

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE APRIL 2025



Town of North Attleborough
43 South Washington Street
North Attleborough, MA 02760

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

April 2025

Town of North Attleborough
43 South Washington Street
North Attleborough, MA 02760
<https://www.nattleboro.com/>

Prepared by:

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

351 Pleasant Street, Suite B # 208 · Northampton, MA 01060
Phone: 413-586-0867 · Fax: 413-727-8282 · www.jamiecaplan.com

Table of Contents

Table of Figures	6
Table of Tables.....	6
Acknowledgements	10
Record of Changes	13
Chapter 1. Introduction.....	14
Purpose of the Plan	14
Guiding Principles for Plan Development	15
Mitigation Strategy.....	16
Land Use and Development	17
Changes in Development.....	17
Progress in Mitigation Efforts	18
Authority and Assurances.....	19
Plan Adoption	19
Document Overview	20
Chapter 2: Planning Area Profile	22
People.....	24
Land Use and Development (Structures).....	25
Natural Resources	26
Rivers, Wetlands, and Other Water Bodies	27
Forested Land and Open Space	28
Critical Facilities and Infrastructure.....	29
Water and Sewer Service.....	29
Energy	29
Critical Facilities	29
Critical Transportation Infrastructure.....	33
Dams	34
Economy	34

Town of North Attleborough, MA Hazard Mitigation Plan Update

Historic and Cultural Resources.....	35
Chapter 3. Planning Process	37
Hazard Mitigation Planning Committee	38
Public Outreach	46
List of Key Stakeholders Invited to Public Meetings	50
Review of Draft Plan	51
Chapter 4. Risk Assessment.....	52
Hazard Identification	52
Massachusetts Emergency Declarations	53
Link to Massachusetts Climate Change Assessment	55
Hazard Profiles.....	59
Average and Extreme Temperatures	60
Droughts	70
Earthquakes	80
Flooding from Precipitation	87
Flooding from Dam Failure or Overtopping.....	100
Hurricanes and Tropical Storms.....	118
Invasive Species	131
Other Severe Weather	141
Severe Winter Storms	150
Tornadoes	157
Wildfires/Brushfires.....	162
National Flood Insurance Repetitive Loss Properties	175
Hazard Ranking.....	176
Problem Statements Summary.....	180
Chapter 5: Capability Assessment	188
Overview.....	188
Review and Incorporation of Existing Plans, Studies, and Reports	189
Planning and Regulatory Capabilities	195
Safe Growth Survey	202

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative and Technical Capabilities.....	206
Financial Capabilities	211
Education and Outreach Capabilities	214
National Flood Insurance Program (NFIP) Participation and Compliance	217
Summary and Conclusions.....	222
Opportunities to Expand and Improve Capabilities to Reduce Risk	224
Chapter 6. Mitigation Strategy	228
Mitigation Goals	228
Municipal Vulnerability Preparedness Plan.....	233
Comprehensive Range of Mitigation Actions	233
Mitigation Action Plan	240
Possible Funding Sources	256
Chapter 7. Plan Integration and Maintenance	261
Continued Public Participation	261
Method and Schedule for Keeping the Plan Current.....	262
Responsible Parties for Plan Implementation and Maintenance	264
Plan Integration	265
Acronyms	267
Appendix A. Planning Process Supporting Materials	271
Hazard Mitigation Planning Committee Meetings	271
HMPC Meeting Participants.....	271
HMPC Meeting Agendas.....	272
Public Outreach	278
Public Meeting 1/29/2025	278
Public Meeting 4/14/2025	284
Appendix B. Mitigation Actions.....	288
Priority Ranking Points	288
Types of Mitigation Actions.....	293
Actions Sorted by Goal Statement	295
Actions Sorted by Hazard	297

Town of North Attleborough, MA Hazard Mitigation Plan Update

Actions Sorted by Lead Position	300
Actions Sorted by Implementation Schedule	302
Appendix C. Plan Implementation and Review Supporting Materials.	304
Plan Update Evaluation Worksheet.....	304
Mitigation Action Progress Worksheet.....	305
Appendix D. Hazus Reports	306

Table of Figures

Figure 1. Goal Statements.	17
Figure 2. North Attleborough Base Map.	22
Figure 3. Town of North Attleborough Environmental Justice Populations.....	25
Figure 4. Town of North Attleborough Zoning Map.....	26
Figure 5. Community Lifelines.....	47
Figure 6. Public Meeting Flyer.....	48
Figure 7. Screen Shot of North Star Reporter Article.....	48
Figure 8. Agenda for Public Meeting Two.....	49
Figure 9. Picture of Town LED Sign Advertising the January Public Meeting.....	51
Figure 10. Climate Assessment Regions. North Attleborough is in the Eastern Inland Region.....	56
Figure 11. NWS Wind Chill Temperature Index and Frostbite Risk.....	63
Figure 12. NWS Heat Index Chart.....	64
Figure 13. Projected Annual Days with Temperatures above 90 Degrees (left) and Below 32 Degrees (right).....	68
Figure 14. Drought Mapping of 2022 and 2024.....	73
Figure 15. North Attleborough Critical Facilities and 100-Year Floodplain.....	96
Figure 16. Location and Hazard Potential of Dams in North Attleborough.....	110
Figure 17. Historical Tropical Storm and Hurricane Tracks in North Attleborough.....	120
Figure 18. Tracks for Tropical Storms that Impacted Massachusetts 2021.....	123
Figure 19. 100-Year Windspeeds (ASCE 7-98).....	127
Figure 20. Wildfire Burn Probability Map.....	172
Figure 21. Goal Statements.....	229
Figure 22. Process of Identifying a Range of Mitigation Actions.....	235
Figure 23. Types of Mitigation Actions.....	235

Table of Tables

Table 1. Summary of Changes.....	13
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Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 2. List of Critical Facilities in the Town of North Attleborough.....	30
Table 3. Dams in North Attleborough.	34
Table 4. Planning Process Schedule.	38
Table 5. Sectors of the Community Represented On HMPC.	39
Table 6. HMPC Members.....	41
Table 7. Where Public Engagement Informed the Plan.	49
Table 8. Massachusetts Emergency Declarations.	54
Table 9. Top Impacts of Climate Change per Sector in Eastern Inland Region.....	56
Table 10. How This Plan Addresses the Top Impacts of Climate Change per Sector.	57
Table 11. Hazard Characterization.	59
Table 12. USDA Disaster Events That Refer to Extreme Temperatures.	62
Table 13. Problem Statements for Extreme Temperatures.	69
Table 14. USDA Disasters Events That Refer to Drought.....	72
Table 15. Number of Consecutive Dry Days (CDD) and Days Without Rain (DWR) per Year.	78
Table 16. Problem Statements for Drought.	79
Table 17. Modified Mercalli Intensity.	83
Table 18. Modified Mercalli Intensity and Moment Magnitude.	83
Table 19. Building Losses for a 1500-Year Earthquake Scenario.....	85
Table 20. Building Losses for a 2500-Year Earthquake Scenario.	85
Table 21. Problem Statements for Earthquakes.....	86
Table 22. NCEI Severe Storm Database Entries Covering Floods in North Attleborough.....	90
Table 23. USDA Disaster Events That Refer to Flooding.....	92
Table 24. Buildings in 100-Year Floodplain.	94
Table 25. Population Exposed to 100-Year Floodplain (2020 U.S. Census).....	94
Table 26. Building Loss for the 100-Year Flood Scenario.	97
Table 27. Problem Statements Related to Flooding.....	99
Table 28. Significant and High Hazard Dams in North Attleborough	101
Table 29. Dam Conditions and Downstream Channels in North Attleborough.....	103
Table 30. Dam Failure Modes.....	106
Table 31. Dams in the Vicinity.	109
Table 32. Critical Facilities Exposed to Dam Inundation Areas.....	111
Table 33. Buildings in Falls Pond Dam Inundation Area.	112
Table 34. Buildings in Greenwood Lake Dam Inundation Area.	112
Table 35. Buildings in Hoppin Hill Reservoir Dam Inundation Area.	113
Table 36. Buildings in Whiting Pond Dam Inundation Area.	113
Table 37. Population Exposed to Dam Breach (2020 U.S. Census).....	114
Table 38. Building Impacts in the Falls Pond Dam Inundation Area.....	114
Table 39. Building Impacts in the Greenwood Lake Dam Inundation Area.....	115
Table 40. Building Impacts in the Hoppin Hill Reservoir Dam Inundation Area.	115
Table 41. Building Impacts in the Whiting Pond Dam Inundation Area.	116

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 42. Problem Statements Related to Dam Failure and Overtopping.	117
Table 43. Saffir-Simpson Scale.	125
Table 44. Building Losses Due to Wind for a 500-Year Scenario.	128
Table 45. Building Losses Due to Wind for a 1000-Year Scenario.	129
Table 46. Problem Statements for Hurricanes/Tropical Storms.....	130
Table 47. Early Detection Information for Addressing Invasive Species.	135
Table 48. Problem Statements for Invasive Species.....	140
Table 49. NCEI Severe Storm Database Entries Covering Other Severe Storms in North Attleborough. .	143
Table 50. Problem Statements for Other Severe Weather.	149
Table 51. NCEI Severe Storm Database Entries Covering Winter Storms in North Attleborough.	152
Table 52. RSI Scale.....	153
Table 53. Problem Statements for Severe Winter Storms.	156
Table 54. Enhanced Fujita Scale.	160
Table 55. Problem Statements for Tornadoes.	162
Table 56. Statewide Brush Fire Counts.....	164
Table 57. Outdoor and Total Fire Event Figures for North Attleborough.....	165
Table 58. Estimated Brush Fire Event Figures for North Attleborough.	165
Table 59. Buildings in 0.0133% Annual Chance Area.	170
Table 60. Population Exposed to 0.0133% Annual Chance Wildfire (2020 U.S. Census).....	171
Table 61. Problem Statements for Wildfires.	174
Table 62. Hazard Ranking Criteria.	177
Table 63. Final Hazard Ranking of Hazards for North Attleborough.	178
Table 64. Impacts from Population and Land Use.....	178
Table 65. Problem Statements Summary.....	180
Table 66. Capability Assessment Components.....	188
Table 67. Relevant Plans, Studies, and Reports for Incorporation.	189
Table 68. Planning and Regulatory Findings.....	196
Table 69. Safe Growth Survey Results.	203
Table 70. Administrative and Technical Findings.	206
Table 71. Financial Findings.....	211
Table 72. Education and Outreach Findings.....	214
Table 73. NFIP Participation and Compliance Findings.	217
Table 74. Additional NFIP Participation and Compliance Information.....	221
Table 75. Status of Previous Plan's Hazard Mitigation Actions.	230
Table 76. Status of MVP Recommendations.	233
Table 77. Examples of Mitigation Actions in Each Category.	235
Table 78. Dam Risk Mitigation Activities.	237
Table 79. Possible Mitigation Actions for Each Hazard.	239
Table 80. North Attleborough Hazard Mitigation Actions.....	242
Table 81. Actions that Target Vulnerable Populations.....	255

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 82. Actions that Target Buildings and Infrastructure.....	255
Table 83. Mitigation Actions that Target Dam Safety.	256
Table 84. Priority Ranking Points for Each Action.	288
Table 85. Mitigation Actions Sorted by Action Category.....	293
Table 86. Mitigation Actions Sorted by Goal Statement.	295
Table 87. Mitigation Actions Sorted by Hazards Addressed.....	297
Table 88. Mitigation Actions Sorted by Lead Position.....	300
Table 89. Mitigation Actions Sorted by Implementation Schedule.....	302
Table 90. Plan Update Evaluation Worksheet.....	304
Table 91. Mitigation Action Progress Worksheet.....	305

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- Jon Antonucci, School Superintendent, Town of North Attleborough
- Michael Borg, Town Manager, Town of North Attleborough
- Peter Clondas, North Attleboro Electric - Assistant Operations Manager, Town of North Attleborough
- Christopher Coleman, Fire Chief/Emergency Management Director, Town of North Attleborough
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- Mark Hollowell, Director of Public Works, Town of North Attleborough
- Carl Johnson, North Attleborough Electric - Operations Manager, Town of North Attleborough
- Brian Kelley, Emergency Medical Services Coordinator - Fire Department, Town of North Attleborough
- Sandra McCrory, Conservation Administrator - Conservation Commission, Town of North Attleborough
- Rick McQuade, Police Chief, Town of North Attleborough
- Antonio Morabito, Assistant Town Manager, Town of North Attleborough
- Taylor O'Neil, Communications and Information Officer, Town of North Attleborough
- Peter Schiffman, North Attleboro Electric - General Manager/Electric Power Engineer, Town of North Attleborough
- Karen Testa, Council on Aging Director/Senior Center, Town of North Attleborough

F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement §201.6(c)(5))

Local Adoption Resolution

TOWN OF NORTH ATTLEBOROUGH, MASSACHUSETTS
TOWN COUNCIL
A RESOLUTION ADOPTING THE
TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE
RESOLUTION NO. _____

WHEREAS the Town of North Attleborough recognizes the threat that natural hazards pose to people and property within the Town of North Attleborough; and

WHEREAS the Town of North Attleborough has prepared a multi-hazard mitigation plan, hereby known as TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of North Attleborough from the impacts of future hazards and disasters; and

WHEREAS adoption by Town of North Attleborough Town Council demonstrates its commitment to hazard mitigation and achieving the goals outlined in the TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF NORTH ATTLEBOROUGH, MA, THAT:

Section 1. In accordance with M.G.L. c. 40, the Town of North Attleborough Town Council adopts the TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE. While content related to the Town of North Attleborough may require revisions to meet the plan approval requirements, changes occurring after adoption will not require Town of North Attleborough to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

Town of North Attleborough, MA Hazard Mitigation Plan Update

ADOPTED by a vote of _____ in favor and _____ against, and _____ abstaining, this
_____ day of _____, _____.

TOWN COUNCIL:

By: _____ Justin Paré, President

By: _____ Keith LaPointe, Vice President

Record of Changes

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

Table 1. Summary of Changes.

Date of Change	Entered By	Summary of Changes

Chapter 1. Introduction

The Federal Emergency Management Agency (FEMA) defines hazard mitigation per the Code of Federal Regulations (CFR) 44 Section 201.2 as “any **sustained** action taken to reduce **or eliminate** the **long-term risk** to human life and property from hazards.”

“Disaster Mitigation Act (DMA) 2000 (Public Law 106-390)¹ provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts.”²

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

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

Purpose of the Plan

The purpose of the Local Hazard Mitigation Plan is to provide the Town of North Attleborough with a comprehensive examination of all natural hazards affecting the area, as well as a framework for informed decision-making regarding the selection of cost-effective mitigation actions. When implemented, these mitigation actions will reduce the Town’s risk and vulnerability to natural hazards.

This plan is a result of a collaborative effort between the Town of North Attleborough and the surrounding communities. Throughout the development of the plan, the Hazard Mitigation Planning Committee (HMPC) consulted the public and key stakeholders for input regarding identified goals, mitigation actions, risk assessment, and mitigation implementation strategy. A sample of key

¹ Disaster Mitigation Act of 2000, Pub. L. 106-390, as amended

² Disaster Mitigation Act of 2000. <https://www.congress.gov/106/plaws/publ390/PLAW-106publ390.pdf>

Town of North Attleborough, MA Hazard Mitigation Plan Update

stakeholders who participated, included the Massachusetts Emergency Management Agency (MEMA), North Attleborough Electric, and the North Attleborough School District.

Guiding Principles for Plan Development

The HMPC adhered to the following guiding principles in the plan's development.³

- Plan and invest for the future.
- Collaborate and engage early.
- Integrate community planning.

This plan update meets the requirements outlined in 44 CFR § 201.6(d)(3). These requirements are included in the plan in the green call-out boxes, like the one below.

A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Yellow call-out boxes like the one to the right, are definitions taken from the Federal Emergency Management Agency Local Policy Guide, April 2025. These are included throughout the plan for reference and explanation.

The HMPC prioritized mitigating impacts of climate change, mitigating risk to vulnerable communities, and protecting the built environment both today and in the future.

COMMUNITY RESILIENCE is the ability of a community to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Activities such as disaster preparedness (which includes prevention, protection, mitigation, response and recovery) and reducing community stressors (the underlying social, economic and environmental conditions that can weaken a community) are key steps to resilience.

The HMPC identified the following list of hazards to profile:

- Average/Extreme Temperatures
- Changes in Groundwater (Covered in Flooding and Drought Sections)
- Drought
- Earthquakes
- Flooding from Dam Overtopping
- Flooding from Precipitation

³ Federal Emergency Management Agency. (April 11, 2025). Local Mitigation Planning Policy Guide, p.10.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Hurricanes/Tropical Storms
- Invasive Species
- Other Severe Weather
- Severe Winter Storms
- Tornadoes
- Wildfires and Brushfires

Mitigation Strategy

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

The hazard mitigation strategy is the culmination of work presented in the Planning Area Profile (Chapter 2), Risk Assessment (Chapter 4), and Capability Assessment (Chapter 5). It is also the result of multiple meetings and sustained public outreach. The HMPC developed the goals shown below. The goals from the previous Town of North Attleborough Hazard Mitigation Plan 2019 and the Town of North Attleborough MVP Community Resilience Building Workshop Summary of Findings 2019 were revised to develop this current list. Information about the goal development process is in Chapter 6 (Mitigation Strategy). The goals are considered “broad policy-type statements”⁴ that represent the long-term vision for mitigating risk to natural hazards in the Town of North Attleborough.

Save Lives and Property

Reduce risk to life, property, infrastructure, natural and cultural resources from natural hazards and climate change.

High Hazard Potential Dams

Assess and fortify high-hazard dams, ensuring risk reduction while promoting ecological resilience.

Local Plans and Regulations

Institute climate resilient and risk reduction plans and policies to promote smart growth and low impact development.

Buildings and Infrastructure

Develop Town facilities and infrastructure to increase climate resilience and risk reduction from natural hazards.

Natural Resources

Preserve lands with flood- and climate-resilience, agricultural, and habitat value.

Education

Expand education and awareness programs for Town employees and residents to support the implementation of hazard mitigation and climate adaptation throughout the Town.

⁴ Federal Emergency Management Agency. (2013). *Local Mitigation Planning Handbook*, p. 6.

Figure 1. Goal Statements.

Land Use and Development

Changes in Development

E1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

CHANGES IN DEVELOPMENT means recent development (for example, construction completed since the last plan was approved), potential development (for example, development planned or under consideration by the jurisdiction), or conditions that may affect the risks and vulnerabilities of the jurisdictions (for example, climate change, declining populations or projected increases in population, or foreclosures) or shifts in the needs of underserved communities or gaps in social equity. This can also include changes in local policies, standards, codes, regulations, land use regulations and other conditions.

North Attleborough has not seen many changes in development since the last plan update in 2019. This is primarily due to the general lack of population growth driving new construction and economic development in the community. The Town grew considerably during the end of the twentieth century, with population booms exceeding 20 percent over some decades. However, growth has since been modest, not exceeding 10 percent in the past three decades and less than 1 percent over the past 5 years. This trend of limited growth is expected to continue. Current population projections from the UMass Donahue Institute estimate that North Attleborough's may slightly decline by the year 2050.

The lack of population growth and development pressure has helped North Attleborough avoid development in hazard-prone areas and other changes that could increase its vulnerability to natural hazards. Further supporting this fact is the Town's strong planning and regulatory framework which helps to ensure the community's undeveloped areas are protected from hazardous development. Land use and new development in North Attleborough is managed through the Town's Zoning Bylaw and other regulations, including building codes and site plan review procedures that ensure new, or improved development projects address risk reduction through various provisions such as stormwater and floodplain management, erosion control, and wetlands protection. These regulations are all strictly enforced through the Town's planning and regulatory process, which is considered an effective tool for preventing changes in development from increasing hazard vulnerability. Other barriers to development in hazard areas include the lack of developable land along with minimal provisions for public utilities, transportation options and other infrastructure.

While the Town has reviewed and/or approved some major development projects since 2019, there have been no major changes in development in hazard-prone areas since the previous plan was approved. This includes the construction of several new subdivisions, commercial developments, and a

Town of North Attleborough, MA Hazard Mitigation Plan Update

mobile home park which are all in compliance with the above referenced regulations and inspected by the Planning Department's consultant engineer. Recent project reviews and site plan approvals have been limited to the redevelopment of existing sites that are outside hazard-prone areas. Examples include a new ten-lot subdivision for a residential development off Towne Street and several improvements or expansions to commercial properties, all of which were determined to be located outside of hazard areas and not leading to any increases in community vulnerability. Of the 797 building permits issued since 2019, only one was issued for construction in a hazard area—and this was for only the parking lot associated with 21 East Apartments which is impacted by the Ten-Mile River.

In summary, the long-term development outlook for North Attleborough is one of slow growth, and there are no changes in development that are determined to be increasing the risks and vulnerabilities of the community to hazards. Limited development may still occur, but most of this will be clustered around areas already developed, while existing land use policies and regulations effectively discourage construction in hazard-prone areas. As described in the Town's Master Plan and in Chapter 4 of this plan (Risk Assessment), it is anticipated that climate change and projected future conditions will increase the threats posed by multiple hazards. Increasing risks associated with these hazards could result in more frequent and/or more severe impacts on the community and especially those populations considered to be more vulnerable to their effects. As such, the Town has prioritized preparing for potential disasters and more frequent weather events related to climate change through the implementation of its Master Plan, and through mitigation projects that include dredging of the Ten Mile River, numerous stormwater drainage improvements, building retrofits, and the maintenance or upgrades to high hazard dams. These activities will help decrease the community's vulnerability to hazards in the years to come.

Progress in Mitigation Efforts

E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?
(Requirement §201.6(d)(3))

Priorities in the Town of North Attleborough have shifted in several areas including economic development, infrastructure improvements, financial management, public safety and education. Review of the Town reports from 2019-2023 emphasize these shifts since the Town's 2019 Hazard Mitigation Plan was developed. In addition to reviewing the Town reports these shifts can be seen in the following documents:

- 2023 Water Quality Report
- 2023 North Attleborough Housing Production Plan
- 2023 North Attleborough Master Plan

Since 2019 North Attleborough has seen positive economic growth and pursued grant opportunities to support the revitalization of the downtown area. The Department of Public Works has focused on road

Town of North Attleborough, MA Hazard Mitigation Plan Update

paving, water main replacements and sewer system upgrades with an emphasis on stormwater management and reducing flood risk. The Fire Department reorganized its staffing structure to reduce response times and secure grants for equipment and facilities. The Town has pursued historic preservation projects and sought grants for the Falls Pond Dam.

The status of each mitigation action from the Town's 2019 Hazard Mitigation Plan is included in Chapter 6 (Mitigation Strategy). The text in this chapter includes a designation of Completed, Completed & To Be Continued, Partially Completed/In Progress, Delayed, or Cancelled with a corresponding description. In addition, if the mitigation action has moved forward to this Plan's list of actions, that is included. The Town reviews and updates its regulations and procedures that support natural hazard mitigation on a regular basis. This includes the administration of zoning regulations, building codes, and special permit and site plan review procedures that ensure new or improved development projects address risk reduction through various provisions such as stormwater and floodplain management. Including mitigation principles into the plans named above and into Town policies and budget processes illustrates how the Town has leveraged mitigation concepts of reducing risk and increasing resilience from their 2019 Hazard Mitigation Plan Update.

Authority and Assurances

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

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended.
- National Flood Insurance Act of 1968, as amended.
- National Dam Safety Program Act (Pub. L. 92-367), as amended.
- 44 CFR Part 201 Mitigation Planning.
- 44 CFR, Part 60, Subpart A, including § 60.3 Flood plain management criteria for flood-prone areas.
- 44 CFR Part 77 Flood Mitigation Grants¹⁰.
- 44 CFR Part 206 Subpart N. Hazard Mitigation Grant Program.

Plan Adoption

The Town of North Attleborough will adopt the Plan when it has received "approved-pending adoption" status from the Federal Emergency Management Agency (FEMA). The Certificate of Adoption is included on page 7.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Document Overview

Below is a summary of the Town of North Attleborough, MA Hazard Mitigation Plan Update chapters, including appendices. The planning process closely adhered to FEMA guidelines and to the intent of those guidelines.

Chapter 2: Planning Area Profile

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

Chapter 3: Planning Process

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

Chapter 4: Risk Assessment

The Risk Assessment identifies the natural hazard risks to the Town of North Attleborough and its residents. The risk assessment looks at current and future vulnerabilities based on land use development including structures and infrastructure. Included in this chapter is a list of critical facilities identified by the HMPC.

Chapter 5: Capability Assessment

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

Chapter 6: Mitigation Strategy

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

Chapter 7: Plan Implementation and Maintenance

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

Appendices

The Appendices includes documentation regarding the planning process, the list of mitigation actions and the *Hazus* Reports.

Chapter 2: Planning Area Profile

The Town of North Attleborough has a population of 30,834,⁵ and is in Bristol County. The Town is bordered by the communities of Mansfield, Foxboro, Attleboro, Plainville, and Cumberland, Rhode Island. Due to its location, the Town is part of the Providence-Pawtucket-Warwick Standard Metropolitan Statistical Area (SMSA). The major city of Boston, Massachusetts, is located approximately 45 minutes away, while Providence, Rhode Island is only 15 minutes away.⁶

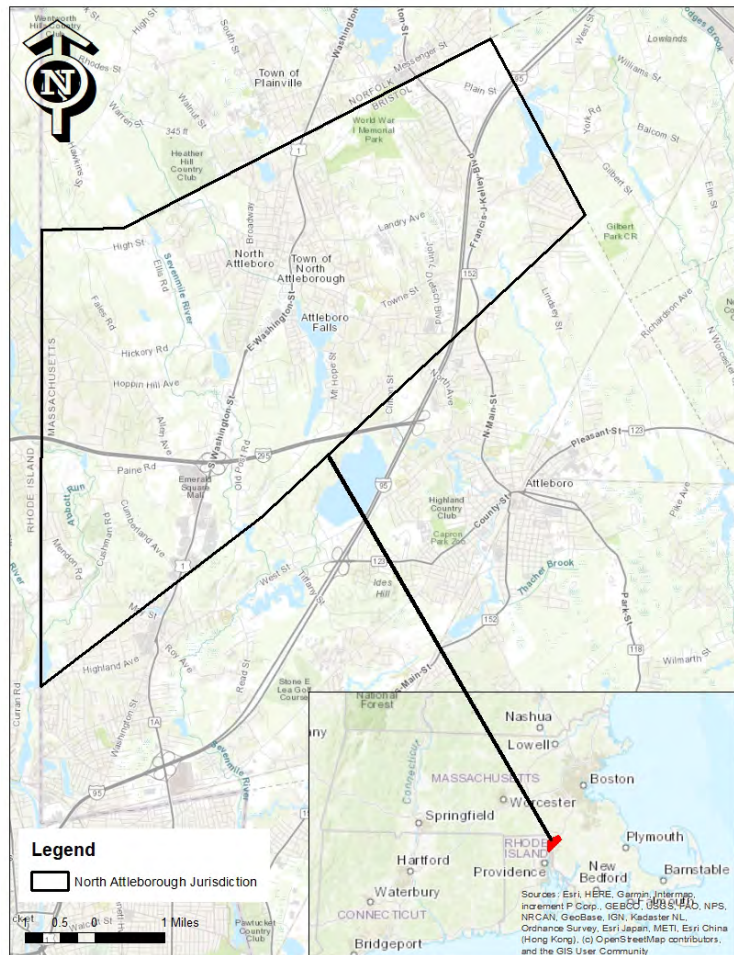


Figure 2. North Attleborough Base Map.

Due to archaeological and cultural resources, human habitation in North Attleborough has been documented as far back as 9,000 years. One of the most visible features in the Town is the “Attleboro

⁵ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

⁶ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Red” felsite rock outcrops that were quarried by Native Americans for thousands of years.⁷ The Pokanoket or Wampanoag tribes inhabited the region which served as an area for hunting, fishing, and quarrying.⁸

Written history dates to 1661 when Captain Thomas Willet purchased the territory from the Native American leader Wamsutta. In 1666, the area was settled and called “The Town Rehoboth Purchase.” It was later renamed Attleboro and incorporated as a Town in 1694. Many of the early settlers gathered in the vicinity of today’s Old Post Road in an area called “Oldtown.”⁹

As the settlers moved into other areas of the Town, land was cleared for farms. A corn mill was established in 1677 in Attleboro Falls and agriculture occupied at least half of the Town’s land areas in the early 1800’s. Industry then began to move into the community and in the 18th century, iron works were established. In 1780, a person only known as “the Frenchman” establish the first jewelry manufacturing business in the United States in what is now North Attleborough. Other industries, such as cotton mills, button manufacturing, and leather goods were established in the 18th and 19th centuries.¹⁰

Development clustered around streams and ponds and growth continued in the 1800s. Because of its growing size, the Town of Attleboro decided to divide into the present-day towns of Attleboro and North Attleborough. As a separate Town, North Attleborough took on “its own separate social and economic identity.”¹¹ The development of several buildings in the downtown such as the Telephone Building, the Post Office, Police Station, Library, and Hotel Hixon and the construction of East Washington Street (part of Route 1) “altered the Town’s commercial character, shifting retail trade somewhat from the old downtown area to other parts of Town.”¹² Small population centers were located in Attleboro Falls, Adamsdale, and Oldtown; however, the construction of Interstate 95 in the 1960’s led the Town to become more suburban in character. Growth in the past forty years has changed the layout of the Town with less densely developed housing and commercial areas alongside a variety of subdivisions tracts, industrial parks, highway strip developments, and shopping centers.¹³

⁷ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁸ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

⁹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

¹⁰ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

¹¹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

¹² Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

¹³ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough,

Town of North Attleborough, MA Hazard Mitigation Plan Update

The Town is governed by a Town Manager-Town Council form of government. The Town Manager is the Chief Executive Officer of the Town and is “responsible to the Town Council for the proper operation of Town affairs.”¹⁴

People

As of 2020, 86.6% of the Town identified as White, 1.9% identified as Black or African American, 5.2% identified as Asian, 3.6 % identified as Hispanic or Latino, and 4.6% identified as Two or More Races.¹⁵ About 8.5% of the population is foreign-born and 10.4% of the population speaks a language other than English at home.¹⁶ There are approximately 12,855 households in North Attleborough.¹⁷ The median household income is \$109,426.¹⁸ The number of people living below the poverty level is 5.4%.¹⁹ Almost 95% percent of the Town, aged 25 years or older, is a high school graduate or higher.²⁰

The State of Massachusetts defines “Environmental Justice Populations” as areas of a community where at least one of the following criteria it true:

1. Annual median household income is 65% or less of the state’s annual median household income.
2. Minorities make up 40% or more of the Town population.
3. Twenty-five percent or more of households speak English “less than very well.”
4. Minorities make up 25% or more of the population *and* the annual median household income of the municipality where the neighborhood is located does not exceed 150% of the statewide annual median household income.²¹

Massachusetts.

¹⁴ “Town Manager.” (n.d.) Town of North Attleborough, Massachusetts. Retrieved from <https://www.nattleboro.com/313/Town-Manager>.

¹⁵ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

¹⁶ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

¹⁷ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

¹⁸ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

¹⁹ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

²⁰ “QuickFacts North Attleborough Town city, Massachusetts.” (2020). United States Census Bureau. Retrieved from <https://www.census.gov/quickfacts/fact/table/northattleboroughtowncitymassachusetts/PST045224>.

²¹ “Environmental Justice Populations in Massachusetts.” (2024). Commonwealth of Massachusetts. <https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts>.

Town of North Attleborough, MA Hazard Mitigation Plan Update

These populations are more vulnerable due to being disproportionately affected by the negative impacts of natural hazards nationwide. The data for identifying Environmental Justice Populations comes from the Executive Office of Energy and Environmental Affairs (EEA) who uses American Community Survey data.²²

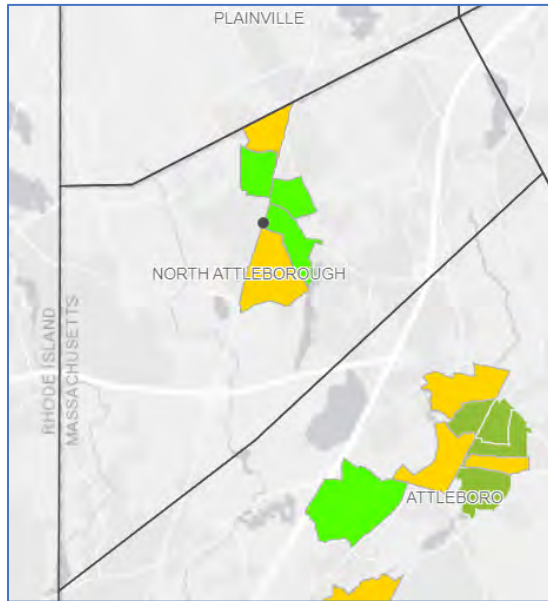


Figure 3. Town of North Attleborough Environmental Justice Populations.²³

The center of North Attleborough has a concentration of Environmental Justice (EJ) communities who meet the “Minority” EJ Criteria shown in yellow and the “Income” EJ Criteria shown in neon green.

Land Use and Development (Structures)

The majority of North Attleborough is comprised of lower-density, single family homes. There are larger, single-use commercial properties located along Route 1 as well as a “greenbelt” in the west that is made up of preserved open space, recreational, and agricultural land uses. North Attleborough’s industrial land uses are primarily located in the eastern side of Town.²⁴

Housing in Town is made up of older structures that were built prior to the year 2000. The largest housing construction boom occurred between 1980 and 1999, while a significant decrease in housing construction occurred after 2008.²⁵

There has been a shift in land use in the Town, with the amount of forest land in the Town decreasing by 24% from 1951 to 2005. While forest land decreased, urban land increased by approximately 120% during that same time period. In 1951, active agricultural land once compromised 16% of Town’s land use and now only occupies 3.4% of the Town’s land. Overall, development in North Attleborough has slowed over the past 15 years; however, with new planned subdivisions and construction in the Town, there will likely be residential growth to accommodate for.²⁶

²² “Environmental Justice Populations in Massachusetts.” (2024). Commonwealth of Massachusetts. <https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts>.

²³ Massachusetts 2020 Environmental Justice Populations Map. (2024). Commonwealth of Massachusetts.

