is expected to occur once every 50 to 60 years.¹⁰⁰ The risk of hurricanes and tropical storms in Groton is considered high given their frequency and expected severity.

Thunderstorms, Lightning, and Downbursts

Thunderstorms are formed when warm, moist air rises into cold, dry air with sufficient energy to create a storm cloud with strong updrafts and downdrafts. As the cloud grows vertically, some of its water vapor condenses into droplets or freezes (which may fall as rain or hail). Both have electrical charges, and lightning is the process by which energy is discharged once a sufficient electrical charge is built up. The resulting sound wave is the noise of thunder.¹⁰¹

In addition to lightning, rain, and hail, thunderstorms can also bring strong and potentially damaging winds. As air sinks in a thunderstorm, these downdrafts (which is also where rain and hail falls) can become extremely intense. Downbursts that are less than 2.5 miles in diameter are known as “microbursts,” while those larger than 2.5 miles in diameter are known as “macrobursts.”¹⁰² A group of microbursts traveling in a fast-moving, relatively straight line that exceeds 240 miles and has wind gusts of at least 58 mph along most of its length is known as a “derecho.”¹⁰³ Altogether, the lightning, precipitation, and winds associated with thunderstorms can lead to secondary hazards (e.g., flash flooding, fires, downed trees and powerlines) and can cause property damage and injury or loss of life.

NOAA classifies a thunderstorm as severe when it produces hail that is one inch in diameter or larger, wind gusts that exceed 58 mph, or a tornado.¹⁰⁴ Middlesex County has averaged about 6-7 severe thunderstorm watches annually for the period of 2005-2024 (Figure 4-3). There are two types of thunderstorm advisories that may be issued:¹⁰⁵

- **Severe Thunderstorm Watch:** Issued when weather conditions favorable for severe thunderstorms are detected. The expected timeframe for these storms is three to six hours. The watch may cover parts of a state or several states.
- **Severe Thunderstorm Warning:** Issued when severe thunderstorms have been reported by spotters or indicated by radar. A warning indicates that there is a threat to life and property, and individuals should seek shelter. The warning is highly localized and covers parts of one to several counties.

⁹⁹ *ResilientMass Plan: Appendices* (2023), 5.9-5.

¹⁰⁰ *Ibid.*

¹⁰¹ *Ibid.*, 5.12-2.

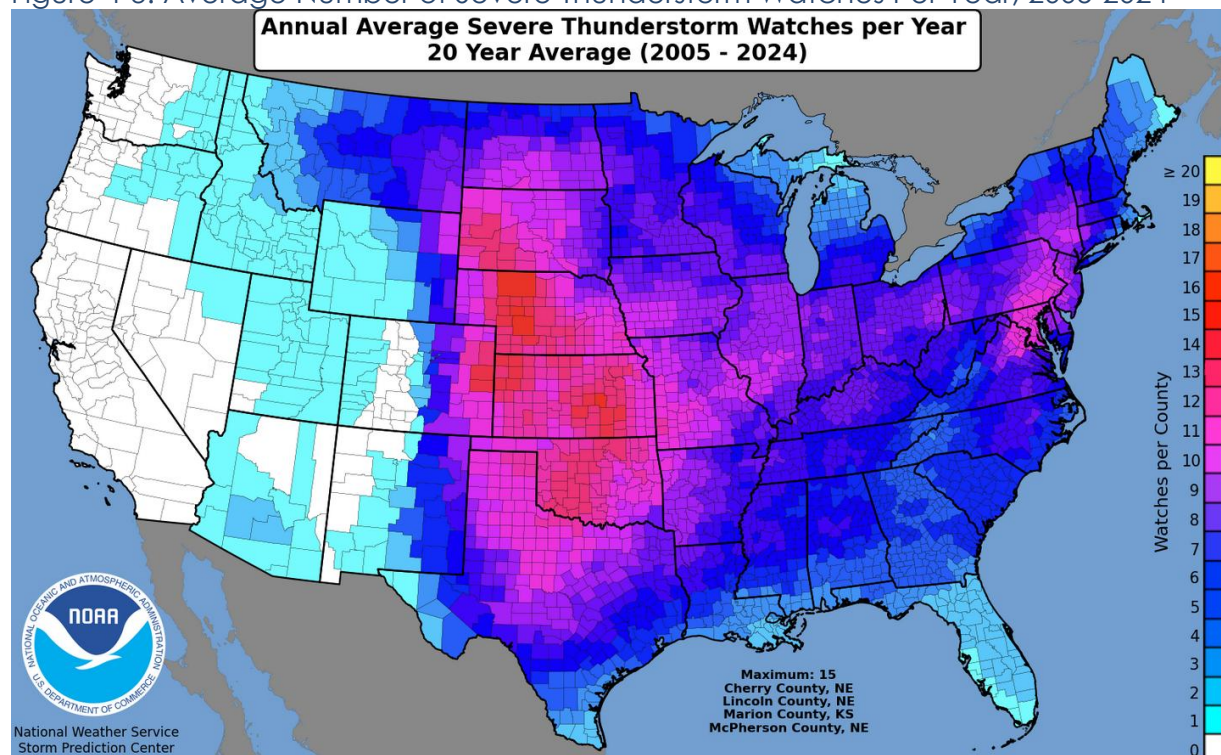
¹⁰² *Ibid.*, 5.12-3.

¹⁰³ NOAA NSSL, “Severe Weather 101 – Thunderstorms,” accessed February 18, 2026, <https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/types/>.

¹⁰⁴ *Ibid.*

¹⁰⁵ *Ibid.*

Figure 4-3. Average Number of Severe Thunderstorm Watches Per Year, 2005-2024

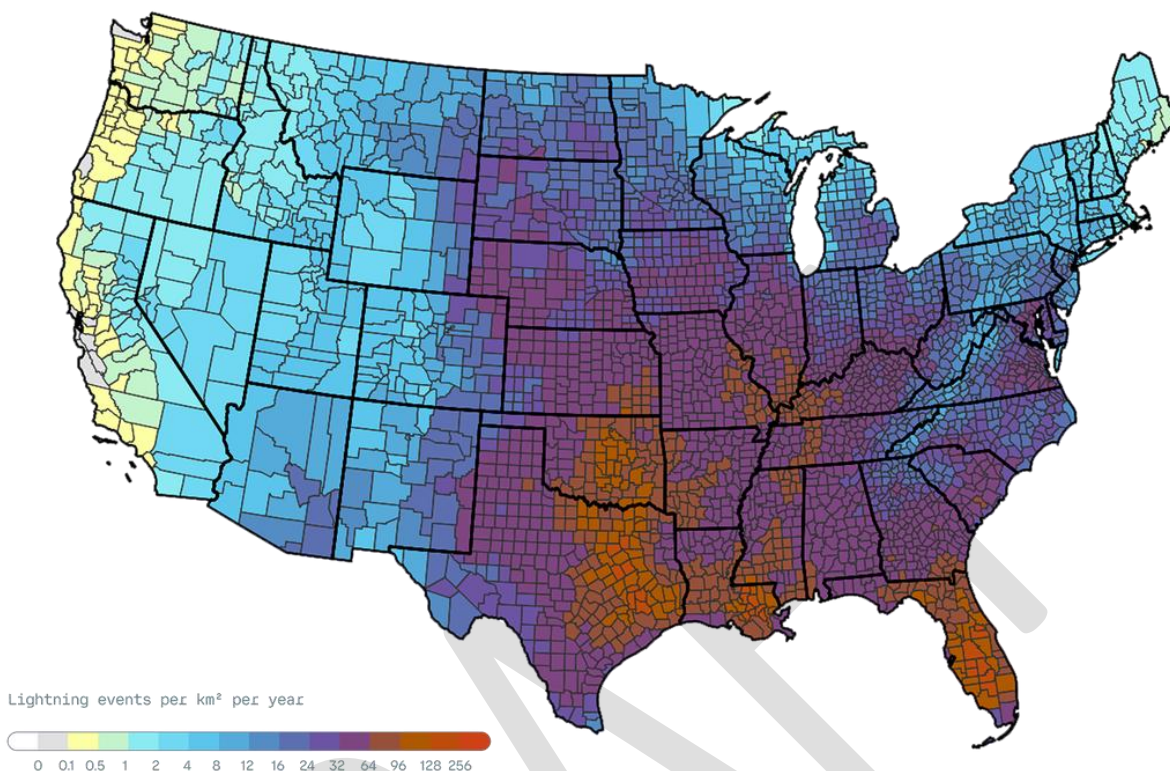


Source: NOAA Storm Prediction Center, [Severe Weather Maps, Graphics, and Data Page](#).

Lightning is a dramatic and defining characteristic of thunderstorms. Lightning may strike objects on the earth's surface, with the lightning traveling from cloud-to-ground. In cloud-to-ground lightning, a channel of negative charge travels downward toward the earth's surface, where objects send up streams of positive charge. When the downward moving channel of negative charge connects with a positive charge, an electrical current, seen as lightning, occurs. Taller objects on the landscape, like trees, multistory buildings, and electrical transmission and communications towers are most likely to be struck by lightning.¹⁰⁶ Lightning strikes to infrastructure can cause power and communications outages, as well as spark fires. People who are struck by lightning may be killed or severely injured.

¹⁰⁶ NOAA NSSL, "Severe Weather 101 – Lightning," accessed February 21, 2026, <https://www.nssl.noaa.gov/education/svrwx101/lightning/types/>.

Figure 4-4. Lightning Events per Square Kilometer, 2016-2024



Source: Vaisala, [The Annual Lightning Report 2025](#).

History and Location

Groton is uniformly exposed to thunderstorm-related events. Recently, the most damaging and disrupting aspect of thunderstorms have been the associated winds, including microburst events. Since 2019, there have been five recorded thunderstorm wind events affecting Groton, causing a total of \$22,500 in recorded damage (Table 4-12). Additionally, a July 2024 lightning strike at the Gibbet Hill Communications Tower damaged cybercommunications and electrical systems, costing the Town approximately \$87,200 in damage, clean up, and repair costs.

Within Middlesex County, 184 thunderstorm wind events (across 47 different days) have been recorded in the NOAA NCEI Storm Events Database since 2019, with a reported five injuries and \$750,150 in property damage.¹⁰⁷ Thunderstorm wind events generally cause downed trees and/or powerlines in Groton, which can cause power outages and block roadways.

Table 4-12. Significant Thunderstorm Wind Events, Groton, MA

Date	Wind Speed	Damages	Notes
5/15/2020	78 knots (90 mph)	\$20,000	Another microburst, with discontinuous damage approximately 1.5 miles in length, occurred in Groton and Westford. A drone video showed extensive tree damage near Cow Pond Brook Conservation area in Groton, with the vast majority

¹⁰⁷ NOAA NCEI, "Storm Events Database," accessed February 22, 2026, <https://www.ncei.noaa.gov/stormevents/>.

Date	Wind Speed	Damages	Notes
			of the trees blown down in a straight line. A wind gust to 89 mph was measured at MIT's Millstone facility near the Groton/Westford line.
7/30/2020	50 knots (58 mph)	\$1,300	In Groton, a large tree was down on Farmers Row and power lines were down on West Street.
7/21/2023	50 knots (58 mph)	\$500	In Groton, a tree was down on Chicopee Row. Trees and wires were down near Hollis Street.
7/17/2024	50 knots (58 mph)	\$500	In Groton, wires were reported down.
8/15/2024	50 knots (58 mph)	\$200	In Groton, a tree was down on Dunstable Rd.

Source: NOAA NCEI, [Storm Events Database](#). Data is current through October 2025.

Probability of Future Occurrence

The risk of thunderstorms, lightning, and downbursts is considered high in Groton based on the high frequency of occurrence (at least once annually) and medium severity of impacts (typically, downed trees and/or powerlines that require immediate response).

Tornadoes

A tornado is a narrow, violently rotating column of air that extends vertically from the earth's surface to a thunderstorm cloud. Tornadoes become more visible as water condensation forms within the funnel and dust and debris is picked up by wind movement. All thunderstorms have the potential to produce a tornado, but tornadoes are most often produced by supercells, which is a type of thunderstorm characterized by its severity and sustained rotating updraft of wind. Common factors in tornado formation are:¹⁰⁸

- Very strong winds in the middle and upper levels of the atmosphere.
- Clockwise turning of the wind with height.
- Increasing wind speed in the lowest 10,000 feet of the atmosphere.
- Very warm, moist air near the ground, with unusually cooler air higher in the atmosphere.
- A forcing mechanism such as a cold front or leftover weather boundary or thunderstorm activity that helps drive wind movement from areas of different atmospheric pressures.

Tornadoes are measured using the Enhanced Fujita (EF) scale, which rates tornado intensity based on estimated wind speeds (which are often difficult or dangerous to directly capture) and related damage (Table 4-13). The scale was adopted in 2007, replacing the earlier Fujita (F) scale.

Table 4-13. Enhanced Fujita Scale

EF Rating	Wind Speeds 3 second gust	Damage	Damage Description
EF-0	65-85 mph	Minor	Shingles blown off or parts of a roof peeled off; damage to gutters/siding; branches broken off trees; shallow rooted trees toppled.
EF-1	86-110 mph	Moderate	More significant roof damage; windows broken; exterior doors damaged or lost; mobile homes overturned or badly damaged.

¹⁰⁸ *ResilientMass Plan: Appendices* (2023), 5.14-1.

EF Rating	Wind Speeds 3 second gust	Damage	Damage Description
EF-2	111-135 mph	Considerable	Roofs torn off well-constructed homes; homes shifted off their foundations; mobile homes destroyed, large trees snapped or uprooted; cars can be tossed.
EF-3	136-165 mph	Severe	Entire stories of well-constructed homes destroyed; significant damage done to large buildings; homes with weak foundations can be blown away; trees begin to lose their bark.
EF-4	166-200 mph	Extreme	Well-constructed homes are leveled; cars thrown significant distances, top story exterior walls of masonry buildings likely to collapse.
EF-5	>200 mph	Massive / Incredible	Well-constructed homes are swept away; steel-reinforced concrete structures are critically damaged; high-rise buildings sustain severe structural damage; trees are usually completely debarked, stripped of branches, and snapped.

Source: Adapted from *ResilientMass Plan: Appendices* (2023) and NOAA NWS, [The Enhanced Fujita Scale \(EF Scale\)](#).

History and Location

No tornadoes have been reported in Groton since 2019, and only two have been observed crossing or immediately adjacent to Groton according to NOAA’s NCEI Severe Events Database:

- **October 3, 1970, F-3 tornado (158-206 mph winds):** The tornado originated in Littleton before traveling less than a mile north. The tornado caused an estimated \$250k in property damage and one fatality.¹⁰⁹
- **July 1, 1971, F-1 tornado (73-112 mph winds):** The tornado originated in Ayer before traveling 25 miles to the northeast. The tornado caused an estimated \$25k in property damage and one injury.¹¹⁰

See Map 3 (Appendix D) for historical tornado paths. More generally, between 1950 and 2021, 190 tornadoes were documented in the Commonwealth.¹¹¹ If a tornado were to occur in Groton, the affected area would vary based on the tornado’s track and width. However, a tornado may occur or travel through any part of Groton.

Probability of Future Occurrence

On average, Massachusetts experiences two to five tornadoes annually, with touchdowns most common in the region running from south-central to northeastern Massachusetts (including a portion of Groton). The risk of tornadoes is considered low in Groton based on their limited historical occurrence and overall rarity in Massachusetts.

Hail

Hail forms in thunderstorms when strong updrafts carry water droplets upward, where they freeze into hailstones of solid ice. Hailstones will continue to grow as they collide with liquid precipitation that then freezes onto the hailstone. Hail falls to the ground when it becomes too heavy to remain aloft and/or as

¹⁰⁹ NOAA NCEI, “Storm Events Database, Event Details, 1970-10-03,” accessed February 16, 2026, <https://www.ncei.noaa.gov/stormevents/eventdetails.jsp?id=10040166>.

¹¹⁰ NOAA NCEI, “Storm Events Database, Event Details, 1971-07-01,” accessed February 16, 2026, <https://www.ncei.noaa.gov/stormevents/eventdetails.jsp?id=10040178>.

¹¹¹ *ResilientMass Plan: Appendices* (2023), 5.14-4.

thunderstorm updrafts weaken. The speed at which hailstones fall is influenced by their size, friction between the hailstones and surrounding air, wind conditions, and the rate at which the hailstones are melting. In general, larger hailstones fall faster. Smaller hailstones (less than 1-inch in diameter) have a typical fall speed between 9 to 25 mph, while slightly larger hailstones (1- to 1.75-inches in diameter) associated with severe thunderstorms may have a fall speed between 25 to 40 mph.¹¹²

The Tornado and Storm Research Organisation (TORRO) scale is often used to measure hailstorm intensity and includes hailstone size descriptions (Table 4-14).

Table 4-14. TORRO Hailstorm Intensity Scale

Scale	Intensity	Typical Diameter (in)	Size Comparison	Damage
H0	Hard hail	0.25	Pea	No damage.
H1	Potentially damaging	0.50	Mothball	Slight general damage to plants and crops.
H2	Significant	0.75	Marble, grape	Significant damage to fruit, crops, vegetation.
H3	Severe	1.25	Walnut	Severe damage to fruit and crops; damage to glass and plastic structures; paint and wood scored.
H4	Severe	1.50	Pigeon's egg to squash ball	Widespread glass damage; vehicle bodywork damage.
H5	Desctructive	1.75	Golf ball to pullet's egg	Wholesale destruction of glass; damage to tiled roofs; significant risk of injuries.
H6	Desctructive	2.0	Hen's egg	Bodywork of grounded aircraft dented; brick walls pitted.
H7	Desctructive	2.5	Tennis ball to cricket ball	Severe roof damage; risk of serious injuries
H8	Desctructive	2.75	Large orange to softball	Severe damage to aircraft bodywork
H9	Super hailstorms	3.0	Grapefruit	Extensive structural damage; risk of severe or even fatal injuries to people caught in the open
H10	Super hailstorms	4.0	Melon	Extensive structural damage; risk of severe or even fatal injuries to people caught in the open

Source: TORRO, [The TORRO Hailstorm Intensity Scale](#).

History and Location

All of Groton is considered uniformly exposed to hail events. NOAA's NCEI Severe Events Database does not document any hail events occurring within Groton since 2019, though the LHMC indicated that smaller hailstorms with no or limited damage typically occur at least once a year. Additionally, there are 10 hailstorm events documented across Middlesex County, including in adjacent municipalities. None were associated with any financial damage, and hail size was recorded as 0.75 to 1 inch in size.

Probability of Future Occurrence

Hail is considered a medium risk hazard, primarily driven by the likelihood that it will continue to occur on at least an annual basis in Groton. However, the expected severity of hail events is considered negligible based on past occurrences.

¹¹² NOAA NSSL, "Severe Weather 101 – Hail," accessed February 16, 2026, <https://www.nssl.noaa.gov/education/svrwx101/hail/>.

Climate Change Impacts on Wind-Related Hazards

Wind-related hazards affecting Massachusetts are each driven by unique complex and interacting factors. Related to high winds in isolation, the *ResilientMass Plan* notes that climate models do not always model expected impacts on winds, and some uncertainties in long-term wind trends still exist. However, data indicates that average global wind speeds have increased since 2010.¹¹³

Climate change is expected to increase the severity of hurricanes and tropical storms, including more intense precipitation, though there is remaining uncertainty about how their frequency will be affected. However, recent data suggests that tropical cyclones in the Atlantic are increasing in frequency due to warming air and water temperatures, which will also make associated winds and precipitation more intense. So, while there is uncertainty as to how their frequency will change, there is consensus that hurricanes and tropical storms will become stronger, with a greater number of storms expected to intensify into major hurricanes.¹¹⁴

The *ResilientMass Plan* notes that Massachusetts is expected to continue experiencing thunderstorms under future climate conditions, with downscaled climate models suggesting that conditions will become more favorable for severe thunderstorm formation. Insofar as severe thunderstorms can produce tornadoes and hail, the potential for these events may also increase in association. However, there is still some uncertainty about how exactly tornado frequency will be impacted, with some studies suggesting that the number of tornado days will decrease even as the number of tornadoes per day increases. The *ResilientMass Plan* observes that less than 10% of severe thunderstorms produce tornadoes, so drawing firm conclusions about how climate change will affect tornado incidence is difficult.¹¹⁵

People and Property at Risk from Wind-Related Hazards

Groton is uniformly exposed to wind-related hazards. However, actual impacts of wind-related hazards on individual people or properties will vary based on several factors, including building construction and nearby features on the landscapes (e.g., trees, waterbodies). In Groton, where much of the community is heavily wooded, downed trees and powerlines are typically a primary concern related to wind-related hazards. Proactive tree management is especially important to remove branches or trees that are susceptible to being downed during a wind event. GELD maintains an aggressive vegetation management and trimming program to mitigate impacts to its system.

Summary of Anticipated Impacts from Wind-Related Hazards

Wind-related hazards are associated with a range of direct impacts and secondary hazards, including severe precipitation (leading to inland flooding) and fires caused by lightning strikes. Downed power lines are also a concern for utility-caused fires. A summary of anticipated impacts from wind-related hazards most relevant to Groton are noted by sector:

- **Human:** Potential for injury or loss of life, particularly for those who have difficulty evacuating or accessing safe shelter spaces. Certain structures (e.g., manufactured homes, structures that

¹¹³ *ResilientMass Plan: Appendices* (2023), 5.12-5-6.

¹¹⁴ NASA, "A Force of Nature: Hurricanes in a Changing Climate," updated June 1, 2022, <https://science.nasa.gov/earth/climate-change/a-force-of-nature-hurricanes-in-a-changing-climate/>.

¹¹⁵ *ResilientMass Plan: Appendices* (2023), 5.12-6 and 5.14-6.

predate modern building codes) may be particularly vulnerable to wind-related hazards, including tornadoes. Power outages and blocked roadways may affect access to emergency care.

- **Infrastructure:** Direct damage to utility infrastructure (e.g., energy transmission lines) Potential for evacuation routes to be blocked by downed trees and/or powerlines. Wind-related hazards can cause flying debris, which can cause additional damage to structures and infrastructure.
- **Economy:** Potential losses associated with business interruptions and structural damage, as well as clean up, debris management, and recovery costs. Recovery and clean up costs may be significant depending on the severity and proximity of the wind-related hazard.
- **Governance:** Potential for damage to public safety infrastructure, as well as public health facilities. Increased service demands.
- **Natural Environment:** High winds and associated intense precipitation (including hail) can significantly damage or destroy vegetation and tree canopy. High winds may transport hazardous materials, and lightning strikes may start fires. Secondary hazards and impacts (e.g., landslides, erosion) may occur in areas that experienced flooding.

3. Winter-Related Hazards

Winter-related hazards are atmospheric in nature and can include heavy snow, blizzards, ice, and extreme cold. The entire Town and its population are at risk of winter-related hazards, which can have a variety of potential impacts and range from minor inconveniences to extreme events depending on their severity. Heavy snow loads may cause roofs and trees to collapse, leading to structural damage and potential for injury or loss of life. Additional impacts often include road closures, power outages, business interruption and losses (e.g., due to road closures), hazardous driving conditions, frozen pipes, fires due to improper heating, and secondary adverse health impacts caused by shoveling (such as a heart attack). Emergency response efforts may be complicated during and after winter-related hazards, particularly when streets become partially or fully inaccessible due to snow accumulations or downed trees and/or powerlines.

Blizzards, Heavy Snow, Winter Weather, and Nor'easters

Blizzards, heavy snow, winter weather, and Nor'easters occur regularly in Massachusetts. These severe winter storms are extratropical cyclones, which can form when cold and warm masses of air converge and create front. Severe winter storms may vary in wind speeds, with some storms associated with extremely strong winds. Winter storms include multiple risks, including high winds, heavy snow, and ice.

To be considered a blizzard, a severe winter storm must have sustained wind or frequent wind gusts of 35 mph or greater and have falling or blowing snow that reduces visibility frequently to less than a quarter mile for at least three hours.¹¹⁶ Heavy snowfall and extreme cold may occur as well. Blizzard conditions become more likely when temperatures fall below 20°F. A severe blizzard is categorized as having temperatures near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero.¹¹⁷ Life-threatening conditions can be created by blizzards, and transportation is often extremely dangerous due to “whiteout” conditions caused by the loss of visibility. When blizzards include extreme cold and high winds, wind chill (how cold it feels) can also threaten life safety.¹¹⁸

¹¹⁶ NOAA NWS, “Winter Storms and Blizzards,” accessed March 1, 2026, <https://www.weather.gov/fgz/WinterStorms>.

¹¹⁷ *ResilientMass Plan: Appendices* (2023), 5.13-1.

¹¹⁸ NOAA NWS, “Winter Storms and Blizzards,” accessed March 1, 2026, <https://www.weather.gov/fgz/WinterStorms>.

The NWS defines “heavy snow” as snowfall that accumulates to four inches or more in depth in 12 hours or less or snowfall that accumulates to six inches or more in depth in 24 hours or less.¹¹⁹

Nor’easters occur along the East Coast and are characterized by large counterclockwise wind circulation around a low-pressure center. Nor’easters often result in heavy snow, high winds, and heavy precipitation, along with strong waves and coastal flooding. The name “Nor’easter” refers to the strong northeasterly winds blowing in from the ocean that precede the storms. Nor’easters are most common between September and April, though they can occur at any time of year. The storm radius is often as large as 100 miles across with sustained wind speeds of 20 to 40 mph (with gusts up to 50 to 60 mph). Nor’easters can last for several days.¹²⁰

There is no widely used scale to classify snowstorms. The Northeast Snowfall Impact Scale (NESIS) was developed by Paul Kocin and Louis Uccellini of The Weather Channel and the National Weather Service, respectively, to characterize and rank high-impact snowstorms (10-inch snowfall accumulations or greater) that occur in the Northeast (Table 4-15). The NESIS index differs from other meteorological indices in that it uses population information in addition to meteorological measurements to give an indication of social impacts. The NESIS index was developed because snowstorms across the Northeast Corridor (between Boston and Washington, D.C.) can have major implications to transportation and economic productivity across the rest of the country. The index derives a NESIS value based on the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm to assign a category to the storm. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers. NOAA began using the NESIS in 2005 to determine impact of snow events.¹²¹

Table 4-15. NESIS Impact Scale

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	≥10.0	Extreme

Source: NOAA NCEI, [The Northeast Snowfall Impact Scale \(NESIS\)](https://www.ncei.noaa.gov/access/monitoring/rsi/nesis).

History and Location

Groton is uniformly exposed to blizzards, heavy snow, winter weather, and Nor’easters. Since 2019, there have been 22 significant blizzard, heavy snow, and winter weather events in Northwest Middlesex County, where Groton is located, documented in the NOAA NCEI Severe Events Database (Table 4-16). Note Nor’easters are not documented as a separate hazard type. Based on their social impact, note also that not all storms have an associated NESIS value above 1.

¹¹⁹ NOAA NWS, “Weather Glossary,” accessed March 1, 2026, https://www.weather.gov/otx/full_weather_glossary.

¹²⁰ *ResilientMass Plan: Appendices* (2023), 5.13-1-2.

¹²¹ NOAA NCEI, “The Northeast Snowfall Impact Scale (NESIS),” accessed March 1, 2026, <https://www.ncei.noaa.gov/access/monitoring/rsi/nesis>.

Table 4-16. Significant Events and NESIS Impact Scale Rankings

Date	Snowfall and/or Ice Accumulation	Damages	Notes	NESIS Value	NESIS Category (Description)
Blizzard					
1/28/2022	7-10 inches snowfall	\$0	N/A	1.73	1 (Notable)
Heavy Snow					
12/1/2019	22-25 inches snowfall	\$0	N/A	N/A	N/A
1/18/2020	4 - 6 inches snowfall	\$0	N/A	N/A	N/A
3/23/2020	6.5 - 7.8 inches snowfall	\$0	N/A	N/A	N/A
12/5/2020	5.5 inches snowfall	\$0	N/A	N/A	N/A
12/16/2020	10.5 - 14.5 inches snowfall	\$0	N/A	3.21	2 (Significant)
2/1/2021	12 - 18 inches snowfall	\$0	N/A	4.933	3 (Major)
4/16/2021	3.1 - 11 inches snowfall	\$0	N/A	N/A	N/A
1/16/2022	5 - 6 inches snowfall	\$0	N/A	N/A	N/A
2/25/2022	6 - 8 inches snowfall	\$0	N/A	N/A	N/A
1/20/2023	5 - 7 inches snowfall	\$0	N/A	N/A	N/A
1/23/2023	5 - 7 inches snowfall	\$7,000	In Groton at 330 AM EST, police reported a large tree down on Whitman Road at Nicole Lane.	N/A	N/A
3/3/2023	7 - 8.4 inches snowfall	\$0	N/A	N/A	N/A
3/13/2023	15 - 30 inches snowfall	\$9,000	N/A	N/A	N/A
1/28/2024	5 - 8.4 inches snowfall	\$0	N/A	N/A	N/A
2/9/2025	6 - 8 inches snowfall	\$0	N/A	N/A	N/A
Winter Storm					
1/19/2019	5 - 8 inches snowfall	\$0	N/A	N/A	N/A
3/3/2019	7 - 8 inches snowfall	\$0	N/A	1.29	1 (Notable)
2/15/2025	5 - 7 inches snowfall; 0.25 inches ice accumulation	\$0	N/A	N/A	N/A
Winter Weather					
2/13/2019	0.25 inches ice accumulation	\$0	N/A	N/A	N/A
12/30/2019	0.1 - 0.25 inches ice accumulation	\$300	N/A	N/A	N/A
12/16/2022	0.3 - 11 inches snowfall	\$1,000	N/A	2.66	2 (Significant)

Source: NOAA NCEI, [Storm Events Database](#). Data is current through October 2025.