²⁴ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

²⁵ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

²⁶ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough,

Town of North Attleborough, MA Hazard Mitigation Plan Update

The Town has twelve zoning districts that include residential, commercial, and industrial land uses, alongside an office and business park. The Town also has two Overlay Districts which include the Aquifer Protection Overlay District and the Transit Oriented Development Overlay District. A Zoning Map created by the Southeastern Regional Planning and Economic Development District (SRPEDD) for the Town's most recent 2023 Master Plan outlining these zoning districts can be seen below.²⁷

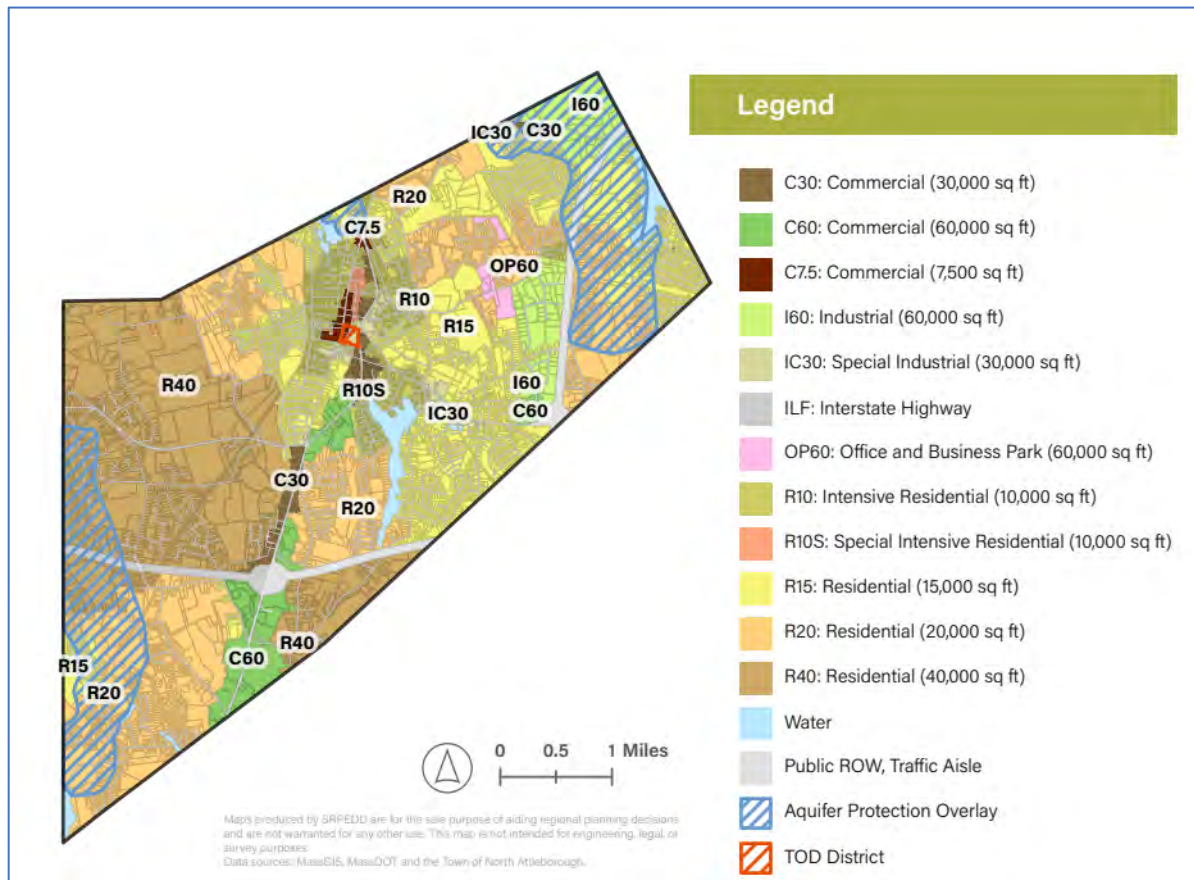


Figure 4. Town of North Attleborough Zoning Map.²⁸

Natural Resources

Natural resources provide habitats for plants and animals, increase biodiversity, and support various ecosystems while also providing recreational opportunities and access to the natural environment. Natural resources include features such as bodies of water like rivers and wetlands and open space like forests and parks. These features play an important part in maintaining environmental sustainability and life, but they are also threatened by natural hazards and climate change. As a result, they need to be

Massachusetts.

²⁷ Zoning By-Law Map of the Town of North Attleborough, Massachusetts. (2011). Town of North Attleborough, Massachusetts.

²⁸ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

protected and managed to mitigate risk to people and the built environment, prevent irreparable damage to the resources themselves, and lessen the impacts of major threats such as floods or drought.

Rivers, Wetlands, and Other Water Bodies

The Town falls within four major watersheds which include:

1. Abbott Run Watershed
2. Bungay River Watershed
3. Seven Mile River Watershed
4. Ten Mile River Watershed.²⁹

Abbott Run starts in the towns of Franklin and Wrentham and flows along the western boundary of North Attleborough before entering the Blackstone River in Rhode Island. The Abbot Run drainage area covers about 2,500 acres and lies in the western portion of the Town. It supplies water to the Millers River in Central Falls, Rhode Island and Robin Hollow Pond.³⁰

The Bungay River is a major tributary of the Ten Mile River. The Bungay River flows through Greenwood Lake, the North Attleborough Fish Hatchery, and the “upper reach” of the Bungay Swamp.³¹ The Bungay River’s drainage area covers about 2,400 acres in the eastern part of the Town.³²

The Ten Mile River has its headwaters in the neighboring towns of Wrentham and Plainville and enters North Attleborough in the north. The Ten Mile River extends from Whiting Pond near Routes 1 and 1A to the areas of Falls Pond and Attleboro Falls before entering the Town of Attleboro in the south. The Ten Mile River Watershed drainage area covers about 4,300 acres and drains into Scotts Brook and the Ten Mile River itself. The Ten Mile River Watershed has experienced “chronic flooding and flood related loss for decades.”³³

The Seven Mile River is in the western part of North Attleborough and flows south, parallel to the Ten Mile River. It is the largest tributary of the Ten Mile River. The Seven Mile River Watershed drainage area covers approximately 2,900 acres and supplies water to the Hoppin Hill and Luther Reservoirs.³⁴

²⁹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁰ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³¹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³² Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³³ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁴ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough,

Town of North Attleborough, MA Hazard Mitigation Plan Update

In addition to these major watersheds, there are three major aquifers in the Town:

1. Abbott Run Aquifer
2. Bungay Aquifer
3. Ten Mile River Aquifer.³⁵

These three aquifers are the “only major sources of water available” to North Attleborough and are protected by the Aquifer Protection Overlay District that was adopted in April 1998.³⁶

Forested Land and Open Space

North Attleborough has “relatively flat topography” with river corridors and a “rolling countryside” that defines the landscape of the Town.³⁷ There is meadow and forested land to the west and north of the Town along the Seven Mile River. This area remains largely undeveloped and agricultural. Much of this open space is also protected through agricultural preservation restrictions.³⁸

In 2011, a trail project completed by the Conservation Commission and a local Boy Scout Troop has since been expanded to one of the “largest pieces of conservation land in the west side” called the Chorney Property.³⁹ The trail now travels through fields, a walking bridge and into the forested land present in the Town.⁴⁰ In addition to this trail, there are several open spaces for hiking, wildlife viewing, and fishing. The Town is home to several parks, as well. Some of the most “notable” open spaces include:

- Bragg and MacDonald Memorial Town Forest and Dog Park – 142 Acres
- Chorney Property – 86 acres
- North Attleborough National Fish Hatchery – 225 acres
- WW1 Memorial Park – 184 acres.⁴¹

Massachusetts.

³⁵ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁶ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁷ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁸ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

³⁹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴⁰ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴¹ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

The Town is home to a variety of plant communities, including the upland woodland community that is predominantly pine-oak and oak-hickory forests which cover approximately 36% of the Town's total land area.⁴²

Critical Facilities and Infrastructure

Critical facilities and infrastructure are considered community lifelines; towns rely on these facilities before, during, and after a disaster. Critical facilities and infrastructure are important to identify and manage because of the services and access they provide daily. Mitigating risks related to natural hazards and climate change improves a town's resilience and economic vitality.

Water and Sewer Service

The Town maintains eight municipal wells that have a combined pumping capacity of about 5.58 million gallons per day (mgd). As of 2020, the Town's wells supply 2.6 million gallons of drinking water per day through approximately fourteen miles of water mains. The Water Division provides service to over 9,000 residential and commercial customers in North Attleborough.⁴³

The sewer collection system in Town has approximately 57 miles of pipes, manholes, and appurtenances that flow to the Wastewater Treatment Facility. There are four personnel that maintain the collection system.⁴⁴

Energy

Electricity is provided by the North Attleboro Electric Department (NAED). Operations began in 1894 and continue to this day to serve the local community.⁴⁵

Critical Facilities

The term "critical facilities" is often used to describe structures necessary for a community to respond and recover in emergency situations. These facilities often include emergency response facilities (fire stations, police stations, rescue squads, and emergency operation centers [EOCs]), custodial facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), communications facilities, and any other assets determined by the community to be of critical

⁴² Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴³ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴⁴ "Sewer Collection System." (n.d.) Town of North Attleborough, Massachusetts. Retrieved from <https://www.nattleboro.com/264/Sewer-Collection>.

⁴⁵ "History." (n.d.). North Attleboro Electric Department. Retrieved from <https://www.naelectric.com/330/130-years-of-North-Attleboro-Electric>.

Town of North Attleborough, MA Hazard Mitigation Plan Update

importance for the protection of the health and safety of the population. The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas.

The number and nature of critical facilities in a community can differ greatly from one jurisdiction to another and usually includes both public and private facilities. Each community needs to determine the relative importance of the publicly and privately owned facilities that deliver vital services, provide important functions, and protect special populations.

The Town identified seventy-seven critical facilities. The list of critical facilities in North Attleborough is provided in the table below. This list was obtained from the previous edition of the hazard mitigation plan and the MVP-funded Community Resilience Building (CRB) plan; and reviewed by the HMPC throughout the planning process. The facilities with back-up generators include the Police Department, Fire Station Headquarters, Fire Station 2, Fire Station 3, North Attleborough Middle School, North Attleborough Electric Department Operations, and North Attleborough Electric Department Substation.

The Local Mitigation Planning Handbook (FEMA, 2013) explains that “*Critical facilities are structures and institutions necessary for a community’s response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery. When identifying vulnerabilities, it is important to consider both the structural integrity and content value of critical facilities and the effects of interrupting their services to the community.*”

Table 2. List of Critical Facilities in the Town of North Attleborough.

Name	Type	Address	Notes
4211000-07G	Water Supply	Whiting Street	Critical Facility
Water Booster Station	Water Supply	2 Harold Bishop Boulevard	Critical Facility
Highpoint Tank	Water Supply	9 Highpoint Drive	Critical Facility
Fire Station 3	Fire Station	210 Allen Avenue	Critical Facility
Fire Station 2	Fire Station	465 Kelly Boulevard	Critical Facility
Fire Station Headquarters	Fire Station	50 Elm Street	Critical Facility
Police Department	Police Station	102 South Washington Street	Critical Facility
Sewer Pump Station	Sewer System	Route 1 @ Jefferson Street	Critical Facility
Sewer Pump Station	Sewer System	Route 1 (near Walmart)	Critical Facility
Sewer Pump Station	Sewer System	Route 1 (near mall)	Critical Facility

Town of North Attleborough, MA Hazard Mitigation Plan Update

Name	Type	Address	Notes
Sewer Pump Station	Sewer System	Metcalf Road	Critical Facility
Sewer Pump Station	Sewer System	Edmund Corrigan Road	Critical Facility
Sewer Pump Station	Sewer System	Alice Agnow Drive	Critical Facility
Sewer Pump Station	Sewer System	Mary Kennedy Drive	Critical Facility
Sewer Pump Station	Sewer System	Whitman Lane	Critical Facility
Dodge Avenue Pump Station	Sewer System	Dodge Avenue	Critical Facility
Sewer Pump Station (Private)	Sewer System	Draper Avenue	Critical Facility
Sewer Pump Station	Sewer System	Norton Road	Critical Facility
Wastewater Treatment Facility	Sewer System	Cedar Street	Critical Facility
4211001-02G	Water Supply	Mendon Road	Critical Facility
4211001-01G	Water Supply	Mendon Road	Critical Facility
4211000-09G	Water Supply	Huntsbridge Road	Critical Facility
4211000-08G	Water Supply	Grandview Drive	Critical Facility
4211000-06G	Water Supply	Mary Kennedy Drive	Critical Facility
4211000-05G	Water Supply	Mary Kennedy Drive	Critical Facility
4211000-04G	Water Supply	West Bacon Street (Plainville)	Critical Facility
4211000-03G	Water Supply	West Bacon Street (Plainville)	Critical Facility
4211000-02G	Water Supply	West Bacon Street (Plainville)	Critical Facility
4211000-01G	Water Supply	West Bacon Street (Plainville)	Critical Facility
4211000-0AG	Water Supply	Mary Kennedy Drive	Critical Facility
Water Booster Station	Water Supply	185 Elmwood Street	Critical Facility
Oldwood Tank	Water Supply	197 Oldwood Road	Critical Facility
Elmwood Tank	Water Supply	185 Elmwood Street	Critical Facility
Greenwood Lake Dam			Critical Facility
Whitings Pond Dam			Critical Facility
Falls Pond Dam			Critical Facility
ScribbleTime A Center for Early Learning	Daycare	451 Elm Street	High Response
Children's Worship	Daycare	444 Kelley Boulevard	High Response
Madonna Manor Nursing Home	Nursing Home	85 North Washington Street	High Response
The Branches	Assisted Living	40 Robert Toner Blvd	High Response
Waters Early Learning Center	Daycare	57 John L Dietsch Square	High response

Town of North Attleborough, MA Hazard Mitigation Plan Update

Name	Type	Address	Notes
Animal Crackers Nursery School	Daycare	211 Landry Avenue	High response
Top of the Hill Nursery School	Daycare	300 Elmwood Street	High Response
Rhymes and Fables Schoolhouse	Daycare	729 Allen Avenue	High Response
Jolly Farm Day Care Inc	Daycare	97 Park Street	High Response
The Three Bears Child Care	Daycare	401 Paine Road	High Response
A Touch of Honey	Daycare	42 Commonwealth Avenue	High Response
Hockomock Area YMCA	Daycare	300 Elmwood Street	High Response
Little Wonders Family Childcare	Daycare	143 Ivy Street	High Response
Twinkle Little Star Child Care	Daycare	115 Commonwealth Avenue	High Response
Little Feet Creative Learning	Daycare	55 Plain Street	High response
Priceless Moments Inc	Daycare	68 Park Street	High Response
Cheecon	Industrial	30 Larsen Way	High Response
VH Blackinton	Industrial badge making	221 John Dietsch Blvd	High Response
Metalor Refining	Refinery	N/A	High Response
21 East Street Apartments	Residential	21 East Street	High Response
North Attleboro High School	School	1 Wilson Whitty Way	High Response
Roosevelt Avenue School	School	108 Roosevelt Avenue	Town Infrastructure
Community School	School	45 South Washington Street	Town Infrastructure
Falls School	School	2 Jackson Street	Town Infrastructure
Amvet Boulevard School	School	70 Amvet Boulevard	Town Infrastructure
North Attleborough Town Hall	Town Facility	43 South Washington Street	Town Infrastructure
North Attleborough DPW	Department of Public Works	10 Whiting Street	Town Infrastructure
Circle Ct	Elderly Housing	Circle Ct	Town Infrastructure
Elm Terrace	Elderly Housing	Elm Terrace off Hope Street	Town Infrastructure
22 South Washington Street	Elderly Housing	22 South Washington	Town Infrastructure
99-101 Hope Street	Elderly Housing	Hope Street	Town Infrastructure

Town of North Attleborough, MA Hazard Mitigation Plan Update

Name	Type	Address	Notes
NAED Substation	Electricity	280 Landry Ave	Town Infrastructure
NAED Operations	Electricity	275 Landry Ave.	Town Infrastructure
Falmouth Street Housing	North Attleboro Housing Authority	Falmouth Street	Town Infrastructure
Martin School	School	37 Landry Ave	Town Infrastructure
St Mary Sacred Heart School	School	57 Richards Avenue	Town Infrastructure
North Attleborough Middle School	School	564 Landry Avenue	Town Infrastructure
North Attleborough Early Learning Center	School	25 School Street	Town Infrastructure
Joseph W Martin JR Elementary School	School	37 Landry Avenue	Town Infrastructure
451 Elm Street Town Building	Town Administration	451 Elm Street	Town Infrastructure
Richards Memorial Library	Town Facility	118 North Washington Street	Town Infrastructure

Critical Transportation Infrastructure

The Town has many significant transportation networks. These routes include State Routes 1, 1A, and 152 that run north-south and State Route 120 that runs east-west, all of which bisect the Town. There are also two interstates, Interstate 95 that runs north-south and Interstate 205 that runs east-west. North Attleborough can access the Interstate 495 corridor in the neighboring town of Plainville.⁴⁶

The Greater Attleboro-Taunton Regional Authority (GATRA) offers a bus service to North Attleborough alongside a Dial-a-Ride, a transportation service for senior citizens and disabled individuals. Though there are no direct stops in Town, residents can access the Massachusetts Bay Transportation Authority (MBTA) commuter train in nearby Attleboro or Mansfield. This commuter train travels into Boston.⁴⁷

The Mansfield Municipal Airport is located to the east of North Attleborough and provides access for small, private planes.⁴⁸

⁴⁶ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴⁷ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁴⁸ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

For pedestrian and biking options, the Town has a few formal bike lanes alongside a contiguous network of sidewalks especially near several local schools in Town and in the downtown neighborhood which is said to be “benefiting the EJ Community.” The Town is working to improve multimodal transportation options and overall access after completing a Complete Streets Gap Analysis.⁴⁹

Dams

The Town of North Attleborough has four high hazard potential dams and one significant hazard dam shown in Table 3.

Table 3. Dams in North Attleborough.

Dam Name	Owner Type	Hazard Potential
Greenwood Lake Dam	U.S. Fish & Wildlife Service	High
Hoppin Hill Reservoir Dam	City of Attleboro	High
Whiting Pond Dam	Town of North Attleborough	High
Falls Pond Dam	Town of North Attleborough	High
Melewski Pond Dam	Private	Significant

Economy

As of 2020, North Attleborough’s top industries by occupation according to the United States Census include:

- Educational services, healthcare and social assistance
- Retail trade
- Manufacturing.⁵⁰

The largest employers in the Town include the Walmart Supercenter and Lowe’s Home Improvement.⁵¹

⁴⁹ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁵⁰ “Industry By Occupation for the Civilian Employed Population 16 Years and Over ACS 5-Year Estimates.” (2020). United States Census Bureau.

⁵¹ North Attleborough Master Plan. (2023). Town of North Attleborough, Massachusetts.

Historic and Cultural Resources

Historic and cultural resources shape a community's character and identity while also creating a sense of place for residents and visitors. Many New England cities and towns are home to significant sites and structures that capture the history and heritage of an area. Some resources may date back centuries, like burial grounds, while others can be more recent, like newly designated historic districts. Their importance lies in what they mean to a community and how they represent its people and place. Historic and cultural resources can be at risk due to the negative impacts of natural hazards and climate change. This plan identifies these resources so the HMPC may consider their vulnerability and potential need for mitigation.

The Town has several archeological resources that date back to the "earliest period of Native American exploration and settlement of New England about 13,000 years ago."⁵² These sites were identified through a communitywide "archaeological reconnaissance survey" conducted in 2020 under the direction of the North Attleborough Historical Commission (NAHC).⁵³

The NAHC was formed in 1978 and since its formation, the Town has been able to inventory "structures of some historical significance." The NAHC has identified nineteen individual and district designations on the list of the National Historic Places and the State Register of Historic Places. The nineteen designated sites contain a total of 386 properties. According to the Town's most recent Open Space and Recreation Plan, the nineteen sites include:

1. Angle Tree Stone
2. Attleborough Fall Gasholder Building
3. Attleborough Falls Historic District
4. Barrows, H.F. Manufacturing Company Building
5. Coddington Farm
6. Commonwealth Avenue Historic District
7. Cottage-Freeman Historic District
8. Fire Barn
9. Grace Episcopal Church
10. High, Church, and Gould Streets Historic District
11. Holmes School Historic District

⁵² Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

⁵³ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

12. North Attleborough Town Center Historic District
13. Number 2 School
14. Old Towne Historic District
15. Richards Memorial Library
16. South Washing Historic District
17. Towne Street Historic District
18. Woodcock Garrison-Dagget, John House.
19. Woodcock-Hatch-Maxy House Historic District.⁵⁴

⁵⁴ Town of North Attleborough Open Space and Recreation Plan. (2021-2032). Town of North Attleborough, Massachusetts.

Chapter 3. Planning Process

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

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000
- Code of Federal Regulations – Title 44, Chapter 1, Part 201 (§201.6: Local Mitigation Plans)
- Federal Emergency Management Agency Local Mitigation Planning Policy Guide, (Effective April 11, 2025)
- In addition, the plan was prepared with the suggestions found in the Demonstrating Good Practices Within Local Hazard Mitigation Plans, FEMA Region 1, January 2017.

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

A priority through the planning process was equity, which FEMA defines as the “consistent and systematic fair, just and impartial treatment for all individuals.” This was a central theme throughout the planning process and effort was made to develop an inclusive planning process. The whole community (individuals, communities, private and nonprofit sectors, faith-based organizations, and all levels of government) were given an opportunity to participate.

The planning process for this updated mitigation plan began in September 2024 and concluded in May 2025 (this does not include the months of plan review and adoption). The Town developed a Municipal Vulnerability Preparedness (MVP) Program summary of findings in 2019. This planning effort contributed to the update of the mitigation plan. Below is a graphical display of the plan development timeline.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 4. Planning Process Schedule.

Tasks	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APRIL	MAY	JUN
Convene LHMP Committee	Kick-off Meeting	HMPC #1 Meeting			HMPC #2 Meeting & Public Meeting #1	HMPC #3 Meeting		HMPC #4 Meeting & Public Meeting #2		
Update Hazard Profiles			Draft Risk Assessment	Complete Risk Assessment						
Update Critical Facility Inventory										
Meet High Hazard Potential Dam (HHPD) Requirements		Review HHPD Plans	Conduct Outreach to HHPD Owners	Conduct HHPD Risk Analysis	Identify HHPD Actions & Meeting	Prioritize Actions with HHPD				
Update Mitigation Goals	Capability Assessment Meetings									
Update Actions			Previous Actions Meeting		New Actions Meeting	Final Mitigation Action List		Prioritize Mitigation Actions		
Plan Review, Evaluation, and Implementation								Complete Draft for HMPC Review		
Public Review of Draft									Public Review	
Review and Approval										Submit Plan to MEMA

Christopher Coleman, Fire Department Chief and Emergency Management Director, facilitated all activities related to the Mitigation Plan Update, including meeting logistics, data gathering, and public outreach. The Consulting Team met with Mr. Coleman on September 16, 2024, for a Kick-Off Meeting to review the planning process and timeline, and to discuss developing the HMPC, collecting GIS data if possible, and determining the status of previously identified mitigation actions.

Hazard Mitigation Planning Committee

The Fire Department Chief, Christopher Coleman, developed the Hazard Mitigation Planning Committee (HMPC) and was the point of contact for the Consulting Team. The HMPC included Town employees and officials who represented five sectors of the community shown in the table below. A full list of HMPC members is shown in the table after that. The HMPC met four times, October 21, 2024, January 6, 2025, February 10, 2025, and April 3, 2025. All the meetings were conducted via Zoom, however sometimes

Town of North Attleborough, MA Hazard Mitigation Plan Update

Town employees gathered at their Town offices. A list of participants at each of these meetings is included in the Appendix.

Table 5. Sectors of the Community Represented On HMPC.

Sectors of the Community	HMPC Members
Emergency Management	- Assistant Town Manager - Communications and Information Officer - Fire Department Chief & Emergency Management Director - Fire Department – Emergency Medical Services Coordinator - Health Director & Nurse - Police Chief - Town Manager - Town Planner
Economic Development	- Assistant Town Manager - Town Manager - Town Planner
Land Use and Development	- Assistant Town Manager - Conservation Commission – Administrative Coordinator - Director of Public Works - North Attleboro Electric – Assistant Operations Manager - North Attleboro Electric – General Manager/Electric Power Engineer - North Attleboro Electric – Operations Manager - Town Manager - Town Planner
Health and Social Services	Assistant Town Manager

Town of North Attleborough, MA Hazard Mitigation Plan Update

Sectors of the Community	HMPC Members
	• Communications and Information Officer • Council on Aging Director/Senior Center • Fire Department Chief & Emergency Management Director • Fire Department – Emergency Medical Services Coordinator • Health Director & Nurse • Police Chief • Town Manager • Town Planner
• Infrastructure	• Assistant Town Manager • Director of Public Works • North Attleboro Electric - Assistant Operations Manager • North Attleboro Electric – General Manager/Electric Power Engineer • North Attleboro Electric - Operations Manager • Town Manager • Town Planner

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 6. HMPC Members.

First Name	Last Name	Title	Affiliation	Phone	Email
Jon	Antonucci	School Superintendent	Town of North Attleborough	508-643-2100	jantonucci@naschools.net
Michael	Borg	Town Manager	Town of North Attleborough	508-699-0100 x2555	mborg@nattleboro.com
Peter	Clondas	North Attleboro Electric - Assistant Operations Manager	Town of North Attleborough	508-643-6372	pclondas@naelectric.com
Christopher	Coleman	Fire Chief/Emergency Management Director	Town of North Attleborough	508-699-0140 x5620	ccoleman@nattleboro.com
AnneMarie	Fleming	Health Director/Health Nurse	Town of North Attleborough	508-699-0100	amfleming@nattleboro.com
Gil	Hilario	Town Planner	Town of North Attleborough	508-699-0116	ghilario@nattleboro.com
Mark	Hollowell	Director of Public Works	Town of North Attleborough	508-695-9621	mhollowell@nattleboro.com
Carl	Johnson	North Attleborough Electric - Operations Manager	Town of North Attleborough	508-643-6331	cjohnson@naelectric.com
Brian	Kelley	Emergency Medical Services Coordinator - Fire Department	Town of North Attleborough	774-847-4411	bkelley@nattleboro.com

Town of North Attleborough, MA Hazard Mitigation Plan Update

First Name	Last Name	Title	Affiliation	Phone	Email
Sandra	McCrory	Conservation Administrator - Conservation Commission	Town of North Attleborough	508-699-0100 x2584	smccrory@nattleboro.com
Rick	McQuade	Police Chief	Town of North Attleborough	508-695-1212	rmcquade@nattleboro.com
Antonio	Morabito	Assistant Town Manager	Town of North Attleborough	508-699-0100 x 2555	amorabito@nattleboro.com
Taylor	O'Neil	Communications and Information Officer	Town of North Attleborough	508-699-0100 x2556	toneil@nattleboro.com
Peter	Schiffman	North Attleboro Electric - General Manager/Electric Power Engineer	Town of North Attleborough	508-643-6300	pschiffman@naelectric.com
Karen	Testa	Council on Aging Director/Senior Center	Town of North Attleborough	508-699-0100 x2631	ktesta@nattleboro.com

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

The Town of North Attleborough has a Town Manager and an elected Planning Board. The Planning Board is responsible for overseeing the long-term land use patterns of North Attleborough through their Zoning By-Laws, Subdivision Control Laws, Master Plan, and a Comprehensive Planning Process.

Stakeholders were invited to participate in the planning process through the HMPC, High Hazard Potential Dam (HHPD) meeting, public meetings, and plan review. Appendix A includes the agendas and flyers used to announce meetings and opportunities for participation. Press releases for each public meeting were also distributed. The Fire Department Chief with the support of other members of the HMPC, specifically the Communications and Information Officer, conducted outreach to local and regional agencies involved in hazard mitigation, Town boards and departments that regulate development, neighboring communities, as well as organization representatives that serve socially vulnerable populations, businesses, and academic institutions. The surrounding communities invited to participate included Plainville, MA, Mansfield, MA, Attleboro, MA, and Cumberland, Rhode Island.

The first HMPC Meeting was held on October 21, 2024. The meeting began with introductions and sharing the benefits of hazard mitigation planning as well as receiving existing plans and reports such as the newly updated Town Master Plan. A list of additional stakeholders was shared by the HMPC and included members of the school system, elected officials, the Conservation Commission, and the Council on Aging who were unable to attend the first meeting but would be part of the HMPC moving forward. The HMPC and consulting team went over future public outreach regarding the plan and noted communicating with neighboring communities that the Town has worked with in the past, alongside the Downtown Collaborative, Team Rubicon, MEMA, the American Red Cross, Southeastern Regional Planning and Economic Development District (SRPEDD), and the Mansfield Emergency Management Agency. Vulnerable populations were also identified and included the concentrations of mobile homes along Route 1 and the Plainville Town Line, the significant senior community which includes Circle Court, a senior housing establishment, and the lower-income neighborhood off Falmouth Street that is run by the Housing Authority.

The meeting then went on to an overview of the Town's capabilities which included some updates such as an updated MS4 Stormwater Permit, the Fire Department's Bucket Program that works to deliver salt and sand to the elderly to reduce slip and falls, a fair amount of personnel turnover, an increase in staffing within the Fire Department, improved social media engagement and education, and the lack of Floodplain Administrator. An initial list of critical facilities was also shared which included emergency facilities, schools, health services, various housing developments, hazardous waste buildings, potential

Town of North Attleborough, MA Hazard Mitigation Plan Update

new projects, and high hazard dams. The meeting then went on to a discussion of past and current hazards in North Attleborough. The HMPC shared that the Senior Center and Library could be used as cooling centers, and the Middle School is the primary shelter that has not been used. Additional notes include changes in groundwater like shallow wells and lakes that are in poor condition. Flooding from the Ten-Mile River and Falls Pond is significant and a major concern. The HMPC also shared that the work of their municipal electric department, trees have been managed well; however, some remote areas still deal with fallen trees and wind damage, such as those in the southwest corridor of the Town. The meeting then wrapped up with a draft of mitigation actions and goal statements.

The second HMPC Meeting was held on January 6, 2025. The meeting began with a discussion regarding public meeting outreach for the first public meeting that was planned for the end of the month. Outreach would include advertising on the Town website, using the Town Hall LED sign, sharing on social media, and using the resources available through the Communications and Information Office. The HMPC and consulting team then went on to review some of the capability assessment surveys and found that the Conservation Commission position is still vacant, the North Attleboro Electric Emergency Response Team has a “robust system,” the Town has strong Geographic Information System (GIS) capabilities, as well as good maintenance and outreach programs. The HMPC shared more on the Ten Mile River Flood Mitigation Project and discussed the National Flood Insurance Program properties present in the Town.

A brief update of the critical facility list was discussed before moving onto the Town’s risk assessment. Major takeaways included identifying culverts that need to be considered for replacement due to flooding such as those on Elm Street, Orne Street, and Arnold Road. The HMPC noted that they have had their fair share of brushfires and may need to consider the Algonquin Pipeline and the Liberty Utilities Gas Infrastructure Building in the earthquake risk section. Some community wide risks that were discussed included the Middle School that has partial air conditioning, areas of Town that can be isolated from downed trees or flooding due to having “one way in, one way out” such as Wild Acres Road and Diamond Street, and the Town having mobile and/or fixed generators present in Town if needed to minimize risk. The meeting wrapped up with a review of goal statements as well as an overview of the essential details needed for the mitigation actions in the mitigation action tracker, which was identified as the priority task for the HMPC moving forward.

The third HMPC Meeting was held on February 10, 2025. The meeting began with an overview of the first public meeting, and it was evident that flooding was a primary concern for the community. The HMPC then discussed the goal statements and wanted to include dredging the Ten-Mile River for the Spring and Summer as well as updating buildings and infrastructure which would be dependent on whether the new high school development would be approved in June 2025. Some buildings that need renovation include the local elementary schools and the Town Hall. There is also the possibility of a new fire station in the future. The HMPC then reviewed the hazard ranking list provided by the consulting team and were in approval with one suggestion of listing droughts as having a higher probability. The

Town of North Attleborough, MA Hazard Mitigation Plan Update

Town also mentioned that they were working on sending out a Public Service Announcement (PSA) about the Spotted Lantern Fly as a precautionary measure.

Problem statements were then reviewed for each of the hazards listed in the plan update. Some important comments included the need for more communication, standard operating procedures, and issues with dam breaches for floods. Some properties that are at risk are not Town-owned, so it was important to bring owners together to be educated on maintenance and upkeep, especially with dam infrastructure. The HMPC then stated the different strategies they employ for outreach regarding extreme temperatures which include holding events, updating webpages, social media, information flyers, and having the Town Manager visit local businesses to speak to residents about community-wide issues. For severe wind and winter storms, the HMPC wanted to keep up with their current practices, but noted that some sites need generators, such as the Senior Center. The HMPC also wants to increase outreach on water conservation during times of drought.

The meeting then went on to discuss the capability assessment which identified a strong planning and regulatory framework, administrative resources, the ability to leverage external financial resources, and the strong ongoing educational outreach. The Fire Department wants to work on getting to a Class 2 Fire Protection Certification as that was noted as a benefit to taxpayers. Some suggestions for improving existing capabilities included integrating more climate and hazard components within the Town bylaws and regulations, continuing professional development and training, and looking at the Massachusetts Community Preservation Act as a legislative option. The meeting wrapped up with looking over the status of the mitigation actions and the need for additional information and details in the coming weeks.

The fourth and final HMPC Meeting was held on April 3, 2025. In the meeting, the HMPC discussed the final stages of the plan, including a public meeting and a draft plan review. The plan would be posted on the Town website and social media threads. The HMPC also planned to reach out to vulnerable populations for their input. The consulting team then went on to discuss the organization of hazards into high, moderate, and low categories, emphasizing that the order of mitigation does not necessarily follow this categorization. Some clarification on how to mitigate risk to the Riverview Mobile Home Park was discussed, and the HMPC suggested better communication, emergency notification, response, and evacuation planning.

The HMPC discussed potential issues with the Ten Mile River and the Riverview area. They considered the impact of dredging on the river's flow and its potential to reduce flooding risks. They also discussed the challenges of accessing properties along the Greenwood Lake Dam, particularly in emergency situations. The possibility of alternative access through Oak Ridge Avenue was explored, but it was noted that this would require collaboration with the Federal Government and the fish hatchery. The HMPC and consulting team also discussed the need for fencing or a cage structure to prevent access to the Whiting Pond dam, which could be funded through a capital project.

Town of North Attleborough, MA Hazard Mitigation Plan Update

The meeting wrapped up with the plan update's overall organization and contents, emphasizing the importance of the mitigation strategy and the need for community input. The consulting team clarified that the plan is a living document, subject to change, and that it is not a commitment to action. Plan maintenance and implementation was then reviewed so that the plan would be implemented beyond the planning process that was undertaken to complete the plan update.

HHPD1: Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?

In addition to the four HMPC meetings, the Town and consulting team met to discuss High Hazard Potential Dams on January 14, 2025. The meeting was held with members of the HMPC, Department of Public Works, United States Fish and Wildlife, MEMA, and dam owners. The Office of Dam Safety was invited to the meeting. The meeting discussed the importance of including dams within the updated plan. It was noted that North Attleborough has four High Hazard Potential Dams (HHPDs) and one Significant Hazard Dam, which all represent critical infrastructure in the Town. The meeting participants shared current resources and practices which included Emergency Action Plans (EAPs) for all the High Hazard Dams alongside inundation areas mapped in GIS, scenario and hydrologic modeling, and annual and five-year inspections. Key actions moving forward were to improve collaboration between North Attleborough and Attleboro on dam safety and removal plans, as well as developing internal communication protocols regarding grant application and studies and enhancing security for Falls Pond Dam. The meeting then went on to review risk summaries for each of the dams and the general downstream risks included flooding of residential and commercial areas, infrastructure damage, and ecological impacts. The meeting participants shared that controlled releases and storm management will require improved predictive tools in the future. There was a brief overview of the Fire Department's resources regarding the dams which included being equipped with water rescue teams and high-water response resources, as well as having mutual aid agreements in place during emergencies. Risk and resilience studies were suggested for future actions that the Town and dam owners could undertake.

The HMPC also participated in two public meetings, one on January 29, 2025, and one on April 14, 2025. Finally, the HMPC reviewed the draft Town of North Attleborough, MA Hazard Mitigation Plan Update prior to sending it to the Massachusetts Emergency Management Agency (MEMA) for their review in May 2025.

Public Outreach

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

Town of North Attleborough, MA Hazard Mitigation Plan Update

The Public Outreach Strategy was designed to involve the whole community in the mitigation planning process. The public was engaged in the planning process during the drafting of the plan and prior to plan approval through two public workshops (a flyer for the workshop is shown below). Each public meeting was held virtually. The public was also given a chance to look over the plan and provide feedback prior to its review by MEMA or FEMA. The purpose of public engagement was to:

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

Each public meeting included a PowerPoint presentation and plenty of opportunities for questions and discussion. The HMPC participated in each meeting.

COMMUNITY LIFELINES are the most fundamental services in the community that, when stabilized, enable all other aspects of society.

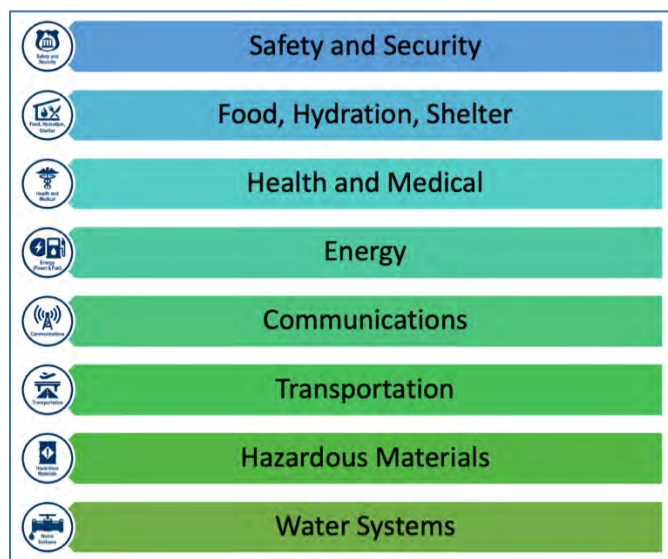


Figure 5. Community Lifelines.

Representatives from all community lifelines were included in public engagement efforts. Community lifelines are a driving force behind FEMA's strategic goals for building a culture of preparedness and readying the nation for catastrophic disasters. The eight community lifelines can be a powerful tool for local governments when evaluating risk and developing mitigation actions. The HMPC considered the eight community lifelines when conducting outreach through this planning process. The eight community lifelines and their respective components are shown in the figure to the left.

Outreach for the public meetings and for plan review was sent via press release, email blasts, connecting with vulnerable populations such as the elderly community via the Council on Aging, using the Town's robust social media pages, posting on the Town's LED sign outside of the Town Hall, and reaching out to local and regional partners like the Town's Housing Authority, Lenora's Pantry, and the Southeastern Regional Planning & Economic Development District (SRPEDD). The Town website (<https://www.nattleboro.com/>) included announcements for meetings, the press releases were sent to local organizations, using online platforms like the Town's

Town of North Attleborough, MA Hazard Mitigation Plan Update

social media pages, and posted around the Town at frequented buildings such as the Town Hall, Council on Aging, and Housing Authority.

Information gathered during the public meetings contributed to the plan's development. The first public meeting was held via Zoom and in person at the JoAnn Cathcart Conference Room in Town Hall on January 29, 2025, in conjunction with a Local Emergency Planning Committee meeting.

The meeting asked participants a series of questions to engage them and help them understand the process of developing a hazard mitigation plan. The questions are listed below.

- Who lives and works in your community?
- What buildings and infrastructure are critical to your community?
- What weather related hazards can impact your community?
- Name specific locations in your community that flood or are vulnerable to natural hazards.
- What can be done to mitigate the risks you have identified? Think of activities to protect the people, buildings, and infrastructure named previously.

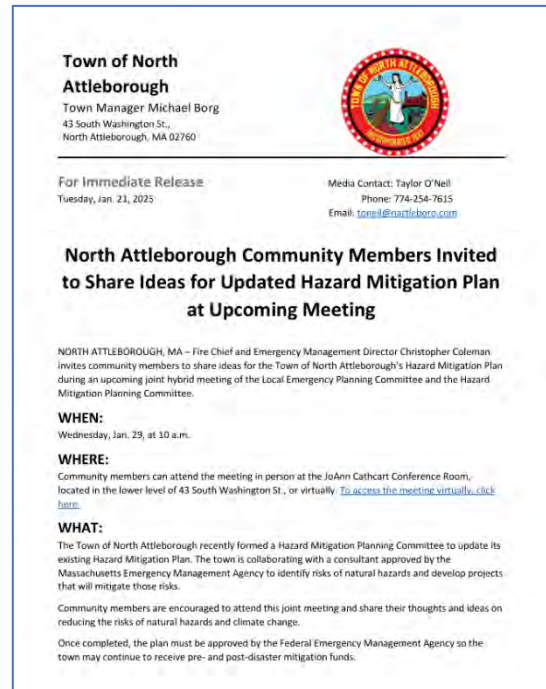


Figure 6. Public Meeting Flyer.

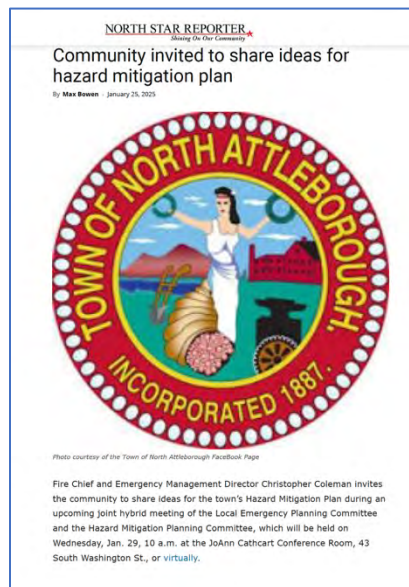
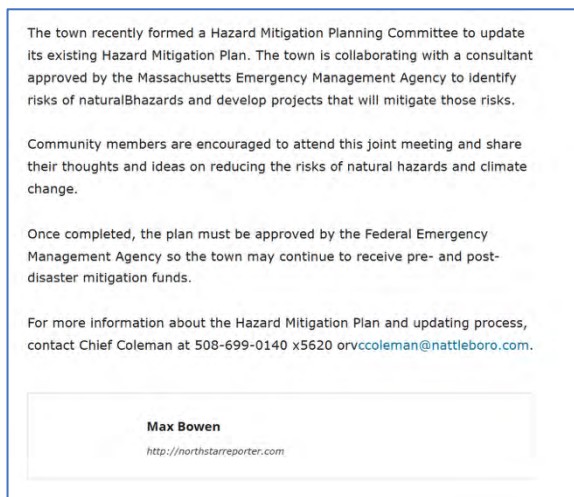


Figure 7. Screen Shot of North Star Reporter Article.

To the left is a screen shot from a North Star Reporter article advertising the first public meeting. The remainder of the article is shown below.



Town of North Attleborough, MA Hazard Mitigation Plan Update

The discussion also included residents' concerns about sewage backups exacerbated by rainwater infiltration and illegal sewer connections, with personal accounts of flooding in basements. The impact of new developments on the sewer system was debated, with suggestions for implementing laws to inspect basements for illegal connections. Additionally, the participants discussed specific flooding risks, such as high water levels in Falls Pond and areas prone to flooding, emphasizing the need for attention to disadvantaged communities. The consulting team encouraged residents to participate in identifying natural hazards and highlighted the importance of risk analysis in emergency planning.

The second public meeting was held on April 14, 2025, virtually on Zoom as well as in-person. There were at least eight participants online as well as those in-person. Discussion points and questions during the meeting included power outages and mitigating risk due to lack of power, as well as, whether water

and or sewer would still be running. The response was that because the major plants and critical facilities have backup generators, the Town has the capacity to respond to such events. There was also mention of funding and issues getting financial resources to undergo some of the larger Town projects such as the work needed for the Ten Mile River. The Town also aims to continue tracking incidents and damage reporting through new software. The consulting team also shared some disaster preparedness information and suggested residents sign up for CodeRed to be informed of any issues or emergencies.

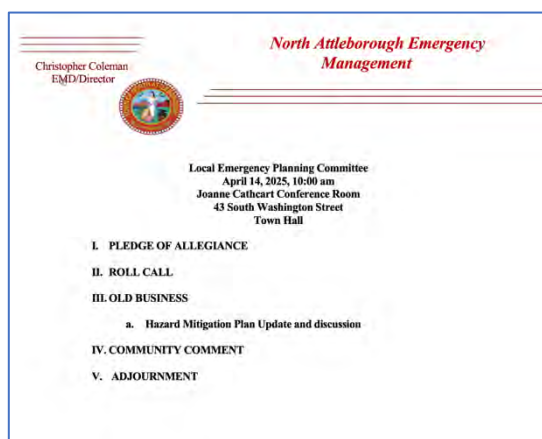


Figure 8. Agenda for Public Meeting Two.

Contributions from the HMPC and public engagement impacted the plan in multiple ways. The table below indicates some of the contributions, others are included above and throughout the plan.

Table 7. Where Public Engagement Informed the Plan.

Area of the Plan Impacted	Contributions
Planning Area Profile	The HMPC updated the list of critical facilities. They also contributed information regarding current land use practices and priorities.
Planning Process	Participated in every aspect of the planning process and made recommendations regarding how to engage the public and key stakeholders.
Risk Assessment	- Described extent of hazard impacts based on previous events. - Offered first-hand insight and experiences of residents.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Area of the Plan Impacted	Contributions
	Added the qualitative review to the risk analysis for determination of the hazard risk ranking.
Capability Assessment	- Contributed plans, bylaws, and reports for review. - Completed three Capability Assessment questionnaires including the National Flood Insurance survey and the Safe Growth survey.
Mitigation Strategy	- Identified and prioritized mitigation actions based on their concerns. - Focused on the concerns raised by community members.
Implementation Plan	Committed to integrating this plan more thoroughly throughout Town government and to posting the plan on the Town's website.

List of Key Stakeholders Invited to Public Meetings

- North Attleborough Town Departments
- North Attleborough Boards and Committees
- North Attleboro Electric
- Neighboring Communities (Plainville, MA, Mansfield, MA, Attleboro, MA, and Cumberland, Rhode Island)
- Southeastern Regional Planning & Economic Development District
- Town Residents

Town of North Attleborough, MA Hazard Mitigation Plan Update

Review of Draft Plan

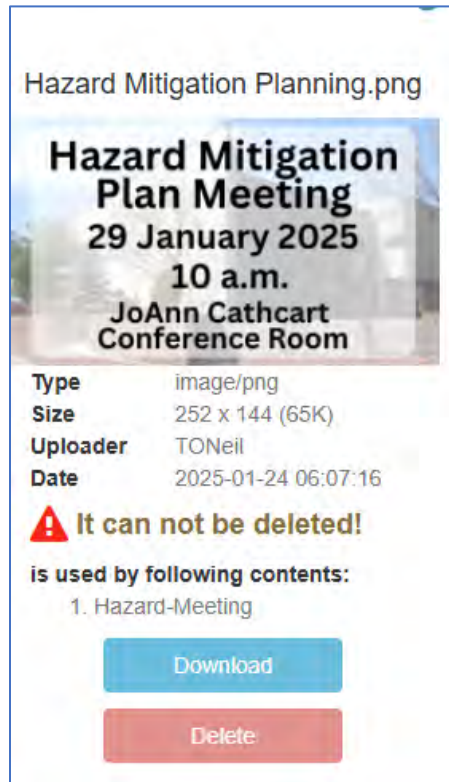


Figure 9. Picture of Town LED Sign Advertising the January Public Meeting.

The Town made the plan available for public review in May 2025. A press release announcing the availability to review the plan was sent and the announcement was posted to the Town website. The HMPC connected with neighboring communities to announce the plans availability for review by sending personal emails to people in similar positions in adjacent communities and making announcements at regional meeting they attended. The HMPC sent emails to Town employees, committees, and boards. Hard copies of the plan were kept in the Town Hall and Council on Aging. An electronic version would also be made available on the Town's website. An electronically available comment form via Google was provided for the public to offer feedback on the plan's content. The Fire Department Chief was available to receive comments from the public if needed.

Chapter 4. Risk Assessment

Hazard Identification

RISK for the purpose of hazard mitigation planning, is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources.

The first step in the risk assessment was to revisit and evaluate the hazards identified for study and inclusion in the Town’s previous hazard mitigation plan. This was a key topic of discussion at the first Hazard Mitigation Planning Committee (HMPC) meeting, along with the consideration of any additional hazards to include in the updated risk

assessment. While only natural hazards are required to be addressed by FEMA, other hazards such as technological and human-caused hazards may be included if they are of significant concern to the community and determined to be a mitigation priority.

In completing the updated hazard identification process, the HMPC considered the results of the Town’s Municipal Vulnerability Preparedness (MVP) planning effort (completed in 2019), as well as the “ResilientMass Plan” (2023⁵⁵) which is the formal update to the 2018 State Hazard Mitigation and Adaptation Plan (SHMCAP). As a result of this process all hazards from the prior hazard mitigation plan (adopted in 2019) remain in this updated risk assessment. Coastal hazards were not included because North Attleborough is a land-locked community in Eastern Massachusetts. For this updated assessment, some hazards have been consolidated or renamed to be consistent with the ResilientMass Plan, as further described below. The top natural hazards identified for the MVP effort are thoroughly covered in this assessment, which are flooding, winter storms, wildfires, wind events, and extreme weather. Invasive species as a hazard was added to reflect the concern for this becoming a more prevalent challenge with projected climate change; and to ensure that the risk assessment is aligned with the ResilientMass Plan.

Landslides were initially screened for inclusion in this plan update, but a review of landslide susceptibility revealed that only a handful of undeveloped properties were potentially at risk. Furthermore, the Community Resilience Building Summary Report for North Attleborough does not identify landslides as a primary concern; and the 2019 edition of the HMP did not identify any previous incidences of landslides within North Attleborough, nor were any incidents or areas of concern identified by the HMPC over the last five years. As a result of this screening exercise, landslides were dropped from further analysis.

⁵⁵ <https://www.mass.gov/doc/resilientmass-plan-2023>

Town of North Attleborough, MA Hazard Mitigation Plan Update

In summary, all relevant hazards identified in the ResilientMass Plan were carried forward and addressed in this risk assessment chapter, with the exception of landslides for the reasons provided above; and coastal hazards (flooding and erosion) which are not applicable due to the inland location. Furthermore, the hazard “flooding from precipitation and dam overtopping” from the ResilientMass Plan was separated into “flooding from precipitation” and “flooding from dam failure and overtopping” in this plan to facilitate review under the HHPD element of the Local Plan Review Tool. The profiled hazards are as follows:

The profiled hazards are as follows:

- Average/Extreme Temperatures
- Drought
- Earthquakes
- Flooding from Precipitation
- Flooding from Dam Failure or Overtopping
- Hurricanes and Tropical Storms
- Invasive Species
- Other Severe Weather
- Severe Winter Storms
- Tornadoes
- Wildfires

One “hazard” profiled in the ResilientMass Plan – “changes in groundwater” – is included as appropriate in the flood and drought hazard profiles in this plan.

Massachusetts Emergency Declarations

The Town of North Attleborough has been subject to numerous federal disaster declarations along with the entirety of Bristol County. Some of these disaster declarations correspond to emergency declarations in portions of Massachusetts. The following table cross-references the 13 Massachusetts emergency declarations starting in 2011 with the corresponding federal disaster declarations. All the Massachusetts emergency declarations corresponding to North Attleborough have involved natural hazards addressed in this plan except for the shelter capacity crisis, which is not a natural hazard and not profiled in this plan. Hazards that do not appear in this table (i.e., earthquakes) have not been subject to Massachusetts emergency declarations.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 8. Massachusetts Emergency Declarations.

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance Available	Applicable to North Attleborough?
Storm Lee	9/15/2023	9/17/2023	EM-3599-MA	All counties	Yes
Severe Weather and Flooding	9/11/2023	9/13/2023	DR-4780-MA	Not applicable	Yes
Shelter Capacity Crisis	8/8/2023	Pending	Not applicable	Not applicable	Yes, but not a natural hazard and not a FEMA declaration for Massachusetts
COVID-19	3/10/2020	5/11/2023	DR-4496-MA	All counties	Yes
Merrimack Valley Gas Explosion	9/14/2018	10/4/2018	Not applicable	Not applicable	No
Coastal Storm	3/3/2018	3/6/2018	DR-4372-MA	Essex, Norfolk, Plymouth, Bristol, Barnstable, and Nantucket Counties	No
Winter Storm	2/9/2015	2/25/2015	Not applicable	Not applicable	Yes
Winter Storm	1/26/2015	1/28/2015	DR-4214-MA	Worcester County and eastward	Yes
Winter Storm	2/8/2013	2/13/2013	DR-4110-MA	All counties	Yes
Hurricane Sandy	10/27/2012	11/1/2012	DR-4097-MA	Suffolk, Bristol, Plymouth, Barnstable, Dukes, and	Yes

Town of North Attleborough, MA Hazard Mitigation Plan Update

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance Available	Applicable to North Attleborough?
				Nantucket Counties	
Nor'easter	10/29/2011	11/7/2011	DR-4051-MA	Berkshire, Franklin, Hampshire, Hampden, Worcester, and Middlesex Counties	No
Hurricane Irene	8/26/2011	9/6/2011	DR-4028-MA	Berkshire, Franklin, Hampshire, Hampden, Norfolk, Bristol, Plymouth, Barnstable, and Dukes Counties	Yes
Tornadoes	6/1/2011	6/19/2011	DR-1994-MA	Hampden and Worcester Counties	No

Link to Massachusetts Climate Change Assessment

The 2022 *Massachusetts Climate Change Assessment* report was issued in December 2022 (<https://www.mass.gov/info-details/massachusetts-climate-change-assessment#read-the-report->). This report provided statements about the impacts of climate change in five sectors within each of seven designated regions of Massachusetts. North Attleborough is in the “Eastern Inland” region shown in purple in the figure below.

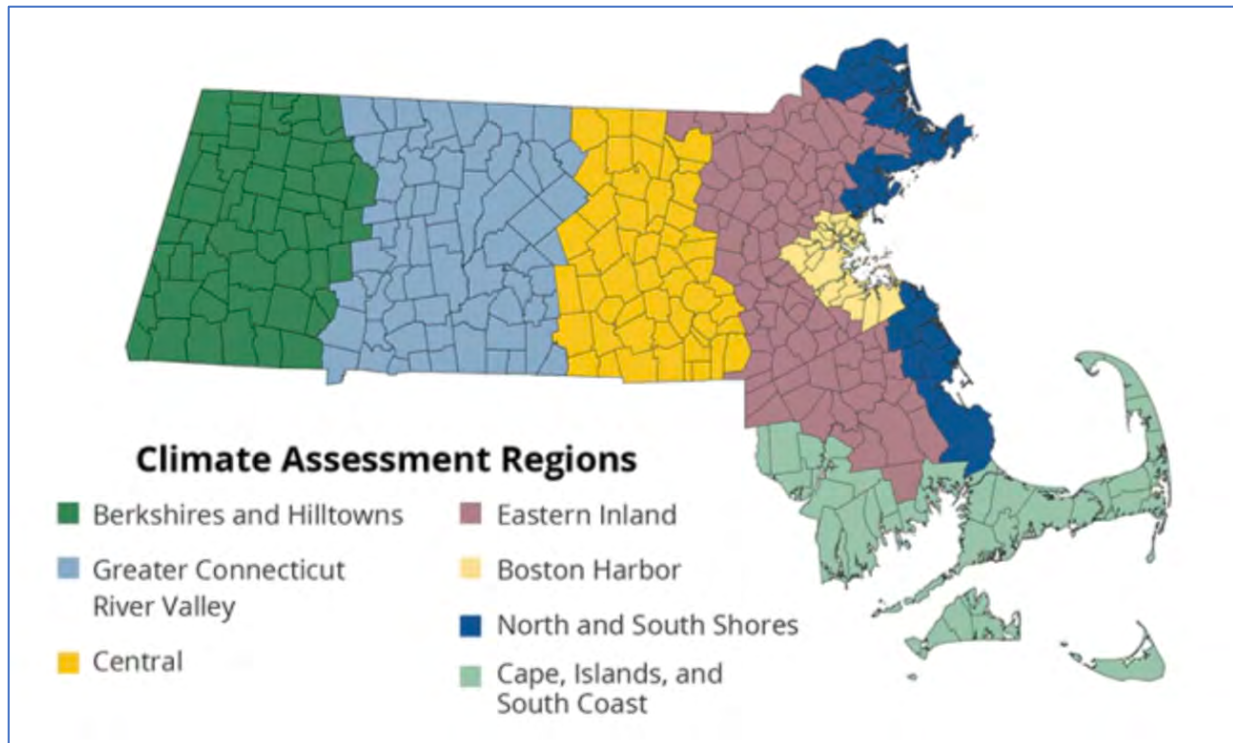


Figure 10. Climate Assessment Regions. North Attleborough is in the Eastern Inland Region.

The table below lists the top two or three impacts of climate change in each of the five sectors within this region.

Table 9. Top Impacts of Climate Change per Sector in Eastern Inland Region.

Sector	Top Impacts per Sector	Comments
Human	Increase in vector-borne disease incidence and bacterial infections	Including West Nile Virus and Lyme due to favorable conditions for mosquitoes and ticks
	Reduction in food safety and security	Causes are production and supply chain issues as well as spoilage during power outages
Infrastructure	Damage to electric transmission and utility distribution infrastructure	From heat stress and extreme storms
	Damage to inland buildings	From heavy rainfall and overwhelmed drainage systems
	Damage to rails and loss of rail / transit service	From flooding and track buckling during high heat events

Town of North Attleborough, MA Hazard Mitigation Plan Update

Sector	Top Impacts per Sector	Comments
Natural Environment	Freshwater ecosystem degradation	Causes are warming waters, drought, and runoff
	Forest health degradation	Causes are warming temperatures, changing precipitation, wildfire frequency, and increasing pests
Governance	Increase in costs of responding to climate migration	Includes planning for abrupt increases in local populations
	Increase in demand for State and municipal services	Emergency response, food assistance, and health care
Economy	Reduced ability to work	For outdoor workers during extreme heat, as well as commuting delays due to damaged infrastructure
	Reduction in availability of affordably priced housing	Direct damage (floods) and scarcity caused by demand

The Town proposes to incorporate these top climate change impacts in this edition of its plan as outlined below.

Table 10. How This Plan Addresses the Top Impacts of Climate Change per Sector.

Sector	Top Impacts per Sector	Approach to Incorporating Impacts
Human	Increase in vector-borne disease incidence and bacterial infections	Not applicable; addressed in other plans.
	Reduction in food safety and security	Local droughts that impact food security will be addressed. Food safety and security nationwide will not be directly addressed, but the capability assessment will help describe Townwide capabilities for food security.
Infrastructure	Damage to electric transmission and distribution	Severe weather events that damage transmission and distribution are hazards profiled in this plan.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Sector	Top Impacts per Sector	Approach to Incorporating Impacts
	Damage to buildings	Damage to buildings is addressed in the vulnerability assessment for each hazard.
	Damage to rails and loss of rail / transit service	Damage to rail lines and transit services are addressed in the vulnerability assessment for each hazard.
Natural Environment	Freshwater ecosystem degradation	Changes in precipitation, drought, and invasive species are all hazards addressed in this plan.
	Forest health degradation	Extreme temperatures, changing precipitation, wildfires, and invasive species are all hazards addressed in this plan.
Governance	Increase in costs of responding to climate migration	The capability assessment and related mitigation actions will help address response functions.
	Increase in demand for State and municipal services	The capability assessment and related mitigation actions will help address increased demands for municipal services.
Economy	Reduced ability to work	Extreme temperatures and potential damage to transportation infrastructure are addressed in this plan.
	Reduction in availability of affordably priced housing	The individual hazards addressed in this plan can reduce the availability of affordably priced housing, and the specific actions for each hazard will help protect housing options and opportunities.

B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR §201.6(c)(s)(i))

B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does the summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR §201.6(c)(s)(ii))

Hazard Profiles

IMPACTS are the consequences or effects of each hazard on the participant’s assets identified in the vulnerability assessment. For example, impacts could be described by referencing historical disaster damages with an estimate of potential future losses (such as percentage of damage vs. total exposure).

The risk assessment for the ResilientMass Plan describes the natural hazards that have the potential to impact the Commonwealth and provides the underlying narrative for this hazard profile for the Town. Because this section repeats information from the ResilientMass Plan, some citations have been removed for brevity. The original citations can be found in the ResilientMass Plan.

Profiles have been developed for each identified hazard, organized by primary climate change interaction. Hazard profiles include the following sections: Hazard Description, Location, Previous Occurrences, Extent, Probability of Future Events, and Vulnerability Assessment; these are described in the table below.

Table 11. Hazard Characterization.

Category/Method	Definition
Description	Description of hazard, its characteristics, and potential effects.
Location	Describes geographic areas within the Town that are affected by the hazard.
Previous Occurrences	Provides information on the history of previous hazard events for the region, including their impact on people and property.
Extent	Describes potential strength or magnitude of a hazard. Where possible, extent is described using established scales.
Vulnerability Assessment	Describes potential impact on the community, including estimated potential losses and the anticipated effects of climate change.
Probability of Future Events	Describes likelihood of future hazard occurrences in the Town based on best available and climate-informed science.

To describe previous occurrences, this plan update highlights major events from history but relies primarily on a roughly ten-year lookback (2014 through 2024) ending with any events from the date of plan development (2024-2025). This helps maintain a concise narrative. Where applicable, narratives about warning times (i.e., floods, heat advisories, and wildfires) are incorporated into the “Extent” subsections.

The vulnerability assessment characterizes how hazards have impacted and may impact the different aspects of the community. In the vulnerability assessment sub-sections, the magnitude and likelihood of a hazard event are evaluated, and impacts are quantified using hazard models. Some hazards, like earthquakes and winter storms, will impact the entire community while other hazards, like floods and landslides, impact specific locations in the community. The areas that could be impacted are defined as the community's exposure. The results of the vulnerability assessment are used to help identify mitigation measures the community may take to lessen the impact and better understand their benefits.

Average and Extreme Temperatures

According to the ResilientMass Plan, extreme heat for Massachusetts is usually defined as daily high temperatures above 90 degrees Fahrenheit (°F) which may be accompanied by high humidity. Extreme cold is also considered relative to the normal climatic lows in a region. Extreme cold is a period of excessively low temperatures, particularly with the addition of wind chill. The ResilientMass Plan notes that typically in Massachusetts the highest temperatures are experienced in the southeast where North Attleborough is generally located while the coldest are typical in the northwest.

Description

Extreme cold is a dangerous situation that can result in health emergencies for susceptible or vulnerable people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat. Extreme cold events are events when temperatures drop well below normal in an area. When winter temperatures drop significantly below normal, staying warm and safe can become a challenge. Extremely cold temperatures often accompany a winter storm, which may also cause power failures and icy roads. During cold months, carbon monoxide may be high in some areas because the colder weather makes it difficult for car emission control systems to operate effectively, and temperature inversions can trap the resulting pollutants closer to the ground.

Likewise, extreme heat is a dangerous situation that can result in health emergencies for susceptible and vulnerable people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without adequate cooling.

A heat wave is defined as three or more days of temperatures of 90°F or above. A basic definition of a heat wave implies that it is an extended period of unusually high atmosphere-related heat stress, which causes temporary modifications in lifestyle, and which may have adverse health consequences for the affected population. Heat waves cause more fatalities in the U.S. than the total of all other meteorological events combined. According to the EPA, more than 11,000 Americans have died from heat-related causes (EPA, 2016) since 1979.⁵⁶

⁵⁶ <https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths#:~:text=Some%20statistical%20approaches%20estimate%20that,set%20shown%20in%20Figure%201.>

Town of North Attleborough, MA Hazard Mitigation Plan Update

Heat impacts can be particularly significant in urban areas. Buildings, roads, and other infrastructure replace open land and vegetation. Dark-colored asphalt and roofs also absorb more of the sun's energy. These changes cause urban areas to become warmer than the surrounding areas. This forms "islands" of higher temperatures, often referred to as "heat islands." Heat islands can affect communities by increasing peak energy demand during the summer, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and death, and water quality degradation (EPA).

Many conditions associated with heat waves or more severe events (including high temperatures, low precipitation, strong sunlight, and low wind speeds) contribute to a worsening of air quality in several ways. High temperatures can increase the production of ozone from volatile organic compounds and other aerosols. Weather patterns that bring high temperatures can also transport particulate matter air pollutants from other areas of the continent. Additionally, atmospheric inversions and low wind speeds allow polluted air to remain in one location for a prolonged period of time.

Location

The Massachusetts Climate Assessment (2022) explains that recent efforts to characterize extreme heat have underscored that risks are present throughout the entire commonwealth. Therefore, the entire Town of North Attleborough is subject to extreme heat. As with the entire Commonwealth, North Attleborough is also exposed to extreme cold temperatures.

Previous Occurrences

Extreme Cold: The ResilientMass Plan notes that since 1995, there have been 120 cold weather events within the Commonwealth, ranging from Cold/Wind Chill to Extreme Cold/Wind Chill events. The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists only one extreme cold and/or wind chill events for the area of North Attleborough during the timeframe 2014-2024 (February 2016).

Extreme Heat: The ResilientMass Plan notes that according to the NOAA Storm Events Database there have been 118 warm weather events (Heat to Excessive Heat events) between 2010 and 2022. Excessive heat results from a combination of temperatures well above normal and high humidity. Whenever the heat index values meet or exceed locally or regionally established heat or excessive heat warning thresholds, an event is reported in the database.

In 2012, Massachusetts temperatures broke 27 heat records. Most of these records were broken between June 20 and June 22, 2012, during the first major heat wave of the summer to hit Massachusetts and the East Coast. In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the Heat Index reached 100°F. August 2022 was the hottest August on record for the Commonwealth, and 2020

Town of North Attleborough, MA Hazard Mitigation Plan Update

and 2022 were the two hottest records for the State. Boston experienced two six-day heat waves and 17 days above 90 degrees in 2022.

The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists historic extreme heat events for the area of North Attleborough but none in the timeframe 2014-2024. Nevertheless, evidence demonstrates that several extreme heat events occurred in North Attleborough. According to the HMPC, cooling centers were most recently opened in June 2024 including the Senior Center and the Richards Memorial Library. The HMPC noted that the Middle School (primary shelter) has only partial air conditioning.

Cold events are typically reported with winter storms and will be described in the winter storm section of this chapter. The HMPC reported that warming centers have not been opened in the past decade. If needed, the Middle School (primary shelter) would be opened as a warming center.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>. The events related to extreme temperatures in Bristol County are listed below.

Table 12. USDA Disaster Events That Refer to Extreme Temperatures.

Year	Event	Event “Begin Dates”
2023	Frost and freeze	5/17/2023
2016	Frost and freeze; freeze and unseasonably warm temperatures	2/14/2016
2014	Below average temperatures and excessive ice	1/21/2014

Extent

Extreme Cold: The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when they are outside, and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body loses heat at a faster rate, causing the skin’s temperature to drop. The National Weather Service (NWS) issues a Wind Chill Advisory if the Wind Chill Index is forecast to dip to –15°F to – 24°F for at least 3 hours, based on sustained winds (not gusts). The NWS issues a Wind Chill Warning if the Wind Chill Index is forecast to fall to –25°F or colder for at least 3 hours. On November 1, 2001, the NWS implemented a Wind Chill Temperature Index (Figure 11) designed to more accurately calculate how cold air feels on human skin.