Probability of Future Occurrence

Blizzards, heavy snow, winter weather, and Nor'easters typically occur every year in Groton, though they may vary in severity. Given the frequency of occurrence and potential for severe impacts, blizzards, heavy snow, winter weather, and Nor'easters are considered a high concern hazard in Groton.

Ice Storms

An ice storm is a type of winter storm during which ice accumulation is expected due to freezing rain (i.e., liquid rain that freezes on contact with cold objects, resulting in ice buildup). Given the weight of accumulated ice, these storms can be particularly concerning for their propensity to down trees and utility lines and lead to power and communication outages. Ice accumulation also contributes to dangerous transportation conditions, which can complicate emergency response efforts.¹²² The NWS considers ice accumulations of ¼-inch or greater to be significant. The NWS issues ice storm warnings when conditions are expected to result in ice accumulations of ½-inch or greater, though icing conditions are also included in the criterion for other types of winter weather watches, warnings, and advisories.¹²³

Ice storms can be classified using the Sperry-Piltz Ice Accumulation Index (SPIA), which is an ice accumulation and ice damage prediction index that forecasts the potential damage to overhead utility systems, as well as outage duration possibilities, of approaching ice storms (Table 4-17). The index assigns categories of damages based on precipitation totals, temperatures, and wind speeds and direction.

Table 4-17. Sperry-Piltz Ice Accumulation Index

Ice Damage Index	Damage and Impact Descriptions
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 to 5 days.
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines and structures. Outages lasting 5 to 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Source: SPIA Index, [What is the Sperry-Piltz Ice Accumulation Index?](#)

History and Location

No ice storm events were recorded for the Groton area in the NOAA NCEI Severe Storm Events database for the period between 2019-2025. However, as confirmed by the Groton LHMC, ice storms and icing conditions typically occur on a near-annual basis. Additionally, though this is across a longer period, the *ResilientMass Plan* observes that NOAA has documented 33 ice storm events between 1988-2022 across eight days in the Commonwealth.

The entire Town is uniformly exposed to ice storms, including impacts from ice accumulation on roadways and other surfaces. There are some newer developments in Groton that have underground powerlines and are thus less susceptible to downed powerlines in the immediate area. However, insofar

¹²² *ResilientMass Plan: Appendices* (2023), 5.13-2.

¹²³ NOAA NWS, "National Weather Service Expanded Winter Weather Terminology," accessed March 1, 2026, <https://www.weather.gov/bgm/winterterms>.

overhead powerlines are part of Groton’s larger electrical network, even a building with an underground powerline may be affected by downed powerlines elsewhere in the community.

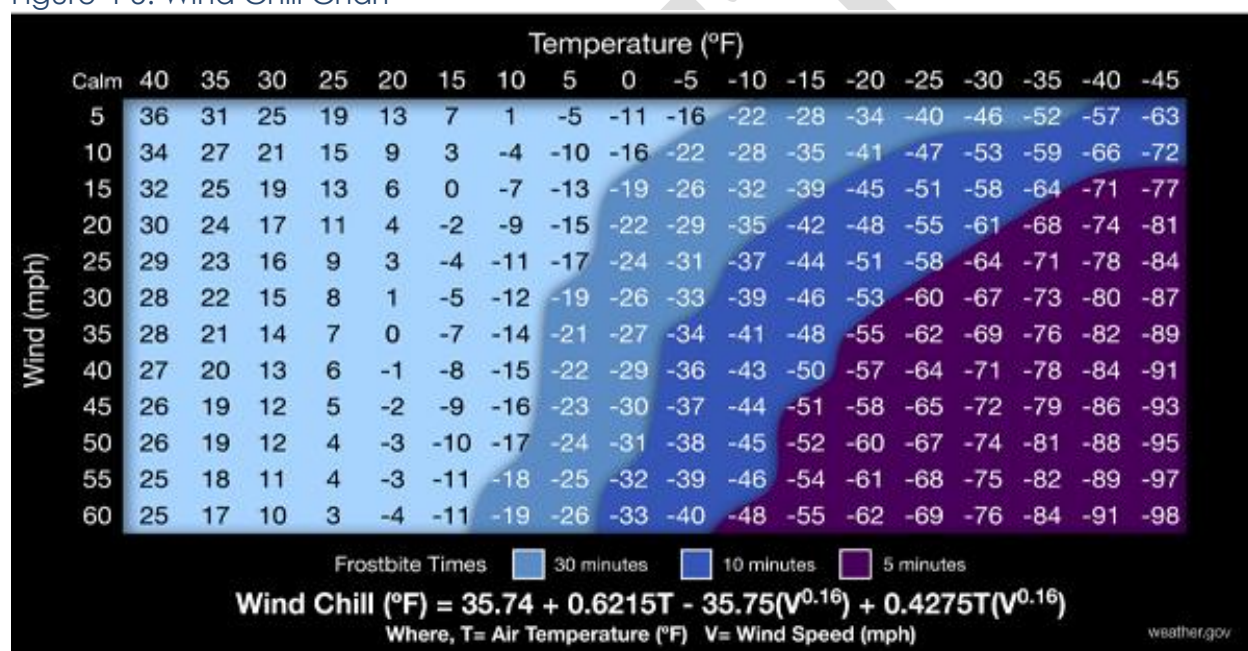
Probability of Future Occurrence

Based on the moderate frequency and limited severity of ice storms, as confirmed by the Groton LHMC, the risk of ice storms to the Town is considered moderate.

Extreme Cold

Extreme cold weather is typically measured in terms of wind chill temperature. The wind chill measurement accounts for a “feels like” temperature based on how cold temperatures, in combination with the effects of wind, affect the rate of heat loss to exposed skin (Figure 4-5). As wind speeds increase in cold temperatures, the rate of heat loss also increases.

Figure 4-5. Wind Chill Chart



Source: NOAA NWS, [Understanding Wind Chill](#).

The NWS issues the following cold weather hazard alerts:

- **Cold Weather Advisory:** Temperatures or wind chills are expected to fall to or below 15°F but remain above 5°F.
- **Extreme Cold Watch:** Temperatures or wind chills are expected to fall to or below 5°F in the next 24 to 48 hours.
- **Extreme Cold Warning:** Temperatures or wind chills are expected to fall to or below 5°F within the next 12 to 24 hours.

Extreme cold can cause frostbite or hypothermia and can quickly become life-threatening if proper precautions (e.g., adequate clothing, seeking warm shelter) are not taken. In addition to direct threats to life safety, extreme cold events can strain power utilities as demand for heat increases. Power outages can become dangerous if homes fall below safe temperatures. Accidental injuries and loss of life

sometimes occur from carbon monoxide poisoning or fires caused by the unsafe use of generators, heating appliances, cooking devices, and cars for heating purposes.¹²⁴ Damage from frozen pipes and subsequent breakage and flooding may occur in homes and other structures. Periods of extended extreme cold can exacerbate hazards associated with other winter-related hazards and make accumulated ice and snow last longer.

History and Location

No extreme cold events were recorded for the Groton area in the NOAA NCEI Severe Storm Events database for the period between 2019-2025. However, as confirmed by the Groton LHMC, the community experiences extreme cold on an annual basis, though the length of extreme cold periods can vary. Additionally, though this is across a longer period, the *ResilientMass Plan* notes that 120 cold weather events have occurred since 1995 across Massachusetts.

The Town is uniformly exposed to extreme cold events. However, the vulnerability of residents is expected to vary based primarily on individual health and home heating circumstances. While extreme cold can affect anyone, vulnerable populations include those with preexisting health conditions such as asthma, older adults, young children, and those without adequate shelter or heating.

Probability of Future Occurrence

The *ResilientMass Plan* estimates that the likelihood of extreme temperatures occurring in the Commonwealth in the future is very high.¹²⁵ The risk of extreme cold is considered moderate in Groton based on its frequent occurrence but relatively limited severity.

Climate Change Impacts on Winter-Related Hazards

The *ResilientMass Plan* notes that extreme cold weather events are expected to occur less frequently and with less severity as annual and seasonal average temperatures increase.¹²⁶ Table 4-18 indicates average and cold day temperatures for Groton in 2030 and 2050 compared to a current baseline; the lower and upper bounds (10th and 90th percentiles) are shown for each projection year.¹²⁷

Table 4-18. Average and Cold Day Temperature Projections: Groton, MA

Climate Metric	Baseline 1950 - 2013	Projection 2030	Projection 2050
<i>Season: Annual</i>			
Average Temperature	46.7°F	48.5 to 52.1°F	50.3 to 54.8°F
Minimum Temperature	-7.6°F	-5.8 to -2.2°F	-4.0 to 0.5°F
Number of Days with Minimum Temperature below 32°F	160 days	118 to 146 days	98 to 132 days
Heating degree days (Base 65°F)	7,092 days	5,635 to 6,580 days	4,983 to 6,095 days
<i>Season: Winter</i>			
Average Temperature	25.1°F	27.8 to 30.5°F	29.6 to 34.1°F
Minimum Temperature	-7.6°F	-5.8 to -2.2°F	-3.1 to 1.4°F

¹²⁴ MA Department of Public Health, Bureau of Climate and Environmental Health, Division of Toxicology, Hazard Assessment, and Prevention, [Extreme Cold](#) (n.d.).

¹²⁵ *ResilientMass Plan* (2023), 5.1-24.

¹²⁶ *ResilientMass Plan: Appendix* (2023), 5.2-9.

¹²⁷ MA EOEEA, "ResilientMass Maps and Data Center," accessed January 20, 2026, <https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/>.

Number of Days with Minimum Temperature below 32°F	85 days	74 to 80 days	65 to 77 days
Heating degree days (Base 65°F)	3,601 days	3,115 to 3,358 days	2,792 to 3,196 days

Source: MA EOEAA, [ResilientMass Climate Change Projections Dashboard](#).

As annual and seasonal average temperatures increase, more precipitation is expected to fall as rain rather than snow (however, extreme rain events are associated with their own unique impacts). There is less certainty about how climate change will affect the frequency of winter-related hazards. The *ResilientMass Plan* notes there is limited evidence that the frequency of Nor'easters and severe winter storms will change. Based on historical data, the frequency of extreme snowstorms actually increased between the first half of the 20th century and the second half, despite overall warming trends. It is hypothesized that the timing of severe winter storms may become more concentrated in the coldest winter months when temperatures will result in snow rather than rain.¹²⁸

Climate change is expected to increase the severity of severe winter storms. Warmer sea surface temperatures can hold more moisture, so it is expected that more precipitation as either rain or snow will fall during extreme events (a trend that is already observed). The *ResilientMass Plan* also observes that increasing water temperatures and reduced sea ice in the Arctic is affecting atmospheric circulation patterns such that more cold air travels to the Atlantic Coast during the winter, which facilitates the development of severe winter storms.¹²⁹

People and Property at Risk from Winter-Related Hazards

Groton is uniformly exposed to winter-related hazards. However, actual impacts of winter-related hazards on individual people or properties will vary based on several factors, including building construction, access to adequate heating, and preexisting health conditions. People who are unable to stay home during winter-related hazards, such as essential workers that must report to their place of employment, may also be more exposed to secondary hazards such as dangerous driving conditions. Another major concern in Groton is the potential for winter-related hazards to cause downed trees and powerlines, including through ice accumulation, which can be disruptive or dangerous if they result in power outages during extreme cold periods.

Summary of Anticipated Impacts from Winter-Related Hazards

Winter-related hazards are associated with a range of impacts, including direct threats to life safety and property. Winter-related hazards also often require extended management and response from the Town, particularly for snow removal, which can become more complicated when multiple snowstorms in quick succession occur. Groton, like many other communities, also activates warming centers during periods of extreme cold, which must be staffed. A summary of anticipated impacts from winter-related hazards most relevant to Groton are noted by sector:

- **Human:** Potential for injury or loss of life, including related to frostbite, hypothermia, overexertion from clearing snow, lack of adequate shelter, and accidental harm from unsafe heating practices. Potential for isolation of homes due to high snowfall, storm debris, power outages, and blocked roadways. Increased risk to emergency responders and utility workers who

¹²⁸ *ResilientMass Plan: Appendices* (2023), 5.13-7.

¹²⁹ *Ibid.*

must respond during the hazard event. Reduced ability to exercise, recreate, and work outdoors in dangerously cold conditions.

- **Infrastructure:** Direct damage to roofs and structures due to snow and ice accumulation. Potential for damage to infrastructure, including downed powerlines and blocked roadways. Increased stress on utilities and power systems due to increased demand for heating.
- **Economy:** Potential losses associated with business interruptions and structural damage, especially related to transportation disruptions and power outages. Costs of snow removal and potential for flooding from snow accumulation and rapid ice melt. Potential for reduced ability to work and loss of wages. Damage to agricultural crops.
- **Governance:** Increased demand for heating services, as well as increased demand for emergency services and public health facilities. Snow removal and management may require extended, around-the-clock effort.
- **Natural Environment:** More intense winter-related hazards can stress ecosystems beyond their natural capacity to recover. Alterations in normal snow and ice melt patterns can lead to lower flow conditions in the spring, affecting aquatic life. Loss of tree cover due to associated winds and precipitation.

4. Geological-Related Hazards

Geologic hazards can include earthquakes, landslides, sinkholes, and subsidence. Town officials did not identify any local areas that were previously recorded as being vulnerable to geologic hazards, which would have included landslide areas and previous damage areas from earthquakes.

Earthquakes

An earthquake is the shaking, sometimes violent, of the Earth's surface that follows the release of energy in its crust due to fault fracture and movement. Earthquakes most commonly originate along tectonic plate boundaries due to the movement of tectonic plates as they grind, slip, and pull against and away from one another. The point on Earth's surface directly above hypocenter of the earthquake (where it originated underground) is called the epicenter. The severity of an earthquake in any given location is dependent upon the magnitude of energy released, proximity to the epicenter, depth to the hypocenter, duration of the earthquake, type of resulting ground motion, and local geologic characteristics. When earthquakes occur, ground shaking or ground motion is the primary cause of earthquake damage to structures. Ground motion from earthquakes is amplified by soft soil and reduced by hard rock.

Earthquakes are measured based on their magnitude and intensity. Magnitude refers to the measurable size (i.e., amplitude of seismic waves) of an earthquake, which is not necessarily a direct indication of damage. For example, an earthquake in a densely populated area that results in loss of life and considerable damage can have the same magnitude as an earthquake in a remote area that causes no damage to human life or property. The most publicly well-known magnitude scale in the U.S. is the Richter Magnitude Scale (Table 4-19), though other magnitude scales are also commonly used. Intensity refers to the degree of shaking experienced on Earth's surface at a specific site and is measured empirically; greater intensity values generally occur closer to the epicenter of the earthquake. The U.S. uses the Modified Mercalli Intensity Scale to measure intensity (Table 4-20).

Table 4-19. Richter Magnitude Scale

Magnitude	Description/Damage
≤2.5	Not felt or felt mildly near the epicenter, but can be recorded by seismographs.
2.5 to 5.4	Often felt but only causes minor damage.
5.5 to 6.0	Slight damage to buildings and other structures.
6.1 to 6.9	May cause a lot of damage in very populated areas.
7.0 to 7.9	Major earthquake; serious damage.
≥8.0	Great earthquake; can totally destroy communities near the epicenter.

Source: Adapted from *ResilientMass Plan: Appendices* (2023).

Table 4-20. Modified Mercalli Intensity Scale

Intensity	Shaking	Description/Damage
I	Not Felt	Not felt except by a very few under especially favorable conditions
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings
III	Weak	Felt quite noticeably by persons indoors, especially
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS, [The Modified Mercalli Intensity Scale](#).

History and Location

As of March 2026, there have been no recorded earthquakes in Groton for the period of record tracked by the USGS, though there have been minor earthquakes with epicenters in adjacent communities, primarily to the south, based on the USGS Latest Earthquakes tool.¹³⁰ See Map 4 (Appendix D). The *ResilientMass Plan* notes that there have been over 1,800 earthquakes between 2007 and 2022 in New England and adjacent areas, with the last major earthquake (above a magnitude of 5.0) recorded occurring in 1940 with an epicenter in the Ossipee Mountains in New Hampshire.¹³¹

¹³⁰ USGS, "Latest Earthquakes," accessed March 15, 2026, <https://earthquake.usgs.gov/earthquakes/map/?extent=22.14671,-130.16602&extent=51.67256,-59.85352>.

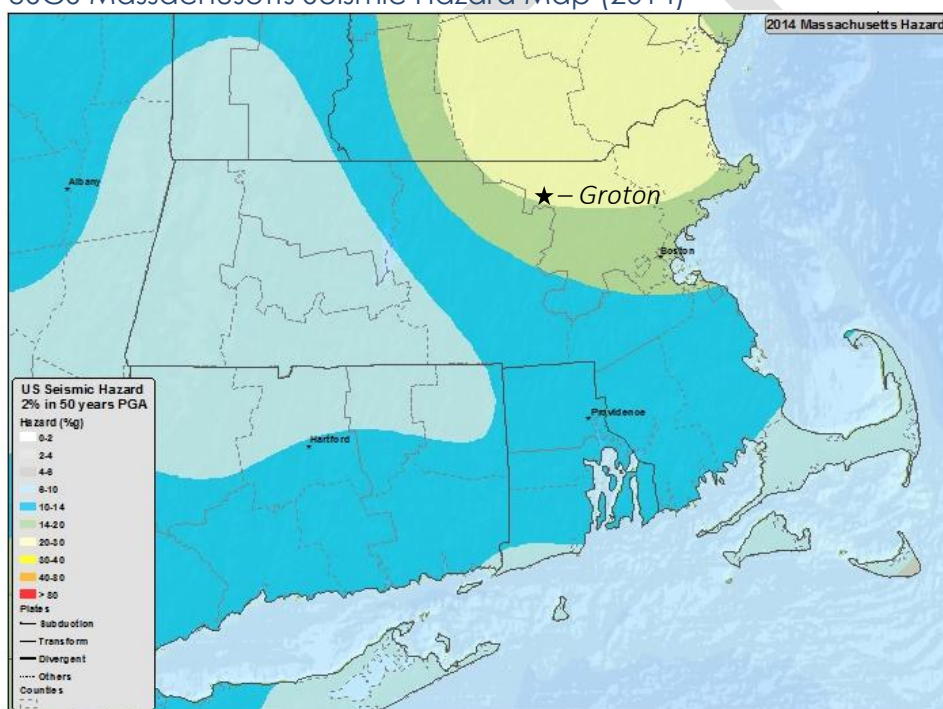
¹³¹ *ResilientMass Plan: Appendices* (2023), 5.7-4.

Probability of Future Occurrence

Massachusetts is not near tectonic plate boundaries, and the USGS lists the region as low risk for earthquakes. Groton is not within what the Commonwealth considers the most at-risk areas (Greater Boston, Cape Code and the Connecticut River Valley due to softer soils that can amplify ground shaking). Smaller scale earthquakes (under magnitude 3.5 on the Richter Magnitude Scale) occur occasionally in New England but are generally too weak to be felt and/or result in minimal to no damage.

The primary cause of earthquake damage to structures is ground shaking or ground motion, which is measured by maximum peak horizontal acceleration expressed as a percentage of gravity (%g). Peak ground acceleration in Massachusetts ranges from 10 %g to 20 %g, with a 2% probability of exceedance in 50 years that an earthquake that size or stronger than that would occur (Figure 4-6). Groton is within a peak ground acceleration area of 16%g with a 2% probability of exceedance in 50 years.

Figure 4-6. USGS Massachusetts Seismic Hazard Map (2014)



Source: Adapted from USGS, [2014 Seismic Hazard Map – Massachusetts](https://www.usgs.gov/programs/seismicity/seismic-hazard-maps/massachusetts).

Overall, the risk of earthquakes is low in Groton based on their limited occurrence and severity.

Landslides

Landslides include a wide range of ground movements, including rock falls, deep failure of slopes, and shallow debris flows, but can be simply summarized as “the downslope movement of earth materials.”¹³² As noted in the *ResilientMass Plan*, most landslides in Massachusetts are translational debris slides, rotational slides, or debris flows that are caused by a combination of unfavorable geological conditions, steep slopes, and/or excessive soil moisture.¹³³ Historical landslides in the Commonwealth have typically

¹³² USGS, “Landslide Basics,” accessed January 19, 2026, <https://www.usgs.gov/programs/landslide-hazards/landslide-basics>.

¹³³ *ResilientMass Plan: Appendices* (2023), 5.11-1.

been “preceded by two or more months of higher-than-normal precipitation, followed by a single, high-intensity rainfall of several inches or more that can cause slopes to become saturated and fail.”¹³⁴

Landslides can occur suddenly or gradually and vary in speed. They can damage buildings and infrastructure, alter the landscape dramatically, and cause sedimentation of local waterbodies.

Many natural processes, hazard events, and/or human activities can exacerbate these conditions and heighten the likelihood of landslides occurring. For example, erosion by natural riverine processes, soil saturation by snowmelt or heavy precipitation, excess weight from the accumulation of snow or precipitation, and earthquake created stresses to weak slopes can all contribute to landslides. Likewise, poor development practices, such as improper stockpiling of heavy materials, land clearing, or development on steep slopes can contribute to landslides, while good engineering practices and effective enforcement of land use management regulations can reduce landslide hazards.

The volume of earth affected, speed, and extent of a landslide can vary greatly depending on the type of landslide and cause. Comparing one landslide to another can be difficult, especially when the landslide types differ. For example, a rockfall landslide occurs when gravity causes rocks and other materials to fall downslope, which is a very different mode of ground movement compared to a slow earthflow landslide (soil and surface material moving gradually down a slope). There is no universal system for measuring landslide magnitude, though various researchers have proposed different methodologies and classification systems. Table 4-21 presents one such classification system for landslide intensity based on volume of earth affected and relatively velocity of the ground movement.

Table 4-21. Landslide Volume and Velocity

Estimated Volume in Cubic Meters (m ³)	Expected Landslide Velocity		
	Fast Moving (Rock Fall)	Rapidly Moving (Debris Flow)	Slow Moving (Slide)
<0.001 m ³	Slight intensity	N/A	N/A
<0.5 m ³	Medium intensity	N/A	N/A
>0.5 m ³	High intensity	N/A	N/A
<500 m ³	High intensity	Slight intensity	N/A
500-10,000 m ³	High intensity	Medium intensity	Slight intensity
10,000 – 50,000 m ³	Very high intensity	High intensity	Medium intensity
>500,000 m ³	N/A	Very high intensity	High to very high intensity

Source: Cardinali et al. 2002 <https://nhess.copernicus.org/articles/2/57/2002/nhess-2-57-2002.pdf>

History and Location

No significant landslides have been recorded for Groton, and there is a limited number of documented landslide incidents occurring across the Commonwealth.¹³⁵ Local officials do not report recent issues related to localized erosion during construction resulting from poor development practices or vegetation clearing. The Town has been active in addressing any potential issues at construction sites as they are identified (e.g., at the Village at Shepley Hill site).

¹³⁴ *ResilientMass Plan: Appendices* (2023), 5.11-1.

¹³⁵ *Ibid*, 5.11-4.

The Town's many drumlins, which clustered in a band that runs north-south across central Groton, are largely considered unsuitable for development due to moderate to steep slopes (exceeding 15% slope). However, there is some preexisting development in and downslope of steep slope areas that may be vulnerable to damage from landslides.

Probability of Future Occurrence

A high-level analysis of slope stability in Massachusetts indicates that there are few areas in Groton that may be prone to low or moderate slope instability following periods of higher-than-normal precipitation punctuated by high-intensity rainfall events.¹³⁶ These areas generally align with the locations of drumlins in Groton. Overall, the risk of landslides is considered low in Groton based on their limited occurrence and severity.

Climate Change Impacts on Geological-Related Hazards

As noted in the *ResilientMass Plan*, research has not identified any effects of climate change on the earthquake hazard in Massachusetts.¹³⁷ However, related to landslide occurrence, climate change is projected to lead to more frequent and intense storms, which can result in soil saturation, while expected increases in the frequency and intensity of drought and wildfires will reduce vegetation cover and decrease soil stability. These factors will thus increase the probability of landslides occurring in the future.¹³⁸

People and Property at Risk from Geological-Related Hazards

It can be assumed that all existing and future buildings and populations are at risk of an earthquake hazard. Although new construction under the most recent building codes will be built to current seismic standards, much of the development in Groton predates the current building code. Individual exposure to an earthquake will depend on many interrelated factors, including location relative to the earthquake epicenter and the age, construction type, and underlying soil characteristics of buildings where people live, work, and go to school, and the time of day an earthquake occurs. For example, an earthquake that occurs at night (when most people are sleeping indoors) in a community with poorly constructed buildings would likely result in more damage to people and infrastructure than one that occurs during the day (when people are more likely to be outside) in a community with buildings constructed to modern standards. People who reside or work in unreinforced masonry buildings are vulnerable to liquefaction, a phenomenon that occurs when a soil's strength and stiffness is temporarily affected by an earthquake, leading it to behave like a liquid rather than solid.

Landslides tend to have localized impacts limited by their size and location. People and development on steep and/or unstable slopes are most at risk from landslides. Effective land use management, including directing development pressure to areas most suitable for development, is essential to mitigating potential harm to people and property from landslides and avoiding locating people in high-risk areas.

¹³⁶ *ResilientMass Plan: Appendices* (2023), 5.11-4.

¹³⁷ *ResilientMass Plan* (2023), 5.1-42.

¹³⁸ *Ibid*, 5.1-50.

Summary of Anticipated Impacts from Geological-Related Hazards

Geological hazards often cause secondary hazards given the physical nature in which they can affect and alter built and natural environments. Earthquakes and landslides, for example, often damage utility infrastructure, which can trigger fires and disruptions to water distribution systems. Both earthquakes and landslides can often lead to business interruptions, loss of utilities, and road closures, which can isolate populations. A summary of anticipated impacts from geological-related hazards most relevant to Groton are noted by sector:

- **Human:** Potential for trauma-related injuries and deaths in areas affected by earthquakes and landslides, as well as displacement caused by damage to buildings.
- **Infrastructure:** Direct damage to infrastructure, including lifeline infrastructure. Damage to buildings that predate modern building codes and seismic design standards.
- **Economy:** Potential losses associated with business interruptions and structural damage, as well as clean up, debris management, and recovery costs.
- **Governance:** Potential for damage to public safety infrastructure, as well as public health facilities. Increased service demands.
- **Natural Environment:** Potential for physical changes that can affect natural ecosystem functions. Potential for secondary impacts like flooding, fire, erosion, sedimentation, and pollution.

5. Brush Fires and Wildfires

Brush fires and wildfires are non-structural fires (i.e., a fire that occurs in a building) that occur in vegetated wildland areas, including amongst grass, shrub, and forestland. These types of fires can be caused by natural events (e.g., lightning) or human activity (e.g., discarded cigarette butts, campfires, arson). Within Massachusetts, nearly all (98%) of all wildfires are caused by human activity.¹³⁹ Brush fires and wildfires often begin unnoticed but can spread rapidly, igniting brush, trees, and homes. Fire risk is influenced by the types of fuel available. In Massachusetts, the most fire prone wooded areas are pitch pine and scrub oak communities, as they contain the most flammable vegetative fuels (and in fact, rely on fires for reproduction). Periods of severe drought and high heat and dry days increase the likelihood and intensity of brush fires and wildfires by causing dry fuel conditions, and strong wind events can promote fire spread through the movement of embers or fire exposure within tree crowns.

Brush fires and wildfires can be particularly dangerous to human life within the wildland urban interface (WUI), which is “the zone of transition between unoccupied land and human development. It is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.”¹⁴⁰ By definition, fires in the WUI occur in close proximity to human lives and infrastructure. The WUI can be further divided into two primary types of land:¹⁴¹

- **Intermix:** Areas with lower density housing intermingled with wildland vegetation. Houses are often on large lots and scattered across the landscape. Human infrastructure, such as roads and long driveways, break up habitat areas.

¹³⁹ *ResilientMass Plan* (2023), 5.1-60.

¹⁴⁰ U.S. Fire Administration, “What is the WUI?” last updated June 8, 2022, <https://www.usfa.fema.gov/wui/what-is-the-wui/>.

¹⁴¹ U.S. Department of Agriculture, U.S. Forest Service, “Where humans and forests meet; The rapidly growing wildland-urban interface,” last updated May 14, 2025, <https://research.fs.usda.gov/nrs/articles/where-humans-and-forests-meet-rapidly-growing-wildland-urban-interface>.

- **Interface:** Areas with densely developed neighborhoods that may lack natural vegetation. These neighborhoods are near wildland vegetation, such as forests or grasslands. Human infrastructure and development tends to be larger and denser as compared to the intermix area, which also breaks up habitat areas.

In addition to direct threats to human life and infrastructure, common secondary effects from brush fires and wildfires include soil erosion caused by decreased vegetative cover, which in turn can contribute to increased flooding, runoff, and sedimentation in local waterbodies. Waterbodies, including drinking water supplies, may also become contaminated from chemicals released from burned materials.