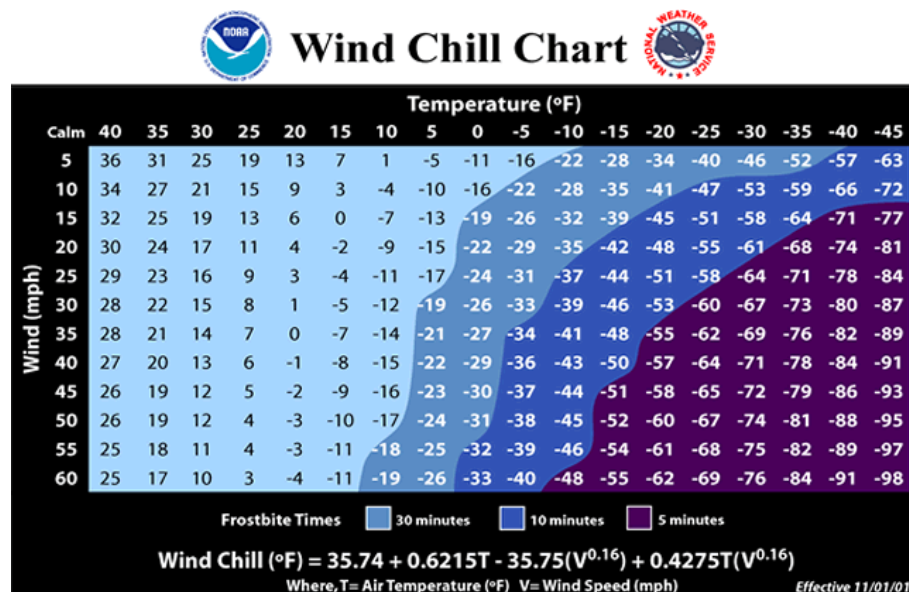


Figure 11. NWS Wind Chill Temperature Index and Frostbite Risk.

Extreme Heat: The NWS issues a Heat Advisory when the NWS Heat Indices are between 95 and 99 degrees for two or more hours or two consecutive days, or if they are between 100 and 104 degrees for two or more hours in a single day. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105°F or higher for 2 or more hours. The NWS Heat Index is based both on temperature and relative humidity and describes a temperature equivalent to what a person would feel at a baseline humidity level. It is scaled to the ability of a person to lose heat to their environment. Exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can increase the risk of heat-related impacts.

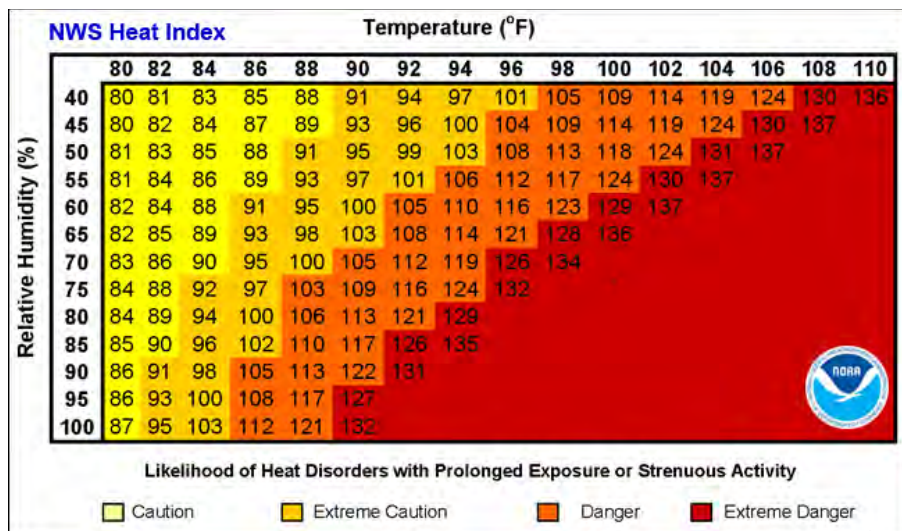


Figure 12. NWS Heat Index Chart.

The NWS advisory and warning products are applicable to all extreme temperature events that may affect North Attleborough, as they are used throughout Massachusetts on a routine basis and appropriately characterized the most recent extreme cold and heat events over the last few years. Extreme temperatures have not been characterized outside of the NWS advisory/warning systems.

Vulnerability Assessment

Exposure

Extreme temperatures are a hazard with no defined geographic boundary. The entire Town should be considered exposed to the hazard.

Excessive heat can occur at any time during the year but is most dangerous during the summer months of June through August, when average temperatures are at their highest. The hottest month of the year in North Attleborough is July, with an average high temperature of 82°F. Extreme heat for the region is typically defined as three or more consecutive days above 90°F.

Extreme cold for the region is considered to occur when temperatures are well below normal and accompanied by winds, which introduce wind chill factors that can be extremely harmful to exposed skin. Extreme cold is common in North Attleborough from December through February, with an average daily high temperature of 42°F. The coldest month is January, with an average low of 21°F and high of 37°F. Based on previous occurrences, the previous Town of North Attleborough HMP (July 2019) characterized extreme temperature as a medium frequency, minor severity event, with an extensive (Town-wide) area of impact.

Built Environment Impacts

The impacts of excessive heat are most prevalent in developed areas. Secondary impacts of excessive heat are severe strain on the electrical power system and increased potential for brownouts or blackouts. Extreme heat can have a negative impact on transportation infrastructure. Highways and roads are damaged by excessive heat as asphalt roads soften and concrete roads expand and can buckle, crack, or shatter. Moreover, concrete has been known to "explode," lifting chunks of concrete and putting those nearby at serious risk. Heat also places stress on automobile cooling systems, diesel trucks, and railroad locomotives, which leads to an increase in mechanical failures. Steel rails are at risk of overheating and warping, which can lead to train derailments.

Extreme cold weather poses a significant threat to utility production, which in turn threatens facilities and operations that rely on utilities, specifically climate stabilization. As temperatures drop and stay low, increased demand for heating places a strain on the electrical system, which can lead to temporary outages. These outages can impact operations throughout the Town, which can result in interruptions and delays in services. Broken pipes may cause flooding in buildings, causing property damage and loss of utility service. Some of the secondary effects presented by extreme/excessive cold include dangerous conditions to livestock and pets.

Climate change will increase the probability of extreme temperatures which may impact utilities, transportation, and especially older structures. Future development should consider keeping more mature trees, creating less dark asphalt-covered areas, and creating more natural areas.

According to the ResilientMass Plan, extreme temperatures are projected to increase annual transportation infrastructure maintenance costs by over \$140 million (across the Commonwealth) by the end of the century.

Population Impacts

Extreme cold events are predicted to decrease in the future, while extreme heat days, as well as average temperatures are projected to increase. The projected increase in extreme heat and heat waves is the source of one of the key health concerns related to climate change. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. People who perform manual labor, particularly those who work outdoors, are at an increased risk for heat-related illnesses. Prolonged heat exposure and the poor air quality and high humidity that often accompany heat waves can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

The greatest danger from extreme cold is to people, as prolonged exposure can cause frostbite or hypothermia, and can become life threatening. Body temperatures that are too low affect the brain,

Town of North Attleborough, MA Hazard Mitigation Plan Update

making it difficult for the victim to think clearly or move well. This makes hypothermia particularly dangerous for those suffering from it, as they may not understand what is happening to them or what to do about it. Hypothermia is most likely at very cold temperatures but can occur at higher temperatures (above 40 degrees Fahrenheit) if the person exposed is also wet from rain, sweat, or submersion. Warning signs of hypothermia include shivering, exhaustion, confusion, fumbling hands, memory loss, slurred speech, or drowsiness. In infants, symptoms include bright red, cold skin and very low energy. A person with hypothermia should receive medical attention as soon as possible, as delays in medical treatment may result in death.

During the HMPC #1 meeting (October 21, 2024), attendees noted that the Town has not opened Warming Centers in the past ten years. It was mentioned that some multi-family homes and mobile parks use alternative fuels for heat sources during the cold months and that this could increase the urban fire risk. A few structure fires have been related to the use of space heaters.

Older adults are often at elevated risk from exposure to extreme temperatures due to a high prevalence of pre-existing and chronic conditions. In the Town of North Attleborough, an estimated 15.3% of the population is age 65 and older (U.S. Census, 2020). People who live in older housing stock and in housing without air conditioning have increased vulnerability to heat-related illnesses. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool during extreme heat. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage. Heat impacts are more likely to be felt by residents without air conditioning, those who work outdoors, and those with underlying health conditions such as heart disease.

The North Attleborough Senior Center (the Council on Aging Building, located at 204 Elm Street) and the Richards Memorial Library (118 N. Washington Street) typically open as cooling (air-conditioned) shelters during excessive heat watch periods.

Extreme heat can pose severe and life-threatening problems for people. According to the NWS, it is one of the leading weather-related killers in the U.S., resulting in hundreds of fatalities each year and even more heat-related illnesses. Extreme heat has a special impact on the most vulnerable segments of the population - the elderly, young children and infants, impoverished individuals, and people who are in poor health. The high-risk population groups with specific physical, social, and economic factors that make them vulnerable include:

- Older people (age > 65)
- Infants (age < 1)
- Homeless population
- Very low- and low-income people

Town of North Attleborough, MA Hazard Mitigation Plan Update

- People who are socially isolated
- People with mobility restrictions or mental impairments
- People taking certain medications (e.g., for high blood pressure, depression, insomnia)
- People engaged in vigorous outdoor exercise or work or those under the influence of drugs or alcohol.

Climate change will increase the rate of heat-related illnesses and the need for cool spaces. Outdoor workers and vulnerable populations will need to be considered during extreme heat events. The previous edition of this plan cited modeling analysis by the Northeast Climate Adaptation Science Center at the University of Massachusetts, Amherst, which indicated at the time that temperatures were increasing, precipitation patterns were changing, sea level was rising, and extreme weather events were becoming more frequent.

Environment Impacts

Extreme heat can lead to water quality issues (e.g., excess algal growth, decreased oxygen), wildlife concerns (e.g., shifts in species distribution), and impact vegetative growth when combined with drought.

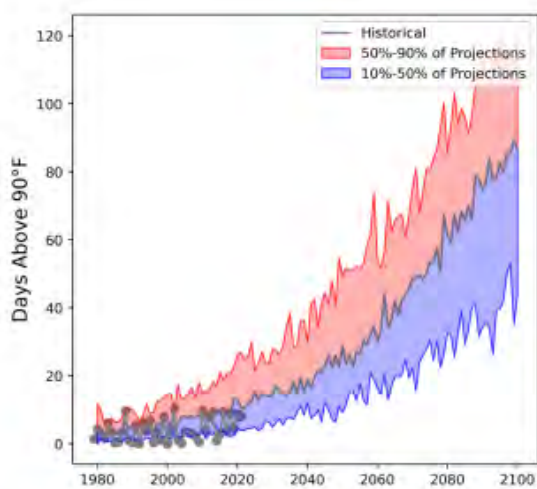
Probability of Future Events

The ResilientMass Plan notes that Massachusetts averaged three declared cold weather events and two extreme cold weather events annually between January 2018 and October 2022. The years 2018 and 2019 were particularly notable, with 10 cold weather events in each year, including five extreme cold/wind chill events in 2018 and six in 2019. The ResilientMass Plan also notes that there was an average of 3.6 heat events and two excessive heat events between January 2018 and December 2022. Many practitioners believe that some heat wave related circulation patterns are occurring more frequently due to climate change.

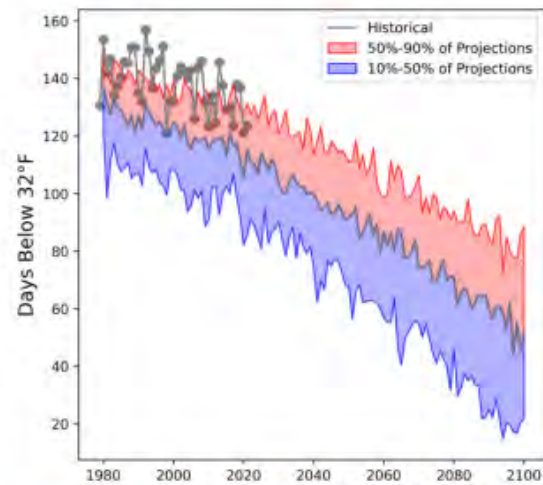
There are a number of climatic phenomena that determine the number of extreme weather events in a specific year. However, there are significant long-term trends in the frequency of extreme hot and cold events. Since 2010, U.S. daily record high temperatures have occurred over eight times as often as record low. This is compared to a nearly 1:1 ratio in the 1950s. Models suggest that this ratio could climb to 20:1 by midcentury, if GHG emissions are not significantly reduced (C2ES, n.d.).

Various climate forecasts support the trends of an increased frequency of extreme hot weather events and a decreased frequency of extreme cold weather events. High, low, and average temperatures in Massachusetts are all likely to increase significantly over the next century as a result of climate change. The graphics below (from Resilient MA, 2018) show the projected annual days with maximum temperature above 90 degrees and projected annual days with minimum temperature below 32 degrees.

Town of North Attleborough, MA Hazard Mitigation Plan Update



Source: CMIP6 downscaled projections (Thrasher et al., 2022), warming scenario SSP 5-8.5, historical data from GridMET.



Source: CMIP6 downscaled projections (Thrasher et al., 2022), warming scenario SSP 5-8.5, historical data from GridMET.

Figure 13. Projected Annual Days with Temperatures above 90 Degrees (left) and Below 32 Degrees (right).

The frequency and magnitude of extreme weather events is projected to increase. Warmer oceans can provide more energy for storms and warmer air can hold more water vapor, increasing the rate of rainfall. When moisture heavy air meets a cold front, an increase in frequency and magnitude of snow events is also predicted.

Overall, the ResilientMass Plan predicts an increase in the number of high heat days to 23-29 per year by 2050 and an annual average temperature increase of 5.9 to 7.9 degrees Fahrenheit. The Town of North Attleborough MVP Program CRB Workshop Summary of Findings (2019) presented the Ten Mile River Basin Climate Change Projections, and at the time, the temperature modeling results indicated that by the 2050s, average temperatures could increase by 15% and by the 2090s, average temperatures could increase by almost 27%. The modeling analysis by the Northeast Climate Adaptation Science Center at the University of Massachusetts, Amherst, also indicated that in Bristol County, the number of days with temperatures below freezing are projected to decrease by 27% by the 2050s and 42% by the 2090s.

Problem Statements for Extreme Temperatures

Problem statements summarize risk and vulnerability and are included following each hazard profile. The problem statements were developed to bridge the gap between identified hazard and development of the mitigation actions. Problem statements are included in each hazard profile section.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 13. Problem Statements for Extreme Temperatures.

Assets	Problems Associated with Extreme Temperatures
People (including underserved communities and socially vulnerable populations)	• Extreme heat will be a significant public health threat to all residents, but especially for vulnerable populations living in older homes or homes without air conditioning. • The elderly and those with mobility issues may not be able to leave their homes and travel safely. • People working in businesses without air conditioning may be at risk of heat illness. • First responders may also be impacted by extreme temperatures. • Pets may be adversely impacted by extreme heat.
Structures (including facilities, lifelines, and critical infrastructure)	• Older homes without insulation and single-pane glass are difficult to heat and cool and may not provide safe living conditions. • Businesses that require refrigerated trucks or refrigeration units may see business losses and increased utility costs. • The electric grid may become stressed and fail during extreme heat events.
Systems (including networks and capabilities)	• Extreme heat mitigation and adaptation have not been fully integrated into existing local plans and regulations for new development, though progress is being made. Extreme heat mitigation and adaptation has not been fully integrated into existing local plans and regulations for new development, though progress is being made.
Natural, historic, and cultural resources	• Extreme heat may lead to, or exacerbate, impacts to natural systems related to wildfires and invasive species (refer to those sections). • Extreme heat may lead to water quality concerns. • Risk of wildfires increases as the number of days greater than 90°F are expected to increase significantly. Coupled with changes in precipitation, less water may be available to fight the wildfires.

Assets	Problems Associated with Extreme Temperatures
Activities that have value to the community	Recreational activities may be adversely impacted by extreme heat.

Droughts

Droughts are typically defined as periods of deficient precipitation. How this deficiency is experienced can depend on factors such as land use, the existence of dams, and water supply withdrawals or diversions. Droughts can vary widely in duration, severity, and local impact.

Description

The National Drought Mitigation Center references five common, conceptual definitions of drought:

1. Meteorological drought is a measure of departure of precipitation from normal.
2. Hydrological drought is related to the effects of precipitation shortfalls on stream flows and on reservoir and groundwater levels.
3. Agricultural drought links various characteristics of meteorological and hydrological drought to agricultural impacts and occurs when there is not enough water available for a particular crop to grow at a particular time.
4. Socioeconomic drought is associated with the supply and demand of economic goods with elements of meteorological, hydrological, and agricultural drought.
5. Ecological drought is an episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability and impacts ecosystem services.

Drought conditions can cause a shortage of water for human consumption and reduce local firefighting capabilities. Public water suppliers may struggle to meet system demands while maintaining adequate pressure for fire suppression and meeting water quality standards. The Massachusetts Department of Environmental Protection (DEP) requires all public water systems (PWSs) to maintain an emergency preparedness plan.

Public water supply in North Attleborough is provided by the North Attleborough Water Division. According to the HMPC, the public water supplies include relatively shallow wells and reservoirs with relatively limited storage which are of concern during drought. An interconnection is available with an adjacent town (Plainville), but a regional drought would affect both areas. Thus, annual water restrictions are often in place for the public water system.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hundreds of private wells are believed to be present in North Attleborough. Private well owners can be vulnerable to droughts. With declining groundwater levels, well owners may experience dry wells or sediment in their water due to the more intense pumping required to pull water from the bedrock or overburden aquifer. Wells may also develop a concentration of pollutants, which may include nitrates and heavy metals depending on local geology. The loss of clean water for consumption and for sanitation cause significant impacts depending on the affected population's ability to quickly drill a deeper or a new well or to relocate to unaffected areas. According to the HMPC, private wells tend to be installed deeper (into bedrock) and therefore seem to have more resistance to the effects of drought.

During a drought, dry soil and the increased prevalence of wildfire can increase the amount of irritants (such as pollen or smoke) in the air. Reduced air quality can have widespread deleterious health impacts but is particularly significant to the health of individuals with pre-existing respiratory health conditions like asthma (Centers for Disease Control [CDC]).

Lowered water levels can result in direct environmental health impacts, as the concentration of contaminants in swimmable bodies of water will increase when less water is present. Harmful algal blooms may occur, closing recreational areas.

One primary hazard in this plan that is commonly associated with drought is wildfire. A prolonged lack of precipitation dries out soil and vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. A drought may increase the probability of a wildfire occurring.

Location

The Massachusetts Drought Management Plan (DMP, 2019) assesses drought conditions in seven regions: Western, Connecticut River Valley, Central, Northeast, Southeast, and Cape Cod, and Islands. A regional approach allows customization of drought actions and conservation measures to address situations in each region; and allows for the determination of a drought on a watershed basis. This approach recognizes that parts of Massachusetts can experience significantly different weather patterns due to topography, distance from coastal influence, as well as a combination of regional, national, and global weather patterns. Droughts have the potential to impact the entirety of North Attleborough, which is located in the Southeast region.

Previous Occurrences

The Commonwealth of Massachusetts has never received a Presidential Disaster Declaration for a drought-related disaster. However, several substantial droughts have occurred over the past 100 years. Massachusetts experienced its most significant drought on record in the 1960s. The severity and duration of the drought caused significant impacts on both water supplies and agriculture.

Although short or relatively minor droughts occurred over the 50 years following the drought of the 1960s, the next long-term event began in March 2015 when Massachusetts began experiencing

Town of North Attleborough, MA Hazard Mitigation Plan Update

widespread abnormally dry conditions. In July 2016, based on a recommendation from the Drought Management Task Force (DMTF), the Secretary of the Executive Office of Energy and Environmental Affairs (EOEEA) declared a Drought Watch for Central and Northeast Massachusetts and a Drought Advisory for Southeast Massachusetts and the Connecticut River Valley. Drought warnings were issued in five out of six drought regions of the state. Many experts stated that this drought was the worst in more than 50 years. DMTF declared an end to the drought in May 2017 with a return to wetter-than-normal conditions.

The severity of a drought depends on the degree of moisture deficiency, duration, spatial extent, and location relative to resources or assets. The drought of the 1960s is the drought of record because duration, spatial extent, moisture deficiency, and impact all contributed to historic levels. In contrast, the severity of the 2016-2017 drought was due to impacts on natural resources (record low stream flows and groundwater levels), many water supplies, farms, and agriculture and to the swift onset of the drought.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>. The line items related to droughts in Bristol County are listed below, corresponding to 2015-2016, 2020, and 2022. The droughts of 2020 and 2022, so-called “flashy droughts” that impacted southern New England, were sufficiently impactful in Bristol County to be included.

Table 14. USDA Disasters Events That Refer to Drought.

Year	Event	Event “Begin Dates”
2022	Drought	8/9/2022, 8/16/2022
2020	Drought	9/15/2020, 9/22/2020, 9/29/2020
2016	Drought	7/5/2016, 8/2/2016, 8/30/2016

Applying the same ten-year lookback as the severe storms database review, USDA payments to Massachusetts agricultural sectors for drought impacts associated with events from 2012 through 2022 were reviewed. This timeframe includes the droughts of 2015-2017 and 2020. There have been no USDA reimbursements for droughts to businesses in North Attleborough during that time period.

Another severe drought occurred in 2024 as noted in the following figure and in the full-page box on the next page.

The drought of 2022 was typical of a flashy drought; it was most severe in August but alleviated with rainfall in September 2022.	The drought of 2024 followed a rainy spring and summer, and was most severe in October/November, but alleviated with rainfall in late November 2024.
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Town of North Attleborough, MA Hazard Mitigation Plan Update

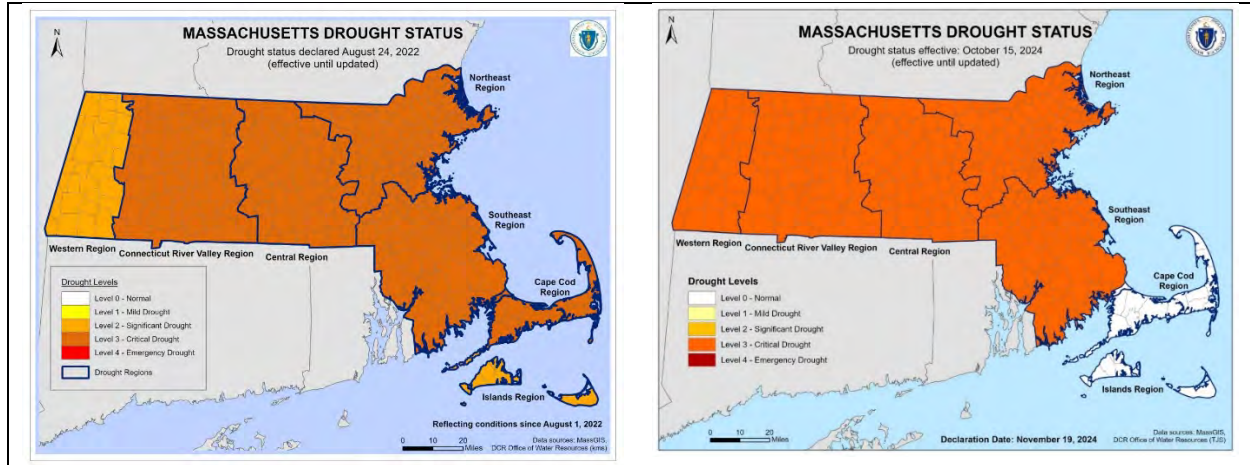


Figure 14. Drought Mapping of 2022 and 2024.

Press Release, 11/19/24 from Energy and Environmental Affairs (EEA)

With precipitation at an unprecedented low over the last three months, EEA elevated the Western, Connecticut River Valley, and Southeast regions to a Level 3 - Critical Drought. A Level 3 - Critical Drought persists in the Central and Northeast regions. As outlined in the Massachusetts Drought Management Plan, a Level 3 - Critical Drought requires detailed monitoring of drought conditions, continued coordination among state and federal agencies to communicate the implementation of water use restrictions, declaration of bans on open burning, engagement with municipalities including local Boards of Health, providing technical outreach and assistance to water suppliers and affected municipalities.

“Massachusetts is experiencing critical drought conditions that are fueling unprecedented and destructive wildfires across the state,” said Energy and Environmental Affairs Secretary Rebecca Tepper. “Climate change is reshaping our region’s weather patterns, resulting in warmer and drier fall and winter seasons. Water conservation is more important than ever. We urge municipalities, residents, and businesses - including those with private wells - to help us reduce stress on our water systems. We need to work together to ensure we have enough clean drinking water, protect wildlife habitats, and maintain effective fire control. Every small effort counts.”

Over the past 30 days, most of the state received less than an inch of rain, which is 3 to 4.5 inches below normal. Many areas recorded their lowest rainfall ever for this time of the year. Since August, when dry conditions began, all regions except the Cape and the Islands have seen an 8-to-11-inch rainfall deficit. Streamflow has also sharply decreased, especially in the Central region. This has resulted in dry brooks and streambeds, increased ponding, exposed beaches and sediments, limited fish passage, and drying ponds. Furthermore, groundwater levels are falling quickly in all regions, with the Western, Connecticut River Valley, Central, and Northeast regions showing the largest drops.

Fire activity has increased across the state because of drought conditions, leading to wildfires that are burning deeper into the soil. Due to fire conditions, the Department of Conservation and Recreation (DCR) has implemented a temporary ban of all open flame and charcoal fires within state park properties. Small portable propane grills are still allowed at campgrounds and recreation areas where grilling is permitted. This situation can make it harder to control fires and may prolong fire incidents. About 200 cities and towns have implemented temporary restrictions on all outdoor burning: residents are encouraged to follow local and state guidance on any activity that involves open flames, sparks and embers, or other ignition sources outdoors. Currently, there are approximately 37 active wildfires across the state. This year’s fire season has lasted longer because of dry conditions. Hundreds of wildfires have broken out across the state since October 1, burning more land than Massachusetts usually sees in an entire year. As firefighting efforts demand significant water resources, it's crucial for residents to practice aggressive indoor water conservation to maintain sufficient supply and pressure in public water systems.

Extent

Drought is defined by a combined look at several indices as detailed in the Massachusetts DMP (EOEEA and MEMA, 2019). The indices are:

Town of North Attleborough, MA Hazard Mitigation Plan Update

- **Precipitation:** The Standard Precipitation Index, which is widely used, is based on monthly precipitation totals from Massachusetts Department of Conservation and Recreation's (DCR) Precipitation Program and the NWS.
- **Streamflow:** Is an early indicator of impacts to rivers, streams, wetlands, and other riparian habitats.
- **Groundwater:** This provides information on impacts over a longer period of time due to groundwater recharge rates.
- **Lakes and Impoundments:** Captures the effects on surface water including lakes, ponds, water supply, and flood control reservoirs.
- **Fire Danger:** The Keetch Byram Drought Index indicates fire potential and flammability of organic matter.
- **Evapotranspiration:** The Crop Moisture Index is used to assess short-term or current conditions of dryness or wetness relative to agricultural crops.

These indices are monitored weekly to generate a monthly hydrological conditions report and used to determine the onset, severity, and end of droughts. Five levels of increasing drought severity are defined in the DMP: *Normal*, *Mild*, *Significant*, *Critical*, and *Emergency*. The drought levels are associated with actions outlined in the DMP. Recommendations of drought levels are made by the DMTF to the Secretary of the EEA, who then declares the drought level for each region of the state.

Other entities may measure drought conditions by these or other criteria more relevant to their operations. For example, water utilities may calculate the days of supply remaining. Farmers may assess soil moisture and calculate the water deficit for specific plants to determine irrigation needs or decide to change their crop based on the deficit or harvest early for non-irrigated crops.

The five drought levels in the 2019 DMP provide a basic framework for taking actions to assess, communicate, and respond to drought conditions. Under the "Normal" condition, data are routinely collected, assessed, and distributed. When drought conditions are identified, the four drought levels escalate moving to heightened action, which may include increased data collection and assessment, interagency communication, public education and messaging, recommendations for water conservation measures, and a state of emergency issued by the Governor. At the "Emergency" level, mandatory water conservation measures may be enacted. These regionally declared drought levels and associated state actions are intended to communicate and provide guidance to the public and stakeholders across industries to enable them to respond early and effectively and to reduce impacts. Individual public water suppliers may have their own drought management plan, drought levels, and associated actions,

Town of North Attleborough, MA Hazard Mitigation Plan Update

which they may follow at all levels except at the Emergency level when mandatory actions may be required.

NOAA and others are advancing the science of early warnings for droughts like the early warnings for floods and earthquakes to better project flashy, or fast-onset, droughts. Based on projected climate change, the distributions of precipitation events will continue to become more extreme, with periods of minimal rain alternating with extreme rain events. Therefore, developing ways to project and adapt to flash droughts may be critical for sectors such as agriculture and water supply.

The Massachusetts Water Resources Commission publishes the hydrologic condition report monthly, which includes the six drought indices and the National Climate Prediction Center's U.S. Monthly and Seasonal Drought Outlooks. The National Drought Mitigation Center produces a weekly Drought Monitor map. In accordance with the DMP, drought declarations are made monthly.

Because "changes in groundwater" was profiled as a subset of drought and a subset of flooding instead of a separate hazard, the above discussion about classification systems for drought is applicable. In fact, groundwater is the third bullet on the list of indices on page 70. The Massachusetts Drought Monitoring Plan describes the groundwater level monitoring network in Massachusetts. Monitoring locations near Dudley can be selected to determine whether groundwater levels in the region are changing outside the range of historic conditions.

The Massachusetts drought warning and characterization products are applicable to all droughts that may occur in North Attleborough, as they are used throughout Massachusetts on a routine basis and appropriately characterized previous droughts affecting North Attleborough. Droughts have not been characterized outside of the framework established in the Massachusetts Drought Management Plan or, more broadly, outside federal resources such as the USGS Drought Monitor.

Vulnerability Assessment

Exposure

Drought is a gradual phenomenon, and its condition occurs naturally in a broad geographic area. The entire Town would be exposed to drought conditions. The Massachusetts Drought Management Task Force uses the Standardized Precipitation Index (SPI), along with six other indices, to determine drought severity, and SPI values are calculated monthly using data from the DCR Office of Water Resources precipitation database. One of the rain gage locations in the Precipitation Monitoring Network is in Attleboro, which, along with the Town of North Attleborough, is identified by the DCR as being in the Southeast Region of Massachusetts.

Town of North Attleborough, MA Hazard Mitigation Plan Update

The previous edition of this plan (2019) noted that North Attleborough does not collect data related to drought events and characterized drought as a low frequency, minor severity hazard with an extensive area of impact. Massachusetts has experienced multi-year drought periods in 1879-83, 1908-12, 1929-32, 1939-44, 1961-69, and 1980-83. During the summer of 2002, one-third of the country, including Massachusetts, experienced drought conditions. From July 2016 to January 2017, most of the Commonwealth of Massachusetts was under drought warning levels. The most severe drought on record in the northeastern United States was during 1961-69. Water supplies and agriculture were affected because of the severity and long duration of the drought. Precipitation was less than average beginning in 1960 in western Massachusetts and beginning in 1962 in eastern Massachusetts. Since 1850, Massachusetts has reached a drought emergency five times and a drought warning five times.

Built Environment Impacts

Major water users are more susceptible to drought, and these include water utilities and some commercial users. The CRB Workshop highlighted the need to study and take appropriate action on the Town's water supply system and the need to plan for backup supplies in case of an extended drought. With an increased probability of drought and magnitude of drought, water utilities should consider reviewing or developing extreme drought scenarios.

Population Impacts

Populations considered most vulnerable to drought impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. Senior and low-income populations are particularly susceptible. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Socioeconomic impacts of the drought may also include anxiety and depression about economic impact, health problems associated with poor water quality, fewer recreational activities, higher incidents of heat stroke, and even loss of human life.

Based on review of drought events data obtained from the NCEI Storm Events Database, between January 2014 and November 2024 (10-year lookback), eleven drought events were recorded for Bristol County, including ten drought events in 2016. None of the events resulted in reported deaths or injuries.

During the HMPC #1 meeting (October 21, 2024), it was noted that the public water supply wells are shallow, 25 to 35 feet deep, and that the surrounding towns tend to have problems with groundwater, and surface water is drying up. It was also mentioned that the private wells tend to be deep, up to 500 feet deep, so they have no major issues during periods of drought.

With an increased probability of drought and increased drought magnitude, and the potential for increased water costs, vulnerable populations may be more severely impacted in the future. Overall, the risk of drought to people and property can be expected to increase with climate change.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Environment Impacts

Drought can impact agricultural areas in the Town, and some natural areas may be adversely impacted by drought too. Drought amplifies the risk of loss of biodiversity and affects animal and plant species. Economic impacts include higher food and lumber prices. Drought can shrink the food supplies of animals and plants dependent on water and damage their habitats. Sometimes the environmental damage caused by a drought is temporary, and other times it is irreversible.

Probability of Future Events

Climate change will increase the probability of droughts. The Massachusetts Climate Change Assessment notes that the region will experience slight increases in the number of consecutive dry days and the number of days without rain from 2050 onward. By 2090, the number of consecutive dry days per year will increase to 33, compared to the annual statewide baseline of 31 days from 1986 to 2005. Table 15 summarizes this data and indicates the projected number of consecutive dry days according to the “high” and “low” limits of the Northeast Climate Adaptation Science Center (NE CASC) data. The Town of North Attleborough is represented by the Eastern Inland region.

Table 15. Number of Consecutive Dry Days (CDD) and Days Without Rain (DWR) per Year.

Region	Baseline		2030		2050		2070		2090	
	CDD	DWR	CDD	DWR	CDD	DWR	CDD	DWR	CDD	DWR
Berkshire and Hilltowns	29	159	29	161	30	165	30	167	31	170
Greater Connecticut River Valley	31	171	31	172	32	175	32	178	33	181
Central	32	180	32	182	32	185	33	188	33	192
Eastern Inland	32	186	32	181	32	185	33	188	33	193
Boston Harbor	31	192	31	185	32	192	32	194	33	198
North and South Shores	31	184	31	182	32	187	32	190	33	195
Cape, Islands, and South Coast	31	186	31	182	32	187	32	191	33	194
Statewide	31	176	31	175	31	179	32	182	33	187
CDD = Consecutive Dry Days per Year (ResilientMass, Steinschneider & Najibi (2022))										
DWR = Days Without Rain per Year (MA Climate Assessment (Commonwealth of Massachusetts, 2022))										

These projections suggest that the days without precipitation are likely to increase across the Commonwealth, while the number of consecutive dry days will vary across the state while increasing over the coming decades. Overall, the Massachusetts Climate Change Adaptation Report finds that by the end of the century, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions. Secondary to drought, wildfire risk can be expected to rise.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Because "changes in groundwater" was profiled as a subset of drought and a subset of flooding instead of a separate hazard, the above discussion about probability is applicable. The probability of low groundwater levels (lower than typical levels in the past) is assumed to be the same as the probability of drought.

Problem Statements for Drought

Table 16. Problem Statements for Drought.

Assets	Problems Associated with Drought
People (including underserved communities and socially vulnerable populations)	• The public water supply wells are shallow, 25 to 35 feet deep. • Vulnerable communities may have difficulty accessing potable water during an emergency drought event. If the water sources are at emergency levels, having a plan to get vulnerable people water should be considered. If rates are increased to lower water demand, this may also adversely impact underserved and vulnerable communities.
Structures (including facilities, lifelines, and critical infrastructure)	• Water supply infrastructure may need to be shut down and water quality may become substandard. Businesses requiring water for daily operations may have their operations limited due to water restrictions.
Systems (including networks and capabilities)	• Outdoor water use restrictions and other water conservation measures during periods of extreme drought can be challenging to enforce, even when mandated through local declaration.
Natural, historic, and cultural resources	• Water quality may be adversely impacted by major droughts. • Agricultural users may have difficulty obtaining water for products and livestock forage.
Activities that have value to the community	• Use of parks and recreational areas may be adversely impacted by droughts due to the effects on plants, trees, and surface water bodies.

Earthquakes

An earthquake is the vibration of the Earth's surface that follows a release of energy in the Earth's crust. New England experiences intraplate earthquakes because it is located within the interior of the North American plate. Although damaging earthquakes are rare in Massachusetts, low-magnitude earthquakes occur regularly in the state.

Description

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electricity, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time without warning.

The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. Earthquakes are described based on their magnitude and intensity as explained below under *Extent*.

New England's earthquakes appear to be the result of the cracking of the crustal rocks due to compression as the North American Plate is being very slowly squeezed by the global plate movements. As a result, New England epicenters do not follow the major mapped faults of the region, nor are they confined to particular geologic structures or terrains. Because earthquakes have been detected all over New England, seismologists suspect that a strong earthquake could be centered anywhere in the region. Furthermore, the mapped geologic faults of New England currently do not provide any indications detailing specific locations where strong earthquakes are most likely to be centered.

In addition to earthquakes occurring within the Commonwealth, earthquakes in other parts of New England can impact widespread areas. Large earthquakes in Canada, which is more seismically active than New England, can affect buildings in Massachusetts. This is due in part to the fact that earthquakes in the eastern U.S. are felt over a larger area than those in the western U.S. The difference between seismic shaking in the East versus the West is primarily due to the geologic structure and rock properties that allow seismic waves to travel farther without weakening (United States Geological Survey [USGS], 2012).

In some places in New England, including locations in Massachusetts, small earthquakes seem to occur with some regularity. In articles appearing in 2016, John Ebel Ph.D., a Senior Research Scientist at the Weston Observatory, was quoted as saying "The Acton, Boxborough and Littleton areas are sporadically active... We tend to get a small earthquake once every three-to-five years." It is not clear why some localities experience such clustering of earthquakes, but clusters may indicate locations where there is an increased likelihood of future earthquake activity.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Location

Given the above discussion, the potential exists for earthquakes to occur within North Attleborough or to occur elsewhere and be felt in North Attleborough.

Previous Occurrences

According to the previous edition of this plan, no documented earthquakes have been centered in the Town of North Attleborough. The largest earthquake since 1900 to strike Massachusetts was a magnitude 3.9 located east of the Quabbin Reservoir in 1994. Two recent earthquakes with epicenters close to Bristol County include a magnitude 1.9 near Milton, MA on July 10, 2024, and a magnitude 1.8 in the area around New Bedford on February 13, 2023. To the southeast, a magnitude 3.0 earthquake occurred approximately 12 kilometers northwest of Nantucket on November 11, 2022. A 4.8 magnitude earthquake centered in New Jersey on April 5, 2024 was felt in North Attleborough as reported by the Fire Department.

To determine whether earthquakes have occurred more recently near or in North Attleborough, all events listed by Weston Observatory were reviewed for all Towns in Massachusetts since the date of last edition of this plan. Listed earthquakes above magnitude 2.0 include the following very minor earthquakes:

- 8/21/19 – 2 km SSE of Wareham, MA, 1.7/2.4 [Mn*/Mc**]
- 12/3/19 – 4 km SSE of Plymouth, MA, 1.6/2.2
- 11/8/20 – 11 km SW of New Bedford, MA, 3.8/3.4
- 11/22/20 – 12 km WSW of New Bedford, MA, 1.7/2.6
- 7/25/21 – 5 km W of Peabody, MA, 1.4/2.5
- 1/1/22 – 13 km N of Rockport, MA, 2.3/3.0
- 3/4/22 – 5 km WSW of Orange, MA, 2.2/2.7
- 3/19/22 – 36 km ENE of Rockport, MA, 1.4/2.2

*Mn is the Nuttli Magnitude (see *Extent* below)

**Mc is the Coda Duration Magnitude (see *Extent* below)

According to the HMPC, the most significant concern related to earthquakes is the potential for damage along underground gas lines.

Extent

Magnitude is an estimate of the relative size or strength of an earthquake and is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of earthquake waves recorded on instruments that have a common calibration. The magnitude of an

Town of North Attleborough, MA Hazard Mitigation Plan Update

earthquake is thus represented by a single instrumentally determined value recorded by a seismograph, which records the varying amplitude of ground oscillations.

The Richter scale was developed in 1935 and was used exclusively until the 1970s. The scale set the magnitude of an earthquake based on the logarithm of the amplitude of recorded waves. Being logarithmic, each whole number increase in magnitude represents a tenfold increase in measured strength. Earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally. Earthquakes with magnitudes of 4.5 or greater are strong enough to be recorded by seismographs all over the world.

As more seismograph stations were installed around the world following the 1930s, it became apparent that the method developed by Richter was valid only for certain frequency and distance ranges, particularly in the southwestern United States. New magnitude scales that are an extension of Richter's original idea were developed for other areas. In particular, the Moment magnitude scale (Mw) was developed in the 1970s to replace the Richter scale and has been in official use by the USGS since 2002.

According to USGS, these multiple methods are used to estimate the magnitude of an earthquake because no single method is capable of accurately estimating the size of all earthquakes. Some magnitude types are calculated to provide a consistent comparison to past earthquakes, and these scales are calibrated to the original Richter scale. However, differences in magnitude of up to 0.5 can be calculated for the same earthquake through different techniques. In general, Moment magnitude provides an estimate of earthquake size that is valid over the complete range of magnitudes and so is commonly used today.

Although Moment magnitude is the most common measure of earthquake size for medium and larger earthquakes, the USGS does not calculate Mw for earthquakes with a magnitude of less than 3.5 which is the more common situation for Massachusetts. Localized Richter scales or other scales are used to calculate magnitudes for smaller earthquakes.

Regionally, the Weston Observatory utilizes two scales to track the magnitude of earthquakes. These include the Nuttli magnitude (Mn) for North America east of the Rocky Mountains and is more appropriate for the relatively harder continental crust in Connecticut compared to California. Weston Observatory also utilizes the Coda Duration magnitude (Mc), which is based on the duration of shaking at a particular station. The advantages of the Coda Duration magnitude are that this method can quickly estimate the magnitude before the exact location of the earthquake is known.

The effect of an earthquake on the earth's surface is called the intensity. The Modified Mercalli Intensity Scale consists of a series of key responses such as people awakening, the movement of furniture, damage to chimneys, and total destruction. This scale, composed of 12 increasing levels of intensity that

Town of North Attleborough, MA Hazard Mitigation Plan Update

range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects.

Table 17. Modified Mercalli Intensity.

Modified Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions
II	Felt only by a few people at rest, especially on the upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	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	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	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	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	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Great damage in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry), structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown in the air.

Source: USGS

A comparison of Richter magnitude to typical Modified Mercalli intensity is presented below.

Table 18. Modified Mercalli Intensity and Moment Magnitude.

Moment Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 to 3.0	I
3.0 to 3.9	II to III
4.0 to 4.9	IV to V

Town of North Attleborough, MA Hazard Mitigation Plan Update

Moment Magnitude	Typical Maximum Modified Mercalli Intensity
5.0 to 5.9	VI to VII
6.0 to 6.9	VII to IX
7.0 and above	VIII or higher

Source: USGS

The above earthquake characterization systems are applicable to all earthquakes that may occur in North Attleborough, as they are used throughout the northeastern United States on a routine basis and appropriately characterized previous earthquakes that were felt in North Attleborough. Earthquakes have not been characterized outside of the Richter, Moment Magnitude, and Mercalli scales.

Vulnerability Assessment

Exposure

A major earthquake could cause severe damage to Town of North Attleborough buildings, including older structures that were built before a 1975 law requiring new buildings to withstand earthquakes. Other associated concerns are debris management issues, including debris removal and identification of disposal sites.

Built Environment Impacts

Historic data for earthquake events indicate that between 1991 and 2022, no major (>5.0 magnitude) earthquakes were recorded in Bristol County during this period, causing no damage to property. The entire built environment of the Town of North Attleborough is vulnerable to earthquakes. Older, unreinforced masonry buildings are very susceptible to earthquakes. Participants in the North Attleborough HMPC #1 meeting (October 21, 2024) identified the earthquake hazard as a low risk and noted that the gas line located in the southern part of the Town could be impacted by an earthquake. During the North Attleborough HMPC #2 meeting (January 6, 2025), the Liberty Utilities Gas Infrastructure Building and the Algonquin Pipeline (near Best Buy) were identified as built assets with potential vulnerability (e.g., gas line ruptures) to the earthquake hazard.

To identify built environment impacts to the Town, Hazus, was used to estimate the economic loss results for a 1500-year earthquake and a 2500-year earthquake scenario. The 1500-year event results are shown in Table 19, and the results for the 2500-year event are shown in Table 20. The Town's Average Annual Loss (AAL) is modeled to be \$41,247.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 19. Building Losses for a 1500-Year Earthquake Scenario.

Loss Type	Residential (\$Million)	Commercial (\$Million)	Other Occupancy (\$Million)	Total (\$Million)
Building Loss	5.37	3.90	2.36	11.62
Content Loss	1.57	1.59	1.10	4.26
Business Inventory Loss	0.00	0.58	0.08	0.66
Business Income Loss	0.05	0.44	0.03	0.52
Business Relocation Loss	0.21	0.63	0.35	1.19
Rental Income Loss	0.13	0.46	0.07	0.66
Wage Loss	0.12	0.64	0.17	0.93
Total	7.45	8.24	4.16	19.84

Table 20. Building Losses for a 2500-Year Earthquake Scenario.

Loss Type	Residential (\$Million)	Commercial (\$Million)	Other Occupancy (\$Million)	Total (\$Million)
Building Loss	11.44	7.69	4.76	23.89
Content Loss	3.66	3.49	2.46	9.61
Business Inventory Loss	0.00	1.23	0.18	1.41
Business Income Loss	0.09	0.80	0.05	0.94
Business Relocation Loss	0.47	1.12	0.64	2.23
Rental Income Loss	0.27	0.80	0.13	1.20
Wage Loss	0.22	1.15	0.30	1.67
Total	16.15	16.28	8.52	40.95

Population Impacts

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations are particularly

Town of North Attleborough, MA Hazard Mitigation Plan Update

susceptible. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Hazus was used to model injuries and fatalities for the 1500-Year and 2500-Year events (Bristol County). For the 1500-Year modeled event, there were an estimated three minor injuries (requiring medical attention but not hospitalization) and no injuries requiring hospitalization. For the 2500-Year event there were an estimated six minor injuries (requiring medical attention but not hospitalization) and one injury requiring hospitalization but not considered life-threatening.

Environment Impacts

The environment may be impacted by cascading impacts from the earthquake, such as a truck accident or train derailment caused by track or road damage, landslide, or dam breach. This could result in a hazardous material release.

Probability of Future Events

Earthquake location and magnitude probabilities are exceptionally difficult to predict in Massachusetts. Minor earthquakes are relatively common in New England, but damaging earthquakes are not. Therefore, USGS instead characterizes the probability of ground acceleration rather than estimating a probability of magnitude. The Seismic Hazard Map for the state of Massachusetts (USGS) shows a peak ground acceleration of 8% to 10% of gravity in North Attleborough having a 2% probability of being exceeded in 50 years.

Climate change is not expected to significantly impact the risk of earthquakes. The ResilientMass Plan notes that there may be additional earthquake risk in conjunction with other hazards such as higher rainfall (which can contribute to soil liquefaction during earthquakes), but that research is not yet mature. At this time, the overall risk from earthquakes to people and property can be expected to remain approximately the same as the current risk level.

Problem Statements for Earthquakes

Problem statements for earthquakes are presented on the following table.

Table 21. Problem Statements for Earthquakes.

Assets	Problems Associated with Earthquakes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations located in unreinforced masonry structures may sustain injuries. • Elderly people may fall during an earthquake.

Assets	Problems Associated with Earthquakes
Structures (including facilities, lifelines, and critical infrastructure)	• Unreinforced masonry and utility lifelines impacted. • Multi-story masonry residential buildings are present in the Town. • Utility systems may be impacted, particularly underground gas lines.
Systems (including networks and capabilities)	• None apparent or projected.
Natural, historic, and cultural resources	• Historical buildings constructed out of unreinforced masonry are susceptible and may be impacted.
Activities that have value to the community	• None apparent or projected.

Flooding from Precipitation

Nationally, flooding causes more damage annually than any other severe weather event. Flooding in Massachusetts is often the direct result of frequent weather events such as coastal storms, nor'easters, tropical storms, hurricanes, heavy rains, and snowmelt. Increases in precipitation and extreme storm events will result in increased inland flooding. Common types of flooding are described below.

The Town of North Attleborough Community Resilience Building Workshop Summary of Findings (2019) lists “flooding” as one of the top hazards of concern.

Description

River and Stream Flooding: River and stream flooding often occurs after heavy rain. Areas of the state with high slopes and minimal soil cover (such as those found in western Massachusetts) are particularly susceptible to flash flooding caused by rapid runoff that occurs in heavy precipitation events and in combination with spring snowmelt, which can contribute to riverine flooding. Frozen ground conditions can also contribute to low rainfall infiltration and high runoff events that may result in riverine flooding. Some of the worst riverine flooding in Massachusetts’ history occurred because of strong nor’easters and tropical storms in which snowmelt was not a factor. Tropical storms can produce very high rainfall rates and volumes of rain that can generate high runoff when soil infiltration rates are exceeded.

Floodplains are the low, flat, and periodically flooded lands adjacent to rivers, lakes, and oceans. These areas are subject to geomorphic and hydrologic processes. Floodplains may be broad, as when a river

crosses an extensive flat landscape, or narrow, as when a river is confined. These areas form a complex physical and biological system that supports a variety of natural resources and flood storage.

Drainage-Related Flooding: Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and adjacent properties. They make use of a conveyance system that channels water away from a developed area to surrounding streams, bypassing natural processes of water infiltration into the ground, groundwater storage, and evapotranspiration. Flooding from overwhelmed drainage entails floods caused by increased water runoff due to development and drainage systems that are not capable of conveying high flows. Since drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding can occur more quickly and reach greater depths than if there were no urban development at all. In almost any community with some degree of development, basement, roadway, and infrastructure flooding can result in significant damage due to poor or insufficient stormwater drainage.

Ice Jam: An ice jam is an accumulation of ice that acts as a natural dam and restricts the flow of a body of water. A freeze-up jam usually occurs from early winter to midwinter during extremely cold weather when supercooled water and ice formations extend to nearly the entire depth of the river channel. This type of jam can act as a dam and begin to back up the flowing water behind it. A breakup jam forms as a result of the breakup of the ice cover at ice-out, causing large pieces of ice to move downstream, potentially piling up at culverts, around bridge abutments, and at curves in river channels. Breakup ice jams occur when warm temperatures and heavy rain cause rapid snowmelt. The melting snow, combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and obstructions (bridges and dams). Ice jams may build up to a thickness great enough to raise the water level and cause flooding upstream of the obstruction.

Secondary Hazards: The most problematic secondary hazards for flooding are fluvial erosion, riverbank erosion, and landslides affecting infrastructure and other assets located within floodplains. Without the space required along river corridors for natural physical adjustment, such changes in rivers after flooding can be more harmful than the actual flooding. The impacts from these secondary hazards are especially prevalent in the upper courses of rivers with steep gradients, where floodwater may pass quickly and without much damage, but scour the banks, edging buildings, and structures closer to the river channel or cause them to fall in. Landslides can occur following flood events when high flows oversaturate soil on steep slopes, causing them to fail. These secondary hazards also affect infrastructure.

Roadways and bridges are impacted when floods undermine or wash out supporting structures. Dams may fail or be damaged, compounding the flood hazard for downstream communities. Failure of wastewater treatment plants from overflow or overtopping of hazardous material tanks and the dislodging of hazardous waste containers can occur during floods as well, releasing untreated

Town of North Attleborough, MA Hazard Mitigation Plan Update

wastewater or hazardous materials directly into storm sewers, rivers, or the ocean. Flooding can also impact public water supplies and the power grid in similar ways, through inundation and/or erosion.

Location

Heavy rainfall events occur regularly in Massachusetts. As a result, inland flooding such as riverine and drainage-related flooding affect most of the communities in the Commonwealth, including North Attleborough. Ice jams were not mentioned in the previous plan and are not believed to be of concern in North Attleborough. Therefore, all flood-related hazards (such as riverine floods and stormwater flooding) except ice jams are relevant to the Town of North Attleborough.

According to the previous plan, flooding impacts occur from several bodies of water including, but not limited to, the Ten Mile River, the Seven Mile River, the Bungay River, Abbott Run, Whiting Pond, Falls Pond, Greenwood Lake, Hoppin Hill Reservoir, and several smaller ponds, streams, and wetland areas. The three rivers tend to have the most significant flooding impact.

- Flooding along the Ten Mile River poses a threat to adjacent industrial, commercial, and residential areas, including several critical facilities.
- The Bungay River and Greenwood Lake have mapped floodplains that include adjacent residential areas.
- The Seven Mile River has mapped floodplains south of Hoppin Hill Avenue that includes residential and commercial areas as well as portions of the Riverview Estates mobile home park and the historic district on Old Post Road.

Previous Occurrences

The previous edition of this plan and the CRB report (2019) includes narratives about previous flood events:

- Flooding along the Ten Mile River and downtown is a major concern for North Attleborough. The major flooding of March 2010 caused the banks of the Ten Mile River to overflow into residences. Numerous streets were closed including North Washington Street, Whiting Street, and Route 1 at Chestnut Street.
 - Following the major flooding of 2010, the Town commissioned the “Ten Mile River Study” performed by BETA Group, Inc. in 2014. That study prioritized mitigating flooding along the Ten Mile River between Whiting Pond dam and the outlet at Falls Pond by increasing stormwater conveyance capacity and retention. Planning recommendations included the development of a hydraulic model of the river. Capital recommendations included replacement of retaining walls, providing stormwater relief in storage areas, and removing accumulated sediment in certain areas.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- In 2022, the Town was awarded a FEMA grant to revisit the 2014 study and develop an updated plan of improvements. The “Ten Mile River Flood Mitigation Study” is presently underway, which is taking a watershed-scale approach to development of flood mitigation solutions based updated precipitation data. One potential recommendation could be to reconfigure Falls Pond Dam to provide mitigation storage during flooding events.
- The Town has also received funding to dredge the river in certain areas to help alleviate some of the flooding concerns.
- Many culverts and bridges draining to, or associated with, the Ten Mile River are in need of cleaning or dredging, which exacerbates flood events.
- According to the HMPC, areas of recent concern during storms include Old Post Road, Paine Road, and Mendon Road which will need culvert upgrades. The Town Hall has also experienced flooding despite not being adjacent to a watercourse.

As noted earlier, this plan update relies primarily on a roughly ten-year lookback (2014 through 2024). The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists six flood events impacting North Attleborough for the period 2014-2024.

Table 22. NCEI Severe Storm Database Entries Covering Floods in North Attleborough.

Date	Description	Losses Reported
6/6/20	<i>Flood.</i> A cold front pushed into a warm, humid air mass and produced two rounds of severe thunderstorms. One moved across the region in the afternoon and a second round impacted eastern sections in the evening. In North Attleboro, a spotter reported flooding on Route 1A, which resulted from 1.5 inches of rain in 15 minutes.	---
6/28/20	<i>Flood:</i> A mid-level short wave trough combined with an approaching cold front and a warm, humid environment to produce severe thunderstorms and flash flooding across MA and northern RI during the afternoon and evening hours. In North Attleboro, roadway flooding was reported at Landry Avenue and Kelley Blvd. (Route 152).	---
7/16/23	<i>Flash Flood:</i> A widespread and substantial flash flood event occurred across much of southern New England. For a few hours during the late morning, helicity values were high, and a brief tornado formed in North Brookfield, MA. In North Attleborough, Chestnut Street was closed due to flooding with cars stuck in the road.	---

Town of North Attleborough, MA Hazard Mitigation Plan Update

Date	Description	Losses Reported
8/18/23	<i>Flash Flood.</i> A high amplitude, negatively tilted trough moving across the Great Lakes and into New England along with cold and warm front provided strong forcing which resulted in flooding, wind damage, and 5 tornadoes. Tornadoes occurred in Scotland, CT, Scituate, RI, North Attleboro, MA, Stoughton, MA, and Weymouth, MA. The tornadoes ranged in intensity from EF-0 to EF-2.	---
9/9/23	<i>Flood / Flash Flood.</i> In the midst of very warm and humid weather a handful of thunderstorms caused some wind damage and flooding. In North Attleboro, there was a car stuck in flood waters on East Street, there was flooding along Rt. 1 near the I-295 interchange, and multiple apartments were flooded on Chestnut Street	---
1/10/24	<i>Flood.</i> A negatively tilted mid-level trough swung through New England while at the surface a low-pressure center passed directly over southern New England. This inland runner brought warm air so that all precipitation fell as rain, along with strong winds. There was a good deal of tree damage from the winds and widespread river flooding with many rivers going into major flood stage. In North Attleboro at 4:20 AM EST there was significant flooding on Paine road	---

Major disaster declaration DR-4780-MA (September 2023) is the sole new disaster related to flooding since the adoption of the last edition of this plan. Individual Assistance was available for residents in Bristol County.

The HMPC noted that Paine Road was emerging as a relatively new area for flooding. The January 2024 event noted in the NCEI above was an extreme event with significant rainfall in a short amount of time that resulted in debris blockages at culverts. This event has prompted the Town to look at long-term changes to culvert maintenance. In addition, during this event the Saint Mark Pond Dam (no hazard classification), where flashboards are used to elevate the water level, flooded out adjacent properties.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>. The events related to extreme temperatures in Bristol County are listed below. No payments to properties in North Attleborough resulted from these events, but the September 2023 event corresponds to DR-4780-MA and the availability of Individual Assistance.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 23. USDA Disaster Events That Refer to Flooding.

Year	Event	Event “Begin Dates”
2023	Excessive rain and flooding	7/9/2023
2023	Excessive rain	7/1/2023
2018	Excessive rain and moisture	7/17/2018

Extent

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the “100-year discharge” has a 1 percent chance of being equaled or exceeded in any given year. The “annual flood” is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The 1% annual chance flood is the standard used by most federal and state agencies. It is used by the National Flood Insurance Program (NFIP) to guide floodplain management and determine the need for flood insurance. The extent of flooding associated with a 1% annual probability of occurrence (the base flood or 100-year flood) is called the 100-year floodplain, which is used as the regulatory boundary by many agencies. Also referred to as the Special Flood Hazard Area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. The term “500-year flood” is the flood that has a 0.2% chance of being equaled or exceeded each year. Base flood elevations and the boundaries of the 1% annual chance (100-year) and the 0.2% annual chance (500-year) floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principal tools for identifying the extent and location of the flood hazard.

Both the 100-year and the 500-year floodplains are determined based on past events. As a result, the flood maps do not reflect projected changes in precipitation events.

Flooding in Massachusetts is forecast and classified by the National Weather Service (NWS) Northeast River Forecast Center as minor, moderate, or severe based upon the types of impacts that occur. Minor flooding is considered “disruptive” flooding that causes impacts such as road closures and flooding of recreational areas and farmland. Moderate flooding can involve land with structures becoming inundated. Major flooding is a widespread, life-threatening event. River forecasts are made at many

Town of North Attleborough, MA Hazard Mitigation Plan Update

locations in the state containing USGS river gauges with established flood elevations and levels that correspond to each of the degrees of flooding.

Due to the pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Flash flooding, which occurs when excessive water fills either normally dry creeks or riverbeds or dramatically increases the water surface elevation on currently flowing creeks and rivers, can be less predictable. However, potential hazard areas can be warned in advance of potential flash-flooding danger. Flooding is more likely to occur due to a rainstorm when the soil is already wet and/or streams are already running high from recent previous rains.

NOAA's Northeast River Forecast Center provides flood warnings for Massachusetts, relying on monitoring data from the USGS stream gauge network. Notice of potential flood conditions is generally available several days in advance. State agency staff also monitor river, weather, and forecast conditions throughout the year. Notification of potential flooding is shared among state agency staff, including the Massachusetts Emergency Management Agency (MEMA) and the Office of Dam Safety. The NWS provides briefings to state and local emergency managers and provides notifications to the public via traditional media and social networking platforms.

Because "changes in groundwater" was profiled as a subset of drought and a subset of flooding instead of a separate hazard, the above discussion about classification systems for flooding is applicable. If groundwater levels are sufficiently high to cause shallow flooding, the current flood classification systems would prevail. The Massachusetts Drought Monitoring Plan describes the groundwater level monitoring network in Massachusetts. Monitoring locations near Dudley can be selected to determine whether groundwater levels in the region are changing outside the range of historic conditions.

The FEMA flood products and the NWS warning products are applicable to all floods that may occur in North Attleborough, as they are used throughout Massachusetts on a routine basis and appropriately characterized previous floods in North Attleborough. Floods have not been characterized outside of the FEMA flood characterization framework or the NWS watch/warning systems for floods.

Vulnerability Assessment

Exposure

In North Attleborough, the 1% annual chance floodplain (100-year floodplain) covers about 1,289 acres, or approximately 10% of the Town. In addition to the 100-year floodplains, stormwater has the potential to cause localized flooding.

The North Attleborough Department of Public Works, a sewer pump station, and two daycare facilities are exposed to flooding. There are two additional daycare facilities that are adjacent to the floodplain and may be impacted during a flood event. Approximately 567 buildings are in the floodplain including

Town of North Attleborough, MA Hazard Mitigation Plan Update

all building occupancies. Additionally, several roads experience flooding, including the Chestnut Street Bridge. Several culverts contribute to flood impacts, including Elm St at Rte. 1, Rte. 1 at Orne Street, and the Arnold Road Culvert. The railroad also crosses the floodplain and may be impacted. There are two structures listed on the National Register of Historic Places that are in the floodplain, the Old Post Road Bridge over Seven Mile River and the Newell-Robinson Industrial Site. During the North Attleborough HMPC #2 Meeting, it was noted that the Town Hall (property off Washington Street) has flooded on a few occasions. According to EPA's Toxic Release Inventory (TRI) database, there are 46 facilities which contain hazardous materials in the 100-year floodplain. Table 24 shows the types of buildings exposed to the flood and their value. The number in parenthesis is the total number of buildings and associated building values for the Town.

Table 24. Buildings in 100-Year Floodplain.

Building Type	Number of Buildings in 100-Year Floodplain (Total in Town)	Building Value in 100-Year Floodplain (Total in Town)
Single Family	234 (9,136)	\$107,388,715 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	122 (1,276)	\$160,677,800 (\$1,252,281,272)
Commercial	132 (626)	\$159,694,664 (\$1,657,764,307)
Agricultural	11 (139)	\$1,084,464 (\$25,431,249)
Educational	1 (20)	\$7,187,243 (\$483,493,391)
Government	2 (47)	\$127,412 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	24 (86)	\$92,343,592 (\$286,554,435)
Garage/Outbuilding	41 (236)	\$3,115,079 (\$20,792,076)
Total	567 (11,585)	\$531,618,968 (\$8,748,619,576)

The population exposed to the 100-year floodplain is shown in Table 25. The column on the left shows the population in and around the floodplain (wherever the Census Block overlapped with the floodplain boundary) while the column on the right shows the total population numbers for the Town of North Attleborough. The population exposed to the flood hazard is similar to that in the Town as a whole, with a slightly higher population over 64 and white in the floodplain.

Table 25. Population Exposed to 100-Year Floodplain (2020 U.S. Census).

Demographics	Population in and Adjacent to 100-Year Floodplain	Total Population
Population	8,491	30,834
Households	3,482	12,551
White	7,466 (87.9%)	25,824 (83.8%)

Town of North Attleborough, MA Hazard Mitigation Plan Update

Demographics	Population in and Adjacent to 100-Year Floodplain	Total Population
Black	219 (2.6%)	944 (3.1%)
American Indian	9 (0.1%)	40 (0.1%)
Asian	353 (4.2%)	1,822 (5.9%)
Pacific Islander	2 (0.02%)	4 (0.01%)
Other Race	101 (1.2%)	524 (1.7%)
Two or More Races	341 (4.0%)	1,676 (5.4%)
Hispanic or Latino:	251 (3.0%)	1250 (4.1%)
Population under 18:	1,871 (22.0%)	6,822 (22.1%)
Population over 64:	1,429 (16.8%)	4,704 (15.3%)
Annual Income < \$30K/year	473 (13.6%)	1,651 (13.2%)
Population in EJ Zone*	1,692 (19.9%)	7,478 (24.3%)

**Massachusetts Office of Energy and Environmental Affairs, 2022*

The 100-year Floodplain (FEMA) with the Town of North Attleborough's critical facilities and roads with flood potential is shown in Figure 15.

Town of North Attleborough, MA Hazard Mitigation Plan Update

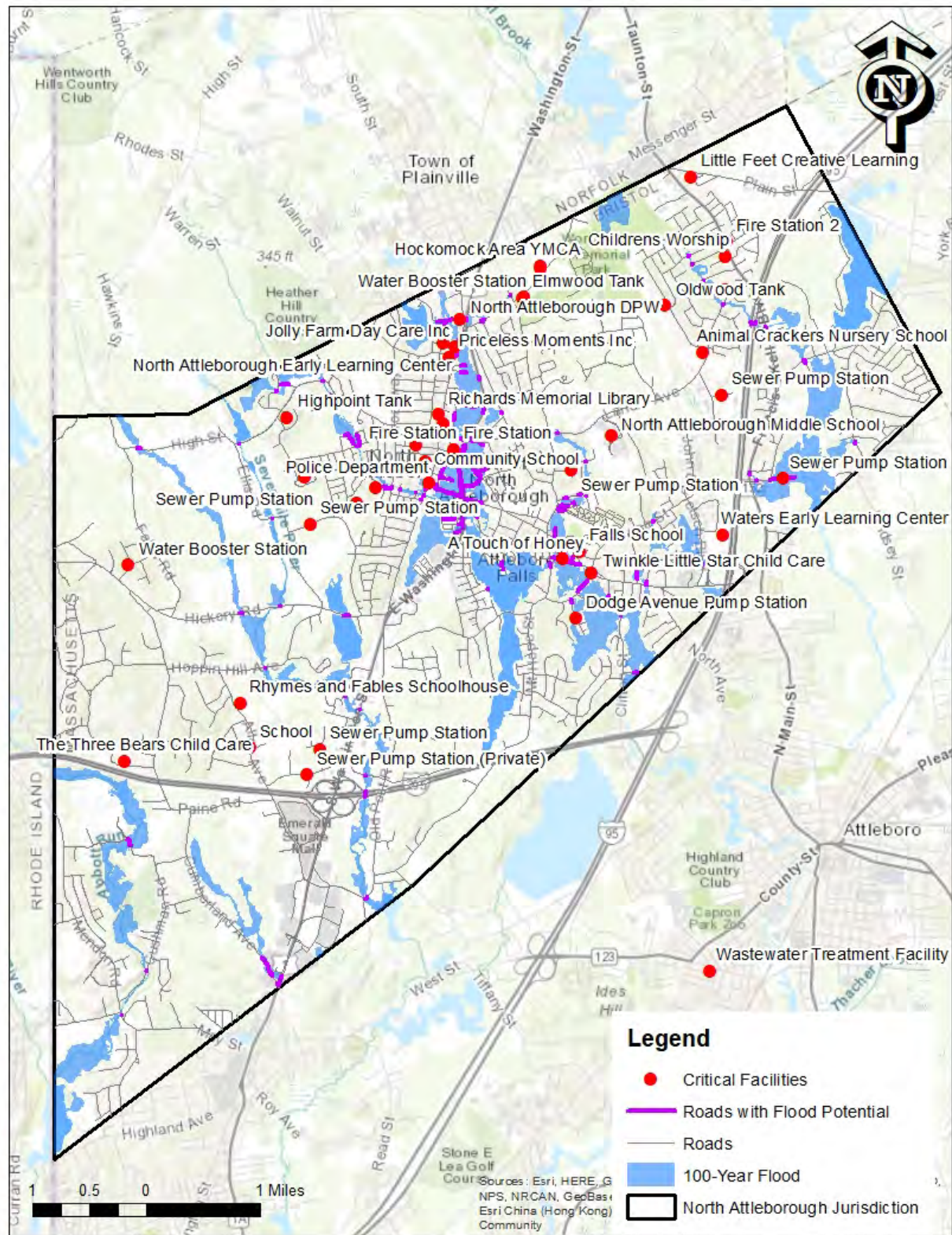


Figure 15. North Attleborough Critical Facilities and 100-Year Floodplain.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Built Environment Impacts

To identify built environment impacts to the Town, FEMA's risk assessment software, Hazus, was implemented. Building footprint data and parcel data were used to update the model, while the latest floodplain was also integrated into the software. The economic loss results of the 100-year flood event are shown in Table 26. The Town's AAL is calculated to be \$1,400,000.

Table 26. Building Loss for the 100-Year Flood Scenario.