History and Location

Based on data provided by the Groton Fire Department, 103 brush fires and wildfires have occurred in Groton since 2019 (Table 4-22).

Table 4-22. Brush Fires and Wildfires, 2019-2026

Year	Number of Brush Fires and Wildfires
2019	4
2020	15
2021	21
2022	18
2023	12
2024	16
2025	17
2026	0*

Source: Groton Fire Department. Data is current through March 11, 2026.

As a heavily forested community, Groton is nearly entirely within the WUI, with most of the community designated as intermix. Interface areas exist around Groton Center, Townsend Road, and between Forge Village Road and Boston Road, as well as other scattered locations. People, infrastructure, and buildings within the WUI are most at risk of impacts from brush fires and wildfires. See Map 7, Appendix D.

Probability of Future Occurrence

Since Groton’s 2020 HMP, Massachusetts has experienced several severe fire seasons, driven particularly by drought conditions. The Massachusetts DCR called the 2024 fire season “historic,” with 1,300 wildfires that year.¹⁴² Over half of the wildfires occurred in November 2024, coinciding with extended drought conditions, resulting in more than 660 wildfires and 4,000 acres burned.¹⁴³

Open burning is allowed in Groton during its burning season, which runs from January 15 to May 1 of each year, though residents must obtain a burn permit to do so and follow the Groton Fire Department’s open burning rules.¹⁴⁴ Safe open burning practices, including maintaining proper distances from structures, keeping fires small, having fire extinguishing materials nearby, and monitoring the fire continuously, can mitigate risks of a fire getting out of control. However, there is always a possibility that

¹⁴² MA DCR, *State Officials Advise Precautions Ahead of Potential Wildfire Activity* [Press release], June 11, 2025, <https://www.mass.gov/news/state-officials-advise-precautions-ahead-of-potential-wildfire-activity>.

¹⁴³ Ibid.

¹⁴⁴ Town of Groton Fire Department, “Home,” accessed January 20, 2026.

human error or a sudden change in the environment (e.g., sudden gust of wind) can cause a fire to get out of control.

The risk of brush fires and wildfires is considered high in Groton based on their high frequency of occurrence but relatively limited impacts.

Climate Change Impacts on Brush Fires and Wildfires

The primary climate change pathway affecting brush fire and wildfires is rising temperatures. In addition, changes in precipitation and related drought incidence (anticipated to become more prolonged, frequent, and intense), as well as increased frequency of lightning is expected to increase the frequency and severity of brush fires and wildfires. More severe storms that include high winds may also contribute to fire spread. While some ecosystems are fire-adapted, with fire a natural part of wilderness life cycles, changes in the frequency and severity of fires may impact these ecosystems negatively, including when combined with other expected climate change stressors (e.g., drought, high heat, invasive species). Ecosystems that are not fire-adapted are expected to experience negative impacts as well.¹⁴⁵

People and Property at Risk from Brush Fires and Wildfires

Groton is nearly entirely within the WUI, or the zone where human development meets and intermingles with undeveloped areas and vegetative fuel. Thus, nearly all of Groton is vulnerable to brush fire and wildfire. This co-location of human development and wildland areas means that brush fires and wildfires can quickly spread to structures, and vice versa. While damaging brush fires and wildfires are not common in Massachusetts, even a small fire occurring in the WUI can directly impact people and property.¹⁴⁶ People with mobility limitations or lacking adequate transportation, as well as those living in areas with limiting access routes, may be most vulnerable to brush fire and wildfire, as their ability to evacuate quickly may be limited.

A key factor in how much damage a brush fire or wildfire causes is how quickly the fire is detected, as earlier detection aids evacuation and fire response efforts. The Massachusetts Department of Conservation Resources, Bureau of Forest Fire Control staffs and maintains 42 fire towers across the Commonwealth, including one located at Gibbet Hill in central Groton.¹⁴⁷ Having a staffed fire tower in Groton helps mitigate the potential risk of a brush fire or wildfire going undetected.

Summary of Anticipated Impacts from Brush Fires and Wildfires

In addition to direct threats to people and property, fires, and particularly wildfires, can broadly affect the natural environment. While fire can be beneficial to ecosystems, less fire-adapted natural communities or those already experiencing stress from human impacts and/or climate change can be negatively affected (e.g., from loss of habitat, increased susceptibility to invasive species). Secondary hazards are also a concern with brush fires and wildfires. For example, loss of vegetative cover can leave areas more vulnerable to erosion and landslides following precipitation events. Contamination from ash, debris, or even hazardous materials releases can degrade habitat and impact drinking water resources. A summary of anticipated impacts from brush fires and wildfires most relevant to Groton are noted by sector:

¹⁴⁵ *ResilientMass Plan* (2023), 5.1-60-61.

¹⁴⁶ *ResilientMass Plan: Appendices* (2023), 5.16-6.

¹⁴⁷ *Ibid*, 5.16-16.

- **Human:** Potential for injury or loss of life in areas affected by brush fires and wildfires, as well as displacement caused by damage to buildings. Potential for negative health impacts due to reduced air quality from smoke.
- **Infrastructure:** Direct damage to utility infrastructure (e.g., energy transmission lines, roads) and other structures located in burn areas. Potential for evacuation routes to be blocked depending on the location of fire hazards.
- **Economy:** Potential losses associated with business interruptions and structural damage, as well as clean up, debris management, and recovery costs. Potential for damage to conservation areas, requiring restoration efforts.
- **Governance:** Potential for damage to public safety infrastructure, as well as public health facilities. Increased service demands.
- **Natural Environment:** Forest degradation in less fire-adapted natural communities. Disruptions to wildlife habitat, and increased susceptibility to invasive species. General loss of vegetative cover.

6. Extreme Heat

Extreme heat occurs when a system of high atmospheric pressure moves into an area. In such a high-pressure system, air from the upper levels of the atmosphere is pulled toward the ground, where it becomes compressed and increases temperatures. This high concentration of pressure makes it difficult for other weather systems to move into the area, explaining why periods of extreme heat can last for several days, or even weeks. The longer the system stays in an area, the hotter the temperature becomes. The high pressure also inhibits winds and prevents clouds from entering a region, reducing the potential for their cooling effects.

Extreme heat days are much hotter than the average summer day that communities are used to experiencing. Extreme heat may occur for a prolonged period; in Massachusetts, a “heat wave” is typically defined as “a period of three or more consecutive days of temperatures of 90°F or above.”¹⁴⁸ When extreme heat days are accompanied by high humidity, which is common in Massachusetts, they can feel even hotter. The “feels like” temperature is referred to as the heat index and is a combination of the relative humidity and actual air temperature, though the heat index and actual air temperature tend to track closely to one another in Massachusetts (Figure 4-7).¹⁴⁹ ¹⁵⁰ Furthermore, high temperatures can contribute to decreased air quality, which can lead to negative health impacts (e.g., asthma attacks).¹⁵¹

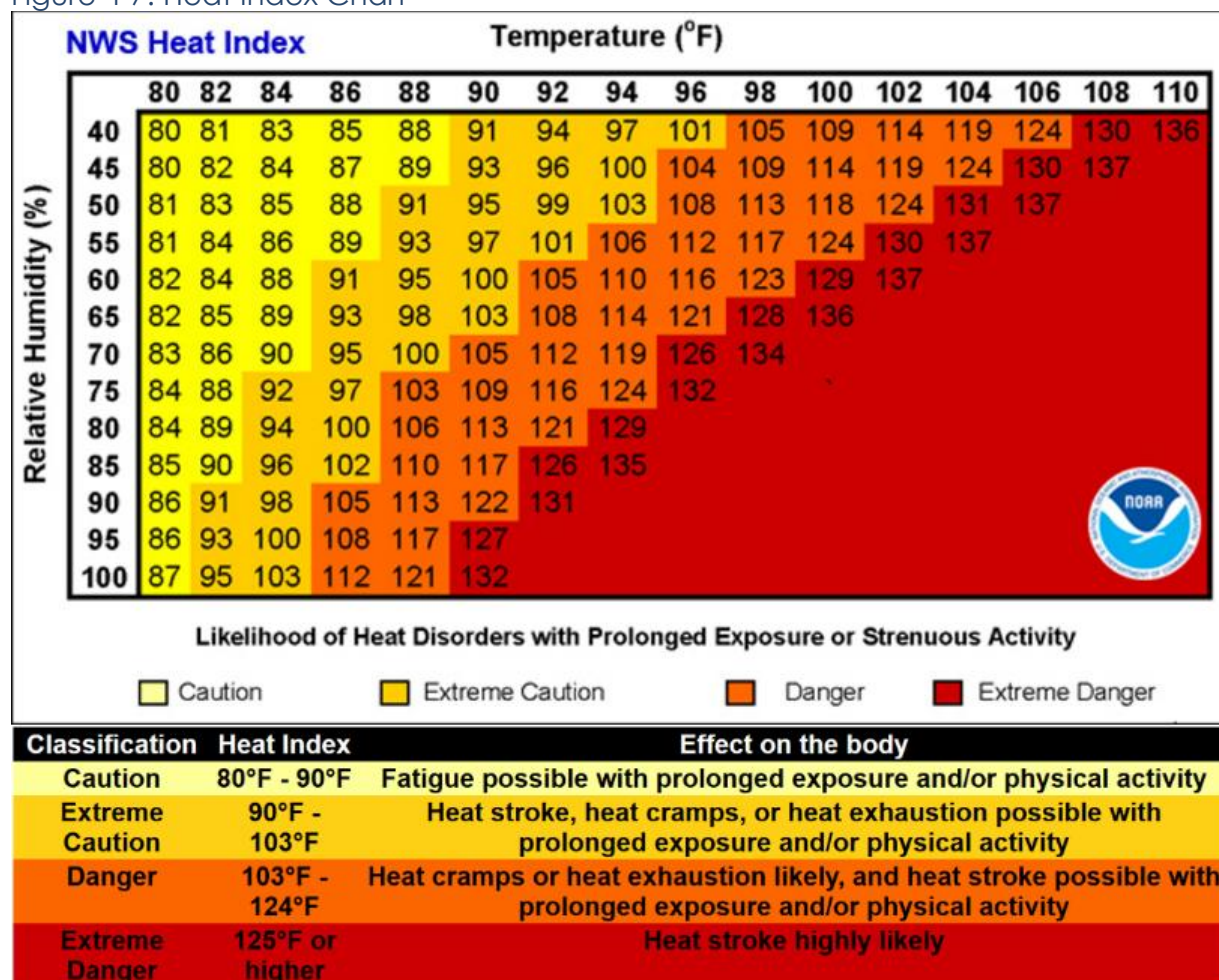
¹⁴⁸ *ResilientMass Plan: Appendices* (2023), 5.2-5.

¹⁴⁹ MA Department of Public Health, Bureau of Climate and Environmental Health, “Extreme heat,” accessed January 21, 2026, <https://www.mass.gov/extreme-heat>.

¹⁵⁰ NOAA NWS, “What is the heat index?” accessed January 21, 2026, <https://www.weather.gov/ama/heatindex>.

¹⁵¹ MA Department of Public Health, Bureau of Climate and Environmental Health, [Massachusetts Extreme Heat Resource Guide](#) (2025), 5.

Figure 4-7. Heat Index Chart



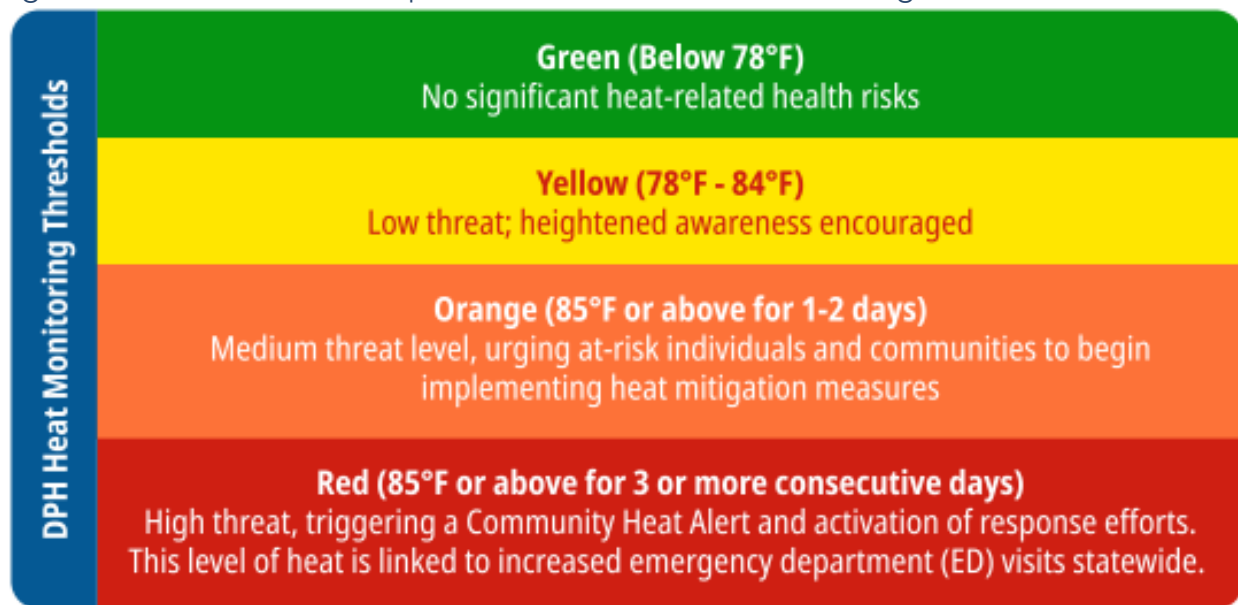
Source: NOAA NWS, [What is the heat index?](#)

When Massachusetts exceeds its Unhealthy Heat Threshold, defined as when temperatures rise to 85°F or higher for more than three days in a row, the Department of Health issues an unhealthy heat alert.¹⁵² Data show that emergency room visits and heat-related illnesses increase significantly once the Unhealthy Heat Threshold is met, so the alert helps notify healthcare professionals, local governments, and other organizations to the risk of extreme heat-related impacts and encourage them to implement heat mitigation measures (Figure 4-8).¹⁵³

¹⁵² Massachusetts Extreme Heat Resource Guide (2025), 8.

¹⁵³ Ibid, 2.

Figure 4-8. Massachusetts Department of Health Heat Monitoring Thresholds



Source: MA Department of Health, Bureau of Climate and Environmental Health, [Massachusetts Extreme Heat Resource Guide](#) (2025).

History and Location

No extreme heat events were recorded for the Groton area in the NOAA NCEI Severe Storm Events database for the period between 2019 – 2025. The adjacent Western Middlesex County area recorded one extreme heat event in this time period, with heat index values reaching 105 to 110 and three injuries reported.¹⁵⁴ Additionally, the *ResilientMass Plan* notes that there were 118 warm weather events (heat and excessive heat events) between 1995 and 2022 in Massachusetts, with record breaking hot summer occurring in 2020 and 2022.¹⁵⁵ Colloquially, Groton has experienced more intense and prolonged periods of high temperatures, though the Town does not collect data on heat occurrences.

Extreme heat events will impact all locations within Groton. However, conditions on the ground may make extreme heat events feel worse in certain areas compared to others. This “heat island” effect occurs when urbanized areas, which have fewer natural features to provide cooling, are hotter than less urbanized, more rural areas.¹⁵⁶ Built infrastructure like roads and buildings can absorb and retain heat, and certain urban development patterns (i.e., tall buildings, narrow streets) can block air flow.¹⁵⁷ While this is less of a concern for Groton than, for example, downtown Boston, there may still be pockets of the community where relatively denser development contributes to localized heat island effects.

¹⁵⁴ NOAA NCEI, “Storm Events Database, Event Details, 2025-06-22,” accessed January 21, 2026, <https://www.ncei.noaa.gov/stormevents/eventdetails.jsp?id=1256851>.

¹⁵⁵ *ResilientMass Plan: Appendices* (2023) 5.2-8

¹⁵⁶ U.S. EPA, “Frequent Heat Island Questions and Resources,” accessed January 21, 2026, <https://www.epa.gov/heatislands/frequent-heat-island-questions-and-resources>.

¹⁵⁷ *Ibid.*

Probability of Future Occurrence

The *ResilientMass Plan* estimates that the likelihood of extreme temperatures occurring in the Commonwealth in the future is very high.¹⁵⁸ The risk of extreme heat is considered moderate in Groton based on its frequent occurrence but relatively limited severity.

Climate Change Impacts on Extreme Heat

Climate change projections have high confidence that average and extreme temperatures in Massachusetts will continue to rise.¹⁵⁹ Additionally, as humidity is also projected to rise, hotter days will feel even hotter.¹⁶⁰ Table 4-23 indicates average and hot day temperature projections for Groton in 2030 and 2050 compared to a current baseline; the lower and upper bounds (10th and 90th percentiles) are shown for each projection year.¹⁶¹

Table 4-23. Average and Hot Day Temperature Projections: Groton, MA

Climate Metric	Baseline 1950 - 2013	Projection 2030	Projection 2050
<i>Season: Annual</i>			
Average Temperature	46.7°F	48.5 to 52.1°F	50.3 to 54.8°F
Maximum Temperature	84.3°F	86.1 to 89.7°F	87.9 to 92.4°F
Number of Days with Maximum Temperature above 90°F	5 days	9 to 25 days	16 to 41 days
Cooling degree days (Base 65°F)	414 days	560 to 926 days	733 to 1,258 days
<i>Season: Summer</i>			
Average Temperature	67.1°F	69.8 to 72.5°F	70.7 to 75.1°F
Maximum Temperature	84.3°F	87.0 to 89.7°F	87.9 to 92.4°F
Number of Days with Maximum Temperature above 90°F	5 days	11 to 22 days	14 to 24 days
Cooling degree days (Base 65°F)	349 days	366 to 733 days	592 to 960 days

Source: MA EOEEA, [ResilientMass Climate Change Projections Dashboard](#).

People and Property at Risk from Extreme Heat

According to the *ResilientMass Plan*, extreme temperature is “the leading cause of weather-related mortality in the U.S.”¹⁶² The entire Town of Groton is uniformly exposed to extreme heat, though individual and population level vulnerability may vary based on demographic, social, and environmental conditions. Vulnerable populations include infants and young children under five, older adults, pregnant people, and people with chronic health conditions. People that have inadequate shelter or who are unhoused, as well as those that work outside, are vulnerable to high heat. People that live in heat islands or that have difficulty accessing community cooling resources are also vulnerable.¹⁶³

¹⁵⁸ *ResilientMass Plan* (2023), 5.1-24.

¹⁵⁹ *Ibid*, 5.1-32.

¹⁶⁰ *Ibid*.

¹⁶¹ MA EOEEA, “ResilientMass Maps and Data Center,” accessed January 20, 2026, <https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/>.

¹⁶² *ResilientMass Plan* (2023), 5.1-32.

¹⁶³ *Massachusetts Extreme Heat Resource Guide* (2025), 6.

Summary of Anticipated Impacts from Extreme Heat

Extreme heat is associated with a range of negative health impacts and secondary hazards. Extreme heat increases drought and wildfire risks, and it can stress natural environments and wildlife species when temperatures exceed preferred temperature ranges. Groton, like many other communities, also activates cooling centers during periods of extreme heat, which must be staffed. A summary of anticipated impacts from extreme heat most relevant to Groton are noted by sector:

- **Human:** Potential for negative health impacts, including loss of life, caused by heat-related illnesses and reduced air quality. Reduced ability to exercise, recreate, and work outdoors.
- **Infrastructure:** Increased stress on electrical utilities due to demand for cooling. Potential for impacts to transportation infrastructure, including expansion and movement of pavement and railroad tracks. Loss of urban tree cover.
- **Economy:** Decreased agricultural productivity. Reduced ability to work outdoors.
- **Governance:** Increased demand for comfort and/or cooling services, as well as increased demand for emergency services and public health facilities.
- **Natural Environment:** Increased heat stress on species with lower temperature ranges, and potential for habitat degradation. Increased susceptibility to invasive species.

7. Drought

Drought is an extended period of abnormally dry conditions relative to average conditions. Drought conditions occur in virtually all climate zones, yet its characteristics vary significantly from one region to another since it is relative to the normal precipitation in that region. Massachusetts identifies seven Drought Regions in its 2023 *Massachusetts Drought Management Plan*, delineated based on precipitation patterns, topography, land use, population density, and other relevant factors, and designed to provide flexible and customized drought responses.¹⁶⁴ Groton is located within the Northeast Drought Region, which consists of the counties of Essex, Middlesex, and Suffolk, in addition to the Town of Brookline.

According to the *Massachusetts Drought Management Plan*, abnormally dry conditions may result from a lack of precipitation and increased evapotranspiration due to heat stress. While droughts in Massachusetts have historically been slow onset and long-lasting events, several droughts since 2016 have experienced rapid intensification. Rapid intensification droughts are characterized “by unusually high temperatures, decreased precipitation, high winds, and rapid change in drought levels by two levels that can last for at least two to four weeks.”¹⁶⁵

The U.S. Drought Monitor uses five categories, with generalized impacts described for each. However, drought impacts can look very different across the country. Example drought impacts common to Massachusetts are also noted in italics below:¹⁶⁶

- **Abnormally Dry (D0):** Indicates a region that is going into or coming out of drought. Under abnormally dry conditions, short-term dryness that inhibits planting and growth of crops may be

¹⁶⁴ MA EOEAA and MA Emergency Management Agency, [Massachusetts Drought Management Plan](#) (2023), 9.

¹⁶⁵ *Ibid*, 3.

¹⁶⁶ NOAA National Integrated Drought Information System, “Drought Impacts,” accessed January 25, 2026, <https://www.drought.gov/impacts#impacts-table>.

experienced. For regions coming out of drought, lingering water deficits are likely, and pasture and crops have not yet fully recovered.

- *Impacts in Massachusetts: Fire danger is elevated, and surface water levels decline. Lawns begin to brown, and gardens wilt.*
- **Moderate Drought (D1):** Some damage to pasture and crops is observed, and some water shortages are developing. Voluntary water-use restrictions are commonly requested.
 - *Impacts in Massachusetts: Wildfires and ground fires increase, and reservoir and lake levels are below normal capacity. Trees, landscaping, and fish are stressed. Irrigation use increases.*
- **Severe Drought (D2):** Pasture and crop loss are likely, and water shortages are common. Water restrictions are imposed.
 - *Impacts in Massachusetts: Outdoor burn warnings are issued, and air quality decreases. Vegetation is prone to insect damage, and wildlife may have difficulty locating food. Water quality decreases, and groundwater levels also decline. Fish kills occur. Specialty crops are negatively affected.*
- **Extreme Drought (D3):** Major pasture and crop losses are experienced. Widespread water shortages occur and subsequent water-use restrictions are implemented.
 - *Impacts in Massachusetts: Wildlife disease outbreaks are observed. There are extremely low flows to waterbodies, and water temperatures are warm. Wells run dry. Crop loss is widespread.*
- **Exceptional Drought (D4):** Exceptional and widespread pasture and crop losses are observed. Severe shortages of water create water emergencies.
 - *Impacts in Massachusetts: None recorded, as there have been little to no exceptional drought events since the U.S. Drought Monitor was first implemented in 2000.*

History and Location

Drought events will impact all locations within Groton. The Town of Groton relies on groundwater wells near the Baddacook and Whitney Ponds for its drinking water supply, and the West Groton Water Supply District's groundwater wells are located along the Squannacook River.¹⁶⁷ Approximately 22% of households rely on private wells.¹⁶⁸

The U.S. Drought Monitor indicates several periods of drought have occurred since 2019 in Middlesex County, with periods of Extreme Drought (D3) occurring in 2020, 2022, and 2024 (Figure 4-9). The 2020 – 2021 and 2022 droughts both had periods of rapid intensification.¹⁶⁹ Since its inception in 2000, the most significant drought recorded on the U.S. Drought Monitor for Middlesex County was the 2016 – 2017 drought, which caused new record low levels for streamflow and groundwater. The drought of record in Massachusetts remains the 1961 – 1969 drought, which caused widespread water-use restrictions and emergency declarations for water supply, with many communities turning to emergency water supplies.¹⁷⁰

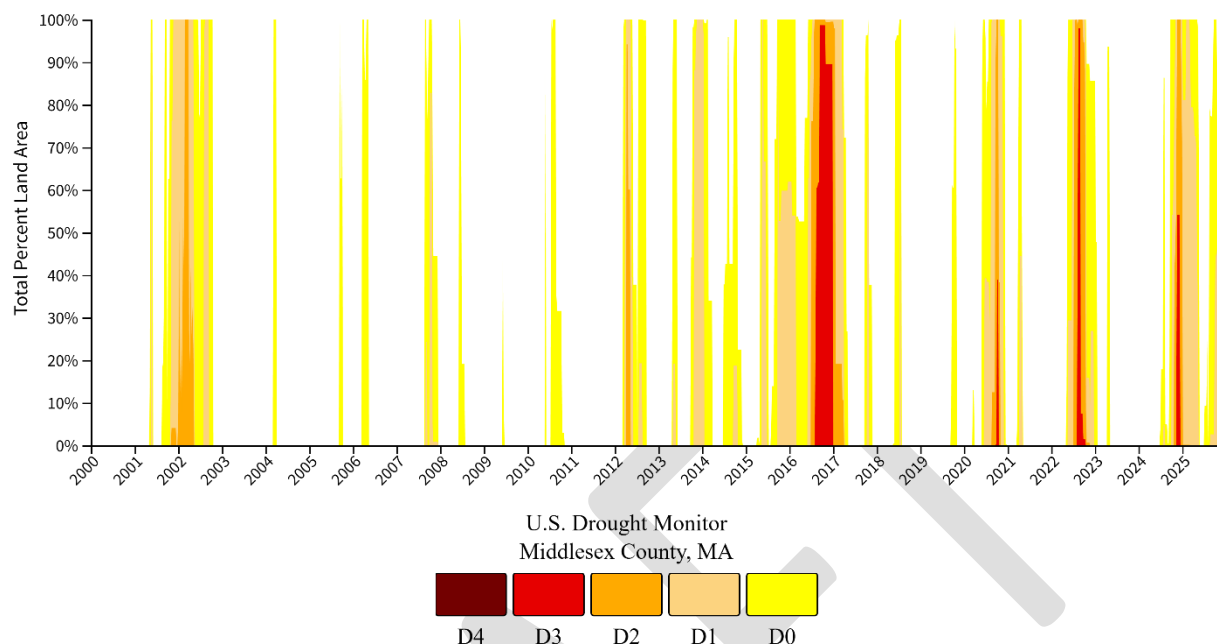
¹⁶⁷ *Groton Master Plan* (2025), 122 and 140.

¹⁶⁸ *Ibid*, 140.

¹⁶⁹ *Massachusetts Drought Management Plan* (2023), 4.

¹⁷⁰ *Ibid*, 3.

Figure 4-9. Historical Drought Conditions, Middlesex County



Source: NOAA National Integrated Drought Information System, [Drought Conditions for Middlesex County](#).

Probability of Future Occurrence

The *ResilientMass Plan* classifies drought as having a medium likelihood of occurrence, though disaster-level drought is considered infrequent in the Commonwealth. The risk of drought is considered high in Groton based on its frequency and expected severity of impacts.

Climate Change Impacts on Drought

The *ResilientMass Plan* notes that the length, frequency, and intensity of droughts are projected to increase, driven by rising temperatures and changes in precipitation patterns. Changes in precipitation patterns are of note—despite expected increases in annual precipitation, most precipitation is anticipated to fall during extreme events, which does “not translate to significant groundwater replenishment or steady streamflows.”¹⁷¹

People and Property at Risk from Drought

The entire Town of Groton is uniformly exposed to drought. Land uses with high water consumption (e.g., agriculture) are likely to be economically more affected by drought.

A minor drought may require some water-use restrictions (e.g., outdoor watering), while a major drought could negatively impact drinking water supplies. Households reliant on private wells are likely more vulnerable to impacts, as declining groundwater levels can affect yield and water quality. However, unlike public water suppliers, which generally have multiple water supply sources and/or interconnection agreements, private well users are less resourced and may need to explore options for deepening an existing well, installing a replacement well, or purchasing bulk or bottled water.¹⁷²

¹⁷¹ *Massachusetts Drought Management Plan* (2023), 2.

¹⁷² *Ibid*, 101-102.

Summary of Anticipated Impacts from Drought

Drought can lead to additional hazards, as well as affect general day-to-day life. For example, reduced surface water levels and water quality can impact the ability for people to recreate in and around water, and affect aquatic life (e.g., fish kills). A summary of anticipated impacts from drought most relevant to Groton are noted by sector:

- **Human:** Declining or no yield from private wells and potential for impacts to water quality. Increases in water prices. Restrictions on water usage.
- **Infrastructure:** Reduced availability of public water supplies, and increased strain on public water utilities. Potential for loss of urban tree cover.
- **Economy:** Decrease in agricultural productivity, and potential for loss of income.
- **Governance:** Increased demand for services. Potential for impacts to fire response from water shortages and impacts to recreation and open space lands.
- **Natural Environment:** Reduced groundwater recharge and streamflow, and degradation of aquatic and terrestrial habitats. Heightened fire risk, and potential for increased susceptibility to invasive species.

8. Changes in Groundwater

This HMP update incorporates changes in groundwater as a new hazard to be profiled. The *ResilientMass Plan* identifies three primary risks related to changing groundwater: increases in groundwater levels, groundwater resource depletion, and contamination of groundwater by pollution and salinity changes from sea level rise and flooding.