Loss Type	Residential (\$Million)	Commercial (\$Million)	Other Occupancy (\$Million)	Total (\$Million)
Building Loss	7.42	5.19	2.15	14.76
Content Loss	4.13	18.08	6.85	29.06
Business Inventory Loss	0.00	2.63	0.55	3.18
Business Income Loss	0.10	20.81	2.33	23.23
Business Relocation Loss	4.02	6.41	1.47	11.90
Rental Income Loss	3.05	4.41	0.23	7.68
Wage Loss	0.24	29.12	20.82	50.19
Total	18.96	86.65	34.40	140.00

Climate change will increase the probability and magnitude of flood impacts to the built environment. Future floodplains may be larger than the current FEMA modeled floodplain, and new development should consider these projected conditions. These new developments may cause additional stormwater issues which should also be considered.

Population Impacts

The Town should be aware that senior and low-income segments of North Attleborough's population may be more vulnerable to hazard events due to a number of factors. Senior and low-income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Using the Hazus software, the 100-year modeled flood scenario results showed that there would be 500 households (or 1,500 people) displaced due to the flood and 343 people seeking temporary public shelter.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Climate change will increase the probability and magnitude of flood impacts to the population. Future floodplains may be larger than the current FEMA modeled floodplain, and new development should consider these projected conditions. Vulnerable populations should be considered when development near the current floodplain is planned. Participants in the HMPC #1 meeting (October 21, 2024) identified the concentrations of mobile homes along Route 1 and along the Plainville Town Line up to the Emerald Square Mall as vulnerable populations.

Environment Impacts

One of the major environmental impacts of a major flood would be the potential release of hazardous materials. According to EPA's TRI database, 46 facilities located in the Town of North Attleborough that report under the EPA TRI are in the 100-year floodplain. The facilities which contain hazardous materials include but are not limited to electroplating, jewelry and precious metals, schools, and industrial and commercial machinery and equipment.

During the North Attleborough HMPC #1 Meeting (October 21, 2024), it was noted that Ten Mile River and Falls Pond have experienced significant flooding, and the flood hazard risk is increasing due to the accumulation of sediment. Participants in the HMPC #1 Meeting also noted the current Town of North Attleborough efforts to get the Ten Mile River dredged and mentioned an ongoing study with FEMA, the presence of an Environmental Justice community (includes the mobile home park), and the estimated cost (\$1.5 million) associated with addressing several feet of metals-contaminated sediment in the river from the former operations of a jewelry industry facility.

During the HMPC #2 meeting (January 6, 2025), the risk of flood hazard impacts was noted for Old Post Road, Mendon Road Area, and other areas where storm events have affected the Town. Participants in the meeting mentioned the potential underinsurance issue, noting that 340 properties have flood insurance (through the NFIP), and 1,200 properties are in flood hazard areas. The ongoing Ten Mile River Flood Mitigation Project, funded by a FEMA Pre-Disaster Mitigation grant awarded in 2022, seeks to identify ways the Town can implement nature-based and green infrastructure solutions to reduce flood damage and improve habitat and wetland ecosystems. The Department of Public Works continues to provide progress updates (e.g., September 13, 2024) on the project website (<https://www.nattleboro.com/924/Ten-Mile-River-Flood-Mitigation-Project>).

Probability of Future Events

Practitioners expect that there will be an overall increase of precipitation on an annual basis across Massachusetts. It is expected that precipitation patterns will become more variable over time, with fewer days with precipitation, but heavier and more intense events when it does rain or snow. Most areas across the state are expected to have small increases in annual total precipitation, but a substantial change in seasonal precipitation patterns. In other words, climate change will increase the probability of flooding caused by intense precipitation.

The National Climate Assessment and NCEI both project more fall, winter, and spring precipitation as well as more intense precipitation. The ResilientMass Plan estimates that precipitation will increase 6 to 14% by mid-century, with an increased frequency of floods meeting current 10-year flood levels. Much of the winter precipitation increase is projected to be in the form of rain rather than snow, which may actually reduce peak spring flooding but could lead to more frequent winter runoff events. As noted in the ResilientMass Plan, extreme river flow events are projected to increase, elevating the probability of damaging floods. In addition, smaller flooding events are likely to occur more frequently. For example, the current 24-hour 10-year storm (about 3 inches) could double in frequency by 2050 in western and central Massachusetts.

Overall, the frequency of flooding events and their impacts on people and property can be expected to increase over time, largely in locations that are already of flood concern. Public health may be impacted through increased mosquito populations, which depend on the availability of standing water. As climate change increases the probability and magnitude of flood impacts, environmental impacts resulting from hazardous materials release could increase. Facilities that contain hazardous materials should be considered when new development is planned.

Because "changes in groundwater" was profiled as a subset of drought and a subset of flooding instead of a separate hazard, the above discussion about probability is applicable. The probability of high groundwater levels (higher than typical levels in the past) is assumed to be high in any given year.

Problem Statements for Flood

Problem statements related to flooding from precipitation are shown in Table 27.

Table 27. Problem Statements Related to Flooding.

Assets	Problems Associated with Flood
People (including underserved communities and socially vulnerable populations)	- Older populations and lower income households in the floodplain may have difficulty evacuating. The Town has a significant Senior Community, including senior housing at Circle Court, 22 South Washington Street (six-story building), and Elm Terrace. The Town has a lower income housing area off Falmouth Street that is managed by the Housing Authority. - Concentrations of mobile homes along Route 1 and along the Plainville Town Line are vulnerable populations.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Assets	Problems Associated with Flood
Structures (including facilities, lifelines, and critical infrastructure)	- Approximately 567 buildings are in the floodplain, including residential, commercial, industrial, and government buildings. - New development under consideration includes a new high school, a hotel, and a fire station.
Systems (including networks and capabilities)	- Road closures may interrupt community systems. - The Town currently has no Floodplain Administrator and has considered if the Building Department could take on that role.
Natural, historic, and cultural resources	The Town of North Attleborough, which was incorporated in 1887, includes a Town Forest (Bragg & MacDonald Memorial Town Forest) with walking/hiking trails, two Town Beaches, the Harold Burns Memorial Wildlife Arboretum, the Woodcock Historical Cemetery, numerous playgrounds, recreational areas, and parks, including a Veterans Memorial Park, World War I Memorial Park and Zoo, and a World War II Memorial Swimming Pool, as well as many historic homes and sites.
Activities that have value to the community	Several road closures may disrupt community events.

Flooding from Dam Failure or Overtopping

A dam failure can cause severe flash flooding in the potential inundation area downstream, resulting in property damage, loss of life, destruction of infrastructure, environmental damage, and displacement of communities. Dam failure in Massachusetts is often the direct result of severe flooding, but may also be caused by insufficient maintenance, deterioration, landslides, or earthquake damage. Increases in precipitation and extreme storm events over time will result in increased risk of dam failure.

The Town of North Attleborough Community Resilience Building Workshop Summary of Findings (2019) lists “dam failure” as one of the top hazards of concern.

Description

Dam overtopping is caused by floods that exceed the capacity of the dam, and it can occur as a result of inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Overtopping accounts for one-third of all dam failures in the U.S. The two primary types of dam failure are catastrophic failure (characterized by the sudden, rapid, and uncontrolled release of impounded water) and design failure (which occurs as a result of minor overflow events). There are a number of ways in which climate change could alter the flow behavior of a river, causing conditions to deviate from what a dam was designed to handle. For example, more extreme precipitation events could increase the frequency of intentional discharges. Many other climate impacts, including shifts in seasonal and geographic rainfall patterns, could also cause the flow behavior of rivers to deviate from previous hydrographs. When flows are greater than expected, spillway overflow events (often referred to as “design failures”) can occur. These overflows result in increased discharges downstream and increased flooding potential. Therefore, although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Beaver dams are an additional dam-related concern in many communities like North Attleborough. Beaver dams obstruct the flow of water and cause water levels to rise. Significant downstream flooding can occur if beaver dams break. Flooding can also occur upstream of beaver dams, though this type of flooding is addressed in the discussion about flooding earlier in the chapter.

Location

Numerous dams are located in and upstream of North Attleborough, as presented on the mapping in the vulnerability section. According to the Massachusetts Office of Dam Safety, eight dams are located in North Attleborough, of which four are high hazard and one is significant hazard. These five high and significant hazard dams are listed in the following table:

Table 28. Significant and High Hazard Dams in North Attleborough

National ID	Dam Name	Owner Type	Hazard Potential	Notes
MA00855	Greenwood Lake Dam	U.S. Fish & Wildlife Service	High	
MA00858	Hoppin Hill Reservoir Dam	City of Attleboro	High	Water Department reservoir
MA00859	Whiting Pond Dam	Town of North Attleborough	High	
MA00865	Falls Pond Dam	Town of North Attleborough	High	
MA03063	Melewski Pond Dam	Private	Significant	

As part of this plan update, the HMPC noted that there were not any current issues with beaver dams other than one or two on the upper west side of Town that cause occasional minor issues.

Town of North Attleborough, MA Hazard Mitigation Plan Update

The Town of North Attleborough maintains dam Emergency Action Plans (EAPs) for its Town-owned dams and also possesses copies of the EAPs for the other high hazard dams in Town. The general downstream inundation areas that may be subject to flooding due to dam failure are noted below:

- The potential downstream inundation area for a failure of the Greenwood Lake Dam would affect buildings associated with the National Fish Hatchery as well as a small number of structures on Bungay Road. According to the dam owner, although the risk of the dam overtopping is reportedly very low, the most significant area of concern is where Bungay Road runs along the dam crest. Bungay Road would also likely be overtopped where the road turns west from the dam, making approximately five homes inaccessible by emergency vehicles (although walking access from the north may be available). A small number of additional structures could also be affected downstream on Mary Kennedy Drive in North Attleborough before the inundation area passes into Attleborough.
- The potential inundation area for the Hoppin Hill Reservoir Dam extends downstream along the Seven Mile River. Structures are likely to be affected immediately downstream including those on Riverview Drive, Quinn Street, and South Washington Street (Route 1), Old Post Road, and Draper Avenue. Backwater conditions may cause flooding to structures on Hoppin Hill Avenue and Oak Knoll Drive. Interstate 295 is not anticipated to overtop. Downstream of Interstate 295, structures are likely to be affected on Old Post Road, Allen Avenue, and Stage Coach Road before the inundation area passes downstream into Attleborough. The current EAP does not include an estimate of the population size at risk in the event of a dam failure event. According to the HMPC, the immediate area of concern includes low-income housing off of Route 1, an elderly housing mobile home park (Riverview), and a significant commercial area that includes two inns, a hotel, a storage facility, a movie theatre, and a residential neighborhood (Quinn Street).

Furthermore, dam breach inundation maps were available for the Whiting Falls and Falls Pond dams.

- For the Whiting Falls Dam, properties are likely to be impacted on Broad Street, Chestnut Street, East Washington Street, Elm Street, Fisher Street, North Washington Street, Orne Street, and Park Street in North Attleborough (and nearby areas) draining to Falls Pond. According to the HMPC, the immediate area of concern includes numerous multi-family homes in the downtown area.
- For the Falls Pond Dam properties are likely to be impacted on Cedar Road, Mount Hope Street, Towne Street, and Freeman Street, as well as additional properties downstream in Attleborough. According to the HMPC, the immediate area of concern includes multi-story apartment complexes near the dam that include some elderly and medically sensitive populations.
- The City of Attleborough noted that they own two dams on the Ten Mile River that would be affected by the upstream failure of these two dams.

Town of North Attleborough, MA Hazard Mitigation Plan Update

The National Inventory of Dams⁵⁷ maintains information on dams across the United States, including information on dam conditions. This information is not always up to date but often provides a good indicator of a dam's condition within the last decade. Data for high and significant hazard dams within North Attleborough are presented in the following table. The information is consistent with the discussions in the CRB report (2019).

Table 29. Dam Conditions and Downstream Channels in North Attleborough

National ID	Dam Name	Downstream Channel	Dam Condition	Dam Condition Date
MA00855	Greenwood Lake Dam	Bungay River	Satisfactory	9/21/2015
MA00858	Hoppin Hill Reservoir Dam	Seven Mile River	Satisfactory	12/28/2022
MA00859	Whiting Pond Dam	Ten Mile River	Satisfactory	6/8/2023
MA00865	Falls Pond Dam	Ten Mile River	Satisfactory	5/17/2021
MA03063	Melewski Pond Dam	Tributary to Ten Mile River	Unknown	N/A

Previous Occurrences

The previous edition of this plan and the CRB report (2019) do not identify any previous dam failures within or affecting North Attleborough. However, the previous plan notes that an uncoordinated release of water from the Falls Pond Dam resulted in downstream flooding in Attleborough in 1998. That event highlighted the need for increased coordination and communication between North Attleborough and Attleborough on dam opening and closing activities. The Ten Mile River Flood Warning Response Plan and a supplemental Emergency Notification Procedure for Potential Flooding Events were created in response to flooding concerns between the two communities. These documents clarify Town officials' responsibilities in regard to notifications and operational procedures in case of a flood.

Dams have been in the news frequently due to severe precipitation events occurring nationwide in the last few years. Events in New England from 2022-2024 include the following:

- The Crosby Pond Dam, a significant hazard dam on Mill Brook in Concord, MA, failed in May 2015. According to the Association of State Dam Safety Officials (ASDSO)⁵⁸, the uncontrolled release of the impoundment inundated a heavily traveled road. No one was injured, but the road was closed all day creating significant traffic delay issues.
- The Silica Pond Dam, a significant hazard dam in Cheshire, New Hampshire, was reported by ASDSO as having had a gate/valve failure in July 2022 that resulted in the release of the

⁵⁷ <https://nid.sec.usace.army.mil/#/>

⁵⁸ <https://www.damsafety.org/incidents>.

impoundment. This was not a catastrophic failure, but the release of storage was caused by the deterioration and/or poor condition of the outlet valve.

- The George Schnopp Road Pond Dam in Hinsdale, MA breached in October 2022. According to the Hinsdale Hazard Mitigation Plan (2024), significant damage did not occur downstream, but the experience underscored the challenges associated with dams. During the breach, five to ten million gallons of water was released rapidly to the downstream watercourse, flowing into Ashmere Lake. The Town responded with clearing and repair of George Schnopp Road, which was covered in debris and eroded partially by the flooding.
- Five dam failures were reported by ASDSO as occurring in Vermont on July 10, 2023, following a severe flood event. These included the Clarks Sawmill Dam, a low hazard dam on the Winooski River which fully failed; the Hands Mill Dam, a significant hazard dam on the Jail Branch River which fully failed; the Lyons Pond Dam, a low hazard dam on Burndt Meadow Brook which fully failed; the Quinn Lower Dam, a low hazard dam on Homer Stone Brook which fully failed; and the South Woodbury Pond Dam, a significant hazard dam on a tributary to Sabin Pond which partially breached. Several of these dams were reportedly remote and failure only discovered several days following the failure.
- A dam overtopped at Barrett Park Pond Dam in September 2023 in Leominster, MA resulting in downstream evacuations and emergency repairs. Floodwaters downstream caused damage to roads and properties.
- A partial dam breach on the Yantic River occurred in January 2024 in Bozrah, Connecticut, resulting in evacuations downstream in the Town of Bozrah and the City of Norwich.

Extent

Many dams in Massachusetts were built in the 19th Century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events. The Massachusetts Department of Conservation and Recreation (DCR) is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44, and the implementing regulations 302 CMR 10.00). The DCR was also responsible for conducting dam inspections until 2002, when state law was changed to place the responsibility and cost of inspections on the owners of the dams. In accordance with the new regulations, which went into effect in 2005, dam owners must register, inspect, and maintain dams in good operating condition. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain, and update EAPs. The state has three hazard classifications for dams:

Town of North Attleborough, MA Hazard Mitigation Plan Update

1. High Hazard Potential: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
2. Significant Hazard Potential: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
3. Low Hazard Potential: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

According to FEMA⁵⁹, hazard potential classification systems vary between certain states and federal agencies. However, the Massachusetts dam hazard classification system is consistent with the federal dam hazard classification system (Low, Significant, and High).

Owners of dams are required by DCR to hire a qualified engineer to inspect and report results using the following inspection schedule:

- High Hazard Potential dams – 2 years
- Significant Hazard Potential dams – 5 years
- Low Hazard Potential dams – 10 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain, and update EAPs. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. FERC inspections of high and significant hazard projects are conducted on a yearly basis. All other dams are subject to the regulations unless exempted in writing by DCR. HMPC members noted the importance of coordination between the Town, dam owners, and the Office of Dam Safety for securing funding for dam inspections and repairs to ensure proper maintenance.

According to FEMA⁵, the common dam failure modes include those in the following table. Any of these failure modes could result in an uncontrolled downstream release of water with potential downstream consequences.

⁵⁹ https://www.fema.gov/sites/default/files/2020-08/fact-sheet_dam-awareness.pdf.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 30. Dam Failure Modes.

Failure Type	Description
Seepage and Piping	Seepage and piping can cause internal erosion within the dam that can erode embankment or foundation materials and lead to dam failure. Evidence of piping is generally detected at the location of seepage discharge.
Overtopping (hydrologic failure)	Overtopping can cause erosion and head-cutting of embankment materials and can lead to dam failure.
Deformation	Deformation is caused by differential settlement; transverse or longitudinal cracking; or slope instability, slumps, or other slope failures. Deformation can provide a path for seepage through the dam and lead to failure. Low areas in the crest of the dam can make the dam more vulnerable to overtopping.
Liquefaction	Liquefaction can occur when the strength and stiffness of a saturated soil is reduced by earthquake shaking or other rapid loading. The weakened soil can cause the collapse of the dam.
Concrete failure	Concrete failure, structural cracking, broken masonry, and offsets at joints can lead to sudden failures.
Neglected maintenance and deterioration	Neglected maintenance and deterioration can leave a dam vulnerable to several failure modes: • Missing riprap can leave areas of an embankment unprotected and vulnerable to erosion from wave action or head-cutting during overtopping events. • Woody vegetation growing on a dam can interfere with effective dam safety monitoring. Uprooted trees can create large voids in the embankment, and roots can create preferred seepage paths, causing internal erosion problems. Vegetation can also block spillways. • Animal burrows in the embankment can cause preferred seepage paths. Livestock activity can damage embankment slopes and increase erosion potential. • Malfunctioning gates, conduits, or valves can reduce discharge capacity and cause the dam to overtop, which could lead to failure.
Other	Other problems that can leave a dam vulnerable to failure include outdated designs; hydraulically inadequate spillways; and damage from vandalism, cyber-attacks, or terrorism.

NOAA's Northeast River Forecast Center provides flood warnings for Massachusetts, relying on monitoring data from the USGS stream gauge network. Notice of potential flood conditions is generally available several days in advance, with the exception of flash flood warnings which can be issued only hours before a flood. State agency staff also monitor river, weather, and forecast conditions throughout the year. Notification of potential flooding is shared among state agency staff, including the MEMA and the Office of Dam Safety. The NWS provides briefings to state and local emergency managers and provides notifications to the public via traditional media and social networking platforms.

Flooding in Massachusetts is forecast and classified by the NWS Northeast River Forecast Center as minor, moderate, or severe based upon the types of impacts that occur. Minor flooding is considered “disruptive” flooding that causes impacts such as road closures and flooding of recreational areas and farmland. Moderate flooding can involve land with structures becoming inundated. Major flooding is a widespread, life-threatening event. River forecasts are made at many locations in the state containing USGS river gauges with established flood elevations and levels that correspond to each of the degrees of flooding. Typically, dam EAPs are triggered by NWS forecasts above a certain precipitation level or by the level of potential flooding that may occur in the watershed above the dam.

Due to the pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Flash flooding, which occurs when excessive water fills either normally dry creeks or riverbeds or dramatically increases the water surface elevation on currently flowing creeks and rivers, can be less predictable. However, potential hazard areas can be warned in advance of potential flash-flooding danger. Flooding is more likely to occur due to a rainstorm when the soil is already wet and/or streams are already running high from recent previous rains.

At the present time, the NWS utilizes the flood advisory, watch, and warning products for dam-related hazards. Specific warnings are used as needed to augment these messages when a dam failure could occur. In Massachusetts, EAPs must include a “procedure for warning downstream residents if failure of the dam is imminent.” Therefore, the use of the word “imminent” is often incorporated into specific dam-related messages from local emergency managers. In North Attleborough, the Town issues messages according to the approach outlined in its EAPs for the Whiting Falls and Falls Pond dams:

- **No Emergency Exists:** Upon inspection, the notification received was a hoax or a misinterpretation of a normal condition. No further action is necessary.
- **Level 1 Emergency:** An emergency condition exists but failure is not imminent. Notification procedures include Phase 1 of the Notification Flow Chart (local and state contacts).
- **Level 2 Emergency:** An emergency condition exists with conditions rapidly deteriorating towards a dam failure. Notification procedures include Phase 1 and Phase 2 (additional local, regional, state, and federal agencies) of the Notification Flow Chart and include public notification using multiple methods.
- **Level 3 Emergency:** An emergency condition exists and dam failure has commenced. Notification procedures are performed as under Level 2 above.

The protocols from the EAPs that are described on this page are provided solely for informational purposes. For a potential dam overtopping or failure event, the EAP for the specific dam must be consulted. This hazard mitigation plan is not appropriate for emergency response related to dams.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Although other EAPs were not examined in detail for emergency response procedures, the HMPC believes that the above approach is generally representative of the response to other potential dam failures in the community.

The NWS⁶⁰ is reportedly in the process of developing alternative forecasting tools and processes that will enable the River Forecast Center (RFC) and Weather Forecast Office (WFO) forecasters of different skill levels to evaluate the consequences of a potential dam failure in a relatively short period of time. This new project is designed to address the limitations of the current dam inventory data and dam break modeling approaches. Two goals should be achieved with this project: the first is to provide RFC and WFO forecasters with access to quality-controlled, up-to-date dam inventory information; and the second goal is to develop a system that will integrate several dam break modeling approaches. Results from these approaches will assist forecasters in selecting the tool that could be most appropriate, given the length of time needed for execution, how quickly the results are needed, and the availability of data.

The dam classifications, modes of failure, and warning procedures outlined in this section are presently appropriate for the dams in North Attleborough and for dams that could affect North Attleborough; and are believed appropriate for future conditions. Response procedures in the EAPs can be revised during any of the routine updates to the EAPs.

Vulnerability Assessment

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence, but dams represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is instantly released, oftentimes with catastrophic consequences as the water rushes in a torrent downstream, flooding an area known as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Exposure

There are four high hazard dams in North Attleborough. Table 31 identifies the dams in the vicinity of the Town of North Attleborough jurisdiction.

⁶⁰ https://www.weather.gov/owp/oh_hrl_hsmc_hydraulics_dam_break_analysis.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 31. Dams in the Vicinity.

Name	Ownership Type	Owner	Hazard Type
Falls Pond Dam	Public	North Attleborough	High
Greenwood Lake Dam	Public	U.S. Fish and Wildlife Service	High
Hoppin Hill Reservoir Dam	Public	City of Attleboro	High
Whiting Pond Dam	Public	North Attleborough	High
Melewski Pond Dam	Private	Private	Significant
Robinson Avenue Dam	Private	Private	Low
Hillman Pond Dam	Private	Private	N/A
Rattle Snake Brook Dam	Private	Private	N/A
Saint Mark Pond Dam	Private	Private	N/A
Todd's Pond Dam	Public	City of Attleboro	N/A

Participants in the North Attleborough HMPC #1 Meeting (October 21, 2024) noted that the Saint Marks Dam had been blocked off and flooded adjacent properties.

Of the ten dams located in and around North Attleborough, four high hazard dams and one significant hazard dam could impact the Town. To determine the exposure of the high hazard dams, the inundation maps were collected from each dam's Emergency Action Plan (EAP). The maps used for this analysis were the wet weather scenario (1/2 Probable Maximum Flood (PMF)). These maps were digitized and integrated into a GIS, where they were converted into an inundation depth using a high-resolution Digital Elevation Model (DEM). This inundation depth was used with the local inventory to determine exposure and loss shown in the next section. Figure 16 shows the dam locations, 100-year floodplain, and the dam breach area for the high hazard dams.

Town of North Attleborough, MA Hazard Mitigation Plan Update

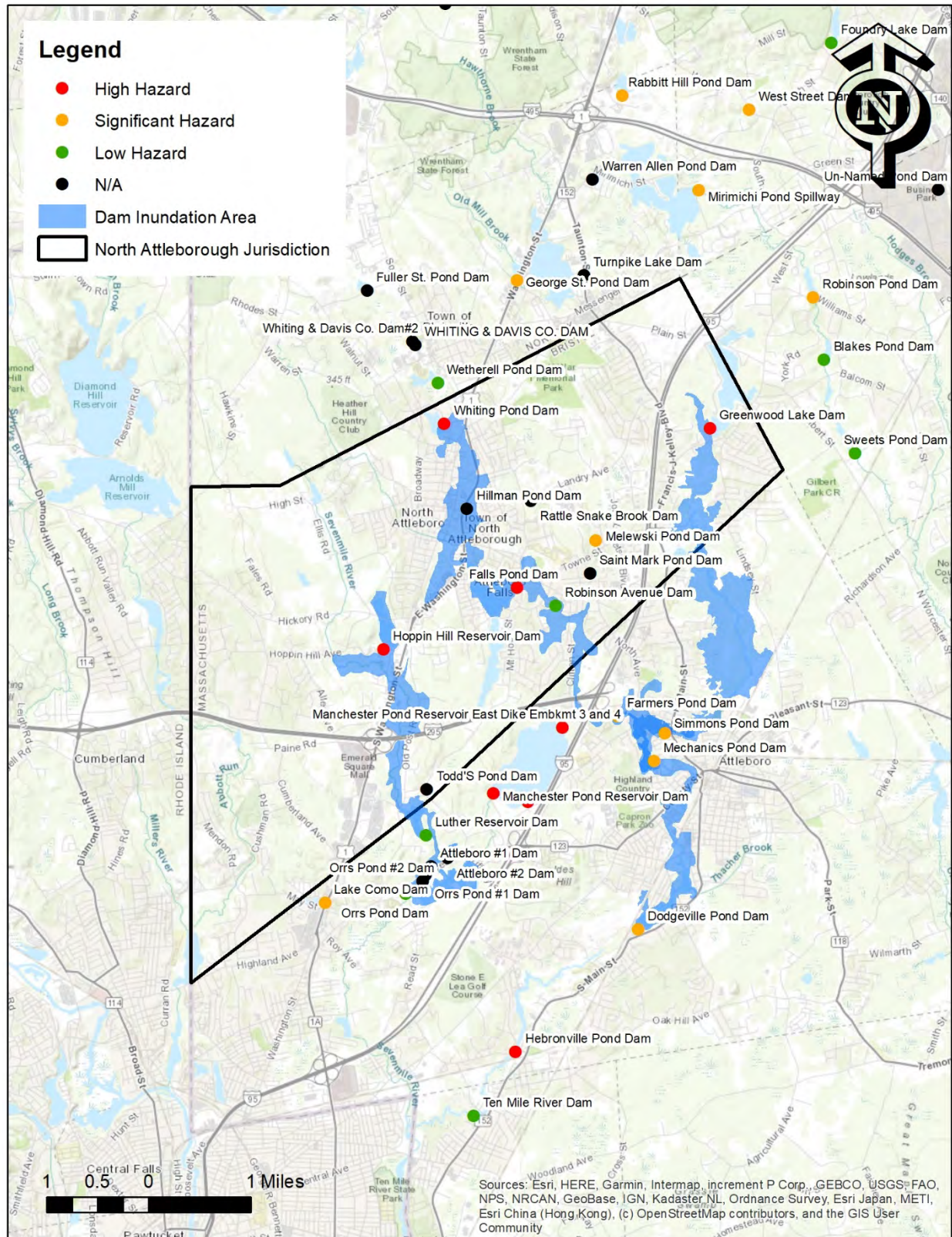


Figure 16. Location and Hazard Potential of Dams in North Attleborough.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Procedures for emergency events at the four high hazard dams are described in detail in EAPs as follows: Whiting Pond Dam: October 2003, Revision 1: March 2013; Falls Pond Dam: October 2003, Revision 1: December 2006, Revision 2: March 2013; Greenwood Lake Dam: November 2022; and Hoppin Hill Reservoir Dam: May 2014.

The Falls Pond Dam, built in 1890, has a drainage area of 8.3 square miles. The Whiting Pond Dam, built in 1959, has a drainage area of 4.10 square miles. The Greenwood Lake Dam, built in 1854, has a drainage area of 1.40 square miles. The Hoppin Hill Reservoir Dam has a drainage area of 0.55 square miles. In the worst-case scenario, a breach of all four dams would impact the Bungay River and areas to the south/southeast and would directly impact the Town of North Attleborough.

To determine the exposure of these dams, the inundation maps were collected from each dam's EAP. The maps used for this analysis were the wet weather scenario (1/2 Probable Maximum Flood (PMF)). These maps were digitized and integrated into a GIS where they were converted into an inundation depth using a high-resolution Digital Elevation Model (DEM). This inundation depth was used with the local inventory to determine exposure and loss shown in the next section.

Table 32 shows the high hazard dam name, the area of the inundation area resulting from a breach, and any critical facilities in the inundation areas. Several roads are also exposed to dam inundation areas including Washington Street (Route 1), Whiting Street, Fisher Street, Chestnut Street, Riverside Drive, Towne Street, Commonwealth Avenue, Elm Street, Freeman Street, Old Post Road, and Cedar Road. There are 47 historic properties in the dam inundation areas.

Table 32. Critical Facilities Exposed to Dam Inundation Areas.

Dam	Area (Acres)	Critical Facilities Exposed
Falls Pond Dam	516.8	• Scribble Time: A Center for Early Learning (Day Care) • A Touch of Honey (Day Care)
Greenwood Lake Dam	722.0	• Mary Kennedy Drive Sewer Pump Station
Hoppin Hill Reservoir Dam	470.4	• None
Whiting Pond Dam	378.0	• Police Station - 102 South Washington Street • Fire Station – 50 Elm Street • North Attleborough DPW – 10 Whiting Street • North Attleborough Early Learning Center • Jolly Farm Day Care • Madonna Manor Nursing Home

Town of North Attleborough, MA Hazard Mitigation Plan Update

The buildings, categorized by building occupancy, exposed to the dam inundation areas are shown in the tables below.

Table 33. Buildings in Falls Pond Dam Inundation Area.

Building Type	Number of Buildings in Dam Breach Inundation Area (Total in Town)	Building Value in Dam Breach Inundation Area (Total in Town)
Single Family	45 (9,136)	\$23,623,188 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	19 (1,276)	\$16,011,708 (\$1,252,281,272)
Commercial	15 (626)	\$12,447,460 (\$1,657,764,307)
Agricultural	3 (139)	\$532,688 (\$25,431,249)
Educational	1 (20)	\$7,187,244 (\$483,493,391)
Government	0 (47)	\$0 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	3 (86)	\$30,459,595 (\$286,554,435)
Garage/Outbuilding	0 (236)	\$0 (\$20,792,076)
Total	86 (11,585)	\$90,261,883 (\$8,748,619,576)

Table 34. Buildings in Greenwood Lake Dam Inundation Area.

Building Type	Number of Buildings in Dam Breach Inundation Area (Total in Town)	Building Value in Dam Breach Inundation Area (Total in Town)
Single Family	10 (9,136)	\$4,529,337 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	0 (1,276)	\$0 (\$1,252,281,272)
Commercial	4 (626)	\$3,578,604 (\$1,657,764,307)
Agricultural	0 (139)	\$0 (\$25,431,249)
Educational	0 (20)	\$0 (\$483,493,391)
Government	8 (47)	\$4,905,545 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	4 (86)	\$694,300 (\$286,554,435)
Garage/Outbuilding	0 (236)	\$0 (\$20,792,076)
Total	26 (11,585)	\$13,707,786 (\$8,748,619,576)

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 35. Buildings in Hoppin Hill Reservoir Dam Inundation Area.

Building Type	Number of Buildings in Dam Breach Inundation Area (Total in Town)	Building Value in Dam Breach Inundation Area (Total in Town)
Single Family	58 (9,136)	\$36,045,168 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	9 (1,276)	\$9,301,453 (\$1,252,281,272)
Commercial	24 (626)	\$41,819,084 (\$1,657,764,307)
Agricultural	0 (139)	\$0 (\$25,431,249)
Educational	0 (20)	\$0 (\$483,493,391)
Government	0 (47)	\$0 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	0 (86)	\$0 (\$286,554,435)
Garage/Outbuilding	43 (236)	\$3,750,825 (\$20,792,076)
Total	134 (11,585)	\$90,916,530 (\$8,748,619,576)

Table 36. Buildings in Whiting Pond Dam Inundation Area.

Building Type	Number of Buildings in Dam Breach Inundation Area (Total in Town)	Building Value in Dam Breach Inundation Area (Total in Town)
Single Family	208 (9,136)	\$78,152,141 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	192 (1,276)	\$240,368,726 (\$1,252,281,272)
Commercial	222 (626)	\$227,720,152 (\$1,657,764,307)
Agricultural	9 (139)	\$1,864,020 (\$25,431,249)
Educational	1 (20)	\$8,184,112 (\$483,493,391)
Government	4 (47)	\$15,474,179 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	23 (86)	\$65,284,066 (\$286,554,435)
Garage/Outbuilding	72 (236)	\$5,697,921 (\$20,792,076)
Total	731 (11,585)	\$642,745,317 (\$8,748,619,576)

The population exposed to dam breach is shown in Table 37. The column on the left shows the population in and around the dam breach areas (wherever the Census Block overlapped with the inundation boundary) while the column on the right shows the total population numbers for the Town. The population exposed has more households with a lower income, a high environmental justice population, and an older population.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 37. Population Exposed to Dam Breach (2020 U.S. Census).

Demographics	Population in and Adjacent to Floodplain	Total Population
Population	10,895	30,834
Households	4,887	12,551
White	9,126 (83.8%)	25,824 (83.8%)
Black	410 (3.8%)	944 (3.1%)
American Indian	17 (0.2%)	40 (0.1%)
Asian	506 (4.6%)	1,822 (5.9%)
Pacific Islander	1 (0.01%)	4 (0.01%)
Other Race	209 (1.9%)	524 (1.7%)
Two or More Races	226 (2.1%)	1,676 (5.4%)
Hispanic or Latino:	494 (4.5%)	1250 (4.1%)
Population under 18:	2,269 (20.8%)	6,822 (22.1%)
Population over 64:	1,770 (16.2%)	4,704 (15.3%)
Annual Income < \$30K/year	693 (14.2%)	1,651 (13.2%)
Population in EJ Zone*:	7,472 (68.6%)	7,478 (24.3%)

*Massachusetts Office of Energy and Environmental Affairs, 2022

Built Environment Impacts

To identify built environment impacts to the Town, FEMA's risk assessment software, Hazus, was implemented. Building footprint data and parcel data was used to update the model while the EAP's ½ PMF wet weather scenario was also integrated into the software. The economic loss results for the dam breach events are shown in Table 38 below. Although there is no specific return period assigned to the dam breach, the assumption is that it is a catastrophic event (1,000-year). The Town's AAL is calculated to be \$218,968.

Table 38. Building Impacts in the Falls Pond Dam Inundation Area.

Building Type	Number of Buildings Impacted	Building Losses	Content Losses	Inventory Losses
Single Family	35	\$6,562,860	\$3,656,024	\$0
Mobile Home	0	\$0	\$0	\$0
Multi-Family	13	\$3,091,429	\$1,879,620	\$0
Commercial	12	\$1,900,563	\$531	\$891,179
Agricultural	3	\$73,508	\$149	\$271,138
Educational	1	\$842,742	\$71	\$0
Government	0	\$0	\$0	\$0
Religious/Non-Profit	0	\$0	\$0	\$0

Town of North Attleborough, MA Hazard Mitigation Plan Update

Building Type	Number of Buildings Impacted	Building Losses	Content Losses	Inventory Losses
Industrial	3	\$5,717,170	\$172	\$2,068,225
Garage/Outbuilding	0	\$0	\$0	\$0
Total	67	\$18,188,272	\$5,536,567	\$3,230,542

Table 39. Building Impacts in the Greenwood Lake Dam Inundation Area.

Building Type	Number of Buildings Impacted	Building Losses	Content Losses	Inventory Losses
Single Family	8	\$1,144,709	\$637,801	\$0
Mobile Home	0	\$0	\$0	\$0
Multi-Family	0	\$0	\$0	\$0
Commercial	2	\$625,564	\$99	\$0
Agricultural	0	\$0	\$0	\$0
Educational	0	\$0	\$0	\$0
Government	8	\$621,992	\$621	\$0
Religious/Non-Profit	0	\$0	\$0	\$0
Industrial	4	\$84,818	\$132	\$27,613
Garage/Outbuilding	0	\$0	\$0	\$0
Total	22	\$2,477,083	\$638,652	\$27,613

Table 40. Building Impacts in the Hoppin Hill Reservoir Dam Inundation Area.

Building Type	Number of Buildings Impacted	Building Losses	Content Losses	Inventory Losses
Single Family	43	\$14,568,371	\$7,748,993	\$0
Mobile Home	0	\$0	\$0	\$0
Multi-Family	9	\$1,805,786	\$1,140,137	\$0
Commercial	15	\$2,847,360	\$867	\$735,664
Agricultural	0	\$0	\$0	\$0
Educational	0	\$0	\$0	\$0
Government	0	\$0	\$0	\$0
Religious/Non-Profit	0	\$0	\$0	\$0
Industrial	0	\$0	\$0	\$0
Garage/Outbuilding	0	\$0	\$0	\$0
Total	67	\$19,221,518	\$8,889,997	\$735,664

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 41. Building Impacts in the Whiting Pond Dam Inundation Area.

Building Type	Number of Buildings Impacted	Building Losses	Content Losses	Inventory Losses
Single Family	147	\$17,369,697	\$9,697,974	\$0
Mobile Home	0	\$0	\$0	\$0
Multi-Family	153	\$58,219,981	\$34,858,917	\$0
Commercial	129	\$14,488,783	\$3,721	\$13,318,165
Agricultural	6	\$96,772	\$224	\$337,244
Educational	0	\$0	\$0	\$0
Government	4	\$1,023,791	\$144	\$0
Religious/Non-Profit	0	\$0	\$0	\$0
Industrial	21	\$8,183,261	\$913	\$2,422,999
Garage/Outbuilding	0	\$0	\$0	\$0
Total	460	\$99,382,285	\$44,561,894	\$16,078,408

Climate change may increase the probability and magnitude of dam breach impacts to the built environment. New development in the Town should consider these projected conditions.

Population Impacts

The Town should be aware that senior and low-income segments of North Attleborough's population may be more vulnerable to hazard events due to a number of factors. Senior and low-income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. The dam inundation areas have high percentages of these vulnerable populations including those in Environmental Justice areas. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Climate change may increase the probability and magnitude of dam inundation impacts to the population. Future inundation areas may be larger than the current modeled scenarios and new development should consider these projected conditions. Vulnerable populations should be considered when development near the current dam breach inundation areas is planned.

Environment Impacts

One of the major environmental impacts of a major flood would be the potential release of hazardous materials. According to EPA's TRI database, there are 73 facilities which contain hazardous materials in the dam breach area.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Probability of Future Events

According to the previous Plan (2019), while North Attleborough contains five significant and high hazard dams, there have not been any reported dam failure events within the Town. The probability for a future failure event in the Town was presumed to be very low with a less than 1% annual chance of a dam failure.

Practitioners expect that there will be an overall increase of precipitation on an annual basis across Massachusetts. It is expected that precipitation patterns will become more variable over time, with fewer days with precipitation, but heavier and more intense events when it does rain or snow. Most areas across the state are expected to have small increases in annual total precipitation, but a substantial change in seasonal precipitation patterns. In other words, climate change will increase the probability of flooding caused by intense precipitation.

The National Climate Assessment and NCEI both project more fall, winter, and spring precipitation as well as more intense precipitation. The ResilientMass Plan estimates that precipitation will increase 6 to 14% by mid-century, with an increased frequency of floods meeting current 10-year flood levels. Much of the winter precipitation increase is projected to be in the form of rain rather than snow, which may actually reduce peak spring flooding but could lead to more frequent winter runoff events. As noted in the ResilientMass Plan, extreme river flow events are projected to increase, elevating the probability of damaging floods. In addition, smaller flooding events are likely to occur more frequently. For example, the current 24-hour 10-year storm (about 3 inches) could double in frequency by 2050 in western and central Massachusetts.

In light of the above, dam overtopping and failure is anticipated to be a greater risk in the future. This is believed to be the case if dam conditions are static. However, many dams are in need of maintenance, which can increase risks of failure in the future if these needs are not addressed.

Problem Statements for Dam Failure and Overtopping

Problem statements related to dam failure are presented in the following table.

Table 42. Problem Statements Related to Dam Failure and Overtopping.

Assets	Problems Associated with Dam Failure and Overtopping
People (including underserved communities and socially vulnerable populations)	Older and lower income populations in the potential downstream inundation area may have difficulty evacuating, particularly in a short time frame.

Assets	Problems Associated with Dam Failure and Overtopping
Structures (including facilities, lifelines, and critical infrastructure)	- Local officials do not always receive copies and updates of EAPs for privately owned dams. Without these documents, it is harder for emergency personnel to characterize the potential downstream risks and prepare for a potential breach event. - When engineered, dam spillways were often designed to pass a discharge for a particular historic storm recurrence interval. As the frequency and magnitude of precipitation events changes, these spillways are becoming undersized relative to their design standard which places downstream areas at increased risk of experiencing inundation from a dam failure.
Systems (including networks and capabilities)	Roads may be impacted by a dam breach, potentially impacting Town capabilities to respond to events.
Natural, historic, and cultural resources	- Forty-seven historic sites may be impacted during a dam breach. - Natural areas around several of the rivers including Bungay, Seven Mile, and Ten Mile may be impacted by a dam breach.
Activities that have value to the community	- Road closures may disrupt community events. - Failure of a dam may result in the dewatering of impoundments, impacting passive and active recreational opportunities.

Hurricanes and Tropical Storms

Flooding in Massachusetts is often the direct result of tropical storms and hurricanes. These powerful storms can also cause significant widespread damage due to high winds. The impacts from high winds are the primary concern of this section.

Description

Tropical cyclones (tropical depressions, tropical storms, and hurricanes) that affect New England form over the warm, moist waters of the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Tropical systems customarily come from a southerly direction and when they accelerate up the East Coast of the U.S., most take on a distinct appearance that is different from a typical hurricane. Although rain is often limited in the areas south and east of the track of the storm, these areas can incur the worst winds and storm surge. Dangerous flooding occurs most often to the north and west of the track of the storm. An

Town of North Attleborough, MA Hazard Mitigation Plan Update

additional threat associated with a tropical system making landfall is the possibility of tornado generation. Tornadoes may occur in the outer bands to the north and east of the storm, a few hours to as much as 15 hours prior to landfall.

Hurricane season runs from June 1 to November 30. In New England, these storms are most likely to occur in August, September, and the first half of October. The ResilientMass Plan notes that this is due in large part to the fact that it takes a considerable amount of time for the waters south of Long Island to warm to the temperature necessary to sustain the storms this far north. Also, as the region progresses into the fall months, the upper-level jet stream steering winds might flow from the Great Lakes southward to the Gulf States and then back northward up the eastern seaboard. This pattern is conducive for capturing a tropical system over the Bahamas and accelerating it northward.

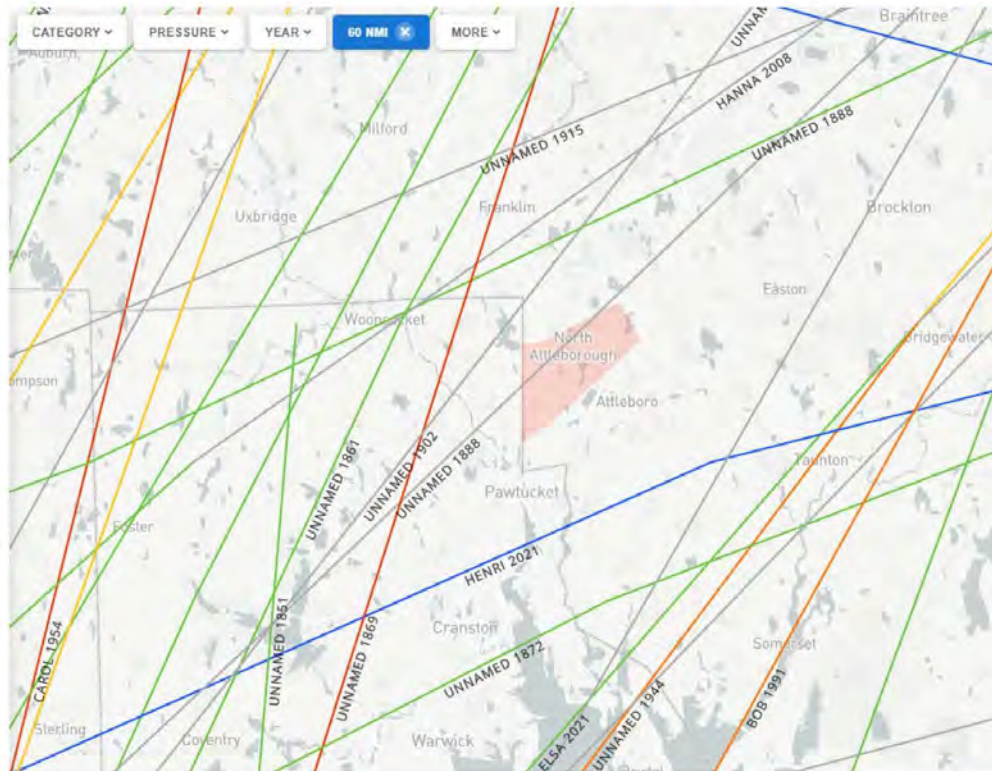
Location

Tropical storms and hurricanes can affect the entirety of Massachusetts, including the geographic extent of North Attleborough.

Previous Occurrences

The ResilientMass Plan notes that hurricanes and tropical storms occur somewhat regularly in Massachusetts. Recent notable events include Tropical Storm Isaias (2020), Tropical Depression Henri (2021), and Tropical Storm Else (2021). Historical tropical system tracks near and through are depicted on the following page. This mapping is available from NOAA and updated continuously. The Town's geographic position in New England is aligned with numerous historic storm tracks.

Historical Tropical Storm Tracks in the Town of North Attleborough



Graphic courtesy of NOAA

Many tropical storms and hurricanes have passed near North Attleborough since recordkeeping began. Hurricane Carol (1954) was a Category 3 storm as it passed west of North Attleborough, causing significant damage with its strong winds and was the strongest hurricane to affect New England at that time. Hurricane Bob (1991) was one of the most costly hurricanes in New England history and was a Category 2 storm as it passed, causing widespread wind damage on a storm track parallel to Carol but east of North Attleborough.

Figure 17. Historical Tropical Storm and Hurricane Tracks in North Attleborough.

Town of North Attleborough, MA Hazard Mitigation Plan Update

As noted elsewhere, this Plan update relies primarily on a ten-year lookback (2014 through 2024) ending with the date of plan development. During that ten-year period, only one Massachusetts emergency declaration (Storm Lee of 2023) was associated with a tropical system, but it is not listed in the NCEI database of severe storms for Bristol County. Tropical Storm Isaias of 2020 and Tropical Storm Jose of 2017 are the only tropical storms appearing in the inventory for Bristol County for the last ten years:

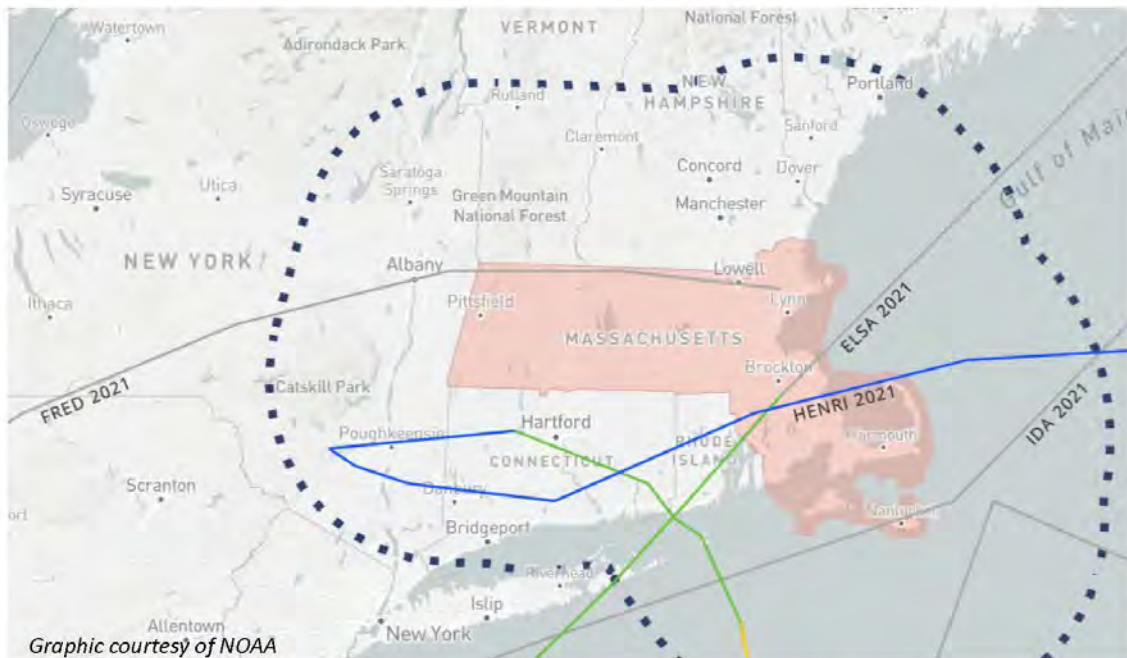
- August 4, 2020: Tropical Storm Isaias tracked northeast from the eastern Carolinas across the mid-Hudson Valley and into New England. The center of the storm passed close to Albany, NY on August 4th. This storm brought tropical storm force winds and moderate rainfall to western Massachusetts throughout the period. These winds caused widespread damage with numerous reports of downed trees and wires across Massachusetts. Power outages were also widespread with over 75,000 outages state-wide. Numerous trees were downed. In North Attleborough, a tree was snapped in half.
- September 22, 2017: Tropical Storm Jose formed over the Tropical Atlantic, moving west and growing to become a Major Hurricane. Jose passed north of the Leeward Islands, then turned on a northward path north of the Dominican Republic. As the storm moved north, Jose diminished to a Tropical Storm during Tuesday the 19th and then stalled about 150 miles southeast of Nantucket. The storm then slowly drifted south by Friday the 22nd and started to dissipate. Jose brought strong wind gusts and heavy downpours, primarily to the islands and south coasts of Massachusetts. A tree was reported down on the access road behind the Savers Store on U.S. Route 1 in North Attleborough.
- July 9, 2021: Tropical Storm Elsa made landfall in Rhode Island on Friday morning before moving into the Gulf of Maine. It interacted with a stalled frontal boundary and brought widespread heavy rainfall of 2 to 3.5 inches and gusty winds along the south coast, which caused scattered tree damage. The North Attleborough Emergency Operations Center was open for a short period during Elsa.
- August 19, 2021: The remnants of Tropical Storm Fred moved across Southern New England producing heavy rain, gusty winds, and two tornadoes.
- August 23, 2021: Tropical Storm Henri made landfall in southwest Rhode Island around noon on August 22nd, then moved slowly northwestward and westward across northern Connecticut and weakened. Henri brought strong wind gusts and flash flooding. The worst flash flooding occurred in northeast Connecticut. As the remnants of Henri moved eastward across southern New England on August 23rd, it spawned three tornadoes and a waterspout in Massachusetts and also it caused some renewed flooding. The highest rainfall totals over the two-day period ranged from 5 to 6 inches in Hartford and Tolland Counties in northern Connecticut and in Franklin, Hampshire, and Hampden Counties in Massachusetts.

None of the above NCEI-listed storms from the past decade were listed in the *Previous Occurrences* section for flood risk because they reportedly did not cause significant flooding in North Attleborough.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Overall, North Attleborough has been moderately impacted by tropical and post-tropical storm systems in recent years, despite T.D. Henri tracking close to the Town. To help illustrate the point that severe flooding can occur – and has often occurred – from storms tracking through Massachusetts, the storm tracks of the 2021 hurricane season are illustrated on the following graphic.

Impacts of the 2021 Hurricane Season on Massachusetts



T.S. Elsa crossed eastern Massachusetts on July 9, delivering wind and flooding rains while transitioning to an extratropical storm later that day. Approximately 2 to 4 inches of rain were recorded in many towns. MBTA commuter rail trains were delayed on the Worcester line due to flooding, and Route 146 was flooded. About 11,000 Eversource customers in Massachusetts lost power.

Extratropical Storm Fred crossed northern Massachusetts lengthwise on August 19 and 20, delivering flooding rains to parts of southern New England. Flooding in Massachusetts was worst in the Worcester area. Approximately 2 to 4 inches of rain were recorded in many towns.

T.D. Henri crossed eastern Massachusetts on August 24, delivering flooding rains to parts of southern New England. Prior to crossing Massachusetts, the storm looped through Connecticut and New York on August 22-24. The path and slow movement of the storm contributed to widespread flooding in all three states, made worse due to the conditions caused by storm Fred only a few days before. Approximately 1 to 4.5 inches of rain were recorded in many towns. About 12,000 Eversource customers in Massachusetts lost power.

Extratropical Storm Ida passed south of New England and crossed Nantucket on September 2, delivering flooding rains to parts of southern New England. The precipitation from Ida was more intense than expected, and it caused widespread flooding. Approximately 2 to 6 inches of rain were recorded in many towns. About 4,000 people in Massachusetts lost power.

Figure 18. Tracks for Tropical Storms that Impacted Massachusetts 2021.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Even without the presence of a catastrophic hurricane striking North Attleborough recently, less severe tropical storms and remnants such as those described above have created disruptions and necessitated public expenditures to deal with outages and debris. The Town has acknowledged this risk. For example, according to the HMPC, the Town recently installed a new 150-foot-high communication tower; wind speeds were a consideration in the design of this structure.

Extent

Hurricanes are measured according to the Saffir-Simpson scale, which categorizes or rates hurricanes from 1 (minimal) to 5 (catastrophic) based on their intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, inherently leaving out any measure of precipitation and flooding.

Table 43. Saffir-Simpson Scale.

Saffir-Simpson Hurricane Wind Scale		
	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Damaging winds will produce some damage: Well-constructed framed homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap, and shallow-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 83-95 kt 154-177 km/h	Very strong, damaging winds will cause widespread damage: Well-constructed framed homes could sustain major roof and siding damage. Many shallow-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 (major)	111-129 mph 96-112 kt 178-208 km/h	Dangerous winds will cause extensive damage: 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 (major)	130-156 mph 113-136 kt 209-251 km/h	Extremely dangerous winds will cause devastating damage: 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 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: 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: National Hurricane Center, NOAA

Tropical storms and tropical depressions, while generally less dangerous than hurricanes, can be deadly. The winds of tropical depressions and tropical storms are usually not the greatest threat; rather, the rains, flooding, and severe weather associated with the tropical storms are what customarily cause more significant problems. Nevertheless, serious power outages can also be associated with these types of events.

The NWS issues a hurricane warning when sustained winds of 74 mph or higher are expected in a specified area in association with a tropical, subtropical, or post-tropical cyclone. A warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds. A hurricane watch is announced when sustained winds of 74 mph or higher are possible within the specified area in association with a

Town of North Attleborough, MA Hazard Mitigation Plan Update

tropical, subtropical, or post-tropical cyclone. A watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds (NWS, 2013).

The Saffir-Simpson scale and the NWS watch/warning products are applicable to all tropical storms and hurricanes that may strike North Attleborough, as they are used throughout Massachusetts on a routine basis and appropriately characterized the previous storms that posed risks to North Attleborough.

Vulnerability Assessment

Exposure

High winds and heavy rain and/or hail associated with hurricanes and tropical storms can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites. All assets in the Town of North Attleborough should be considered exposed to high winds. Figure 19 shows the 100-year windspeeds identified in the ASCE 7-98 publication.

Town of North Attleborough, MA Hazard Mitigation Plan Update

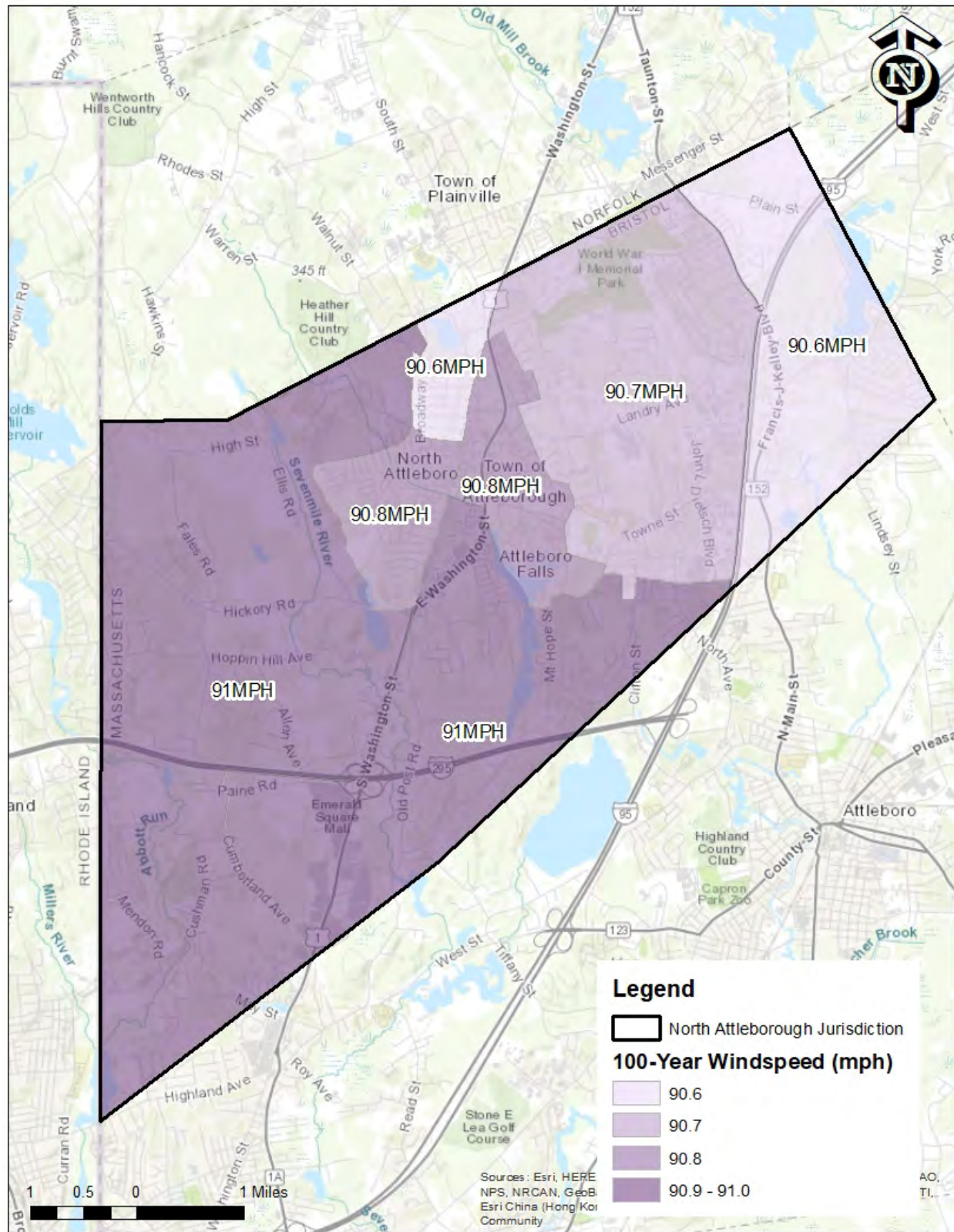


Figure 19. 100-Year Windspeeds (ASCE 7-98).

Town of North Attleborough, MA Hazard Mitigation Plan Update

Built Environment Impacts

To identify built environment impacts to the Town resulting from wind damage, FEMA's risk assessment software, Hazus, was implemented. The economic loss results of the 500-year event are shown in Table 44 while the results for the 1000-year event are shown in Scenario. The Town of North Attleborough's AAL is calculated to be \$2,389,145.

Buildings that are permanently open with bays or open sides are susceptible to wind damage since the building envelope can't be maintained. Communication antennas are vulnerable to high wind speeds and solar arrays may be impacted by very high winds. Neighborhoods with aerial utilities would be more vulnerable than neighborhoods with below ground utilities.

During the North Attleborough HMPC #2 meeting (January 6, 2025), it was noted that the new Communications Tower, which is 150 feet tall, is the highest point in the Town Park and was built to withstand high winds.

Table 44. Building Losses Due to Wind for a 500-Year Scenario.

Loss Type	Residential (\$Million)	Commercial (\$Million)	Other Occupancy (\$Million)	Total (\$Million)
Building Loss	105.72	15.88	11.62	133.22
Content Loss	37.94	4.46	4.44	46.48
Business Inventory Loss	0.00	1.32	0.31	1.63
Business Income Loss	0.00	0.78	0.29	1.07
Business Relocation Loss	7.24	2.49	1.64	11.37
Rental Income Loss	2.81	1.18	0.19	4.18
Wage Loss	0.00	1.12	2.64	3.76
Total	153.71	27.23	21.13	201.71

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 45. Building Losses Due to Wind for a 1000-Year Scenario.

Loss Type	Residential (\$Million)	Commercial (\$Million)	Other Occupancy (\$Million)	Total (\$Million)
Building Loss	165.87	23.47	17.17	206.51
Content Loss	62.99	7.72	7.52	78.23
Business Inventory Loss	0.00	2.25	0.51	2.76
Business Income Loss	0.00	0.68	0.30	0.98
Business Relocation Loss	14.49	3.75	2.42	20.66
Rental Income Loss	5.42	1.88	0.31	7.61
Wage Loss	0.00	1.05	2.67	3.72
Total	248.77	40.80	30.90	320.47

Population Impacts

Populations considered most vulnerable to hurricane and tropical storm impacts in North Attleborough are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. For high windspeeds, it is important to maintain the building envelope during the event. If a window or door fails, damage to the structure will be much greater. The senior and low-income populations in North Attleborough are particularly susceptible to extreme winds and it should be noted that there may be overlap between the two categories. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

For the 500-year event, Hazus predicts that there will be 147 displaced households and 68 people seeking temporary public shelter from the high windspeeds. For the 1000-year event, Hazus predicts that there will be 280 displaced households and 128 people seeking temporary public shelter from the high windspeeds. Participants in the North Attleborough HMPC #1 Meeting noted that the Town opened its Emergency Operations Center during Hurricane Elsa (July 2021).

Environment Impacts

Hurricanes can cause damage to parks and other natural areas. Some areas of the Town may be out of service until trees are removed.

Participants in the North Attleborough HMPC #1 Meeting (October 21, 2024) noted that the Electric Department has made great progress with the tree maintenance program, which involves a contractor

Town of North Attleborough, MA Hazard Mitigation Plan Update

cutting back tree limbs. The southwest corridor of Town was identified as more difficult in terms of addressing tree damage due to the remote location, and the Lindsay Street/Cranberry Road area was identified as having experienced significant wind damage and loss of trees, especially pines and other vulnerable trees at higher elevation.

During the HMPC #2 meeting (January 6, 2025), attendees noted that the Town engages a tree company to trim back overgrowth and to identify and flag hazardous trees annually so that all necessary trimming is completed within a four-year cycle.

Probability of Future Events

The Massachusetts SHMCAP noted that there was a great deal of uncertainty about the impacts of climate change on hurricanes and tropical storms, but that the limited evidence available indicated that stronger storms (Category 4 and 5) were becoming more frequent. Overall, the risk from hurricanes and their associated flooding was expected to increase as a result of climate change. The current ResilientMass Plan explains that Massachusetts experiences a tropical storm or hurricane about once every two years on average, with NOAA estimating the recurrence of any category hurricane between 13 to 30 years, and a Category 3 hurricane occurrence every 50 to 60 years.

Some researchers have suggested that the intensity of tropical cyclones has increased over the last 40 years, with some believing that there is a connection between this increase in intensity and climate change. While most climate simulations agree that greenhouse warming enhances the frequency and intensity of tropical storms, models of the climate system are still limited by resolution and computational ability. Given the history of major storms and the possibility of increased frequency and intensity of tropical storms due to climate change, it is prudent to expect that there will be hurricanes impacting North Attleborough in the future that may be of greater frequency and intensity than in the past.

Problem Statements for Hurricanes/Tropical Storms

Problem statements for hurricanes and tropical storms are presented in the following table.

Table 46. Problem Statements for Hurricanes/Tropical Storms.

Assets	Problems Associated with Hurricanes and Tropical Storms
People (including underserved communities and socially vulnerable populations)	Vulnerable populations may need to be evacuated and could be displaced from their homes.

Assets	Problems Associated with Hurricanes and Tropical Storms
Structures (including facilities, lifelines, and critical infrastructure)	• Wind may cause trees to fall into structures and infrastructure, and roadways. • Wind damage to wind-susceptible buildings such as communication antennas, aerial utilities, solar arrays, greenhouses, pavilions, gazebos, and open-walled buildings. Additional damage to commercial buildings with HVAC located on roofs. • The electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power.
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to tree debris.
Natural, historic, and cultural resources	• Historic buildings may experience damage during high wind events, especially the roofing and windows. Water entering these buildings could impact important historic and cultural artifacts.
Activities that have value to the community	• A severe hurricane wind and rain event could negatively impact outdoor activities in the Town.

Invasive Species

The ResilientMass Plan defines invasive species as non-native species that cause or are likely to cause harm to ecosystems, economies, and/or public health (USDA). The focus of this section is on invasive terrestrial plants, as this is the most studied and managed type of invasive; information for invasive aquatic flora and fauna is also provided when relevant.

Description

The Massachusetts Invasive Plant Advisory Group (MIPAG), a collaborative representing organizations and professionals concerned with the conservation of the Massachusetts landscape, is charged by EOEEA to provide recommendations to the Commonwealth to manage invasive species. MIPAG defines invasive plants 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.” These species have biological traits that

provide them with competitive advantages over native species, particularly because in a new habitat they are not restricted by the biological controls of their native habitat. As a result, these invasive species can monopolize natural communities, displacing many native species and causing widespread economic and environmental damage.

Some examples of invasive insect species include:

- Nantucket Pine Tip Moth (native pest) is a moth with heads, bodies, and appendages covered with gray scales with mottled rusty-red markings. Larvae cause damage to young trees (up to five years old) by feeding inside growing shoots, buds, and conelets. The preferred host is the loblolly pine.
- Bark Beetles (native pest) include more than 600 species of beetles which serve in important ecological roles in small numbers where they live in dead, weakened, and dying host conifer trees.
- Forest Tent Caterpillar (native pest) has the biggest footprint of any indigenous tent caterpillar in North America (Furniss and Carolin 1977) and is a major defoliator of a variety of deciduous hardwood trees. The caterpillars spin silken mats on the trunks and large branches of trees where they molt and feed. Forest Tent Caterpillars can reach outbreak proportions causing massive defoliation of host trees and becoming a nuisance to people.
- Pine Reproduction Weevils (native pest) is a very dark, elongate, oval insect up to 1/2 inch long with indistinct to distinct gray or pale orange spots of scales on the wings and thorax. They feed at night on the conifer seedlings or near the tips of branches of larger plants. Females lay their eggs on the roots of these trees. The weevils breed in all species of pines, hemlocks, junipers, spruces, firs, and cedars.
- Hardwood Borers (native pest) usually attack hardwoods experiencing some kind of stress although the clear-wing moths attack healthy trees. These insects attack the tree year after year and may eventually weaken it enough that it is prone to wind breakage. Some borers develop in the root system damaging young trees.
- Hemlock Woolly and Balsam Woolly Adelgid (non-native pest) is a very small, invasive, aphid-like insect that attacks North American hemlocks (Hemlock Woolly) and firs (Balsam Woolly). They can be identified by the white wooly masses that form on the underside of branches at the base of the tree's needles. They stay at this location for the rest of their lives. Their feeding disrupts the flow of nutrients to the tree twigs and needles leading to a decline in tree health and mortality in 4 to 10 years.
- Spongy Moth (non-native pest) is an insect which feeds on a large variety of tree leaves from oak, maple, apple, crabapple, hickory, basswood, aspen, willow, birch, pine, spruce, hemlock, and others. It does prefer oak tree leaves, however. Periodically, large populations can cause defoliation damaging and killing trees they are feeding on.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Spotted Lanternfly (non-native pest) is an invasive insect first detected in the U.S. in 2014. It feeds on a variety of fruit, ornamental, and wood trees and could seriously impact the grape, orchard, and logging industries.