Groundwater rise is driven by changes in precipitation patterns resulting in a net increase. There is also evidence that sea level rise interactions with groundwater may also lead to rise in some coastal areas of the Commonwealth.¹⁷³ Groundwater supplies may be depleted when there are reduced volumes of surface water being recharged to underground aquifers, in isolation or in combination with human withdrawals (and possible overconsumption) of groundwater. Finally, groundwater contamination may occur when pollutants are introduced into groundwater supplies. Contaminants are often human induced, with common pollutant sources including leakages from septic tanks, combined sewage outflows, pesticides and fertilizers, road salt, and hazardous material spills. Stormwater runoff can also pick up pollutants as it travels across landscapes before infiltrating underground. Rock weathering is also a common source of inorganic contaminants in groundwater.¹⁷⁴ In coastal areas, saltwater intrusion via lateral intrusion or overtopping is also a concern.

History and Location

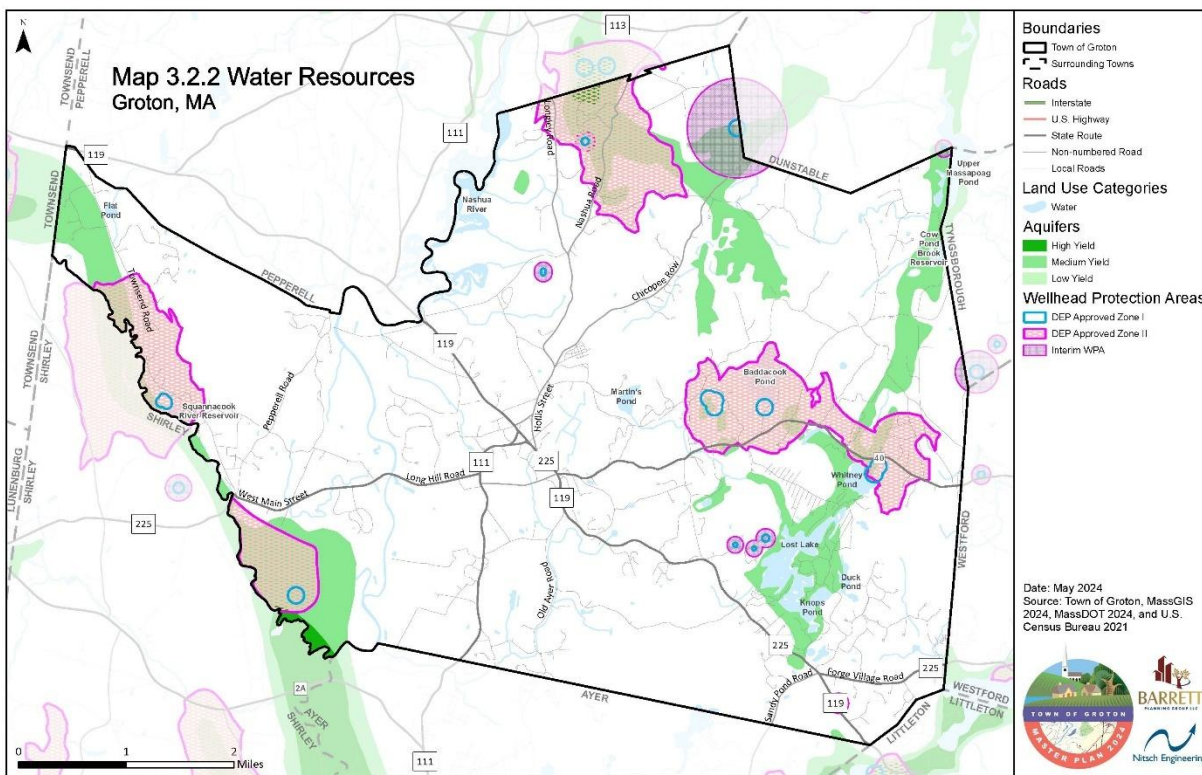
Groundwater resources are depicted on Figure 4-10, with water supply wells located in the vicinity of the Squannacook River, Cow Pond Brook, and Baddacook Pond, as well as in the Reedy Meadow area in northern Groton. As noted previously, the Groton Water Department and West Groton Water Supply

¹⁷³ *ResilientMass Plan: Appendices* (2023), 5.3-1.

¹⁷⁴ USGS, "Contamination of Groundwater," updated June 6, 2018, <https://www.usgs.gov/water-science-school/science/contamination-groundwater>.

District provide public water services to most properties in Town, though approximately 22% of households rely on private wells.¹⁷⁵

Figure 4-10. Groundwater Resources



Source: Groton Master Plan (2025).

All the Town's groundwater resources may be affected by changes. While there are no records of any significant changes in groundwater levels (increase or decrease) since 2019, contamination of groundwater is an ongoing concern for the Town.

In 2019, testing for PFAS identified small amounts in the Groton-Dunstable Regional High School water supply well (located in northern Groton at the Groton-Dunstable border). Initial and ongoing sampling indicates that PFAS levels are below action levels, though sampling of nearby private wells indicates much higher levels of PFAS contamination. The Massachusetts Department of Environmental Protection (MassDEP) determined that the source of PFAS contamination was firefighting foam used during a 2003 fire at the high school.¹⁷⁶ To mitigate exposure, the Town voters authorized an approximately 3.5-mile extension of municipal drinking water services (at an estimated cost of \$13 million) to the high school area. Currently, the project is at construction stage.¹⁷⁷ More immediately, the Groton-Dunstable Regional School District is providing bottled water, conducting regular testing, and has installed point-of-entry

¹⁷⁵ Groton Master Plan (2025), 140.

¹⁷⁶ Town of Groton, [PFAS in Groton](#) (2023), 1.

¹⁷⁷ Town of Groton, "Chicopee Row Water Main Construction Project Site," accessed February 1, 2026, <https://www.grotonma.gov/grotonwaterproject/>.

treatment systems at households with high PFAS levels.¹⁷⁸ The Groton Water Department is also assessing future potential needs for PFAS treatment at its water treatment plant.

The Town has also detected contaminants, including PFAS, in areas near two former landfills. While neither landfill is located within a wellhead protection area, they are both near water resources. The first, Groton Landfill, is located at the end of Cow Pond Brook Road in eastern Groton in proximity to Cow Pond Brook and is upgradient of the Groton Water Department's Whitney Pond wells. The second landfill, Nod Road Landfill (also known as Groton Dump), is on Nod Road at the Nashua River. Both predate landfill lining regulations that otherwise help reduce leaching of contaminants.¹⁷⁹ The Town recently completed a study at the Nod Road Landfill, which determined the site was capped in the mid-1970s with a two-foot cap comprised of clay, soil, and clayey soil layers in compliance with regulations at the time.¹⁸⁰ The study recommended further investigations to confirm the extent and condition of the cap and other environmental monitoring.¹⁸¹

The Town also maintains awareness of sites that may have a history or potential for groundwater contamination, including Chapter 21E sites, sites with activity or use limitations, and gas stations. The Hollingsworth & Vose Company is closing its inactive landfill off Vose Avenue and is going through the closure process with MassDEP and coordinating with the Town on applicable permits. The closure includes installation of an impermeable cap. Stormwater management controls will also be implemented to mitigate any runoff.

Probability of Future Occurrence

It is likely that the Town will continue to experience changes in groundwater. However, the Town and public water suppliers also implement water conservation measures and land use controls that help reduce the probability that future changes in groundwater will occur or mitigate its severity. Additionally, changes in groundwater are complex, and groundwater levels experience natural variation. Both climate change and human activity can affect groundwater, though these pathways and interactions are still being understood. Currently, the Commonwealth lacks a strong understanding of future groundwater levels, and there is a need to develop statewide groundwater mapping products to inform hazard mitigation.¹⁸² As research advances in this area, the Town can expect further clarity on the likelihood and extent of future groundwater changes.

Acknowledging this uncertainty, groundwater contamination is the timeliest concern given the Town's ongoing work to monitor and mitigate PFAS exposure around the Groton-Dunstable Regional High School. The Town implements land use controls to limit intensive and potentially contaminating land uses within its Water Resource Protection District, which encompasses all designated Zone II areas (a state-designated protection area around wellheads) and subwatersheds that drain into designated Zone II areas.¹⁸³

Groundwater depletion is also a concern given the Town's reliance on groundwater for its public and private drinking water supplies. Future development or population increases may lead to additional stress

¹⁷⁸ *PFAS in Groton* (2023), 1.

¹⁷⁹ *Groton Master Plan* (2025), 56.

¹⁸⁰ Langon Environmental, LLC, *Report on Third-Party Inspection of Nod Road Landfill, Groton* (2026), 1-2.

¹⁸¹ *Ibid.*

¹⁸² MA EOEAA, [Flood Risk Mapping Resource Assessment and Recommendations](#) (2025), 27.

¹⁸³ *Groton Master Plan* (2025), 45.

on groundwater resources. Both the Groton Water Department and West Groton Water Supply District impose mandatory water conservation measures to restrict unnecessary use and conduct public education. They also both use increasing block rate fee structures,¹⁸⁴ which help promote water conservation.¹⁸⁵

Climate Change Impacts on Changes in Groundwater

Groundwater recharge is the process by which water (i.e., precipitation, snow melt, surface water) infiltrates and moves downward from Earth's surface into groundwater. For inland communities with aquifers that are not hydrologically connected to or near the ocean, the primary climate change interactions related to groundwater are changes in precipitation and rising temperatures. These interactions can affect the amount of water available, including by contributing to drought conditions. Increased incidence of groundwater contamination may occur in response to more extreme precipitation events (mobilizing surface contaminants) and changing winter weather (road salting).

People and Property at Risk from Changes in Groundwater

As the Town is entirely reliant on groundwater for public and private drinking water supply, all the Town's population is potentially at risk from changes in groundwater. Wells that are downgradient of pollutant sources are most exposed to changes related to contamination. People reliant on private wells may be most vulnerable to groundwater depletion and groundwater contamination, as they may have limited ability to switch to an alternative groundwater supply source.

Summary of Anticipated Impacts from Changes in Groundwater

Changes in groundwater can lead to a range of direct impacts, which the Town has already experienced particularly as it relates to contamination of groundwater. Secondary impacts from groundwater rise can include flooding, while impacts from groundwater depletion include increased severity of drought events and ecosystem stress. A summary of anticipated impacts from changes in groundwater most relevant to Groton are noted by sector:

- **Human:** Declining or no yield from private wells and potential for impacts to water quality. Increases in water prices. Restrictions on water usage. Health impacts from contaminated drinking water.
- **Infrastructure:** Mobilization of contaminants into drinking water.
- **Economy:** Costs of alternative water supplies (e.g., bottled or bulk water) and treatment technology upgrades.
- **Governance:** Increased demand for services, including extension of water services into areas experiencing changes in groundwater.
- **Natural Environment:** Habitat degradation caused by declining groundwater levels, increased risk of fire, and increased susceptibility to invasive species. Mobilization of contaminants into the environment.

¹⁸⁴ Under an increasing block rate, the price per unit of water increases as different tiers of water use are exceeded. For example, the first 10 units of water cost \$5 per unit (\$50), the second 10 units of water cost \$6 per unit (\$60), and so on.

¹⁸⁵ *Groton Master Plan* (2025), 56.

9. Invasive Species

This HMP update incorporates invasive species as a new hazard to be profiled. As with the *ResilientMass Plan*, this HMP focuses on invasive terrestrial plants, though information on invasive terrestrial fauna, as well as aquatic invasive flora and fauna, is provided where relevant. As defined by Executive Order 13112 (1999), an invasive species is:^{186 187}

- Non-native to the ecosystem under consideration, and
- A species whose introduction causes or is likely to cause economic harm, environmental harm, or harm to human health.

The Massachusetts Invasive Plant Advisory Group (MIPAG), a collaborative of academia, non-profit, industry, and state and federal agency representatives tasked by the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) with providing recommendations on invasive species management, further defines invasive plant species as “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.”¹⁸⁸

With many native species already experiencing stress from changing climatic conditions (e.g., loss of suitable habitat, impacts to prey species or food sources), invasive species introduce additional stress as they often outcompete and displace native species.¹⁸⁹ Collectively, invasive species are considered to be one of the most costly hazards in the U.S. given the direct damage they cause (e.g., to crops, commercial forests, recreational amenities, water quality) and difficulty in controlling their spread and/or eradicating them. Aside from the harm to natural biodiversity, invasive species’ impacts often affect ecological functions and can increase the likelihood of secondary hazards occurring, as well as impede post-disaster recovery. For example, loss of tree canopy caused by invasive insects can affect stormwater infiltration and urban heat as trees die off or are removed to prevent further spread.

The Town’s 2019 *Open Space and Recreation Plan* and its Invasive Species Committee have identified invasive and likely invasive plant species of concern for Groton, described in Table 4-24.

Table 4-24. Invasive and Likely Invasive Plant Species of Concern

Common Name <i>Scientific Name</i>	Description
Autumn olive <i>Elaeagnus umbellata</i>	A shrub occurring in uplands in all regions of the state. Grows in full sun. Escaping from cultivation; berries spread by birds; aggressive in open areas; can change soil.
Black swallowwort <i>Cynanchum louiseae</i>	A perennial vine occurring in all regions of the state in upland, wetland, and coastal habitats. Grows in full sun to partial shade. Forms dense stands, outcompeting native species: deadly to Monarch butterflies.
Burning bush <i>Euonymus alatus</i>	A shrub occurring in all regions of the state and capable of germinating prolifically in many different habitats. It grows in full sun to full shade. Escaping from cultivation and can form dense thickets and dominate the understory; seeds are dispersed by birds.

¹⁸⁶ U.S. Department of Agriculture, “Invasive Species,” accessed January 25, 2026, <https://www.usda.gov/farming-and-ranching/plants-and-crops/pest-and-weed-management/invasive-species>.

¹⁸⁷ U.S. Department of Agriculture, “Executive Order 13112 – Invasive Species,” accessed January 25, 2026, <https://www.invasivespeciesinfo.gov/executive-order-13112>.

¹⁸⁸ Massachusetts Invasive Plant Advisory Group, “About the group,” accessed January 25, 2026, <https://massnrc.org/mipag/>.

¹⁸⁹ *ResilientMass Plan: Appendices* (2023), 5.10-1-2.

Common Name Scientific Name	Description
Common buckthorn <i>Rhamnus cathartica</i>	A shrub or tree occurring in all regions of the state in upland and wetland habitats. Grows in full sun to full shade. Produces fruit in fall; grows in multiple habitats; forms dense thickets.
Fanwort <i>Cabomba caroliniana</i>	A perennial herb occurring in all regions of the state in aquatic habitats. Common in the aquarium trade; chokes waterways.
Giant hogweed* <i>Heracleum mantegazzianum</i>	A perennial herb occurring in scattered sites across all regions of the state; thrives in multiple habitats. Grows in full sun to full shade. Escapes from cultivation; seeds can be dispersed by water; can cause severe skin reactions.
Hardy kiwi* <i>Actinidia arguta</i>	A fast-growing woody vine that may climb to 30 feet or more on trees. Grows in sun or shade. Used in permaculture. Where it escapes it can aggressively climb trees and smother them, while also producing new seedlings.
Japanese barberry <i>Berberis thunbergii</i>	A shrub occurring in all regions of the state in open and wooded uplands and wetlands. Grows in full sun to full shade. Escaping from cultivation; spread by birds; forms dense stands.
Japanese honeysuckle <i>Lonicera japonica</i>	A perennial vine occurring in all regions of the state in upland, wetland, and coastal habitats. Grows in full sun to full shade. Rapidly growing, dense stands climb and overwhelm native vegetation; produces many seeds that are bird dispersed; more common in southeastern Massachusetts.
Japanese knotweed <i>Fallopia japonica</i>	A perennial herbaceous subshrub or shrub occurring in all regions of the state in upland, wetland, and coastal habitats. Grows in full sun to full shade, but hardier in full sun. Spreads vegetatively, by root fragments and by seed; forms dense thickets.
Japanese stiltgrass* <i>Microstegium vimineum</i>	An annual grass occurring in the western region of the state in upland and wetland habitats. Grows in full sun to full shade. Forms dense stands; currently localized in the lower Connecticut River Valley; spreads in flood plains.
Kudzu* <i>Pueraria montana</i>	A perennial herbaceous vine found in southeastern Massachusetts. Occurs at Arnold Arboretum, uplands. Grows in full sun to partial shade. Present in Massachusetts and subject to control; marginally hardy in Massachusetts but has the potential to invade minimally managed areas based on its performance elsewhere.
Mile-a-minute vine* <i>Polygonum perfoliatum</i>	This annual herbaceous vine is currently known to exist in several counties in Massachusetts and has also been found in Rhode Island and Connecticut. Habitats include streamside, fields, and road edges in full sun to partial shade. Highly aggressive; bird and human dispersed.
Milfoil <i>Myriophyllum heterophyllum</i> , or <i>M. spicatum</i>	A perennial herb found in all regions of the state in aquatic habitats. Chokes waterways, spread by humans and possibly birds.
Multiflora rose <i>Rosa multiflora</i>	A perennial vine or shrub occurring in all regions of the state in upland, wetland, and coastal habitats. Grows in full sun to full shade. Forms impenetrable thorny thickets that can overwhelm other vegetation; bird dispersed.
Oriental bittersweet <i>Celastrus orbiculatus</i>	A perennial vine occurring in all regions of the state in uplands. Grows in full sun to partial shade. Escaping from cultivation; berries spread by birds and humans; overwhelms and kills vegetation.
Phragmites <i>Phragmites australis</i>	A perennial grass found in all regions of the state. Grows in upland and wetland habitats in full sun to full shade. Overwhelms wetlands forming huge, dense stands; flourishes in disturbed areas; native and introduced strains.
Porcelain berry <i>Ampelopsis glandulosa</i>	A woody vine found primarily in southeastern counties of Massachusetts but known from some western counties as well. Occurs in upland woodland edges and thickets and grows in full sun to partial shade. Escapes from cultivation and is bird dispersed.

Common Name Scientific Name	Description
Purple loosestrife <i>Lythrum salicaria</i>	A perennial herb or subshrub occurring in all regions of the state in upland and wetland habitats. Grows in full sun to partial shade. Escaping from cultivation; overtakes wetlands; high seed production and longevity.
Spiny naiad <i>Najas minor</i>	An annual herb occurring in the western region of the state in aquatic habitats. Chokes waterways; spread by humans and possibly birds.
Tree of heaven* <i>Ailanthus altissima</i>	This tree occurs in all regions of the state in upland, wetland, and coastal habitats. Grows in full sun to full shade. Spreads aggressively from root suckers, especially in disturbed areas.
Wall lettuce* <i>Mycelis muralis</i>	An annual or biennial herbaceous plant with purple-tinged branched stems 2-3 feet tall. It tolerates full shade as well as a wide range of soil conditions and habitats, from woods to stream valleys, and has demonstrated the ability to spread rapidly.
Water chestnut <i>Trapa natans</i>	An annual herb occurring in the western, central, and eastern regions of the state in aquatic habitats. Forms dense floating mats on water.

Source: MIPAG, [Plants voted as: INVASIVE](#).

* Identified by the Groton Invasive Species Committee as one of the “10 Most Wanted” invasive species to watch for in the town. This includes species that have been documented in Groton, as well as species that have been previously eradicated. This also includes species that have been observed in nearby communities or elsewhere in the state.

The Invasive Species Committee has also identified several invasive and potentially invasive invertebrate species of concern for Groton, described in Table 4-25.

Table 4-25. Invasive and Likely Invasive Invertebrate Species of Concern

Common Name Scientific Name	Description
Emerald ash borer <i>Agilus planipennis</i>	An insect that feeds on ash trees. Larvae make distinctive zig zag patterns as they burrow into trees and feed, while adults feed on leaves. Infestations typically result in tree canopy loss within two years and tree death within four years. Spreads organically (flight); accidentally introduced through movement of forestry products (e.g., firewood, nursery stock).
Browntail moth* <i>Euproctis chrysorrhoea</i>	A moth whose caterpillar stage is characterized by its tiny hairs, which contain a toxin and can cause skin rashes and difficulty breathing if inhaled. Hairs shed into the environment and remain toxic for up to three years. Caterpillars are non-specific in feeding, and can affect fruit, ornamental, and hardwood tree species. Spreads organically (flight) and by wind; can also hitchhike as pupae into new areas.
Jumping worm* <i>Amyntas agrestis</i>	An earthworm characterized by a wide band around its body and its propensity to thrash around when threatened. It excessively consumes leaf litter as compared to native earthworms, affecting soil properties and reducing food sources for native species. Thought to spread through the horticultural trade or as fishing bait.
Spotted lanternfly* <i>Lycorma delicatula</i>	A planthopper insect that pierces host plants to feed on sap and exudes a sugary waste substance, impeding photosynthesis, stunting growth, attracting other pests, and encouraging sooty mold growth. Its native preferred host plant is the invasive tree of heaven. Poses a serious economic threat to viticulture, agriculture, and forestry industries. Capable of hitchhiking on vegetative materials, cars, and other equipment.

Source: U.S. Department of Agriculture, National Invasive Species Center, [Terrestrial Invertebrates](#) and Maine Department of Health and Human Services, [Browntail Moth](#).

* Identified by the Groton Invasive Species Committee as one of the “10 Most Wanted” invasive species to watch for in the town. This includes species that have been documented in Groton, as well as species that have been previously eradicated. This also includes species that have been observed in nearby communities or elsewhere in the state.

Effective control and eradication measures vary depending on the invasive species, though actions to prevent their intentional or accidental introduction (e.g., by banning the use of non-local firewood,

inspecting vehicles for hitchhiking insects) are important to prevent spread. In many cases, control and eradication measures require resource intensive and multi-year investments. Depending on the means of dispersal, removal efforts may also carry an inherent risk for spread, as is often a concern with rhizomatic plant species such as Japanese knotweed that can reestablish themselves via small root fragments.

History and Location

Invasive species are a concern across the entirety of the Town, particularly in local waterbodies. Lost Lake/Knops Pond and Massapoag Pond were both listed on the Commonwealth's 2022 Integrated List of Waters¹⁹⁰ as impaired due to the presence of invasive plant species (among other factors).¹⁹¹ The Draft 2024/2026 Integrated List of Waters identifies the portions of the Nashua River, Lost Lake/Knops Pond, and Massapoag Pond as impaired due to the presence of invasive plant species (among other factors).¹⁹² ¹⁹³ The Town has also identified Baddacook Pond and Squannacook River as having invasive plant species present.

Invasive plant species in local waterbodies, including water chestnut, are already impeding recreational activities, and the Town and local stakeholders have employed mechanical removal, herbicide treatments, barriers, and other control and management measures at various sites in the past.¹⁹⁴ Species that are particularly challenging from a management perspective and/or their density in Town include Japanese knotweed, Oriental bittersweet, and phragmites. The Town continues to actively manage invasive species, including on conservation lands. The Invasive Species Committee was established in 2015 to help guide these efforts and act as a resource to residents; two of its members are licensed herbicide applicators.

Probability of Future Occurrence

Certain invasive species are already established in Groton. Thus, it is near certain that Groton will continue to be at risk of invasive species in the future. Depending on the effectiveness of control measures across the Commonwealth, including in nearby communities where invasive species not yet established in Groton have been observed, it is possible that new invasive species will also be introduced in town.

Climate Change Impacts on Invasive Species

Climate change is expected to positively affect invasive species. Some non-native species that prefer warmer climates will be able to shift northward as average temperatures increase in the Commonwealth.¹⁹⁵ Climate change stress on local ecosystems will increase their susceptibility to invasive

¹⁹⁰ The federal Clean Water Act requires states and authorized Tribes to submit, on a two-year cycle, reports on the status of waterbodies and their current attainment of surface water quality standards. Known as the "Integrated List of Waters," these reports indicate whether waterbodies are meeting their designated uses, which describe existing and desired conditions or uses of a waterbody. Typical designated uses include activities like protection and propagation of fish, shellfish, and wildlife and primary and secondary contact recreation.

¹⁹¹ *Groton Master Plan* (2025), 43.

¹⁹² MassDEP, [Draft Massachusetts Integrated List of Waters for the Clean Water Act 2024/2026 Reporting Cycles: Appendix 26, Merrimac River Basin and Coastal Drainage Area Assessment and Listing Decision Summary](#) (2025), 130 and 176.

¹⁹³ MassDEP, [Draft Massachusetts Integrated List of Waters for the Clean Water Act 2024/2026 Reporting Cycles: Appendix 30, Nashua River Basin Assessment and Listing Decision Summary](#) (2025), 359.

¹⁹⁴ *Town of Groton 2019 – 2026 Open Space and Recreation Plan* (2019), 71-72.

¹⁹⁵ *ResilientMass Plan: Appendices* (2023), 5.10-17.

species, and native species may be less able to compete effectively. Additionally, continued globalization of trade and travel is expected to continue to introduce invasive species to new habitats.

Research is still understanding how extreme climate events will affect invasive species and their interactions with local ecosystems. At this point, the *ResilientMass Plan* makes no firm conclusions about how these interactions may positively or negatively affect invasive species.¹⁹⁶

People and Property at Risk from Invasive Species

Collectively, invasive species have the potential to harm the entire Town of Groton and all populations. The Town's 2019 *Open Space and Recreation Plan* observes that invasive plant species have already established themselves along roadways, on open space lands, and on private property, and that former farmland has been particularly vulnerable to the spread of invasive plant species.¹⁹⁷

Groton's forested areas, including its open space lands, and waterways provide ample habitat for invasive plant and animal species. Invasive species typically harm native species through habitat degradation, competition for shared resources, and predation. They are likely to impact the quality and functioning of local ecosystems, including in ways that may impact people's ability to recreate. While only a small percentage of Groton's land area remains in agricultural production, agricultural activity is important to the Town's heritage. However, invasive species, including invertebrate pests, can cause severe crop damage. Finally, invasive species can be present even in one's front yard—and in Groton, where many private properties are heavily wooded, this is especially true.

Invasive plant and animal species can also increase incidences of arboviral diseases (viral infections transmitted primarily via bites from infected insects) and bacterial and parasitic infections.^{198 199} People that work and recreate outdoors are most at risk of negative interactions with invasive species, and populations with compromised immune systems or preexisting health conditions may be most vulnerable to negative health impacts. For example, Lyme disease, a tick-borne disease caused by bacteria, is positively correlated with the presence of certain invasive shrubs. This is thought to be attributable to dense stands of shrubbery and reduced forest and wildlife species diversity, which leads to population increases of animal vectors (notably blacklegged ticks, white-footed mice, and white-tailed deer).²⁰⁰ Asian tiger mosquitos, which are already present in localized areas of Massachusetts and included in the Central Massachusetts Mosquito Control Project's surveillance program, have aggressive human-biting behavior and are a known vector of diseases such as West Nile virus.^{201 202}

Summary of Anticipated Impacts from Invasive Species

Direct impacts from invasive species include degradation of natural habitats and biodiversity, disruption of economic activity, and the spread of arboviral and other diseases. Habitat degradation is of particular

¹⁹⁶ *ResilientMass Plan: Appendices* (2023), 5.10-17.

¹⁹⁷ *Town of Groton 2019 – 2026 Open Space and Recreation Plan* (2019), 71-72.

¹⁹⁸ *ResilientMass Plan: Appendices* (2023), 5.10-29.

¹⁹⁹ New York Department of Health, "Arboviral (Arthropod-borne Viral) Diseases," last updated July 2017, https://health.ny.gov/diseases/communicable/arboviral/fact_sheet.htm.

²⁰⁰ *ResilientMass Plan: Appendices* (2023), 5.10-29.

²⁰¹ U.S. Department of Agriculture, "Asian Tiger Mosquito," accessed January 26, 2026, <https://www.invasivespeciesinfo.gov/terrestrial/invertebrates/asian-tiger-mosquito>.

²⁰² Central Massachusetts Mosquito Control Project, "Asian Tiger Mosquito Protocols," accessed January 26, 2026, <https://www.cmmcp.org/1481/Asian-Tiger-Mosquito-Protocols>.

concern related to natural hazards. Declines in forest health and biodiversity can, for example, contribute to wildfire risk or lead to more trees and branches falling on and around power utilities, while degradation of riverbanks caused by a loss of native stabilizing vegetation can increase localized flooding and erosion.

A summary of anticipated impacts from invasive species most relevant to Groton are noted by sector:

- **Human:** Spread of disease, including arboviral diseases.
- **Infrastructure:** Negative impacts to facilities and industries that rely on healthy ecosystems, including outdoor recreation and tourism, agriculture, and forestry activities. Potential for nuisance issues (e.g., overgrown invasive plants on roadways).
- **Economy:** Continued costs for invasive species control and eradication measures. Potential for economic impacts from loss of productivity or inability to use resources (e.g., conservation lands, surface waters).
- **Governance:** Increased maintenance, staff time, and funding demands for invasive species control and eradication measures at Town-owned and/or -managed lands and waterbodies.
- **Natural Environment:** Habitat degradation and reduced biodiversity, including potential losses of unique habitats and species of concern or endangered species. Potential for increased exposure and vulnerability to natural hazards caused by degradation of native ecosystems.

E. Vulnerability Assessment

A community's vulnerability relates to its susceptibility to damage from a hazard. Assessing vulnerabilities is important to understanding what is likely to be damaged by the hazards present in a community, and how severe that damage may be. Understanding existing and future expected vulnerabilities (based on current trends) is essential to identifying appropriate mitigation strategies for Groton.

The assessment herein examines vulnerability across different facets of life in Groton, noting that there is significant overlap between these broad categories:

- **Built environment**, which encompasses human-made features such as buildings and structures, utility infrastructure, roads, and bridges).
- **Economic environment**, including related to potential damage to real property.
- **Social environment**, including related to potential direct and indirect harm to residents as well as damage that can impact a community's emergency response or recovery.
- **Natural environment**, which encompasses potential for damage to a community's natural areas.

Accounts of historical damage are often good indicators for current exposure and potential damage from hazards in a community. The Groton LHMC has also provided information to supplement available data, including related to emergency response challenges and concerns.

1. Built Environment Vulnerability

This subsection focuses on the susceptibility of the built environment to harm, including reviewing how changes in population patterns and land use and development trends may increase expected exposure or vulnerability to different hazards.

Impacts of Changes in Population and Changes in Land Use/Development

Communities are not static, and the way they change and grow can affect how they experience natural hazard events. As populations change, there may be increased alterations to the landscape or increased utilization of natural resources, which can impact hazard severity. A population with shifting demographics will also see corresponding shifts in its vulnerable populations. How a community develops and uses land, as well as the rules and regulations governing how those activities occur, can also help mitigate or exacerbate hazard impacts.

Flood-Related Hazards

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from flooding, as described in Section 4.D.1.
- **Changes in Land Use and Development Patterns:** Existing land use and development codes and regulations will help to minimize flood impacts. The Town implements the NFIP's minimum regulatory standards and the State Building Code. The Town's stormwater regulations require new development to be designed such that post-development peak discharge rates and volumes do not exceed pre-development conditions.

Wind-Related Hazards

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from wind-related hazards, as described in Section 4.D.2.
- **Changes in Land Use and Development Patterns:** The Town implements the State Building Code, which includes wind speed parameters. Changes in land use and development patterns are not expected to alter the Town's overall risk and exposure of wind-related hazards.

Winter-Related Hazards

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from wind-related hazards, as described in Section 4.D.3.
- **Changes in Land Use and Development Patterns:** The Town implements the State Building Code, which includes snow load parameters. Changes in land use and development patterns are not expected to alter the Town's overall risk and exposure of winter-related hazards.

Geological-Related Hazards

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from geological-related hazards, as described in Section 4.D.4.
- **Changes in Land Use and Development Patterns:** Existing land use and development codes and regulations will help to minimize geological-related impacts. The Town implements the State Building Code, which includes seismic parameters. The Town also earth removal and stormwater management regulations to control land disturbing activities to mitigate the risk of erosion and landslides and considers site suitability as part of broader development review processes.

Brush Fires and Wildfires

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from brush fires and wildfires, as described in Section 4.D.5.
- **Changes in Land Use and Development Patterns:** Any development within the WUI puts additional people and structures in areas where there are significant wildland or vegetative fuels, meaning fires may have the potential for greater impacts to humans and/or be easier to start through human activity.

Extreme Heat

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from extreme heat, as described in Section 4.D.6.
- **Changes in Land Use and Development Patterns:** New development may exacerbate heat island effects, particularly where tree cover has been removed and impervious surfaces are added. The Town's existing codes and regulations provide guidance and requirements for site landscaping and site design, which encourage natural open space and vegetation retention.

Drought

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from drought, as described in Section 4.D.7. People who rely on private drinking water wells will be particularly exposed to potential impacts of drought.
- **Changes in Land Use and Development Patterns:** New development will create additional demands for limited water resources. The Town's development review processes consider potential impacts of development on water resources.

Changes in Groundwater

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to the impacts from drought, as described in Section 4.D.8. People who rely on private drinking water wells will be particularly exposed to changes in groundwater quantity, quality, and levels.
- **Changes in Land Use and Development Patterns:** New development will create additional demands for limited water resources, and some land uses are associated with higher risks to groundwater contamination. The Town's development review processes consider potential impacts of development on water resources.

Invasive Species

- **Changes in Population Patterns:** The Town's population is expected to grow steadily, including its population of older residents, meaning more people may be exposed to direct and indirect impacts from invasive species (e.g., lowered environmental quality), as described in Section 4.D.9.
- **Changes in Land Use and Development Patterns:** New development may fragment existing natural areas and degrade native ecosystems, increasing their susceptibility to invasive species. The Town's existing codes and regulations provide guidance and requirements for

site landscaping and site design, which encourage natural open space, vegetation retention, and the use of native plant species.

Recent Development Projects

Groton’s vulnerability to natural disasters has not changed significantly since the 2020 HMP. However, it is important to note that the frequency and severity of many natural hazard events is changing due to climate change impacts, with many expected to become more frequent and severe. While new development can increase vulnerability to hazards in some ways (e.g., increasing impervious surfaces), they are also required to comply with current codes and requirements, including building codes, stormwater standards, and floodplain management regulations. More protective codes and requirements thus can help minimize negative impacts from new development and ensure new structures and buildings are as resilient as possible to hazard impacts.

As noted in the *Groton Master Plan*, the Town’s “most consistently recurring development trend has been a steady rate of single-family housing development.” Recent development has been concentrated along major roadway corridors with existing infrastructure access, which helps to reduce sprawl. Alongside development, the Town has also emphasized conservation and open space preservation to retain important natural areas and maintain a rural setting.²⁰³ Major development projects (approved, under construction, or completed) since the 2020 HMP are listed in Table 4-27. None of the major development projects are located within the FEMA special flood hazard area.

Table 4-26. Major Development Projects, 2019-2026

Project Name Location	Status	Description
<i>Residential Development</i>		
Hayes Woods, Maple Avenue, and Pepperell Road	Under Construction 2022	16 lots, single-family, flexible development with 60 acres of protected open space
340 Longley Road	Completed 2022	Three lots, single-family
797 Boston Road	Approved 2024	24 units, age-restricted multi-family development
Waters House 11 Lowell Road	Completed 2024	Conversion of historic structure into six apartments
Gratuity Brook Farm Estates 63 Gratuity Road	Approved 2025	12 lots, duplexes (24 units), age-restricted
Madigan Hill 423 Old Ayer Road	Approved 2025	3 lots, single-family, residential compound
500 Main Street	Approved 2025	MBTA Communities multi-family development, 200 units (176 apartments, 24 townhomes)
Village Meadows, Bluebird Lane Formerly 372 Townsend Road	Completed 2025	Nine lots, single-family, flexible development within 24 acres of protected open space
Village at Shepley Hill Legacy Lane and McGovern Way	Completed 2026	13 lots, duplexes (26 units), age-restricted

²⁰³ *Groton Master Plan* (2025), 35-39.

<i>Commercial Development</i>		
Kilborne Place 240 Main Street	Completed 2023	Conversion of former grocery store into medical offices
UMass Memorial Health Care, Nashoba Satellite Emergency Facility 490 Main Street	Under Construction 2025	Construction of new emergency medical facility, 18,500 square feet

Source: Town of Groton

2. Economic Vulnerability

This subsection focuses on the susceptibility of the built environment to harm, with a focus on flood hazard, as mapped by FEMA.

NFIP Insured Property

FEMA's NFIP is the primary source of flood insurance for residential properties. Flood insurance is available to properties located within communities that participate in the NFIP. While there is no state law in Massachusetts requiring property owners to carry flood insurance, there is a federal mandatory purchase requirement requiring property owners with a federally backed mortgage within the special flood hazard area in a community that participates (or has participated) in the NFIP to purchase flood insurance.²⁰⁴ Based on FEMA NFIP records provided via the Massachusetts State NFIP Coordinator, the estimated value of property insured by the NFIP in Groton is \$8,150,000 as of January 7, 2026 (Table 4-28). There are no repetitive or severe repetitive flood loss properties in Groton. Since 1978, there have been two flood insurance claims that were paid. The Town's Building Official administers the NFIP.

Table 4-27. Summary of NFIP Activity, Groton

Policies in Force	Coverage Value (Building & Contents)	Claims since 1978
28	\$8,150,000	2 (\$12,395)

Source: Town of Groton

Nearly all policies in force in Groton cover residential properties, and most insured properties are in A Zones, or the special flood hazard area. The special flood hazard area is the area expected to be inundated during the 1% annual chance flood event.

FEMA Flood Zones

For this HMP update, a GIS-based analysis was performed to estimate the total assessed value of properties within FEMA-designated flood zones corresponding to the 1% annual chance flood hazard (delineated by A Zones) and 0.2% annual chance flood hazard (delineated by the X Zone). The number and types of properties are described earlier in Section 4.D.1 and quantified in Table 4-29. The GIS analysis is based on the FEMA FIRMs, effective July 8, 2025.

²⁰⁴ Congressional Research Service, [A Brief Introduction to the National Flood Insurance Program](#) (2025), 1-2.

Table 4-28. Total Vulnerability, FEMA Flood Hazard Areas

Land Use	Zone A and AE 1% annual chance flood area		Zone X 0.2% annual chance flood area	
	# of Properties	Assessed Value	# of Properties	Assessed Value
<i>Commercial</i>				
General Commercial	2	\$827,600	2	\$822,100
Storage Warehouses & Distribution Facilities	5	\$6,652,600	-	-
Vacant Developable Land	2	\$1,220,200	-	-
<i>Residential</i>				
Single Family	511	\$370,340,590	48	\$33,851,300
Non-Transient Congregate Housing	1	\$6,992,400	-	-
Other Residential	87	\$45,178,876	2	\$1,363,800
Vacant Developable Land	15	\$3,609,900	1	\$217,800
Vacant Potentially Developable Land	4	\$566,500	-	-
Vacant Undevelopable Land	87	\$1,857,200	4	\$140,500
<i>Industrial</i>				
Industrial	4	\$3,355,720	-	-
Vacant Developable Land	1	\$314,00	-	-
Vacant Undevelopable Land	1	\$4,300	-	-
<i>Exempt Property</i>				
Charitable, Conservation	68	\$14,409,600	-	-
Charitable, Other	7	\$3,412,300	1	\$468,200
Commonwealth of Massachusetts Lands	23	\$8,982,360	-	-
District Lands (Improved)	4	\$1,535,300	-	-
District Lands (Vacant)	1	\$52,700	-	-
Housing Authority Lands	2	\$469,220	-	-
Open Space Lands	11	\$0	-	-
Private Education Lands (Improved)	4	\$322,806,100	1	\$708,300
Private Education Lands (Vacant)	2	\$403,700	-	-
Public Education Lands (Improved)	2	\$37,361,900	-	-
Public Education Lands (Vacant)	1	\$51,500	-	-
Religious Group Lands	8	\$15,878,200	-	-
Town of Groton Lands (Improved)	1	\$3,446,000	-	-
Town of Groton Lands (Vacant)	102	\$25,917,580	2	\$513,360
Utility Authority Lands	11	\$3,064,700	1	\$2,706,600
<i>Other</i>				
Chapter 61, 61A & 61B Lands	19	\$363,410	-	-
<i>Total (All Parcels)</i>	<i>986</i>	<i>\$880,074,456</i>	<i>62</i>	<i>\$40,791,960</i>

Source: Town of Groton, MassGIS (Bureau of Geographic Information), and MA Department of Revenue/Division of Local Services, Bureau of Local Assessment, *Property Type Classification Codes* (2019)

Impacts of Business Disruptions

Notwithstanding the obvious costs of commercial property damage, the impacts of potential business interruption from a natural hazard in Groton cannot be understated. Business closure results in a

reduction of revenues to proprietors and a loss of wages to employees. State and local tax revenues can be significantly reduced. In addition to the costs of commercial property damage, the impacts from potential business disruptions following a natural hazard could have long-lasting effects on the local economy, quality of life, and sense of place.

3. Social Vulnerability

Social vulnerability is strongly tied to the way in which the built environment, economy, and environment are also affected by hazard impacts. Most obviously, the vulnerability of a community includes the potential for direct damage to people and property. Disruptions to the typical day-to-day of a community include temporary closures of schools and businesses, temporary disruptions to transportation, and disruption to the movement of goods and services. Emotional stress may result from financial and physical losses. Social vulnerability also encompasses more severe effects on lifeline infrastructure, which are those infrastructure and services that underpin the ability of a society to function. Any infrastructure disruption can have negative effects, and natural hazards have the potential to lead to extended loss or reduction in lifeline infrastructure functioning. This is especially the case when a natural hazard is extreme enough to require evacuation and/or residents may be subject to shortages of basic supplies.

Transportation Infrastructure

The Town of Groton has 109 miles of roadway, of which 100 are accepted by the Town, 5.5 miles are under the jurisdiction of the Massachusetts Department of Transportation (MassDOT), and another 3.5 miles are private ways. Routes 119 and 225 are state highways, and Routes 40 and 111 are locally accepted minor arterials.²⁰⁵ The Groton Department of Public Works and its Highway Department are responsible for roadway maintenance and management.

The sidewalk network is limited and disconnected, with most sidewalks located downtown or in recent subdivisions (with sidewalk installation now mandated in new subdivisions). On-road bicycle infrastructure is also limited, but the Town has two shared use paths. The Nashua River Rail Trail is a 12.5-mile shared use path that runs between Nashua, NH and Ayer, MA, with the southern end terminating at the Ayer Commuter Rail Station.²⁰⁶ The Squannacook River Trail is a 3.7-mile shared use path that connects the Town of Townsend to the Bertozzi Wildlife Management Area in the northwestern corner of Groton. Both communities and local trail advocates are seeking fund for further extensions of the Squannacook River Trail.^{207 208}

There are no public transportation routes within Groton, though the MBTA Fitchburg Commuter Rail line is accessible via the Ayer, Littleton, and Shirley Commuter Rail Stations. Boston Express bus service provides access from Tyngsborough to both Logan Airport and the MBTA system at South Station.²⁰⁹ The Town also operates a shuttle service for senior residents.²¹⁰

²⁰⁵ *Groton Master Plan* (2025), 77.

²⁰⁶ *Ibid*, 66.

²⁰⁷ Squannacook Greenways, Inc., “Squannacook River Rail Trail,” accessed January 19, 2026, <http://sqrrt.org/>.

²⁰⁸ Massachusetts Office of Grants and Technical Assistance, “2023 MassTrails Grant Awards,” accessed January 19, 2026, <https://www.mass.gov/guides/masstrails-grants#-masstrails-grant-awards-by-year->.

²⁰⁹ *Groton Master Plan* (2025), 67.

²¹⁰ *Ibid*.

Transportation infrastructure will likely experience an accelerated rate of deterioration from the combination of extreme temperatures, increased precipitation, and flooding. Extended periods of extreme heat can cause thermal expansion of concrete and metal materials and softening and road ruts in asphalt, affecting the integrity of roadways and bridges. While annual average temperatures may increase, decreasing the need for snow and ice removal, more rapid freeze-thaw cycles can cause cracks and degradation of roads. Additionally, bridges may experience scour or damage from flood debris during riverine and flash flooding events. Low-lying roadways and those with insufficient drainage infrastructure may also experience flooding, leading to access issues.

There have been no projects as part of the State Transportation Improvement Program (STIP) in Groton since 2019, nor are any projects identified through the STIP 2028 funding year.²¹¹

Utility Services

Stormwater

Groton is a regulated MS4 community. Groton DPW manages the Town's stormwater program and infrastructure, which includes the catch basins, storm drainage, curbs, pipes, and other assets that capture, convey, and discharge stormwater to surface waters. The Town is responsible for managing over 3,100 catch basins, 100 outfalls, 1,000 drain manholes, 100 best management practices, and 75 culverts.

Town voters approved the creation of a Stormwater Utility Enterprise Fund in 2020, which is funded through an annual fee charged to developed public and privately owned properties and supports stormwater management costs.²¹² The Town's Illicit Discharge Detection and Elimination (IDDE) Plan was completed in 2016.

Stormwater infrastructure on private property and state-owned roads is owned and maintained by the property owners and MassDOT, respectively.

Climate change is expected to increase the frequency and intensity of precipitation, with intense precipitation occurring over fewer days. Stormwater infrastructure must be sized appropriately to ensure sufficient capacity to capture and convey precipitation without resulting in flooding.

Drinking Water

Public water service is provided by the Groton Water Department and the West Groton Water Supply District to approximately 78% of households in Groton, while the remaining 22% of households rely on private wells.²¹³ Both public water suppliers also serve non-residential customers. Drinking water is sourced entirely from groundwater resources in the area.

The Groton Water Department has approximately 1,900 service accounts. The Water Department's four groundwater wells are located near Baddacook and Whitney Ponds, and the Water Department also

²¹¹ MA Department of Transportation, "STIP Viewer," accessed March 9, 2026, <https://gisstg.massdot.state.ma.us/estipviewer/>.

²¹² Town of Groton, "Stormwater Utility Enterprise Fund Frequently Asked Questions," accessed February 1, 2026, <https://www.grotonma.gov/2020/10/27/stormwater-utility-enterprise-fund-frequently-asked-questions/>.

²¹³ *Groton Master Plan* (2025), 140.

maintains a 1-million-gallon storage tank. In total, the distribution system consists of 52.9 miles of water mains.²¹⁴ The Water Department is currently authorized to withdraw 547,000 gallons per day.²¹⁵

In 2024, the Groton Water Department completed construction of the Whitney Pond Wells Water Treatment Facility to address iron and manganese in its drinking water source. The Groton Water Department is also currently in the construction phase of a water main extension project to extend public drinking water service to the area around the Groton-Dunstable Regional High School in response to PFAS contamination in private wells.

The West Groton Water Supply District services approximately 670 service accounts, 98% of which are residential customers. The District's two groundwater wells are located along the Squannacook River and can produce in excess of 850,000 gallons per day. The District also has 211,000-gallon and 600,000-gallon storage tanks.²¹⁶ In total, the distribution system consists of about 15 miles of water mains. Peak daily demand during the summer season is about 600,000 gallons per day.²¹⁷

Primary challenges related to natural hazards and climate change include impacts of drought and changes in groundwater on the quantity and quality of drinking water supply sources. Both the Groton Water Department and West Groton Water Supply District institute seasonal mandatory water conservation programs to mitigate excessive use of water resources for non-essential activities (e.g., watering lawns). Other challenges include the potential for earthquakes and landslides to break underground pipes, and potential contamination of groundwater resources following brush fires and wildfires.

Wastewater

Public wastewater service is limited in Groton. The Groton Sewer Commission oversees the provision of wastewater service to the Four Corners Sewer District and the Groton Center Sewer District. Effective 2023, the Groton Sewer Commission has implemented a policy of "no expansion of Districts" to its wastewater system due to limited capacity.²¹⁸ Properties outside of the Town's sewer districts rely on private onsite wastewater treatment systems (OWTS) (i.e., septic systems).

The Town has two inter-municipal agreements with the adjacent towns of Ayer and Pepperell to convey 40,050 and 275,000 gallons per day, respectively, to their wastewater treatment plants. Wastewater from the Four Corners Sewer District is conveyed to the Ayer wastewater treatment plant (1.79 million gallons per day capacity), with wastewater from the Groton Center Sewer District conveyed to the Pepperell wastewater treatment plant (1.1 million gallons per day capacity). The Commission maintains 11.3 miles of sewer lines within the Center Sewer District. The Center Sewer District also has three pump stations, two of which are owned by the Commission and one owned by the Groton-Dunstable Regional School District. The Four Corners Sewer District comprises 1.3 miles of sewer lines. Two private pump stations are located within this district, with the first serving Shaw's and the second serving condominiums on Hummingbird Lane and the sewered portion of Oriole Drive.

²¹⁴ Groton Water Department, [Annual Water Quality Report](#) (2026), 2.

²¹⁵ MA Department of Environmental Protection, [Groton Water Department PWS ID #2115000 Final Water Management Act Permit Amendment Permit #9P-2-13-115.01](#) (2023), 2.

²¹⁶ West Groton Water Supply District, "About Us," accessed June 8, 2026, <https://www.westgrotonwaterdistrict.org/about-.html>.

²¹⁷ West Groton Water Supply District, [Annual Water Quality Report 2025](#) (2026), 3.

²¹⁸ Town of Groton, "Groton Sewer Commission," accessed February 1, 2026, <https://www.grotonma.gov/government/boards-and-committees/groton-sewer-commission/>.

The Sewer Commission recently finished minor upgrades and the installation of a pump bypass at the Nod Road pumping station. Should more flow capacity be purchased in the future, the Sewer Commission anticipates prioritizing Nod Road for additional connections. The Sewer Commission is also working on an inventory of properties with private grinder pumps to support proactive notifications to property owners of non-function when power is lost in the community.

Natural hazards and climate change may also affect public and private wastewater infrastructure and/or challenge historical operating procedures. Flooding and extreme precipitation can inundate wastewater treatment facilities, which are typically located at low elevations, and private OWTS, causing releases of raw sewage and local contamination issues. Flooding along the portion of Route 119 from approximately 500 Main Street northward to the Nashua River and eastward about 700 feet along Nod Road has resulted in raw sewage discharges in the past. While this area is not within the FEMA 1% annual chance flood area, the Sewer Commission reports that there have been two supposed 0.2% annual chance flood events at this location in the past 20 years.

Challenges with infiltration and inflow (I&I) may occur because of changes in groundwater levels (e.g., if groundwater levels rise to or above sewer line depths) or extreme precipitation that causes stormwater runoff into inappropriate connections to sanitary sewers. The Sewer Commission has a few known locations with I&I challenges, including a manhole at the Conductor Lab site at 430 Main Street and the lower portion of Route 119. Earthquakes and landslides may break underground pipes and infrastructure. Extreme heat and drought can affect the typical flows of receiving waterbodies of effluent discharges from wastewater treatment facilities, resulting in higher concentrations of potentially harmful pollutants and endangering aquatic life.

Electricity

GELD provides electrical power services to the Town. Overhead wires make up the bulk of GELD's distribution infrastructure. Over the past 25 years, most residential developments were constructed with primary underground electric distribution, and all new residential developments are required to install underground electrical service.

GELD continues to strengthen its system through ongoing pole replacements and general system hardening. GELD is in the process of replacing an aging conductor that serves West Groton and has plans to install a third battery energy storage system to help reduce GELD's peak demand on the ISO New England grid. Because of the specialized nature of its system components, GELD maintains awareness of equipment markets, lead times, and inventory levels closely in order to effectively manage its assets and maintain reliability.

Primary challenges related to natural hazards and climate change include impacts of high wind, heavy snow, and icing events that can down infrastructure. Downed limbs and trees are the leading threat and primary source of damage to the electric distribution system. GELD maintains an aggressive vegetation management and trimming program to mitigate impacts to its system, through tree growth is constant and thus remains an ongoing reliability concern, particularly during storms that result in downed limbs or trees onto power lines. GELD reports that the most susceptible areas to impacts from downed limbs or trees tend to be along roads that are furthest out on its circuits. Increased demand for cooling during periods of extreme heat is also likely to stress the capacity of electrical infrastructure to meet demands.

Broadband and Internet Access

Broadband and internet access is provided privately, with most properties utilizing Verizon or Spectrum services.²¹⁹ Similar to electrical infrastructure, high wind, heavy snow, and icing events will pose threats to overhead utility lines.

Emergency Shelters and Evacuation

The use of mass care facilities during an emergency is dependent on a variety of factors, including warning time ahead of the hazard, public awareness, level of encouragement to utilize facilities, and availability of facilities. Emergency shelters are activated at the direction of the Town Manager or Emergency Management Director. Not all hazard events may necessitate the opening of emergency shelter; therefore, Groton residents should obtain guidance from local officials on which shelters may be open. The following sites are designated shelters and may be activated during emergencies:

- **Groton-Dunstable Regional Middle School (346 Main Street):** Primary shelter and emergency dispensing site
- **The Groton Center (163 West Main Street):** Secondary shelter
- **Groton-Dunstable Regional High School (703 Chicopee Row):** Mass care facility
- **Groton-Dunstable Regional Middle School (346 Main Street):** Mass care facility

Shelter use is not easily predicted because each emergency affects individuals and the community differently. Emergency shelter use may be higher during winter hazards when there is a likelihood of power outages and extreme cold, which can be dangerous to those without adequate shelter or households that lose heating ability.

4. Environmental Vulnerability

All natural hazards identified in this HMP can affect the environment. There is high variability in the expected impacts to the natural environment (along with related costs) of natural hazards, as each is unique in terms of its overall frequency and individual event extent, timing, and severity. Hazards related to storms and extreme weather, such as riverine and flash flooding, hurricanes and tropical storms, and ice storms, are examples of this variability based on their size, path, speed, wind speeds, and intensity of precipitation. Other hazards will likely have greater variability, including brush fires and wildfires and invasive species, where the extent of impacts may be more localized, including due to human interventions and management.

The impacts of an individual hazard event and the compounding impacts of multiple hazard events can result in direct degradation of the natural environment (e.g., loss of habitat, contamination of water resources, declines in native species abundance). In turn, this can lead to the loss of beneficial ecosystem services to the community, including flood storage, heat mitigation, and outdoor recreation benefits.

²¹⁹ *Groton Master Plan* (2025), 125.

SECTION 5. CAPABILITY ASSESSMENT

The Town of Groton has many tools that support its ability to implement hazard mitigation planning and improve community resilience, including related to regulations, policies, programs, staff, and funding. Section 5 documents these existing mitigation capabilities and discusses potential opportunities to strengthen the Town's efforts.

This section is divided into four main parts corresponding with the general categories of capabilities described in FEMA's 2025 *Local Mitigation Planning Handbook*: planning and regulatory, administrative and technical, education and outreach, and financial. Note, however, that not all capabilities fall neatly into these categories and may have cross-category implications.

A. Planning and Regulatory Capabilities

Planning and regulatory capabilities encompass the regulations, policies, plans, and programs that influence the way growth and development occur in a community. These capabilities represent a framework for development, describing the entities involved in review processes and the different requirements and standards that must be met. These capabilities also include long-range planning processes that document communities' overall vision for what growth looks like in the future, and where it is most appropriate to occur. In other words, planning and regulatory capabilities embody the "who, what, when, where, why, and how" of development and growth activities. General examples of planning and regulatory capabilities include the following:

- Community plans, including comprehensive or master plans and open space and recreation plans
- Land use regulations, including zoning, subdivision, and development bylaws and processes
- Building codes and environmental resource protection standards and management programs, including stormwater management programs
- NFIP Community Rating System program participation
- Capital improvement programs
- Open space preservation

1. 2025 Groton Master Plan

The 2025 *Groton Master Plan* is a long-range guidance document for the Town to manage growth and change and was informed by an extensive community engagement process. The plan is comprehensive and reviews trends in Groton related to land use, natural resource areas, community facilities and services, and sustainability and resilience, among other topics. Key issues identified in the *Groton Master Plan* relevant to natural hazards and hazard mitigation are documented below by plan element.

- **Land Use:**
 - Preserving rural character and accommodating development pressures, including related to managing land uses in areas prone to environmental hazards or in areas that provide important ecosystem benefits.
- **Natural Resources, Open Space, and Recreation Areas:**
 - Addressing sites with contamination issues, including two former waste disposal sites and areas of PFAS contamination.

- Continuing to mitigate soil erosion and sedimentation, including by enforcing development bylaws and regulations.
- Responding to chronic flooding and climate change issues that can raise hazard risk.
- Addressing ground and surface water pollution, including related to invasive species, stormwater runoff, and other contaminant sources.
- Managing and containing the spread of invasive species, particularly invasive plant species.
- **Community Facilities and Services:**
 - Responding to water quality contaminants in drinking water, including manganese and PFAS.
 - Maintaining facilities and services, including public safety services, in response to demand.
- **Sustainability and Resilience:**
 - Retrofitting or upgrading infrastructure to respond to climate change impacts and mitigate greenhouse gas emissions and updating bylaws and regulations to more explicitly address climate change impacts.
 - Increasing staff capacity and resources to manage sustainability and resilience priorities.

Relevant strategies from the Master Plan have been implemented into the HMP's mitigation strategies (Section 6).

Suggested improvement: None. Continue to implement identified actions and update as necessary. Periodically (e.g., on an annual basis) assess implementation progress and adjust as necessary.

2. 2019 Groton Open Space and Recreation Plan

The 2019 *Groton Open Space and Recreation Plan* (OSRP) is a seven-year plan that guides the Town's management of its conservation and recreation resources. Many communities, including Groton, are increasingly referencing ecosystem benefits (e.g., flood storage, cooling) that these resources confer, as well as potential climate change impacts (e.g., spread of invasive species, brush fire and wildfire) that can affect their wellbeing. Goals and objectives identified in the *Groton OSRP* relevant to natural hazards and hazard mitigation are documented below.

- **Goal 1: Promote the preservation of important land resources.**
 - Prioritize open space protection.
 - Engage the public to support natural resource protection.
- **Goal 2: Protect water resources**
 - Prevent the disturbance of riparian areas and wetlands and encourage infiltration and water flow.
 - Prevent or reduce the impact of water pollution from local and regional sources.
 - Evaluate and implement strategies for surface water quality and invasive plant control.
- **Goal 3: Promote resiliency to climate change and sustain biological diversity.**
 - Provide resources for effective open space stewardship.
 - Promote public awareness of natural resources and ecological issues.
 - Plan and implement strategies for hazard mitigation.

Relevant strategies from the OSRP have been implemented into the HMP's mitigation strategies (Section 6).

Suggested improvement: Update the OSRP and integrate climate change and natural hazard mitigation considerations.

3. Massachusetts State Building Code

The Massachusetts State Building Code is found at 780 Code of Massachusetts Regulations (CMR) and is comprised of international model codes and state-specific amendments. All Massachusetts municipalities must adhere to the State Building Code. The code includes detailed standards relevant to natural hazards, including wind loads, earthquake resistance design, floodproofing, snow loads, and fire prevention and protection.

Related to wind and geologic related hazards, enforcing the State Building Code provides reasonable mitigation against the impacts of tornadoes and earthquakes (with severe events occurring extremely infrequently). Wind speed and seismic parameters are found in Chapter 16 of the Code. Related to earthquakes, the Code notes that while its intent is to “minimize the hazard to life of occupants of all buildings and nonbuilding structures, to increase the expected performance of high occupancy assembly and education buildings... and to improve the capability of essential facilities to function during and after an earthquakes,” “[a]bsolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically in most buildings.” However, the minimum criteria are considered “prudent and economically justified” for the protection of life and continued capability of essential facilities to function after an earthquake event.²²⁰

Suggested improvement: None. Continue to implement the state building code.

4. Zoning Bylaws (Chapter 218 of Town Bylaws)

Groton's zoning bylaws regulate the use, size, height, appearance, type, location, and occupancy of buildings and structures. Zoning is used as a tool to regulate the safe and sustainable use of land in Groton, including to promote climate resilience. As stated at § 218-1.2, the purpose of the zoning bylaw is as follows:

The purposes of this chapter include but are not limited to the following: to lessen congestion in the streets; to conserve health; to secure safety from fire, flood, panic and other dangers; to provide adequate light and air; to prevent overcrowding of land; to avoid undue concentration of population; to encourage housing for persons of all income levels; to facilitate the adequate provision of transportation, water, water supply, drainage, sewerage, schools, parks, open space and other public requirements; to conserve the value of land and buildings, including the conservation of natural resources and the prevention of blight and pollution of the environment; to encourage the most appropriate use of the land throughout the Town, including consideration of the recommendations of the Comprehensive Plan, if any, adopted by the Planning Board and the Comprehensive Plan, if any, of the Montachusett Regional Planning Commission; and to preserve and increase amenities by the promulgation of regulations to fulfill these purposes under the provisions of MGL c. 40A.

²²⁰ 780 CMR: Massachusetts Amendments to the International Building Code 2021.

Sections of the zoning bylaw with strong applicability to hazard mitigation include the following:

- **§ 218-2.5 Site plan review**, which lays out review procedures for development projects that may have impacts related to traffic, services and utilities, environmental quality, water resources, wetlands, stormwater runoff, and community character.
- **§ 218-5.7 Nonconformance**, which establishes requirements for nonconforming use or structures. Requirements include those related to discontinuation of the nonconforming use or structure, reconstruction or repair of partially destroyed or damaged nonconforming structures or structures with a nonconforming use, and alterations or extensions.
- **§ 218-7.2 Floodplain District regulations**, which establishes a Floodplain Overlay District to regulate activities within the special flood hazard area (i.e., the 1% annual chance flood hazard area). All subdivision and development proposals in the Floodplain Overlay District are reviewed to ensure that flood damage is minimized, public utilities and facilities are located and constructed to minimize flood damage, and adequate drainage is provided. A floodplain permit is required for all proposed construction or development in the Floodplain Overlay District, including new construction or changes to existing buildings. Groton participates in the National Flood Insurance Program (NFIP) and implements the program's minimum regulatory standards through its Floodplain Overlay District requirements. The Town's Building Commissioner is the official floodplain administrator.
- **§ 218-7.2 Water Resource Protection Overlay District**, which identifies prohibited uses and uses where a special permit is required in areas critical for public drinking water supply protection corresponding to the Commonwealth's delineation of Zone I and II wellhead protection areas, as well as land draining into Zone II areas. The purpose of the district is to protect existing and potential sources of drinking water supplies, thereby ensuring adequate quality and quantity of drinking water to the community.

Suggested improvement: Continue to update with best practices as needed and consider opportunities to integrate requirements that achieve hazard mitigation and/or climate resilience goals as part of any bylaw review process.

5. Other Town Bylaws and Regulations

Other Town bylaws under which proposed development is regulated and/or have strong applicability to hazard mitigation are noted below:

- **Earth Removal (Chapter 132)**: Governs the removal of soil, loan, sand, gravel, or removal of other earthen materials. Applicants seeking to conduct earth removal activities must obtain a permit from the Select Board and demonstrate that the proposed removal will not adversely affect groundwater or surface water quality or drainage, will not result in unreasonable or excessive nuisance impacts (e.g., dust, fumes); and will retain vegetative cover to prevent erosion or damage. The bylaw also establishes the Earth Removal-Stormwater Advisory Committee, which provides written recommendations to the Select Board on permit applications.
- **Flood Damage Prevention (Chapter 141)**: Requires that all building permit applications for new construction or substantial improvements be reviewed by the designated Town agent to determine whether the building site is reasonably safe for flooding, and that all subdivision proposals and other new development is reviewed to confirm the risk of flood damage is

minimized and adequate drainage is provided. Further, the regulation requires that all new or replacement water supply systems and sanitary sewage systems are designed to minimize or eliminate infiltration from floodwater and potential discharge to floodwater; on-site waste disposal systems must also be located to avoid impacts or contamination during flood events.

- **Stretch Energy Code (Chapter 168):** Adopts the opt-in building Stretch Energy Code, which is designed to reduce energy costs and greenhouse gas emissions by setting additional standards and specifications for building design elements that affect energy use and efficiency, including heating, cooling, and lighting.²²¹ The Stretch Energy Code applies to residential and commercial buildings in Groton. Communities that adopt the Stretch Energy Code are eligible to become a Massachusetts designated “Green Community” (among other requirements) and access related energy conservation grants.
- **Stormwater Management—Low-Impact Development (Chapter 198):** Establishes minimum requirements and procedures for post-development stormwater runoff and nonpoint source pollution from new development and redevelopment. Stormwater standards are aligned with the Massachusetts stormwater management standards. The regulation establishes a limited stormwater management permit and full stormwater management permit, differentiated by area of disturbance, for applicants for land-disturbing activities (regardless of whether the project is new development or redevelopment). Applicants for a full stormwater management permit submit a stormwater management plan and operation and maintenance plan. The Earth Removal-Stormwater Advisory Committee is the review body for the regulation.
- **Wetlands (Chapter 215):** Regulates activities that may result in alterations to wetland resource areas, which include buffer lands and lands subject to flooding. All proposed activities must first obtain a permit from the Conservation Commission, and various Town and water supply entities may provide written recommendations on permit applications. Certain activities in adjacent upland areas, defined as within 200 feet of rivers and streams and 100 feet of other wetland resource areas, are prohibited, including but not limited to disturbance of existing vegetation within 50 feet of freshwater wetlands (except for invasive vegetation control), construction of permanent buildings or parking lots, installation of new sanitary waste disposal systems, and placement of dumpsters or refuse containers.
- **Subdivision Rules and Regulations (Chapter 381, Part 1):** Regulates the subdivision of land, including by establishing design standards and review procedures for subdivision proposals. All subdivision proposals must minimize impacts on the environment, and low-impact development techniques are encouraged as feasible. The Planning Board administers the Subdivision Rules and Regulations, with enforcement by the Building Official.

Suggested improvement: Continue to update with current best practices as needed to incorporate hazard mitigation and climate resilience goals (e.g., codify the use of NOAA Atlas 14+ precipitation data within stormwater management requirements).

²²¹ MA Department of Energy Resources, Green Communities Division, “Massachusetts Building Energy Code Adoption by Municipality,” accessed April 27, 2026, <https://www.mass.gov/info-details/massachusetts-building-energy-code-adoption-by-municipality>.

6. Board of Health Regulations

The Board of Health, Groton's local health agency, adopts its own regulations to protect public health, control disease, promote sanitary living conditions, and protect the environment from damage and pollution. Relevant regulations include the following:

- **Underground Storage of Fuel and Chemicals (Chapter 280):** Controls the storage of fuels and chemicals in underground and aboveground storage tanks and the installation or replacement of underground and aboveground storage tanks to protect public safety and mitigation contamination of water and wetland resources. Applicants seeking to install and use underground storage tanks must receive an installation and storage permit jointly issued by the Fire Department and Board of Health. The regulation also establishes standards for minimum setbacks and separation from sensitive resources (e.g., groundwater table, wetland resource areas, surface water, drinking water wells).
- **Hazardous Materials (Chapter 286):** Establishes requirements for the safe management of hazardous waste, including biosolids, volatile and semi-volatile organic compounds, and PFAS. The regulation prohibits the disposal of hazardous materials within the community, except at hazardous waste disposal facilities. Any proposed deposition of fill that exceeds 500 cubic yards of material is required to provide laboratory results to document that the material is non-hazardous. Further, the regulation establishes storage standards for hazardous materials to minimize the risk of potential hazards and environmental contamination.
- **Outdoor Wood Burning (Chapter 299):** Controls the installation and use of outdoor wood burning facilities for domestic or commercial heating purposes to prevent nuisance issues and minimize fire hazards. All open burning, outdoor burning, and refuse burning are prohibited, unless permitted by the Groton Fire Department, MassDEP, or the Board of Health. Any applicant seeking to install an outdoor wood-fired furnace must obtain a permit from the Board of Health and demonstrate that the facility meets siting and emission requirements.
- **Subsurface Sewage Disposal Regulations (Chapter 315):** Establishes testing, design, and siting requirements and review procedures for subsurface sewage disposal facilities. All lots proposing subsurface sewage disposal facilities must meet all applicable Massachusetts requirements for septic system design at 310 CMR 15.000 ("Title 5"). Engineering plans must be submitted to the Board of Health, and an engineering peer review may be required for subsurface sewage systems proposing to discharge 5,000 gallons or more.
- **Wells (Chapter 330):** Controls the construction, deconstruction, and decommissioning of private wells to protect the quality of groundwater derived from said wells and establishes a well construction/deconstruction permit that must be obtained by the Board of Health prior to any construction or deconstruction activity. Permit applications must include information on potential sources of contamination; the Board of Health may request additional information about potential pollution sources (e.g., subsurface sewage disposal systems, PFAS contamination sites) within 500 to 1,000 feet of the proposed well site. All well permit applications are subject to review by the Groton Water Department and/or the West Groton Water Supply District prior to issuance. All proposed wells must meet minimum lateral/circumferential distance setbacks from potential sources of contamination. Before a well is placed in service following construction, rehabilitation, or well or pump repair, water samples must be collected to ensure water quality

meets state potable water standards; water quality is also tested against additional secondary standards (e.g., manganese, PFAS, turbidity).

Suggested improvement: None. Continue to update with current best practices and/or as state requirements are updated as needed.

7. Conservation Land Management Plans

The Town has developed land management plans for several of its open space and conservation lands, including the Baddacook-Shattuck Forest and Surrenden Farm. Land management plans offer a more site-specific review of resource needs than the townwide Open Space and Recreation Plan. These plans document site conditions and identify management goals and objectives, appropriate uses of the resource, and stewardship activities. The plans are helpful resources for the land managers and often provide detailed information on what types of stewardship activities must occur, as well as how and when (e.g., landscaping guidelines with notes on mowing in habitat areas or plant care within stormwater management features). The Town is working to develop additional land management plans for its properties.

Suggested improvement: Prioritize open space and conservation lands for the development of individual conservation land management plans, especially for resources that are highly utilized, of townwide importance, and/or facing acute or chronic climate and natural hazard stressors.

B. Administrative and Technical Capabilities

Administrative and technical capabilities refer to the staff, skills, and tools used for hazard mitigation planning and implementation of mitigation actions, including the ability to effectively coordinate across organizations. These “people-powered” skills are essential to ensuring that preparedness, response, and recovery are as seamless as possible. These capabilities are not limited to the Town’s resources alone; they also include other public and private sector resources that the Town can access. General examples of administrative and technical capabilities include the following:

- Staff positions for hazard mitigation planning and related supporting positions, such as a community planner, emergency manager, grant writer, and floodplain administrator
- Hazard data and information, including GIS data
- Mutual aid agreements

1. Municipal Website

The Town maintains a municipal website at <https://www.grotonma.gov/>. The Town’s website includes a variety of resources and information for residents, including related to the responsibilities and activities of the municipal departments and boards, committees, and commissions described in the following subsections (2. Municipal Departments and 3. Municipal Boards, Committees, and Commissions).

Suggested improvement: None. Continue to update the municipal website with information related to hazard mitigation and leverage as a tool to promote hazard risk awareness and mitigation actions that residents and businesses can pursue to increase their resilience.

2. Municipal Administration and Staff

The Town's various municipal departments work closely together to set, implement, and enforce policies and regulations that affect hazard mitigation. As it relates to development, many of Groton's municipal departments (and boards, committees, and commissions) are involved in multi-departmental review of development proposals. Depending on the type of development, extent of construction, and location, multiple departments and review entities may review site plans prior to approval, including the Planning Board, Building Department, Board of Health, Department of Public Works, Conservation Commission, Water Department, Select Board, Historical Commission, Earth Removal-Stormwater Advisory Committee, and Zoning Board of Appeals.

Brief descriptions of municipal departments whose role and responsibilities have strong applicability to hazard mitigation are described in this section.

Suggested improvement: Continue to coordinate across departments. As appropriate, continue to review staffing levels and opportunities to fund needed positions. Continue to implement hazard mitigation and resilience activities and programs, including those identified in the Groton Master Plan (2025), and build staff capacity for mitigation activities through training and professional development opportunities.

Board of Health²²²

The Groton Board of Health is responsible for protecting public health, controlling disease, promoting sanitary living conditions, and protecting the environment from damage and pollution. Its duties include monitoring and providing for hazardous waste disposal, monitoring the Town's sanitary landfill, and enforcing state regulations about septic systems (Title 5). The Board of Health provides numerous resources about mosquito- and tick-borne illnesses and water quality sampling data on its website.

The Groton Board of Health works in partnership with the Nashoba Associated Boards of Health (a regional public health department providing environmental and public health services in North Central Massachusetts and the Nashoba Valley), to provide further resources to the community.

The Groton Channel²²³

The Groton Channel is the Town's public and educational access television channel. In addition to helping residents produce programming for air and creating its own programming, the Groton Channel also broadcasts various Town events and meetings, including regularly scheduled board, commission, and committee meetings. In addition to television broadcasts, the Groton Channel also provides online options for live and on demand video streaming.

Department of Public Works²²⁴

Groton DPW manages the Town's roadways and transfer station, maintains buildings and public fields and commons, and provides support to other municipal departments. DPW is responsible for public shade tree management, and the Tree Warden conducts emergency tree pruning and removes public shade trees as needed. DPW is also responsible for managing the Town's stormwater infrastructure and

²²² Town of Groton, "Board of Health, accessed April 29, 2026, <https://www.grotonma.gov/government/boards-and-committees/board-of-health/>.

²²³ The Groton Channel, "Home," accessed March 19, 2026, <https://www.thegrotonchannel.org/>.

²²⁴ Town of Groton, "Department of Public Works," accessed March 19, 2026, <https://www.grotonma.gov/government/departments/departments-of-public-works/>.

upgrades culvert and other drainage infrastructure on an as-needed basis. DPW maintains a surplus of culvert infrastructure to enable quick replacements. The department is also responsible for maintaining WLCDs (water level control devices, also referred as “beaver pipes” or “beaver deceivers”) at sites across the community to mitigate flooding caused by beaver activity.

DPW implements the Town’s MS4 program per the Massachusetts Small MS4 General Permit requirements, which includes a public education and outreach component. DPW regularly distributes educational materials via its Facebook page and Town webpage related to stormwater to encourage the public to take activities to reduce pollutants in stormwater runoff and their impacts to the environment.

DPW is also responsible for oversight of the Town’s two closed landfills. In 2026, the Town completed an assessment of Groton Dump, located on Nod Road, confirming it was adequately capped per state regulations at the time of its closure and identify recommended management actions. Management actions from the assessment have been incorporated into the Town’s list of mitigation actions (Section 6).

DPW maintains a snow and ice procedures policy outlining its deicing and snow removal activities. When a snowstorm begins, DPW responds by treating all roads with deicing chemicals. Plowing operations begin when two or more inches of snow accumulates on road surfaces. Depending on the severity of the storm, DPW is assisted by hired contractors to expedite snow plowing. Following a storm, roads are given a final treatment of deicing chemicals. DPW also maintains the sidewalks in Groton Center and the West Groton area, which are cleared as soon as time permits after roads are plowed. DPW also makes a mixture of sand and salt available to residents to use on driveways and sidewalks.²²⁵ In addition to DPW’s snowplows, the Fire and Police Departments also have backup snowplow trucks that can be deployed.

In coordination with the Massachusetts Division of Ecological Restoration, Groton Conservation Department, and a private co-owner, DPW has advanced a dam removal feasibility study and basis of design study for the Squannacook River Dam. The 2024 feasibility study found that dam removal would reduce the risk of flooding upstream of the dam, eliminate the risk of loss of life and infrastructure damage in the event of a dam failure, and provide ecological benefits. The 2025 basis of design study summarizes pre-permit-level design phase work, which included a due diligence review, sediment sampling, and hydrologic and hydraulic (H&H) modeling. At the 2026 Spring Town Meeting, Town voters declined to authorize Town funds for dam repairs. As such, the Town intends to seek funding for the removal of the Squannacook River Dam.

Fire Department²²⁶

The Fire Department operates and staffs three fire stations in Groton and is responsible for putting out fires and protecting life and property within Town. The Fire Department consists of approximately 40-45 officers and volunteer firefighters. The department maintains two water cisterns in the Lost Lake neighborhood to aid firefighting response where hydrants are unavailable. As part of the Groton Water Department’s water main expansion along Chicopee Row, additional hydrants will be added that will boost firefighting response.

²²⁵ Town of Groton, Department of Public Works, *Snow & Ice Procedures* (2026), 1-2.

²²⁶ Town of Groton, “Fire Department,” accessed April 27, 2026, <https://www.grotonma.gov/government/departments/fire-department/>.

The Fire Department issues burn permits on behalf of the Town in accordance with 310 CMR 7.07, which specifies timing, location, and materials permissible to burn. Open burning is only allowed subject to a burn permit, with burning permissible between January 15 and May 1 in daylight hours and at least 75 feet away from all buildings.

The Fire Department coordinates with the Conservation Commission to assess options for using prescribed fire for invasive species control and grassland restoration. The Fire Department and Conservation Commission conduct an annual controlled burn at Nipmuc Meadows to help with fire prevention and vegetation management.

As resources permit, the Fire Department offers the Student Awareness of Fire Education (SAFE) program, which educates K-12 students on the dangers of fire and appropriate fire safety and response procedures.²²⁷

In response to concerns about emergency service response times and staffing levels, the Fire Department is conducting a six-month firefighter staffing trial as of March 1, 2026 to evaluate how staffing levels affect response times, unit availability during overlapping calls, reliance on mutual aid, and overall cost. This approach allows the Town to address current service demands while gathering information to inform any future conversations about whether long-term staffing changes should be considered and how those positions would be funded.²²⁸

Land Use Department²²⁹

The Land Use Department is an organizational structure consisting of other departments related to land use, including many development review and permitting processes. The Land Use Department is comprised of the Building Department, Conservation Department, Health Department, Planning Department, and Zoning Board of Appeals.

The Building Department is responsible for enforcing the Massachusetts State Building Code as well as the Town's zoning bylaw and subdivision control laws. The Building Department works closely with the Fire Chief and other Town officials to ensure that public safety standards are met in all public and private buildings and development that occurs in Groton, and is also responsible for appointing and supervising plumbing, gas, and wiring inspectors.²³⁰

Police Department²³¹

The Police Department is responsible for law enforcement and various public safety services. The Department employs approximately 25 officers and operates from the Groton Public Safety Building alongside the Town's Emergency Medical Services.

²²⁷ Groton Master Plan (2025), 81.

²²⁸ Town of Groton, "Fire Department Staffing Study," accessed April 27, 2026, <https://www.grotonma.gov/government/departments/town-manager/fire-department-staffing-study/>.

²²⁹ Town of Groton, "Land Use," accessed April 27, 2026, <https://www.grotonma.gov/government/departments/land-use/>.

²³⁰ Town of Groton, "Building Department," accessed March 19, 2026, <https://www.grotonma.gov/government/departments/building-department/>.

²³¹ Groton Police Department, "Home," accessed March 19, 2026, <http://grotonpd.org/>.

The Police Department enforces the Town's winter parking regulations, which prohibit parking on any public way for extended periods of time in early morning hours from mid-November to mid-April. The winter parking regulations are intended to facilitate snow removal by DPW.

The Police Department encourages all residents to participate in Smart911, the Town's emergency mass notification system. The Police Department, in coordination with the Groton Council on Aging, has also developed Project Safe and Sound, which allows residents to register participants with cognitive impairments, such as memory disorders, and provide participant information to Town emergency services that may be helpful during any future interactions or emergency situations.

Groton Water Department²³²

The Groton Water Department provides public water service to areas of Groton, with approximately 1,900 service accounts. The department provides various information on its website, including its annual Consumer Confidence Reports, source water protection, and informational resources related to pollutants of concern.

The Groton Water Department implements an annual mandatory water conservation program between May and October to reduce excess outdoor water usage and provide guidance on water conservation best practices to customers. The department is responsible for maintaining its fire hydrants. During the winter, residents are also asked to help clear any snow away from fire hydrants near their properties to facilitate access in the event of an emergency.

The Groton Water Department is currently working on a water main extension project to the Groton-Dunstable Regional High School along Chicopee Row in response to PFAS contamination in drinking water wells at the school and surrounding area. In 2024, the Groton Water Department brought its Whitney Pond Wells Water Treatment Facility online, which is designed to remove iron and manganese below state maximum contaminant levels for drinking water. The department has also pursued numerous energy grants to help upgrade and reduce electrical demands for its pumps and buildings.

The Groton Water Department participated in a 2023 Massachusetts Water Resources Authority (MWRA) feasibility study evaluating water system expansion to MetroWest communities. The study reviewed potential options for an expansion of MWRA water service and provided planning- and concept-level cost estimates, timelines, and designs for the identified infrastructure options.²³³

Groton Electric Light Department (GELD)^{234 235 236}

GELD is a municipal utility that provides electrical power services to the Town. GELD has over 10 full-time employees to maintain its infrastructure. GELD maintains a diverse power portfolio (wind, solar, and other renewable energy sources) and is more than 68% carbon-free and 24% renewable.²³⁷ GELD's renewable energy sources include a 2.3-megawatt solar farm on the former Groton Landfill at Cow Pond Brook Road, which produces approximately 25% of GELD's power needs in the spring and fall seasons.

²³² Groton Water Department, "Home," accessed March 19, 2026, <https://www.grotonwater.org/>.

²³³ MWRA, "Water and Wastewater System Expansion," accessed April 27, 2026, <https://www.mwra.com/projects-programs/major-programs/water-wastewater-system-expansion>.

²³⁴ GELD, "Home," accessed May 11, 2026, <https://www.grotonelectric.org/>.

²³⁵ GELD, *2024 Annual Report* (2024), 2-4.

²³⁶ GELD, *The Journey into Time-Of-Use Rates by a Small Municipal Light Department in the Northeast* (2024), 1-11.

²³⁷ *Groton Master Plan* (2025), 124.

The utility recently installed two 8.9-megawatt battery energy storage systems in Groton, which are used to store and release electricity, thereby helping stabilize the electrical grid. GELD also has plans to install a third battery energy storage system.

The utility is focused on infrastructure improvements, including replacing and upgrading aging equipment. One recent infrastructure improvement was the replacement of an aging conductor serving West Groton.

Trees and wildlife interactions are GELD's two primary reasons for power outages. To mitigate the potential for power outages, GELD has its own tree trimming crew which allows for a year-round, proactive vegetation management program. The utility also installs protective coverings on its equipment and designs its infrastructure with wildlife in mind to prevent rodents and birds from coming into contact with electrical equipment.

In 2023, GELD transitioned to time-of-use rates for most of its residential rate class. A time-of-use rate varies based on when electricity is used (e.g., by time of day, season, day), with higher rates set during peak usage periods to better reflect the cost of providing utility services and incentivize reductions in energy usage by customers. GELD's time-of-use rates include a peak and off-peak rate for the summer (March 24 to November 24) and winter (November 24 to March 24).

GELD is publicly owned by Town residents, with profits reinvested into system improvements and lower rates. Compared to other municipal electrical utilities in Massachusetts, GELD's rates are lower than about half of other utilities.

3. Municipal Boards, Committees, and Commissions²³⁸

Brief descriptions of municipal boards, committees, and commissions whose role and responsibilities have strong applicability to hazard mitigation are described in this section:

- **Select Board:** Serves as the Chief Executive body of the Town and has general supervision over all matters not specifically delegated by law or by vote of the Town to some other officer or board. The Select Board's responsibilities include overseeing municipal property and risk management for the community, among others.
- **Capital Planning Advisory Committee:** Advises the Town Manager in overseeing the planning and design for construction, reconstruction, major alteration, renovation, enlargement, major maintenance, demolition, and removal of all Town buildings and recreation structures and playing fields and courts, including any significant installation, renovation or upgrade of service equipment and major systems.
- **Conductorlab Oversight Committee:** Represents the Town's interest at the MassDEP level through the 21E (hazardous contamination reporting) process and assists residents living in areas affected by contamination from the former Conductorlab facility.
- **Conservation Commission:** Promotes natural resource protection in Groton and administers state and local wetlands regulations. The Commission also manages over 1,000 acres of Town-owned conservation land, which includes coordinating vegetation management with other Town departments.

²³⁸ Town of Groton, "Boards and Committees," accessed May 11, 2026, <https://www.grotonma.gov/government/boards-and-committees/>.

- **Council on Aging:** Coordinates and carries out programs designed to enrich the lives of Groton's senior residents. The Council on Aging also coordinates with other Town departments on outreach and safety initiatives (e.g., Project Safe and Sound).
- **Earth Removal-Stormwater Advisory Committee:** Reviews all earth removal applications, conducts site visits, and files recommendations for consideration by the Select Board for its deliberations. The Committee is also the review body for stormwater permit applications. The Committee hosts various public education materials about stormwater management and nonpoint pollution control on its webpage.
- **Emergency Management Agency:** Responsible for the Comprehensive Emergency Management Plan, as well as the coordination of local and regional emergency response services in the event of a natural or manmade disaster. The Agency is also responsible for preparing and maintaining the functions of the Emergency Operations Center. Hazard-related information is available on the Agency's website.
- **Invasive Species Committee:** Responsible for addressing invasive species issues in Town, including by documenting the presence of invasive species, coordinating invasive species control activities (including in coordination with private property owners and volunteers), and staying educated on best practices for invasive species control and removal. Two members of the Committee are licensed herbicide applicators.
- **Local Emergency Planning Committee:** Conducts hazardous materials planning for the Town and develops and maintains the Comprehensive Emergency Management Plan, in coordination with the Emergency Management Agency. The Committee is composed of Town officials, including from its public safety departments.
- **Planning Board:** Maintains the Town's Master Plan and reviews and makes recommendations on zoning bylaws, site plans, subdivisions, and other land development matters.
- **Sewer Commission:** Manages the Town's two sewer districts (Groton Center Sewer District and Four Corners Sewer District) and provides oversight for regulations for sewer design, construction, and use and allocation of sewer system capacity. The Sewer Commission recently completed minor upgrades and installation of a pump bypass system at its Nod Road pumping station. The Commission is planning a project inventorying properties with private grinder pumps to allow for rapid notification of loss of function in the event of a power outage.
- **Stewardship Committee:** Under the supervision of the Conservation Commission, performs stewardship and monitoring activities on Town-owned conservation lands and lands with Town-held conservation restrictions.
- **Sustainability Commission:** Coordinates the Town's sustainability efforts and provides guidance on climate resilience activities. The Commission assists with identifying and preparing sustainability related grant applications. The Commission has various resources on its webpage related to climate change, greenhouse gas emissions, and sustainability topics.
- **Town Forest Committee:** Manages the Town's forestlands, including overseeing selective timber harvesting and maintaining trails for the purpose of fire protection.
- **Zoning Board of Appeals:** Issues certain special permit applications, hears petitions for variances from the requirements of the Town's Zoning Bylaws, and hears appeals from acts of the Building Inspector.

Suggested improvement: As noted in the Town’s Master Plan (2025), Groton has over fifty boards, commissions, and committees. While this provides opportunities for civic participation, it can also present challenges. Consider consolidating boards and creating subcommittees to streamline municipal organization, reduce redundancy, and minimize vacancies. Consider creating clear guidelines for membership and responsibilities of different boards and recruit from a diverse pool of volunteers to help expand institutional knowledge and address succession planning.

4. Regional Energy Manager

As of 2025, the Towns of Ayer, Groton, Harvard, and Shirley share a regional energy manager who will work to lead efforts on energy use and carbon emission reductions from municipality facilities in the respective communities. Groton is the host community for the energy manager, whose position is funded in part through the Mass Save® Municipal Energy Manager Grant program. One of Groton’s priorities for the energy manager’s work is supporting the Town’s efforts to participate in Massachusetts’ Climate Leaders program, which provides access to grant funding via the Massachusetts Department of Energy Resources Green Communities Division.²³⁹

5. Comprehensive Emergency Management Plan

The Comprehensive Emergency Management Plan (CEMP) addresses mitigation, preparedness, response, and recovery from a variety of natural and human induced emergencies. The CEMP is intended to document:

- Responsibilities of agencies, organizations, and individuals to carry out specific actions during an emergency or event, as well as their broader responsibilities and areas of expertise.
- Procedures for designated personnel to assess emergencies and take appropriate actions to protect human life, property, and the environment.
- Preparedness, response, and recovery activities for emergency response personnel and municipal staff.
- Lines of authority and coordination for the management of an emergency or event.

Every community in Massachusetts is required to have a CEMP. The Groton Emergency Management Agency is currently updating the Town’s existing CEMP (which was written in 1997), targeting 2027 for completion.

Suggested improvement: Update the CEMP. Integration risk assessment information from this HMP update into the CEMP’s threat, hazard, and vulnerability components.

6. Emergency Operations Center

The Town maintains a primary emergency operations center (EOC) that serves as the center point for coordination of its emergency management and response activities. The EOC is also responsible for maintaining situational awareness about emergency situations and managing requests for the deployment of resources, including coordinating with external entities. If the primary EOC becomes

²³⁹ Groton Herald, “Groton Hires First Energy Manager in Four-Town Climate Partnership,” July 24, 2025, <https://grotonherald.com/2025/07/24/groton-hires-first-energy-manager-in-four-town-climate-partnership/>.

unusable, the Town's emergency operations will relocate to an alternative EOC location. The Town's EOCs are listed below:

- **Primary EOC:** Groton Public Safety Building, 99 Pleasant Street
- **Alternative EOC:** Groton Center Fire Station, 45 Farmers Road

Suggested improvement: Pursue equipment upgrades to maintain and improve functionality and response, including communication equipment and interactive whiteboards.

7. Emergency Notifications

Emergency notification systems help local authorities warn the public of impending or current threats or emergencies affecting their area. Emergency notification systems are essential to communicating critical information at times when other communications systems may not be dependable. The Town utilizes Smart 911 for emergency notifications, which has an "opt-in" design. Residents may sign up for free to receive emergency notifications and alerts and create an optional profile for their household to provide detailed information that may be helpful to first responders.

The Town also uses its municipal website, social media, and the local access television station (Groton Channel) to provide supplementary communications during emergencies.

Suggested improvement: None. Continue to encourage residents to sign-up for Smart911.

8. Emergency Shelters, Emergency Dispensing Sites, and Mass Care Facilities

The Town operates emergency shelters, an emergency dispensing site, and mass care facilities at the direction of the Town Manager or Emergency Management Director during certain hazard events. The Town uses its Smart 911 emergency notification system and supplementary communication methods to alert residents when emergency shelters and mass care facilities are activated, as not all hazard events may necessitate their use. An emergency dispensing site is a planned location where medical countermeasures can be efficiently dispensed to individuals who may have been exposed to a health threat, such as those resulting from disease outbreaks resulting from natural disasters.²⁴⁰ The following sites are designated emergency shelters, emergency dispensing sites, and/or mass care facilities:

- Primary Shelter and Emergency Dispensing Site: Groton-Dunstable Regional Middle School, 344-346 Main Street
- Secondary Shelter: Groton Center, 163 West Main Street
- Mass Care Facility: Groton-Dunstable Regional High School, 703 Chicopee Row
- Mass Care Facility: Stone Athletic Center, 56 Academy Road

The Town has approximately 50 beds available for use in emergency shelters. All emergency shelter sites have backup generators for emergency power. The Town's Emergency Management Agency is small (two staff). The Town anticipates requesting further equipment or staffing assistance from MEMA during emergency events. The Town uses its Smart911 emergency notifications systems and social media to

²⁴⁰ MA Department of Public Health, *Emergency Dispensing Sites (EDS)* (2019), 7.

communicate during hazard events. The Town does not have any identified evacuation assembly points at this time; evacuation routes are considered fluid and would be determined based on the hazard event.

Suggested improvement: Continue to inventory supplies, including beds and pet cages, to create a “needs list” and seek funding to maintain and acquire adequate supplies. Consider options for developing a local Community Emergency Response Team program, which could augment the Town’s emergency management capacity. As part of the Comprehensive Emergency Management Plan update, identify evacuation protocols, including assembly points. Confirm shelter space capacity and identify necessary facility upgrades.

9. Warming and Cooling Stations

The Town operates a warming and cooling station during extreme temperatures. Warming and cooling stations provide safe and heated or air-conditioned environments for community members who may lack access to adequate heating and cooling. Groton activates the Groton Center (163 West Main Street) as its official warming and cooling station. The Town also directs residents to the Groton Public Library (99 Main Street) as a publicly accessible municipal facility, although it is not officially designated as a warming or cooling station due to its lack of an emergency generator.

The Groton Center has kitchen facilities, various seating and group spaces, and restroom facilities. An emergency generator was installed in 2026. Again, while the Groton Public Library is not an official warming or cooling station, it has similar facilities as the Groton Center.

Suggested improvement: Continue to advertise the Town’s warming and cooling stations during extreme temperatures, including via targeted outreach to vulnerable populations. Consider identifying and implementing any potential improvements to the Groton Public Library based on the Massachusetts Department of Public Health’s recommended best practices for the operation of warming and cooling stations and designate it as an official station.

10. The Groton Center

The Groton Center (163 West Main Street) is located in western Groton and is the Town’s senior center. The Groton Center is a central hub in the community for activity, education, wellness, transportation, and social service resources for senior residents. Run by the Council on Aging staff with guidance from its Board of Directors, the Groton Center offers various health and wellness offerings, educational classes, socialization opportunities, and entertainment events. The Groton Center is open on weekdays.

The Groton Center and the Council of Aging provide several services to the community, including a reservation-based van service for seniors and Meals on Wheels program. Additionally, the Groton Center serves as the Town’s secondary emergency shelter and can be activated as a warming or cooling station.

Suggested improvement: See Emergency Shelters, Emergency Dispensing Sites, and Mass Care Facilities and Warming and Cooling Stations.

11. Groton Public Library

The Groton Public Library (99 Main Street) is located in central Groton and has been an important community institution for over 170 years. The Groton Public Library Trustees, a publicly elected governing board of six members, oversees the custody and management of the library. The library is open six days a

week, including in the evenings, and serves all ages and populations, including vulnerable populations. Several members of staff receive regular training on the signs of mental and emotional unwellness, and reference librarians frequently provide technical support to patrons (e.g., filling out government forms, job applications). The library has a mix of meeting spaces, small group and individual areas, and separate children and teenager spaces, and offers a variety of programming and amenities to patrons (e.g., after-school programming, printers, desktop and laptop computers).

As noted previously, at the request of the Groton Emergency Management Agency, the Groton Public Library can be designated as a relief center as needed during emergencies. The building can serve as a warming or cooling center during hours of operation, as well as a designated location with heat and electricity during emergencies such as storms and power outages (as long as the building has power). Should there be a need to extend emergency services past hours of operation, the Library Director will determine the necessary staff to keep the building open and request their assistance.

Suggested improvement: See Warming and Cooling Stations.

12. List of Critical Facilities and Vulnerable Populations.

As part of the 2026 HMP Update, the Town reviewed and updated its list of critical facilities and vulnerable populations. See Tables A-1 and A-2 and Maps 6A and 6b in Appendix D for locations of critical facilities and vulnerable populations. This list will help inform emergency preparedness and response activities.

Suggested improvement: None. Continue to update locations of critical facilities and vulnerable populations as changes occur.

13. Stream Crossing Assessments

The Conservation Commission has been working on completing assessments of stream crossings (e.g., culverts, bridges) across Groton using the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocols, which provide a standardized approach for rating aquatic connectivity, as well as structural vulnerabilities and risk of failure. To date, Groton has assessed over 40 stream crossings and is working to assess the few crossings remaining. The stream crossing data is available through NAACC's online web portal, which also includes photos and the assessor's field notes, as available. This data can be used to help prioritize crossings for repair or replacement to enhance aquatic connectivity and mitigate risk of failure and flooding and provides a useful log of photos and observations.

Suggested improvement: None. Complete remaining stream crossing assessments and use as a tool for DPW, the Conservation Commission, and other entities to help prioritize investments when considering broader roadway and culvert improvements.

14. National Flood Insurance Program (NFIP) Participation

Groton participates in the NFIP, a federal program administered by FEMA that enables property owners in participating communities to purchase flood insurance as a protection against flood losses. To participate in the NFIP, communities must adopt and enforce floodplain management regulations that meet or exceed the program's minimum requirements. Updated FEMA Flood Insurance Rate Maps (FIRMs) for the Groton area became effective in July 2025. The community subsequently completed an update of its

zoning bylaws to reference the new FIRMs and incorporate new model floodplain regulatory language developed by MA DCR. The Town's Building Commissioner is the official floodplain administrator.

The Town implements the substantial improvement and substantial damage provisions of its floodplain management regulations as required per the NFIP (44 CFR Parts 59 to 65) and the Massachusetts State Building Code (780 CMR). The Town coordinates with Massachusetts Flood Hazard Management Program personnel to ensure that proper practices are followed and a post-disaster plan will be in place to implement all substantial improvement and substantial damage provisions.

The NFIP's Community Rating System (CRS) program incentivizes communities to voluntarily exceed minimum required regulatory standards and floodplain management activities by offering tiered discounts on flood insurance premiums for property owners within CRS communities. As of May 2026, Groton does not participate in the CRS program.

Table 5-1 identifies actions that the Town has already completed for compliance with NFIP, and those actions that will be completed within the next five years for continued compliance.

Table 5-1. Actions for Continued Compliance with the NFIP

Actions	Complete or Ongoing	To be Completed
Join the NFIP.	✓	
Participate in NFIP training offered by the Commonwealth and/or FEMA.	✓	
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event.	✓	
Revise or adopt subdivision regulations and erosion control regulations to improve floodplain management in the community.	✓	
Participate in the CRS.		✓
Prepare, distribute, or make available NFIP, insurance, and building code explanatory pamphlets or booklets.		✓
Identify and become knowledgeable on non-compliant structures in the community.	✓	
Identify cause of submit to rate structure and analyze how to prevent non-compliant structures in the future.		✓
Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE).	✓	
Require use of elevation certificates.	✓	
Report any changes in the Special Flood Hazard Area (SFHA) to FEMA within 180 days of the change.	✓	
Identify and keep track of Letters of Map Amendment and Letters of Map Revision in the community.	✓	
Gain familiarity with the community's FIRMs.	✓	
Address repetitive loss structures.	N/A (no repetitive or severe repetitive loss structures)	

Source: Town of Groton

Suggested improvement: Complete outstanding activities as described in Table 5-1.

15. Northern Middlesex Regional Emergency Planning Committee

Under the federal Emergency Planning and Community Right-to-Know Act of 1986, communities are required to establish Emergency Planning Committees to develop a response plan for chemical emergencies. Groton is part of Northern Middlesex Regional Emergency Planning Committee, which includes Ashby, Ayer, Dunstable, Harvard, Littleton, Pepperell, Shirley, Townsend, and Westford. In accordance with this legislation, the Town of Groton has identified locations where hazardous materials are stored, used, and transported. This work is led by Groton's Local Emergency Planning Committee.

Suggested improvement: None. Continue to update locations of hazardous materials as necessary

16. Worcester Regional Medical Reserve Corps

One of 38 MRC units in Massachusetts, the Worcester Regional Medical Reserve Corps is a non-profit volunteer-run organization that provides medical care, counseling, and other community services within its region. It volunteers supplement communities' emergency response and public health services and can provide year-round education, outreach, and public health services.²⁴¹

Suggested improvement: None.

17. Coordination with Neighboring Municipalities

The Town of Groton participates in regional planning efforts, including through the Montachusett Regional Planning Commission (MRPC). The Town coordinates with the adjacent communities of Pepperell, Dunstable, Tyngsborough, Westford, Littleton, Ayer, Shirley, and Townsend periodically across municipal issues. The Town will continue coordinating with these communities and across the region, as applicable, on natural hazard mitigation planning. Coordination may include resource sharing and regional planning, especially related to emergency evacuation.

Suggested improvement: None. Continue to coordinate with adjacent communities and across the region on hazard mitigation topics and regional hazard mitigation projects, as appropriate.

18. Mutual Aid Systems

Mutual aid systems provide critical access to additional emergency response capabilities via pre-established agreements that facilitate rapid and seamless resource-sharing across various jurisdictions.

Suggested improvement: None. Continue to participate in mutual aid agreements.

Community-To-Community Mutual Aid

Groton has opted into statewide mutual aid agreements, which allow the Town to request or provide support from and to other Massachusetts communities for response activities. Established agreements and plans document the intrastate mutual aid procedures.

²⁴¹ Health & Medical Coordinating Coalition Massachusetts Region 2, "What is the Medical Reserve Corps (MRC)?" accessed May 1, 2026, <https://maregion2hmcc.org/medical-reserve-corps/>.

- **Massachusetts Fire Service and EMS Mobilization Plan:** Coordinates resource sharing for communities to draw upon in the event of structure fires or wildfires that exhaust local resources. The plan also includes details on arranging ambulances and alarm run cards. Groton is within Northeast Region 1, District 6 (Northern Middlesex).²⁴²
- **Massachusetts Public Safety Mutual Aid Agreement:** Allows communities to request emergency response assistance during any public safety event or incident from other participating communities.²⁴³

State-To-Community Mutual Aid

MEMA is authorized to direct the Commonwealth’s emergency response resources to individual municipalities upon request by their respective municipal administrator and/or appointed agents (e.g., emergency management directors and fire or police chiefs). Resources may include equipment, services, or facilities owned or organized by the Commonwealth. Requests may be made after the Governor of Massachusetts declares a state of emergency for the area including the requestee. Additionally, MEMA is authorized to reinforce emergency management agencies in areas affected by emergencies or disasters. Groton may request assistance even if a declaration or state of emergency has not yet been issued.

Other Mutual Aid Agreements

Groton may also receive assistance through the Commonwealth’s participation in broader interstate and international mutual aid compacts, described below:

- **New England State Police Compact:** An interstate mutual aid agreement that member states may activate in the event of a police emergency, during which state and local police forces may be insufficient to respond to substantial and imminent dangers to public safety. The compact also establishes the legal powers, duties, rights, privileges, and immunities of police personnel when rendering mutual aid.
- **Northeastern Forest Fire Protection Compact:** An international mutual aid agreement with the New England states, New York, and five Canadian provinces. Member states may activate the compact in response to fires that may be beyond their individual capabilities to access information, technology, and resource sharing assistance.²⁴⁴
- **Emergency Management Assistance Compact (EMAC):** An interstate mutual aid agreement with participation from all U.S. states and D.C., as well as four U.S. territories. EMAC assistance can be activated following a governor-declared state of emergency or disaster and may encompass personnel, equipment, and commodities to help with response and recovery. EMAC complements the federal disaster response system and can also be used in lieu of federal assistance.²⁴⁵
- **International Emergency Management Assistance Compact (IEMAC):** An international mutual agreement with the New England states and five Canadian provinces. Member states may access mutual assistance for managing any emergency or disasters (not limited to just natural disasters);

²⁴² MEMA, “Fire Mobilization,” accessed May 1, 2026, <https://www.mass.gov/info-details/fire-mobilization>.

²⁴³ MEMA, “Intrastate Mutual Aid,” accessed May 1, 2026, <https://www.mass.gov/info-details/intrastate-mutual-aid>

²⁴⁴ Northeastern Forest Fire Protection Commission, “Overview of the Compact,” accessed February 10, 2026, <https://www.nffpc.org/en/about/overview>.

²⁴⁵ Emergency Management Assistance Compact, “What is EMAC?” accessed February 10, 2026, <https://www.emacweb.org/index.php/learn-about-emac/what-is-emac>.

the agreement also establishes a framework for mutual cooperation on emergency related exercises, testing, and training activities. A governor-declared state of emergency is not necessary for a member state to request resources through IEMAC.²⁴⁶

C. Education and Outreach Capabilities

Education and outreach capabilities refer to the various programs and methods that communities utilize to educate their residents, businesses, and visitors about hazards and risk reduction options. General examples of education and outreach capabilities include the following:

- Media campaigns, including social media
- Websites with maps and information
- Presentations to school groups or neighborhood organizations
- Mailings to residents in hazard-prone areas

The Town communicates with residents, businesses, and visitors through its municipal website, email blasts, and social media (including Facebook pages for the Town, Library, Police Department, and Fire Department). The Town also regularly posts announcements via *The Groton Herald* newspaper and through the distribution channels of various community groups and facilities, including the Groton Center.

Suggested improvement: Continue to explore communication strategies to reach vulnerable and underrepresented populations.

D. Financial Capabilities

Financial capabilities refer to the resources that can fund mitigation actions. These resources may include staff time and existing budgets as well as external hazard mitigation funding sources, such as state and federal grants. The Town considers and pursues all applicable federal, state, and local funding program opportunities to assist in implementing hazard mitigation activities. Hazard mitigation funding received since 2019 is described in Table 5-2.

In 2020, Town voters approved the creation of a Stormwater Utility Enterprise Fund, which is funded through an annual fee charged to developed public and privately owned properties. The Stormwater Utility Enterprise Fund provides a dedicated and predictable source of funding for the Town's stormwater program (managed by DPW). Revenue from the Stormwater Utility Enterprise Fund is used to fund capital projects and may also be used for increased street sweeping and catch basin cleaning, stormwater sampling and testing, purchase of specialty equipment, and reporting activities, among others.

Suggested improvement: Consider integrating long-term risk reduction and resilience as a key principle, screening, and/or prioritization criterion within the Town's annual budgeting and capital improvements program planning.

²⁴⁶ International Emergency Management Group, "Home," accessed February 10, 2026, <https://www.iemg-gigu-web.org/content/iemg-gigu/en.html>.

Table 5-2. Hazard Mitigation Funds Received Since 2019

Source Date Amount	Primary Purpose
CARES Act June 2020 – August 2021 \$890,886.72	• Building modifications • Disinfection protocols • “Work from home” IT equipment • Personal protective equipment (e.g., masks, gloves, face shields, thermometers) • Social distancing materials and outdoor Town Meeting materials • Library patron delivery service and materials • COVID-19 testing kits/services • Virtual meeting services, hardware, and materials • Professional services, including consultants and auditors • COVID-19 mitigation at regional schools
CARES Act HHS Stimulus May 2020 \$6,900.50	• Fire Department medical supplies, physicals, and cleaning supplies
FEMA COVID-19 Reimbursement March 2021 – February 2022 \$214,542.57	• Personal protective equipment (e.g., masks, gloves, thermometers) • Medical supplies • Public Safety COVID-19 wages • Cleaning/disinfecting supplies and services • Air purifying equipment • Social distancing supplies
Fire Safer Grant June 2021 – February 2022 \$48,580.35	• Fire Department wages and gear
ARPA Funding June 2021 – September 2022 \$3,385,119.87	• Subaward to Groton-Dunstable Regional School District • Employee retention • Public Safety operations and dispatch center upgrades • DPW full-time employee replacement and COVID-19 overtime • Infrastructure projects: construction of communication towers, Taylor Street water main, Nod Road sewer pump station, Broadmeadow Road engineering, PFAS engineering, chlorine booster pump water infrastructure • Mental health services • Audits and administration • Snow and ice deficit • Employee health insurance • Land survey for Town field
Fire Fighter Equipment Grant August 2021 – August 2025 \$71,279.76	• Fire equipment, gear, hose, pagers, nozzles, etc.
ARPA Earmarks August 2022 – November 2024 \$175,000	• Paving Main Street and sidewalks on Old Ayer Road
CARES Act Election Postage Grant December 2023 \$1,859.36	• Postage for outdoor Town Meeting warrant

Source Date Amount	Primary Purpose
Department of Public Health EMS Grant February 2025 \$250,000	Purchase of medical equipment (to reduce impact of Nashoba Valley Medical Center (NVMC) closure)
Emergency Management Agency EMPG Grant June 2025 \$3,500	Purchase of fire safety equipment trailer
Department of Public Health NVMC EMS Funding Anticipated by June 2027 \$999,051.78	Mitigating extraordinary costs due to closure of NVMC

Source: Town of Groton, Accounting Department (2026).

SECTION 6. MITIGATION STRATEGIES

The Town developed a list of priority hazard mitigation strategies through a multi-faceted approach. Strategies were discussed and developed with the LHMC in response to the hazard risk assessment, a review of existing capabilities to mitigate and respond to natural hazards, implementation progress on the 2020 HMP, and feedback from Town staff and the public. Actions from the 2020 HMP that were not completed or were partially completed and still have relevance to hazard mitigation in Groton are incorporated into this 2026 HMP update.

Implementing these hazard mitigation strategies requires the support of numerous town departments, boards, and committees. The Town Emergency Management Director will be responsible for overseeing the management and implementation of the mitigation strategies, in coordination with the LHMC.

The hazard mitigation strategies are organized by their general focus areas (e.g., dam or drinking water related projects). Each hazard mitigation strategy includes a brief description of the scope of the action. The LHMC identified the action type, implementation entity (leads and supports), timeframe, planning-level cost estimate, and potential funding sources for each strategy. Further, the original source for the mitigation strategy has been provided.

Table 6-1 summarizes the mitigation strategies identified for Groton's 2026 HMP update.

The action type is categorized and abbreviated as follows:

- **Emergency Services (ES):** The action is primarily related to the Town's provision of emergency services, including before, during, and after a natural hazard.
- **Natural Resource Protection (NRP):** The action is primarily related to stewarding natural resources to better preserve beneficial ecosystem services.
- **Planning and Prevention (PP):** The action is primarily related to policies, codes, and regulations that influence the way in which development and construction occur.
- **Property Protection (Prop):** The action is primarily related to activities that mitigate hazards at public or private structures and critical facilities and infrastructure.
- **Public Education and Awareness (PEA):** The action is primarily related to increasing awareness about potential natural disasters and appropriate response and mitigation measures.
- **Structural Projects (SP):** The action involves modifying existing structures and infrastructure, often representing capital improvements.

The implementation timeframe is categorized and abbreviated as follows:

- **Immediate (Immed):** 0-1 years
- **Short Term (Short):** 1-3 years
- **Medium Term (Med):** 3-5 years
- **Long Term (Long):** >5 years

The planning-level cost estimate is categorized and abbreviated as follows:

- **Staff Time (Staff):** Integrated with normal staff responsibilities
- **Low (\$):** ≤50k
- **Moderate (\$\$):** >50k and ≤100k

- **High (\$\$\$):** >100k

A key for the implementation entities is provided below:

- | | |
|---|--|
| • Ag – Agricultural Commission | • HDC – Historic Districts Commission |
| • AHT – Affordable Housing Trust | • Health – Health Department |
| • CC – Conservation Commission | • HP – Housing Partnership |
| • COA – Council on Aging | • Inter - Interdepartmental |
| • COAcc – Commission on Accessibility | • ISC – Invasive Species Committee |
| • DPW – Department of Public Works | • LA – Lawrence Academy |
| • EMD – Emergency Management Director | • LUD – Land Use Department |
| • ERSAC – Earth Removal Stormwater Advisory Committee | • MRPC – Montachusett Regional Planning Commission |
| • Fire – Fire Department | • Park – Park Commission |
| • FOTW – Friends of the Tree Warden | • PB – Planning Board |
| • GELD – Groton Electric Light Department | • Police – Police Department |
| • GDRSD – Groton-Dunstable Regional School District | • SB – Select Board |
| • GS – Groton School | • SC – Sustainability Commission |
| • GWD – Groton Water Department | • Sewer – Sewer Commission |
| • HC – Housing Coordinator | • WGWSD – West Groton Water Supply District |
| | • TFC – Town Forest Committee |
| | • TM – Town Manager |

For the 2026 HMP update, the LHMC used FEMA’s STAPLEE method to evaluate and prioritize proposed mitigation strategies. Due to budgetary constraints and other limitations, it is often impossible to implement all mitigation strategies. The STAPLEE method is a helpful tool to evaluate potential challenges and opportunities for implementation, which can then inform when and how the Town begins to implement the identified mitigation strategies. The STAPLEE method considers the following planning-level questions to understand the viability of different mitigation strategies:

- **Social:** Is the action socially acceptable within Groton?
- **Technical:** Will the action help reduce losses in the long term?
- **Administrative:** Does Groton have the administrative capacity and capability (e.g., staffing, funding, and maintenance) to implement the action?
- **Political:** Is there political support for the action, including at the local and state level?
- **Legal:** Does the entity responsible for implementation have legal authority to implement the action?
- **Economic:** Is the action cost-effective, and what level of funding is needed?
- **Environmental:** How will the action affect the environment, and to what cost or what benefit?

Guiding questions were used to evaluate the above seven STAPLEE criteria, with the LHMC’s response to each question determined as either positive, neutral, or negative. These were translated into numeric scores (total number of positive responses minus total number of negative responses). High-priority mitigation strategies received scores of 16 or above, indicating a high number of positive responses to the

guiding questions. Medium-priority mitigation strategies received scores of 10 to 15, while lower-priority mitigation strategies received scores of 9 or below. Mitigation actions related to high hazard potential dams (Actions 6 and 7) were prioritized using the same method. Both actions are intended to reduce long-term vulnerabilities consistent with the goals identified in Section 2.B of this 2026 HMP, including:

- Infrastructure: Protect public infrastructure, buildings, and essential services such as electric power, drinking water, and the sewer system from climate change and hazard mitigation impacts.
- Vulnerable Populations: Build community and individual resilience, with a special focus on vulnerable populations.

The detailed results of the prioritization of mitigation strategies using the STAPLEE method are included in Appendix F.

Table 6-1. 2026 Hazard Mitigation Strategies

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
<i>Roadways, Bridges, Culverts, and Stormwater Drainage Related Actions</i>								
1	Advocate for and coordinate/collaborate with MassDOT on resilience improvements on state roads (e.g., bridge design), particularly to mitigate impacts from riverine and stormwater flooding. This includes: Route 225 (West Main Street) at Nashua River <i>Hazards Addressed: Flood-Related Hazards</i>	2020 HMP-MVP Action 5; Groton LHMC	DPW	SP	Long	High	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant
2	Improve drainage and address flooding at roads and culverts that are frequently flooded. Specific activities should include: - Regular maintenance, including catch basin and drainage ditch cleaning - Replace undersized drainage pipes and culverts, incorporating data collected using the North Atlantic Aquatic Connectivity Collaborative (NAAC) culvert assessment protocols to evaluate aquatic connectivity and structural vulnerability. - Use pavement management plan to guide road repairs - Coordinate with MassDOT on maintenance needs at state roads. Roadways and culverts of concern due to vegetation overgrowth and undersized drainage pipes/culverts include: - Route 40 (Lowell Road) crossing at Whitney (Cow) Pond, Broadmeadow Road - Station Avenue - Route 119 (Boston Road)/Main Street - Route 225 (West Main Street) at Hill Road - Townsend Road at Cherry Tree Landing <i>Hazards Addressed: Flood-Related Hazards</i>	2020 HMP-MVP Actions 1, 3, and 4; 2025 Master Plan SR2.3; Groton LHMC; 2026 HMP Risk Assessment	DPW	SP	Immed (1, 4) Med (2, 3)	Staff (1, 4) High (2, 3)	Medium	- MA DER Culvert Replacement Municipal Assistance Grant Program - MassDOT Community Culvert Program - MassDOT Municipal Small Bridge Program - MA MVP Action Grant - MA Chapter 90 Program - FEMA Hazard Mitigation Assistance grant programs - MassWorks Infrastructure Program - Municipal operating budget (DPW)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
3	Mitigate the risk of flooding at roads and culverts due to beaver related activity in adjacent waterbodies. Specific activities should include: 1. Regular cleaning of water level control devices ("beaver deceivers") 2. Evaluation of water level control/flow device technologies for use in areas with known beaver activity 3. Monitoring of locations with known beaver activity for potential threats to people and property. 4. Coordination with private property owners to mitigate the risk of flooding using methods authorized under MA G. L. c. 131 §80A. Roadways and culverts of concern due to beaver activity include ("*" indicates a water level control device is present at the time of this plan's writing): • Townsend Road at Nutting Stream crossing (outlet from Flat Pond)* • Route 225 (West Main Street) at Wrangling Brook crossing* • Hill Road at Wrangling Brook crossing* • Broadmeadow Road at James Brook crossing* • Old Ayer Road at James Brook crossing* • Old Ayer Road/Worthen Drive at James Brook crossing* • Nashua Road at Reedy Meadow Brook* • Raddin Road at Unkety Brook* • Radding Road at wetlands west of Dan Parker Road* • Hemlock Park Drive at wetlands west of Baddacook Pond* • Old Dunstable Road at Baddacook Brook crossing* • Hoyts Wharf Road at Cow Pond Brook crossing* • Cow Pond Brook Road at wetlands north of Cow Pond Brook Park* • Lost Lake Drive at Cow Pond Brook crossing* • Hayden Road at eastern edge of Carmichael Swamp Conservation Area* • Route 119 (Boston Road) at wetlands around Cady Pond* • Indian Hill Road/Old Ayer Road at James Brook <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	LHMC; 2026 HMP Risk Assessment	DPW, Private Property Owner CC	SP	Immed (1, 3, 4) Med (2)	Staff (1, 3, 4) Low (2)	Medium	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (DPW) • MA MVP Action Grant • Private property owner funds

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
Critical Facilities and Vulnerable Populations Related Actions								
4	Ensure that critical facilities are adequately protected against flood hazards. Facilities at risk: • Hollingsworth & Vose Company • Hollingsworth & Vose Company Dam • Hollingsworth & Vose Tower • Lost Lake Dam • Nashua River Bridge (at Route 225) • Nod Road Sewer Pump Station • Squannacook River Dam • Townsend Road Wellfields #1-4 • West Groton Pumping Station • Woods Mill Pond Dam <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	DPW, LUD	PP	Long	High	Medium	• FEMA Hazard Mitigation Assistance grant programs • MA EEA Dam and Seawall Repair or Removal Program • Private property owner funds
5	Ensure that vulnerable populations are adequately protected against flood hazards. Populations at risk: • Hollingsworth & Vose Company • RiverCourt Residences <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	DPW, LUD	PP	Med	High	Medium	• FEMA Hazard Mitigation Assistance grant programs • Private property owner funds
Dam Related Actions								
6	Pursue removal of the Squannacook River Dam (high hazard), inclusive of pursuing funding and coordinating with the private property co-owner and the Town of Shirley. Until the dam is removed: • Update the Emergency Action Plan on an annual basis • Implement applicable recommended improvements identified in the Phase I Inspection Evaluation Report: ○ Monitor the condition of the spillway and dam several times per year. ○ Exercise the low level outlet gate several times per year. ○ Remove debris on the spillway. <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2020 HMP-MVP Action 49; Groton LHMC; 2026 HMP Risk Assessment	DPW, Private Property Owner <i>Town of Shirley</i>	SP	Short	High	Medium	• FEMA Hazard Mitigation Assistance grant programs • FEMA Rehabilitation of High Hazard Potential Dams program • MA EEA Dam and Seawall Repair or Removal Program • MA DER Priority Projects Program • MA MVP Action Grant • Private property owner funds

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
7	Coordinate with the private property owner of the Hollingsworth & Vose Company Dam (low hazard) to ensure the completion of recommended improvements identified in the 2024 Phase I Inspection Report: • Complete an underwater inspection of the dam system to evaluate the condition of the steel sheet piles, the outlet intakes, and other underwater areas of the dam. • Complete a pipe inspection of the mill intake overflow pipe and low-level outlet conduit. • Develop a monitoring program to continue to assess deterioration of the structure. • Undertake repair activities including: ○ Clearing the embankment right of the spillway of trees, brush, and other vegetation. ○ Clearing the downstream channel walls of trees, brush, and other vegetation. ○ Fill in depressions. ○ Regrade the embankment to the right of the spillway. ○ Loam and seed exposed portions of the embankment. ○ Complete concrete repairs (seal cracks, remove loose/deteriorated concrete, overlay/fill areas of scour and spalls) throughout the dam system. ○ Replace missing stones within the downstream right channel wall. <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	Private Property Owner DPW	SP	Short	Staff	Medium	• FEMA Hazard Mitigation Assistance grant programs • Private property owner funds
8	Coordinate with the private property owner of the Woods Mill Pond Dam to ensure a Phase I Inspection is completed. Once a new Phase I Inspection is completed, ensure completion of recommended improvements. <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	Private Property Owner DPW	SP	Immed	Staff	Medium	• Private property owner funds
9	Coordinate with the private property owner of the Townsend Harbor Dam (significant hazard) to ensure the completion of an updated EAP, as well as the completion of any recommended improvements identified in its Phase I Inspection Report. <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	DPW, Private Property Owner Town of Townsend	SP	Short	Staff	Medium	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (DPW)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
10	Ensure completion of an updated Phase I Inspection Evaluation Report for the Town-owned Lost Lake Dam (high hazard) and implement recommended actions for improvement. Update the Emergency Action Plan on an annual basis. In addition to implementing the recommended actions from an updated Phase I Inspection Evaluation Report, the Town will also evaluate opportunities to: • Rehabilitate/remove the dam. • Adopt and enforce land use ordinances in the inundation zone. • Elevate structures in the inundation zone. • Add flood protection, such as berms, floodwalls, or floodproofing, in the inundation zone. <i>Hazards Addressed: Flood-Related Hazards (including Dam Failure)</i>	2026 HMP Risk Assessment	DPW, LUD	SP	Med	High	Low	• FEMA Hazard Mitigation Assistance grant programs • FEMA Rehabilitation of High Hazard Potential Dams program • MA EEA Dam and Seawall Repair or Removal Program
Water Supply and Distribution Related Actions								
11	Implement and regularly update the Groton Water Department Drought Management Plan (2025) and related supply strategies. Recommendations for improvements/actions include: 1. Continue system-wide leak detection and repair efforts, building on recent work that has already saved approximately 15.7 million gallons annually. 2. Evaluate and pursue updates to the Water Use Restrictions bylaw. 3. Pursue development of additional water sources (e.g., alternative well sites) to address projected future supply shortfalls. 4. Update drought status based on the state's Drought Management Task Force determination. 5. Enhance public outreach and information campaigns during declared drought stages to improve customer compliance and conservation. <i>Hazards Addressed: Drought, Changes in Groundwater</i>	2020 HMP-MVP Action 4, 2025 Master Plan CFS1.1	GWD	PP	Immed (1, 4, 5) Short (2) Med (3)	Staff (2, 4, 5) High (1, 3)	High	• MassDEP Statewide Water Management Act Grant • MA Drinking Water State Revolving Fund Program • MA MVP Action Grant • Groton Water Department Enterprise Fund • FEMA Hazard Mitigation Assistance grant programs
12	Monitor groundwater quality for PFAS and other contaminants and coordinate with MassDEP to ensure standards are met. <i>Hazards Addressed: Changes in Groundwater</i>	2020 HMP-MVP Action 5, 2025 Master Plan CFS1.2, Groton LHMC	GWD	NRP	Immed	Low	High	• Groton Water Department Enterprise Fund • MA MVP Action Grant • FEMA Hazard Mitigation Assistance grant programs

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
13	Support upgrades to the West Groton Water Supply District's drinking water distribution system, including: - Replacement of emergency power generator - Replacement of the Kemp Street Tank <i>Hazards Addressed: Drought, Changes in Groundwater</i>	2026 HMP Risk Assessment	WGWSDTM	SP	Short	High	Medium	- West Groton Water Supply District operating budget - MA Drinking Water State Revolving Fund Program - FEMA Hazard Mitigation Assistance grant programs
14	Assess the impacts of inter-basin transfers of sewer effluent on groundwater levels and the need for any mitigation actions during future updates to the Town's water withdrawal permit for drinking water supply. <i>Hazards Addressed: Drought, Changes in Groundwater</i>	2020 HMP-MVP Action 16	SB Sewer, GWD	NRP	Med	Mod	Medium	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - MassDEP Statewide Water Management Act Grant - MA Drinking Water State Revolving Fund Program - Groton Water Department Enterprise Fund - Groton Sewer Commission Enterprise Fund
15	Extend water mains and evaluate need for additional water cisterns in the Lost Lake neighborhood, which currently relies on private drinking water wells, for water supply, fire response, public safety, and property protection. <i>Hazards Addressed: Brush Fire & Wildfire, Drought, Changes in Groundwater</i>	2020 HMP-MVP Action 11	GWD Fire	SP	Med	High	Low	- FEMA Hazard Mitigation Assistance grant programs - MA Drinking Water State Revolving Fund Program - MassWorks Infrastructure Program - MA MVP Action Grant - Groton Water Department Enterprise Fund

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
Wastewater Related Actions								
16	Conduct an inventory of properties with private grinder pumps and develop a standard operating protocol (SOP) to support proactive notifications to property owners of non-function during power outages and mitigate risks of raw sewage backups. <i>Hazards Addressed: Changes in Groundwater</i>	2026 HMP Risk Assessment	Sewer	PP	Immed	Staff	High	- Groton Sewer Commission Enterprise Fund - FEMA Hazard Mitigation Assistance grant programs
17	Conduct an Infiltration and Inflow (I/I) Analysis to identify I/I points to Groton's sewer system and implement remedial actions to reduce flows into the sanitary sewer system and mitigate risks of raw sewer overflows, including at: - Conductorlab site - Route 119 <i>Hazards Addressed: Flood-Related Hazards, Changes in Groundwater</i>	2026 HMP Risk Assessment	Sewer	SP	Long	High	High	- MA Clean Water State Revolving Fund Program - Groton Sewer Commission Enterprise Fund - FEMA Hazard Mitigation Assistance grant programs
18	Consider intermunicipal purchase of additional capacity for future wastewater flows from the Town of Pepperell to expand sewer service in the Nod Road area and reduce the need for onsite wastewater treatment systems. <i>Hazards Addressed: Drought, Changes in Groundwater</i>	2026 HMP Risk Assessment	Sewer	SP	Long	High	Medium	- MA Clean Water State Revolving Fund Program - MassWorks Infrastructure Program - Groton Sewer Commission Enterprise Fund - FEMA Hazard Mitigation Assistance grant programs
Electric Grid and Energy Related Actions								
19	Collaborate with the Towns of Ayer, Harvard, and Shirley to identify long-term funding options to make the Regional Energy Manager a permanent position and support Groton's energy efficiency and energy security efforts. <i>Hazards Addressed: Wind-Related Hazards, Winter-Related Hazards, Extreme Heat</i>	2025 Master Plan SR4.1	TM SC, GELD, Towns of Ayer, Harvard, and Shirley	PP	Med	Staff	High	- FEMA Hazard Mitigation Assistance grant programs - Municipal operating budget (TM)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
20	Pending completion of the Town's feasibility assessment of a shared heat pump system for Town Hall and the Groton-Dunstable Regional Middle School complex to improve heating and cooling capabilities, support efforts to fund and implement identified improvements. <i>Hazards Addressed: Winter-Related Hazards, Extreme Heat</i>	2020 HMP-MVP Action 39; 2025 Master PlanSR1.7	TM, GDRSD	SP	Med	High	Medium	- FEMA Hazard Mitigation Assistance grant programs - MA Dept of Energy Resources Green Communities Designation & Grant Program - Mass Clean Energy Center Green School Works Grants - Mass School Building Authority Accelerated Repair Program - MA MVP Action Grant - GDRSD Operating Fund
21	Conduct a feasibility study of critical facilities and Town properties for opportunities for battery energy storage to reduce peak demand, increase resilience against power outages during wind- and winter-related hazard events, and reduce strain on power grids as energy demand rises during extreme cold and heat events. <i>Hazards Addressed: Wind-Related Hazards, Winter-Related Hazards, Extreme Heat</i>	2020 HMP-MVP Action 23; 2025 Master Plan SR1.8	GELD SC	PP	Med	Mod	Low	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - MA Dept of Energy Resources Green Communities Designation & Grant Program - GELD Operating Fund
Emergency Response Related Actions								
22	On an annual basis or after a significant hazard event, assess the need and feasibility of upscaling or downscaling relevant municipal services based on changes in population. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Action 67	Police, EMA Fire	ES	Long	Low	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (Police, EMA)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
23	Update the Town's Comprehensive Emergency Management Plan (CEMP). As part of the CEMP update: - Identify evacuation protocols (including assembly points) and verify available transportation resources and capabilities to support evacuation of impacted populations with access and functional needs. - Include an agriculture annex/emergency response plan to evaluate needs of local farms and livestock. - Include emergency response plans for medical and long-term care facilities (e.g., hospitals), schools, and large housing complexes. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Actions 6, 31, 70; Groton LHMC	Police, EMA Ag, DPW	ES	Immed	Low	Medium	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (Police, EMA) - FEMA Emergency Management Performance Grant
24	Improve emergency communications with community members to ensure public safety and efficient dissemination of information before, during, and after hazard events. This should include: - Public outreach to encourage community members to sign up for Smart 911, Groton's emergency notification system. - Facilitating the addition of more cell towers in Groton to improve cell coverage. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Actions 27 and 48; 2025 Master Plan CFS4.5	Police, EMA TM, SB	ES	Short	Low	Medium	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (Police, EMA) - FEMA Emergency Management Performance Grant
25	Ensure emergency shelters meet the needs of Groton's population: - Increase shelter space. - Assess emergency shelters for necessary facility upgrades, including for storage of supplies. - Inventory shelter supplies and compile a needs list. Pursue funding for supplies. - Increase availability of shelter equipment for residents evacuating with pets, including pet cages and carriers. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Actions 33-36	Police, EMA Health, LUD	ES	Short	Mod	Medium	- FEMA Hazard Mitigation Assistance grant programs - FEMA Emergency Management Performance Grant - MA MVP Action Grant - Municipal operating budget (Police, EMA)
26	Enhance volunteer capacity through recruitment and training efforts. This could include specific recruitment and training for: - Fire Department, - Emergency shelter staffing, and/or - A local Community Emergency Response Team program, if established. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Action 32; Groton LHMC	Fire Police, EMA	ES	Short	Low	Medium	- FEMA Hazard Mitigation Assistance grant programs - FEMA Emergency Management Performance Grant - MA MVP Action Grant - Municipal operating budget (Police, EMA)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
<i>Bylaws, Regulations, and Planning Related Actions</i>								
27	Participate in the MA MVP 2.0 Program to expand community involvement and social resilience in climate adaptation and resilience planning and implementation projects. <i>Hazards Addressed: All hazards</i>	2026 HMP Risk Assessment	LUD TM, SB	PP	Short	Staff	High	- FEMA Hazard Mitigation Assistance grant programs - Municipal operating budget (LUD)
28	Pursue grant opportunities to develop a comprehensive Climate Action Plan and establish townwide sustainability goals and metrics, including related to climate resilience. <i>Hazards Addressed: All hazards</i>	2025 Master Plan SR4.2	TM SC, LUD	PP	Short	Staff	High	- FEMA Hazard Mitigation Assistance grant programs - Municipal operating budget (TM, LUD)
29	Strengthen regional connections by collaborating with the Montachusett Regional Planning Commission (MRPC) and other communities in the commission to address cross-town challenges, such as invasive species and water quality. <i>Hazards Addressed: All hazards</i>	2025 Master Plan SR 4.4	LUD SC, MRPC	PP	Short	Staff	High	- FEMA Hazard Mitigation Assistance grant programs - Municipal operating budget (LUD)
30	Revise stormwater management regulations to integrate best practices that consider climate change and natural resource protection, which may include: - Requiring or recommending the use of climate data using a 50-year planning horizon to ensure that infrastructure will operate effectively given potential impacts of climate change. - Requiring drainage analyses and design calculations to use precipitation depths based on 90% of the Atlas 14 upper confidence interval, also known as “NOAA Plus” values, for project locations. <i>Hazards Addressed: Flood-Related Hazards</i>	2020 HMP-MVP Actions 2 and 19; 2025 Master Plan SR3.1; 2019 OSRP 2.1; Groton LHMC	LUD DPW, ERSAC, SC, PB	NRP	Immed	Low	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - MA EEA Planning Assistance Grants - Municipal operating budget (DPW, LUD)
31	Revise wetland regulations to integrate current best practices that consider climate change and strengthen natural resource protection, including for protection of vernal pools and other sensitive water resources. <i>Hazards Addressed: Flood-Related Hazards</i>	2019 OSRP 2.1; Groton LHMC	LUD CC	NRP	Short	Low	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - MA EEA Planning Assistance Grants - Municipal operating budget (LUD)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
32	Update zoning and development regulations to encourage sustainable land use patterns and protect natural resources that promote growth in existing developed areas and away from high hazard areas (e.g., flood hazard areas, steep slopes). This may include: 1. Exploring zoning alternatives, such as form-based codes, to the existing Town Center Overlay District zoning ordinance to preserve physical town characteristics and resources while encouraging growth. 2. Considering amending zoning to increase density bonuses for Flexible Developments. 3. Encouraging and promoting infill housing development in mixed-use districts over expanding and encroaching into natural areas. 4. Reevaluating the existing Water Resource Protection Districts and consider complementing the existing overlay zoning with additional water protections, such as limiting land use where water consumption exceeds natural recharge or requiring water-use minimization measures for new developments. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Action 20; 2025 Master Plan LU1.2, LU1.3, H1.6, and CFS1.3; Groton LHMC	LUD COAcc, Fire, COA, DPW, GELD, HC, AHT, HP	PP	Immed (3) Long (1, 2, 4)	Staff (3) Mod (1, 2, 4)	High	• FEMA Hazard Mitigation Assistance grant programs • MA EOHLC Community Planning Grant Program • MA MVP Action Grant • MA EEA Planning Assistance Grants • Municipal operating budget (LUD)
33	Integrate sustainability and climate resilience considerations into administrative policies and decision-making, including purchasing, procurement, and the Capital Improvement Planning process, i.e., creating a sustainability checklist for all new Town projects. <i>Hazards Addressed: All hazards</i>	2025 Master Plan SR 4.5	LUD, Inter SC	PP	Short	Low	High	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (LUD, DPW, SB)
34	Develop a Forest and Vegetation Management Plan. The plan should guide the management of Town resources, with the goal of protecting forested areas from threats, increasing their resilience to hazard events, and enhancing their beneficial ecosystem services. The plan should include: • Protocols and schedules for controlled burns at Town owned/managed resources. • Protocols and best practices for cleaning debris and creating a wood bank of recently downed trees. • Informational resources for private property owners about fire safety, including strategies to mitigate fire risk. • In alignment with invasive species management strategies, monitoring protocols for surveying for native and non-native invasive species and disease threats. • Protocols for coordination with GELD on its vegetative management and tree trimming program. <i>Hazards Addressed: Wind-Related Hazards, Brush Fires & Wildfires, Extreme Heat, Invasive Species</i>	2020 HMP-MVP Actions 55 and 61	Fire, CC, DPW, TFC GELD	NRP	Short	Low	High	• FEMA Hazard Mitigation Assistance grant programs • MA MVP Action Grant • MA EEA Urban and Community Forestry Challenge Grants • Municipal operating budget (LUD, Park, Fire)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
35	Develop a Fertilizer Management Plan to minimize contaminants that could be spread via runoff, flooding, and/or improper use. Consider use by and at: • Town properties • Agriculture sites • Private property owners • Commercial applicators <i>Hazards Addressed: Flood Related Hazards, Changes in Groundwater</i>	2020 HMP-MVP Action 17	Ag, Park	NRP	Med	Low	High	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (LUD, Park) • MA MVP Action Grant • MA Section 604(b) Water Quality Management Planning Grant Program
36	Create a prioritization plan to bolster multi-hazard resilience and advance adaptation strategies at key municipal facilities. The prioritization plan should incorporate a needs assessment of building retrofits for facilities that predate modern building codes to improve resilience to earthquakes and other hazards. <i>Hazards Addressed: All hazards</i>	2025 Master Plan SR2.1	TM, LUD SC, DPW	PP	Med	Low	Medium	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (LUD, General Government)
37	Address the impact of invasive species in Groton and implement management and eradication strategies. This may include: • Developing and implementing an Invasive Species Inventory and Management Plan. • Developing outreach strategies and materials to private landowners about invasive species management and best practices for management and removal. • Conducting training and organizing volunteer opportunities for invasive species management. • Developing resources on native and/or adapted plant species that are suitable to Groton's climate and support local ecosystem health. • Exploring regional cost-sharing opportunities for invasive species management or eradication efforts. • Integrating invasive species management and removal protocols into land management plans for the Town's open space resources. • Address aquatic invasive plant species at Lost Lake. This could include a treatment with the herbicide Fluridone (sonar). • Conduct a municipal tree inventory and identify resource areas most at risk of impacts from invasive species. <i>Hazards Addressed: Invasive Species</i>	2020 HMP-MVP Action 26; 2025 Master Plan NR1.1; 2019 OSRP 3.1 and 3.5	CC, ISC, LUD	NRP	Immed	Mod	Medium	• FEMA Hazard Mitigation Assistance grant programs • MassWildlife Habitat Management Grant Program • MA MVP Action Grant • EEA Urban and Community Forestry Challenge Grants • Municipal operating budget (LUD, Park)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
38	Incorporate climate considerations into Town design standards. This may include: • Requiring reflective surfaces to mitigate the heat island effect • Limiting lawn sizes • Utilizing dark sky compliant lighting • Updating landscaping and site design regulations with best practices, such as requiring the planting of native or adapted species, and requiring the use of low impact development techniques and stormwater best management practices (BMPs). <i>Hazards Addressed: Flood-Related Hazards, Brush Fires & Wildfires, Extreme Heat, Drought, Changes in Groundwater, Invasive Species</i>	2020 HMP-MVP Action 24; 2025 Master Plan SR3.3	LUD, PB SC	NRP	Med	Low	Medium	• FEMA Hazard Mitigation Assistance grant programs • MA MVP Action Grant • MA EEA Planning Assistance Grants • Municipal operating budget (LUD)
39	Adopt a Tree Preservation Ordinance to encourage the protection of trees during significant construction activity and maintain the Town's canopy, mitigating the impacts of the heat island effect and protecting ecologically valuable trees. <i>Hazards Addressed: Flood-Related Hazards, Extreme Heat</i>	2025 Master Plan SR3.2	DPW, CC SC, TFC, FOTW	NRP	Med	Low	Medium	• FEMA Hazard Mitigation Assistance grant programs • MA EEA Urban and Community Forestry Challenge Grants • MA EEA Planning Assistance Grants • Municipal operating budget (LUD)
40	Consider enrolling in the NFIP Community Rating System (CRS) program and identify necessary changes to Groton's floodplain management program to enable participation. Then, decide whether to pursue participation in the CRS. <i>Hazards Addressed: Flood-Related Hazards</i>	2026 HMP Risk Assessment	LUD TM, SB	PP	Immed	Staff	Low	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (LUD)
Education and Awareness Related Actions								
41	Conduct outreach and provide resources to private property owners in the FEMA Special Flood Hazard Area about flood risk and mitigation. This should include: • Developing and posting online resources about flood mitigation (e.g., floodproofing), flood insurance) and providing hard copy versions at the Building Department. <i>Hazards Addressed: Flood-Related Hazards</i>	2020 HMP-MVP Action 64	LUD Police, EMA	PEA	Immed	Staff	High	• FEMA Hazard Mitigation Assistance grant programs • MA MVP Action Grant
42	Add information on earthquake hazard to Groton's Emergency Management Agency webpage. Include measures that property owners can take to secure moveable items and utilities to prevent injuries and damage. <i>Hazards Addressed: Geological-Related Hazards</i>	2026 HMP Risk Assessment	Police, EMA	PEA	Immed	Staff	High	• FEMA Hazard Mitigation Assistance grant programs • Municipal operating budget (Police, EMA)

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
43	Invest in education and training for municipal staff, boards, and commissions, and committees to communicate the impacts of climate change and Groton's sustainability goals. <i>Hazards Addressed: All hazards</i>	2025 Master Plan SR4.3	TM SC	PEA	Short	Low	Medium	- FEMA Hazard Mitigation Assistance grant programs - Municipal operating budget (LUD, DPW, SB)
44	Assess opportunities for green infrastructure on municipal properties. Consider implementing demonstration projects that can educate private property owners on the multiple benefits of green infrastructure (e.g., water quality, groundwater infiltration, urban heat mitigation, wildlife habitat). <i>Hazards Addressed: Flood-Related Hazards, Extreme Heat, Drought, Changes in Groundwater, Invasive Species</i>	2020 HMP-MVP Action 22; 2025 Master Plan SR2.2; Groton LHMC	TM SC, DPW, CC	PEA	Short	Mod	Medium	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - MA Clean Water State Revolving Fund Program - Groton Stormwater Utility Enterprise Fund
45	Educate Groton residents and private property owners on fire safety. This could include targeted education to K-12 students. <i>Hazards Addressed: Brush Fires & Wildfires</i>	2020 HMP-MVP Action 61	Fire	PEA	Med	Staff	Low	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (Fire)
46	Collaborate with the Groton-Dunstable Regional School District, Groton School, Lawrence Academy, educators, and parents to bring climate and natural hazard related education into Groton's public and private schools and student activities. <i>Hazards Addressed: All hazards</i>	2020 HMP-MVP Action 40; 2025 Master Plan SR4.6	GDRSD, GS, LA SC	PEA	Med	Low	Low	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (Land Use Dept, Police/EMD, Fire, GDRSD) - Groton School operating budget - Lawrence Academy operating budget

#	Mitigation Action <i>Hazards Addressed</i>	Source	Lead Support	Type	Timing	Cost	Priority	Funding
<i>Managed Sites Related Actions</i>								
47	Implement recommendations from the 2026 Report on Third-Party Inspection of Nod Road Landfill to ensure the landfill cap is maintained and potential impacts on human health, safety, and the environment are mitigated: - Mow and remove bushy vegetation from within the limits of the existing soil final cap. Inspect mowed areas to identify if additional corrective actions are required. - Pending submission to and approval by MassDEP of an Initial Site Assessment (ISA)/Comprehensive Site Assessment (CSA) Scope of Work Permit Application to MassDEP, implement further corrective actions. The ISA/CSA Scope of Work is expected to include installation of groundwater monitoring wells, water quality sampling, landfill gas migration sampling, development of a site base plan, test pits to confirm the extent of landfilled waste and the existing final cap, and a qualitative risk assessment. <i>Hazards Addressed: Changes in Groundwater</i>	2020 HMP-MVP Action 71; Groton LHMC	DPW, CC	PP	Med	Mod	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Municipal operating budget (DPW)
48	Reassess need for action to mitigate potential groundwater contamination at the Conductorlab site pending further water quality sampling by the property owner for PFAS as required by MassDEP. As needed, collaborate with and provide support to the private property owner to ensure implementation of necessary remediation actions. <i>Hazards Addressed: Changes in Groundwater</i>	2020 HMP-MVP Action 72	LUD, CC <i>Private Property Owner</i>	NRP	Immed	Staff	High	- FEMA Hazard Mitigation Assistance grant programs - MA MVP Action Grant - Private property owner funds

SECTION 7. PLAN IMPLEMENTATION & MAINTENANCE

A. Implementation

The LHMC will use Table 6-1 indicating the implementation entity, timeframe, and priority for each mitigation action to guide hazard mitigation activities. Table 6-1 also identifies various funding mechanisms. The LHMC will be held accountable through the tracking mechanisms explained in the following sections. The HMP will also inform future planning and budgeting processes.

B. Evaluating Implementation Progress

FEMA's initial approval of this plan is valid for five years. During that time, the Town will need to continue to track implementation progress, document natural hazards, and identify future mitigation efforts. This can be achieved through a combination of methods, led by the Town's Emergency Management Director:

- **Local Emergency Planning Committee meetings:** On an as needed basis, the Town's Emergency Management Director will solicit feedback on the status of mitigation actions during monthly Local Emergency Planning Committee meetings. The Local Emergency Planning Committee includes members of the LHMC.
- **Annual HMP Review Meeting:** The LHMC, as coordinated by the Town's Emergency Management Director, will convene on an annual basis in October to monitor plan implementation. During the annual HMP review meeting, the LHMC will review the status of all mitigation actions, including tracking overall progress, funding sources, and challenges related to the implementation of individual actions. This review will be documented in an annual "report card" of the HMP.
- **Report to Town Manager and Select Board:** Within two months of the annual HMP review meeting, the Emergency Management Director will deliver the annual HMP report card to the Town Manager and Select Board. It is advantageous that the annual HMP review meeting and subsequent preparation of the report card be conducted prior to the Town's annual budget process so any locally funded projects can be considered.

C. Continued Public Involvement

Groton will continue to offer opportunities for public involvement in the plan maintenance process by:

- Posting the approved and adopted plan on the Town's website and designating a Town staff point of contact for any questions or comments from the public.
- Posting and advertising the annual HMP review meeting in accordance with Town and State open meeting laws.
- The LHMT will include the public in the preparation of the next five-year HMP update using the same public participation process as utilized in this plan update cycle.

D. Integrating the HMP

Once the HMP is approved by FEMA and adopted by the Town of Groton, the LHMC will make the plan available to all interested parties and all departments and entities with an implementation responsibility

(noting that the LHMC is made up of individuals from departments and entities that are primarily responsible for implementation of the HMP).

Relevant sections of the HMP will be integrated into other plans, policies, and documents as those are updated and renewed, including the *Open Space and Recreation Plan* and *Comprehensive Emergency Management Plan*. Coordination with the Montachusett Regional Planning Commission, local organizations, businesses, watershed groups, and state agencies will be required for successful implementation and continued updating. Additional opportunities to integrate the goals and actions of this HMP into other plans, studies, reports, and processes will continue to be identified through the annual review process described in this section.

E. Updating the HMP

In accordance with 44 CFR 201.6(d)(3), this plan will be revised and updated to “reflect changes in development, progress in local mitigation efforts, and changes in priorities” and resubmitted for approval to FEMA (following review by MEMA) within five years in order to maintain eligibility for mitigation project grant funding.²⁴⁷ The Town’s Emergency Management Director will reconvene the LHC and initiate the update process no later than one year prior to plan expiration (i.e., end of Year 4 of compliance).

The update process will utilize FEMA’s Local Mitigation Planning Handbook to guide plan development, as well as the annual HMP status reports prepared as part of the periodic evaluation of implementation progress during the LHMC’s annual HMP review meeting. The 2026 HMP update will also be evaluated and updated after a natural disaster, or as funding opportunities arise for the actions and projects identified in the plan.

²⁴⁷ Mitigation Planning, Local Mitigation Plans, Plan review, 44 CFR 201.6(d)(3) (2021), [https://www.ecfr.gov/current/title-44/part-201#p-201.6\(d\)\(3\)](https://www.ecfr.gov/current/title-44/part-201#p-201.6(d)(3)).

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