Location

The entire Commonwealth is vulnerable to invasive species. Types of species can vary by location, elevation, ecosystem, and habitat type, as well as land and water use. Furthermore, the ability of invasive species to travel distances (either via natural mechanisms or accidental human interference) allows these species to propagate rapidly over a large geographic area. Similarly, in open freshwater and marine ecosystems, invasive species can quickly spread once introduced, as there are generally no physical barriers to prevent establishment, outside of physiological tolerances, and multiple opportunities for transport to new locations (by boats, for example). The entire geographic area of North Attleborough is believed at risk for invasive species propagation.

Previous Occurrences

Invasive species do not represent a singular event but rather an ongoing or emerging problem, so it is difficult to measure the frequency of occurrences. A comprehensive list of invasives can be found at <https://www.massnrc.org/mipag/invasive.htm>. Invasives of current concern to forest health (<https://www.mass.gov/service-details/current-forest-health-threats>) in Bristol County are reportedly:

- Emerald Ash Borer
- Hemlock Woolly Adelgid
- Southern Pine Beetle
- Spongy Moth
- White Pine Needlecast
- Winter Moth

North Attleborough's Open Space and Recreation Plan (2021) notes that risks to North Attleborough's forests include air pollution, invasive pests (such as the emerald ash borer and Asian long-horned beetle), invasive species crowding native tree species, and natural disasters. The plan further states that "in years past when funding was not provided by the Town, invasive weeds, at lower Falls Pond in particular, significantly interfered with kayaking and boating on the pond." The HMPC confirmed that knotweed continues to be an issue on the pond.

The previous edition of this hazard mitigation plan and the CRB report did not discuss invasive species. In general, climate change is expected to impact forest species composition in a variety of ways, with cooler species such as sugar maples and hemlocks retreating northward and higher in elevation and invasive forest pests increasing tree mortality of key species. The trees most susceptible to these invasive species – oak, birch, and ash trees – will be more vulnerable and susceptible to severe storm events and drought, increasing risk of wildfires and electrical line damage.

The HMPC noted in February 2025 that public outreach related to Spotted Lanternfly was planned, as the species had been observed in nearby communities.

Extent

MIPAG recognizes 74 plant species as "Invasive," "Likely Invasive," or "Potentially Invasive." The criteria for an "Invasive" species are listed below; the other assigned categories are associated with lower scores on the criteria checklist. The criteria for invasive animal species are less well-defined, but many of the same characteristics (including a non-Massachusetts origin and the ability to out-compete native species) are similar. To be considered "Invasive" by MIPAG, a plant species must meet the following complex set of criteria:

1. Be nonindigenous to Massachusetts.
2. Have the biologic potential for rapid and widespread dispersion and establishment in minimally managed habitats.
3. Have the biologic potential for dispersing over spatial gaps away from the site of introduction.
4. Have the biologic potential for existing in high numbers away from intensively managed artificial habitats.
5. Be naturalized in Massachusetts (persists without cultivation in Massachusetts).

If a species meets criteria 1–4 and criterion 5, it may be considered "invasive" or "likely invasive" in Massachusetts. If it does not meet criterion 5, it may be considered "potentially invasive" if it meets criteria 13–15 below.

6. The species is widespread in Massachusetts, or common in a region or habitat type(s) in the state.
7. The species has many occurrences in Massachusetts that have high numbers of individuals in minimally managed habitats.
8. The species is able to outcompete other species in the same natural plant community.
9. The species has the potential for rapid growth, for high seed or propagule production and dissemination, and for establishment in natural plant communities.

Town of North Attleborough, MA Hazard Mitigation Plan Update

If a species meets the initial five criteria and criteria 6–9 at this time, it may be considered a “likely invasive” species in Massachusetts if it also meets at least one of the following three criteria:

10. The species has at least one occurrence in Massachusetts that has high numbers of individuals forming dense stands in minimally managed habitats.
11. The species has the potential, based on its biology, colonization history outside its native range, and likelihood of range expansion or change in biologic potential from climate change predictions, to become invasive in Massachusetts.
12. The species is acknowledged to be invasive in nearby states, but its status in Massachusetts is unknown or unclear. This may result from lack of field experience with the species or from difficulty in species determination or taxonomy.

If the species meets the basic criteria for invasiveness (criteria 1–4) but is not naturalized in Massachusetts (criterion 5), the species may be considered “potentially invasive” in Massachusetts if it meets the following three criteria (criteria 13–15):

13. The species, if it becomes naturalized in Massachusetts, based on its biology and biologic potential, would pose an imminent threat to the biodiversity of Massachusetts and
14. Its naturalization in Massachusetts is anticipated, and
15. The species has a documented history of invasiveness in other areas outside its native range including expansion of range and/or change in biological potential from climate change predictions.

The MIPAG has developed a list of Early Detection plant species according to an established set of criteria that includes MIPAG classification as an *invasive*, *likely invasive*, or *potentially invasive* ecological threat and one of these three criteria: *limited prevalence in Massachusetts*, *partial containment potential*, or *public health threat*. The Early Detection table includes the documented distribution of a species by county.

Table 47. Early Detection Information for Addressing Invasive Species.

Species	Common Name	Current County of Distribution (November 2010)	Notes
<i>Arthraxon hispidus</i>	Hairy joint grass; jointhead;	Franklin (historically)	This species is not currently known in Massachusetts; it was last collected in Deerfield

Town of North Attleborough, MA Hazard Mitigation Plan Update

Species	Common Name	Current County of Distribution (November 2010)	Notes
	small carpetgrass		in 1973. This is an annual grass that co-occurs with Japanese stilt grass further south.
<i>Butomus umbellatus</i>	Flowering rush	Essex, Middlesex	<i>Butomus umbellatus</i> is an aquatic perennial herb which reproduces by seed dispersal or vegetatively by bulbils
<i>Carex kobomugi</i>	Japanese sedge; Asiatic sand sedge	Barnstable (historically)	Native to northeastern Asia, <i>Carex kobomugi</i> is an invasive plant that invades coastal sand dunes and can outcompete native dune-binding grasses. This species was last collected in 1973.
<i>Egeria densa</i>	Brazilian waterweed; Brazilian elodea	Essex, Middlesex, Norfolk, Plymouth, Worcester	This species is often confused with Hydrilla and native <i>Elodea</i> spp. but has larger, nickel-sized flowers. This is a submerged aquatic species whose rapid growth often leads to dense mats on the water surface, which crowds out native plants and damages fish and aquatic habitat. The mats can also impede boat traffic.
<i>Glyceria maxima</i>	Tall mannagrass; reed mannagrass	Essex	This perennial grass invades low shrub-swamps and other wetland
<i>Heracleum mantegazzianum</i>	Giant hogweed	Berkshire, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Suffolk, Worcester	Giant hogweed is a federal noxious weed that is currently being eradicated under the U.S. Department of Agriculture's authority. This is a perennial herb that can cause painful burns and permanent scarring to humans if they touch the plant.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Species	Common Name	Current County of Distribution (November 2010)	Notes
<i>Hydrilla verticillata</i>	Hydrilla; water-thyme; Florida elodea	Barnstable, Plymouth, Worcester	Hydrilla is an invasive non-native submerged plant. This plant grows and reproduces rapidly, displacing native species, hampering recreational uses, and slowing water flow. Hydrilla, once established, can replace native vegetation and affect fish populations.
<i>Myriophyllum aquaticum</i>	Parrot-feather; water-feather; Brazilian watermilfoil	Norfolk	Parrot-feather is a perennial aquatic plant native to South America. This plant typically grows in freshwater, with a preference for areas with high nutrient contents. Parrot-feather has been introduced worldwide for use in indoor and outdoor aquaria.
<i>Nymphoides peltata</i>	Yellow floating heart	Hampden, Middlesex, Worcester	Yellow floating heart is native to Asia and now is found in over 15 states in the U.S. This plant forms dense mats on the water surface, restricting light penetration into the water and decreasing air exchange between the water's surface and the atmosphere. Algae can be shaded out by this plant, resulting in food chain disruptions for an entire lake.
<i>Persicaria perfoliata</i> syn.: <i>Polygonum perfoliatum</i>	Mile-a-minute vine or weed; Asiatic tearthumb	Barnstable, Essex, Franklin, Norfolk, Plymouth, Suffolk	Mile-a-minute vine is a barbed vine that can grow up to 6 inches a day. This vine smothers other herbaceous plants, shrubs, and even trees by growing over them and blocking their access to sunlight.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Species	Common Name	Current County of Distribution (November 2010)	Notes
<i>Peuraria montana ssp. lobata</i>	Kudzu; Japanese arrowroot	Barnstable, Bristol, Essex, Middlesex, Plymouth, County	Kudzu is native to Japan and southeast China and was introduced to the U.S. during the Philadelphia Centennial Exposition in 1876. Once established, kudzu can grow at a rate of a foot per day, with mature vines as long as 100 feet.
<i>Senecio jacobaea</i>	Tansy ragwort; stinking Willie; stinking Billy	Essex County Suffolk County Worcester County	This biennial herb is a weedy plant that infests woodlands, pastures, and hayfields. This plant is toxic to all classes of livestock but most toxic to cattle and horses. The plant can cause chronic liver disease, and affected animals usually die within a few weeks after ingesting it.
<i>Trapa natans</i>	Water chestnut	Berkshire, Bristol, Essex, Franklin, Hamden, Hampshire, Middlesex, Suffolk, Worcester	Water chestnut is an annual aquatic species with both floating and submerged leaves.

The extent associated with Emerald ash borer, Hemlock wooly adelgid, and Asian longhorn beetle identified under Previous Occurrences are not well addressed by the classification systems presented in this section, as they are insects. Massachusetts DCR maintains online resources and fact sheets for Emerald ash borer, Hemlock wooly adelgid, and Asian longhorn beetle; and these resources are appropriate for North Attleborough. If invasive terrestrial and aquatic vegetation become problematic in North Attleborough, the above resources can help characterize them.

The Massachusetts Department of Agricultural Resources (MDAR) Invasive Pest Dashboard is a convenient tool for tracking invasive pests in Massachusetts. The mapping tool shows the history of detections of Asian longhorn beetle, Beech leaf disease, Box tree moth, Elm zigzag sawfly, Emerald ash

Town of North Attleborough, MA Hazard Mitigation Plan Update

borer, Spotted lanternfly, and a few species of vegetation. As more data is added to the dashboard, scales of invasive species emergence will become more clear and can be used in communities.

Vulnerability Assessment

Exposure

The entire Town has the potential to be exposed to invasive pests. Climate change will make the area more attractive to pests who have not been found there traditionally.

Built Environment Impacts

Although the built environment is not as susceptible to pests as the natural environment, it can help spread the invasive species. This includes trains and vehicles that could move the species from one location to another. Trees, which are damaged or killed by invasive pests, can become hazards to people, property, utility lines, and roadways when they fall. Many dead trees in one area can also become fuel for wildfires interconnecting the two hazards.

Population Impacts

The direct population impacts are minimal. However, the indirect impacts could destroy livelihoods.

Environment Impacts

Most of the natural features in the Town are somewhat susceptible to pests including the parks and other forested areas. Trees that have been damaged by other events such as fire, wind, flooding, and animal browsing are more susceptible to diseases and pests. Certain species of trees are more susceptible based on the need of the damaging organism. Climate change will increase the probability of invasive pests, which will pose increased environmental impacts in the future.

Probability of Future Events

Once established, invasive species often escape notice for years or decades. Introduced species that initially escaped many decades ago are only now being recognized as invasives. Because these species can occur anywhere (on public or private property), new invasive species often escape notice until they are widespread, and eradication is impractical. As a result, early and coordinated action between public and private landholders is critical to preventing widespread damage from an invasive species.

The USDA Animal and Plant Health Inspection Service (APHIS) manages the Plant Protection and Quarantine (PPQ) Program which safeguards U.S. agriculture and natural resources from the introduction, establishment, and spread of plant pests and noxious weeds. PPQ is the lead federal agency for plant health emergencies and works closely with federal, state, and local agencies; universities; industries; and private entities in developing and implementing science-based framework designed to protect against invasive pests and diseases.

Massachusetts has a variety of laws and regulations in place that attempt to mitigate the impacts of these species. The Department of Agricultural Resources (DAR) maintains a list of prohibited plants for the state, which includes federally noxious weeds as well as invasive plants recommended by MIPAG and approved for listing by DAR. Species on the DAR list are regulated with prohibitions on importation, propagation, purchase, and sale in the Commonwealth. Additionally, the Massachusetts Wetlands Protection Act (310 CMR 10.00) includes language requiring all activities covered by the Act to account for, and take steps to prevent, the introduction or propagation of invasive species.

In 2002, Massachusetts passed an Aquatic Invasive Species Management Plan, making the Commonwealth eligible for federal funds to support and implement the plan through the federal Aquatic Nuisance Prevention and Control Act. MassDEP, DCR, CZM, and Massachusetts Institute of Technology Sea Grant College Program are part of the Northeast Aquatic Nuisance Species Panel, which was established under the federal Aquatic Nuisance Species Task Force. This panel allows managers and researchers to exchange information and coordinate efforts on the management of aquatic invasive species. The Commonwealth also has several resources pertaining to terrestrial invasive species, such as the Massachusetts Introduced Pest Outreach Project, although a strategic management plan has not yet been prepared for these species. All these efforts are aimed at reducing the probability of future occurrences.

Notwithstanding the above efforts, the presence of invasive species is ongoing, and it is difficult to quantify the future frequency of these occurrences. Increased rates of global trade and travel have created many new pathways for the dispersion of exotic species. As a result, the frequency with which these threats have been introduced has increased significantly. Increased international trade in ornamental plants is particularly concerning because many of the invasive plant species in the U.S. were originally imported as ornamentals. Furthermore, they are expected to be an increasing problem due to a changing climate and projected increases in non-native plant and animal infestations. For this reason and based on the fact invasive species are already an ongoing issue for the region, this hazard has been assigned a probability of highly likely.

Problem Statements for Invasive Species

Table 48. Problem Statements for Invasive Species.

Assets	Problems Associated with Invasive Species
People (including underserved communities and socially vulnerable populations)	• None apparent or projected.

Structures (including facilities, lifelines, and critical infrastructure)	• None apparent or projected.
Systems (including networks and capabilities)	• Additional Town resources may be required for species such as knotweed.
Natural, historic, and cultural resources	• Invasive species are problematic throughout the Town. • Knotweed may need additional attention in coming years. • Spotted Lanternfly is an emerging concern, and outreach is underway.
Activities that have value to the community	• Recreational activities may be adversely impacted, depending on location, and especially in parks and natural areas.

Other Severe Weather

Several frequent natural hazards in Massachusetts – particularly strong winds and extreme precipitation events – occur outside of notable storm events. This section discusses the nature and impacts of these hazards, as well as ways in which they are likely to respond to climate change. Winter storms and tornadoes are addressed in later sections.

The Town of North Attleborough Community Resilience Building Workshop Summary of Findings (2019) lists “nor’easters/high wind” as one of the top hazards of concern.

Description

Thunderstorms: A thunderstorm is a storm originating in a cumulonimbus cloud. Cumulonimbus clouds produce lightning, which locally heats the air to 50,000 degrees Celsius, which in turn produces an audible shock wave known as thunder. Frequently during thunderstorm events, heavy rain and gusty winds are present. Less frequently, hail is present, which can become very large in size. Tornadoes can also be generated during these events. An average thunderstorm is 15 miles across and lasts 30 minutes, but severe thunderstorms can be much larger and longer.

Three basic components are required for a thunderstorm to form: moisture, rising unstable air, and a lifting mechanism. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise, it will continue to rise as long as it weighs less and stays warmer than the air around it. As the warm surface air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool, releasing the heat, and the vapor condenses into a cloud. The cloud eventually grows upward into areas

Town of North Attleborough, MA Hazard Mitigation Plan Update

where the temperature is below freezing. Some of the water vapor turns to ice, and some of it turns into water droplets. Both have electrical charges. When a sufficient charge builds up, the energy is discharged in a bolt of lightning, which causes the sound waves we hear as thunder.

Downbursts: A downburst is a severe localized wind blasting down from a thunderstorm. They are more common than tornadoes. Depending on the size and location of downburst events, the destruction of property may be significant. Downbursts fall into two categories:

1. Microbursts affect an area less than 2.5 miles in diameter, last 5 to 15 minutes, and can cause damaging winds up to 168 mph.
2. Macrobusts affect an area at least 2.5 miles in diameter, last 5 to 30 minutes, and can cause damaging winds up to 134 mph.

An organized, fast-moving line of microbursts traveling across large areas is known as a “derecho.” These occasionally occur in Massachusetts. Downburst activity is, on occasion, mistaken for tornado activity. Both storms have very damaging winds (downburst wind speeds can exceed 165 mph) and are very loud. These “straight line” winds are distinguishable from tornadic activity by the pattern of destruction and debris such that the best way to determine the damage source is to fly over the area.

Hail: Hailstones are chunks of ice that grow as updrafts in thunderstorms keep them in the atmosphere. Most hailstones are smaller in diameter than a dime, but stones weighing more than 1.5 pounds have been recorded. NOAA has estimates of the velocity of falling hail ranging from 9 meters per second (m/s) (20 mph) for a 1-centimeter (cm)-diameter hailstone to 48 m/s (107 mph) for an 8 cm, 0.7 kilogram stone.

Lightning: Lightning is a discharge of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. According to NOAA, the creation of lightning during a storm is a complicated process that is not fully understood. In the initial stages of development, air acts as an insulator between the positive and negative charges. However, when the potential between the positive and negative charges becomes too great, a discharge of electricity (lightning) occurs. In-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom. Cloud-to-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom of a second cloud. Cloud-to-ground lightning is the most dangerous. In summertime, most cloud-to-ground lightning occurs between the negative charges near the bottom of the cloud and positive charges on the ground.

Location

High wind events, thunderstorms, lightning, and hail can affect the entirety of Massachusetts, including the geographic extent of North Attleborough. The HMPC notes that areas in the south and southwest

Town of North Attleborough, MA Hazard Mitigation Plan Update

corner of North Attleborough tend to have recurring issues with tree damage and power outages, and trees along streets in the eastern part of the Town near Falls Pond (Lindsey Street, Cranberry Road, Mary Ann Way, and Mansfield Road) tend to experience significant wind damage. Some of these areas include one point of road access (e.g., Wild Acres Road) or the second access cannot support large emergency vehicles such as fire trucks (e.g., Lindsey Street).

Previous Occurrences

The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists numerous severe storms affecting the area of North Attleborough from 2014 through 2024. The individual damage figures for these events appear nominal but given the frequency of events, the overall losses from severe storms are striking. Some of these events were truly associated with winter storms, but the lack of snowfall contributed to them being classified as high wind events by NOAA.

Table 49. NCEI Severe Storm Database Entries Covering Other Severe Storms in North Attleborough.

Date	Description	Losses Reported
7/20/13	<i>Lightning:</i> A pre-frontal trough moved into southern New England, providing lift for showers and thunderstorms to develop in a hot and humid atmosphere. In addition, there was enough instability and shear for thunderstorms to become severe. Because of warm air aloft, these thunderstorms mostly produced strong to damaging winds and not large hail. In North Attleborough, lightning struck a house on Elmwood Street, igniting a fire. The house sustained minor damage.	\$5,000
2/25/16	<i>Thunderstorm Wind.</i> Low pressure tracked north through New York bringing a warm front through southern New England. Unseasonably deep moisture accompanied this front. This was a very complicated weather situation as a strong low-level inversion was in place over the area with a very strong low-level jet just above the inversion. As showers and thunderstorms developed, the storms and heavy rain allowed the stronger winds to mix down to the surface. In other areas, temperatures warmed enough at the surface to break the inversion and allow the stronger winds to mix down. This resulted in a complicated combination of severe thunderstorm winds and high winds. To add to the historical nature of this event, it occurred in February all during the overnight hours. Multiple wires were downed throughout North Attleborough.	\$15,000

Town of North Attleborough, MA Hazard Mitigation Plan Update

Date	Description	Losses Reported
8/6/16	<i>Thunderstorm Wind.</i> A strong cold front moved across southern New England, producing scattered showers and thunderstorms. A few of these storms resulted in wind damage and some minor flooding. A large tree on Anawan Road was downed by thunderstorm winds.	\$5,000
6/9/17	<i>Thunderstorm Wind.</i> Solar heating of a cold unstable air aloft helped generate a few thunderstorms over eastern Massachusetts during the afternoon. These thunderstorms dissipated during the evening. At 2:34 PM EST, a tree was reported down on power lines at the World War One Park off Elmwood Street in North Attleboro.	\$1,500
8/4/19	<i>Thunderstorm Wind.</i> A weak cold front moved into a very unstable air mass and triggered isolated severe thunderstorms in southeastern Massachusetts in the later afternoon and early evening. Torrential downpours led to some urban flash flooding as well. In North Attleborough, at 3:50 PM EST, trees were down on wires on Norton Road. A tree was down on Mount Hope Street. At 3:55 PM EST, a tree was down on power lines on Jefferson Street.	\$1,500
8/19/19	<i>Thunderstorm Wind.</i> An upper-level short wave combined with a surface trough and unstable conditions to provide an environment favorable for severe thunderstorms, with both large hail and damaging wind gusts. In North Attleborough, a tree was down on High Street and a tree was down on wires on Ash Street.	\$800
2/7/20	<i>High Wind.</i> Powerful low pressure moved from eastern Pennsylvania across central Connecticut and central Massachusetts on February 7, 2020. A southerly jet of 85 to 95 mph was just above the surface at 925 mb. Damaging winds occurred across much of eastern Massachusetts and Rhode Island with some damage reported farther to the west. There were widespread power outages and numerous trees down, some falling on homes and vehicles. Late in the evening, as of 11 PM, more than 66,000 residents remained without power. At 4:04 PM EST in North Attleborough, a large tree limb was blown through the roof of a home and multiple large limbs were down blocking Hawthorne Street.	\$16,000
6/6/20	<i>Thunderstorm Wind.</i> A cold front pushed into a warm, humid air mass and produced two rounds of severe thunderstorms. One moved	\$1,000

Town of North Attleborough, MA Hazard Mitigation Plan Update

Date	Description	Losses Reported
	across the region in the afternoon and a second round impacted eastern sections in the evening. In North Attleborough, multiple trees were down on High Street.	
12/25/20	<i>Strong Wind.</i> An anomalously deep, full-latitude mid-level trough over the Mississippi Valley caused a strong frontal system to move up the Appalachians. It brought strong to damaging winds, heavy rain with minor flooding, and well above normal temperatures to southern New England early on Christmas Day. Winds generally gusted to 40 to 60 mph, except 65 to 70 mph along the southeast Massachusetts coast. South winds were blowing more than 100 mph only 2000 feet above the ground in eastern Massachusetts and Rhode Island, but despite temperatures in the lower 60s there, a surface inversion was strong enough to prevent these very damaging winds from reaching the surface. Two to four inches of rain fell across the region, with the highest totals from central Rhode Island northwestward across northern Connecticut and portions of western and central Massachusetts. In North Attleboro, winds generally were gusting to 50 to 55 mph and at 9:00 AM EST, a tree was reported down on Mount Hope Street.	\$500
2/3/23	<i>Strong Wind.</i> A major Arctic cold front blasted through southern New England on the morning of March 3rd. It was followed by a few rounds of strong and locally damaging wind gusts. Temperatures plunged to 10 to 20 below zero on the morning of March 4th. The -10F reading at Boston's Logan Airport was the coldest there since 1957. There were numerous instances of burst pipes due to the cold across the region, but it is impossible to quantify dollar damage. Wind chill indices reached 30 to 40 below zero across southern New England. In North Attleboro at 7:10 PM EST, scaffolding set up outside a building on South Washington Street fell over. At 9:00 PM EST, a large tree was down on wires and a utility pole was snapped on Route 152 at Westchester Drive.	\$5,300
7/27/23	<i>Thunderstorm Wind.</i> A potent mid-level shortwave moved in from the Great Lakes bringing widespread wind damage. In North Attleborough, there was a large tree down on power lines on Lindsay Street, there was a tree down on Kelley Boulevard, and there was a tree down on Route 1 South.	\$1,500

Town of North Attleborough, MA Hazard Mitigation Plan Update

Date	Description	Losses Reported
8/18/23	<i>Thunderstorm Wind.</i> A high amplitude, negatively tilted trough moving across the Great Lakes and into New England along with cold and warm front provided strong forcing which resulted in flooding, wind damage, and 5 tornadoes. In the warm sector dewpoints surged into the mid-70s with PWATs near 2 inches which led to torrential downpours. Tornadoes occurred in Scotland, CT, Scituate, RI, North Attleborough, MA, Stoughton, MA, and Weymouth, MA. The tornadoes ranged in intensity from EF-0 to EF-2.	---
9/9/23	<i>Thunderstorm Wind.</i> During very warm and humid weather a handful of thunderstorms caused some wind damage and flooding. In North Attleboro, there were trees down on wires on Jefferson Street.	\$1,000

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>. No line items were recorded for events related to severe winds and hail in Bristol County.

According to the HMPC, the roofs of critical facilities in Town are generally in good shape and there are few concerns related to wind damage.

Extent

The strength of thunderstorms is typically measured in terms of their effects, namely the speed of the wind, the presence of significant lightning, and the size of hail. High winds are defined by the NWS as sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (NCDC, 2018). A thunderstorm is classified as “severe” when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Hailstorms are not typically characterized by intensity or duration; instead, the size of hailstones is described. NOAA provides a range from “bb” (<0.25 inch) to “softball” (4.5 inches) with common sizes reported in Massachusetts ranging from pea to nickel-sized (0.25 inch to 0.875 inch).

The NOAA/NWS classification systems coupled with the NWS warning systems are appropriate for severe storms and hail events in North Attleborough, as they have been used for many of the severe storms that have occurred in the Berkshires. Severe storms have not been characterized outside of these systems of classification.

Vulnerability Assessment

Exposure

The entire built environment of the Town of North Attleborough is vulnerable to thunderstorms, hail, downbursts, extreme wind, and lightning from a severe weather event.

Built Environment Impacts

Severe weather events, including thunderstorms, and their associated wind, hail, and lightning events, brought about only minor property damage in North Attleborough in previous years. Using FEMA's National Risk Index, the expected annual loss from other severe weather to North Attleborough is \$19.6K which is very low compared to the National average. Based on review of the NCEI Storm Events Database, for Bristol County from January 2002 to November 2024, of the 499 events recorded in the County, only ten hail, lightning, and thunderstorm wind events were recorded in North Attleborough. The ten events occurred between 2008 and 2023, had no recorded deaths or injuries, and had total recorded property damages of \$31,300; this equates to an AAL of \$2,086.67 for the Town. Previous impacts to North Attleborough include tree blowdown damaging buildings, interrupting utilities, and closing roads.

Hail may affect vehicles, roofs, landscaping and other areas of the built environment. Hailstorm events can occur anywhere within the Williamstown independently or during a tornado, thunder or lightning storm event. When hail breaks windows, water damage from accompanying rains can also be significant.

Wind structural vulnerability relates to building construction type and age. Structures of light construction, particularly manufactured homes typically sustain the greatest damage. Wood-frame structures are more susceptible to high winds; steel and concrete are more resistant. Even if a building remains structurally sound, broken glass from windows can cause injuries inside and outside the building and badly damage building contents. Failures of windows and doors can greatly increase storm damage. If wind-driven rain and water reach the interior, materials can be damaged or ruined. Wet materials can promote the growth of mold, and even materials that do not appear damaged can harbor enough moisture to contribute to mold growth later on.

Lightning has the ability to create wildfires as well as local and large-scale power outages that can be damaging to communication systems and electrical systems including computers and HVAC. Hail causes billions of dollars in damage to crops and property each year.

Construction sites are especially vulnerable to severe weather because they are so exposed to the elements. Tools, construction materials, cranes, scaffolding, derricks, concrete formwork, sidewalk bridges, and other items may loosen in high winds. Partially completed buildings are also vulnerable if

Town of North Attleborough, MA Hazard Mitigation Plan Update

their components have not yet been fully connected, or if structural features intended to withstand strong winds have not yet been completed.

Population Impacts

Some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low. Based on review of the NCEI Storm Events Database, for Bristol County from January 2014 to November 2024, the 325 events reported in all of Bristol County recorded no deaths and one injury (no injuries were recorded in North Attleborough).

Populations considered most vulnerable to hail, lightning, downbursts, extreme winds, microburst and thunderstorm impacts in North Attleborough are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. Senior and low-income populations in North Attleborough are particularly susceptible to storms. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Thunderstorms and microbursts can cause damage to parks and other natural areas. Some areas of the Town may be out of service until trees are removed. Lightning can cause wildfires and brushfires damaging the community's nature areas.

Probability of Future Events

According to the NWS, an average of 100,000 thunderstorms per year occur in the United States. The ResilientMass Plan notes that over the 15-year period between January 1, 2008, and December 31, 2022, a total of 911 high wind events occurred in Massachusetts on 198 days, and an annual average of 61 events occurred per year. Southern New England typically experienced 10 to 15 days a year with severe thunderstorms, with Massachusetts experiencing between nine and 27 thunderstorm days per year. Climate models show projections that the frequency and intensity of severe thunderstorms (which include tornadoes, hail, and winds) will increase (USGCRP, 2017). Furthermore, the ResilientMass Plan reports that, according to the Localized Constructed Analog's climate change models, thunderstorm event frequency is expected to slightly increase as a result of climate change.

NOAA reports that there are ten downburst reports for every tornado report in the United States. This implies that there are approximately 10,000 downbursts reported in the United States each year and further implies that downbursts occur in approximately 10% of all thunderstorms in the United States annually. This figure suggests that downbursts are a relatively uncommon yet persistent hazard.

An average of 21 people per year died from lightning strikes in the United States from 2013 to 2023. Most lightning deaths and injuries occur outdoors, with 45% of lightning casualties occurring in open

Town of North Attleborough, MA Hazard Mitigation Plan Update

fields and ballparks, 23% under trees, and 14% involving water activities. The ResilientMass Plan notes that 8 fatalities and 148 injuries have occurred in Massachusetts as a result of lightning events between 1990 and 2022 (NOAA, 2022). Given that thunderstorm event frequency is expected to slightly increase as a result of climate change, it is likely that risks associated with lightning may increase.

According to NOAA's National Weather Service, hail caused two deaths and an average of 27 injuries per year in the United States from 2004 to 2013. Given that thunderstorm event frequency is expected to slightly increase as a result of climate change, it is likely that risks associated with hail may increase.

Problem Statements for Other Severe Weather

The problem statements for the other severe weather hazard are listed in the following table.

Table 50. Problem Statements for Other Severe Weather.

Assets	Problems Associated with Other Severe Weather
People (including underserved communities and socially vulnerable populations)	• People in North Attleborough have been disrupted by severe weather events (rain, snow, sleet, ice) and other more frequent wind and thunderstorm events. Vulnerable populations may be isolated if roads are closed.
Structures (including facilities, lifelines, and critical infrastructure)	• Given the frequency of events in and around North Attleborough, the impacts occur often and can occur anywhere in the Town. • The electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power.
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to tree debris.
Natural, historic, and cultural resources	• These can be adversely impacted depending on the specific locations of damage.
Activities that have value to the community	• These can be adversely impacted depending on the specific locations of damage.

Severe Winter Storms

Severe winter storms include ice storms, nor'easters, heavy snow, blowing snow, and other extreme forms of winter precipitation. These are often accompanied by very low temperatures which were previously addressed.

Description

Blizzard: A blizzard is a winter snowstorm with sustained or frequent wind gusts to 35 mph or more, accompanied by blowing snow that reduces visibility to or below a quarter of a mile (NWS, 2018). These conditions must be the predominant condition over a 3-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. However, the hazard created by the combination of snow, wind, and low visibility increases significantly with temperatures 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.

Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm air from the south. Blizzard conditions often develop on the northwest side of an intense storm system. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions due to the blowing snow. Blowing snow is wind-driven snow that reduces visibility to 6 miles or less, causing significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Ice Storms: Ice storm conditions are defined by liquid rain falling and freezing on contact with cold objects, creating ice buildups of one-fourth of an inch or more. These can cause severe damage to vegetation, utilities, and structures. An ice storm warning, which is now included in the criteria for a winter storm warning, is issued when a half inch or more of accretion of freezing rain is expected. This may lead to dangerous walking or driving conditions and the pulling down of power lines and trees. Ice pellets are another form of freezing precipitation, formed when snowflakes melt into raindrops as they pass through a thin layer of warmer air. The raindrops then refreeze into particles of ice when they fall into a layer of subfreezing air near the surface of the earth. Finally, sleet occurs when raindrops fall into subfreezing air thick enough that the raindrops refreeze into ice before hitting the ground. The difference between sleet and hail is that sleet is a wintertime phenomenon whereas hail falls from convective clouds (usually thunderstorms), often during the warm spring and summer months.

Nor'easters: A nor'easter is a storm that occurs along the East Coast of North America. A nor'easter is characterized by a large counterclockwise wind circulation around a low-pressure center that often results in heavy snow, high winds, and rain. A nor'easter gets its name from its continuously strong northeasterly winds blowing in from the ocean ahead of the storm and over the coastal areas.

The Town of North Attleborough Community Resilience Building Workshop Summary of Findings (2019) lists "extreme winter weather" as a top hazard of concern.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Nor'easters are among winter's most ferocious storms. These winter weather events are notorious for producing heavy snow, rain, and oversized waves that crash onto Atlantic beaches, often causing beach erosion and structural damage. These storms occur most often in late fall and early winter. The storm radius is often as much as 100 miles, and nor'easters often sit stationary for several days, affecting multiple tide cycles and causing extended heavy precipitation. Sustained wind speeds of 20 to 40 mph are common during a nor'easter, with short-term wind speeds gusting up to 50 to 60 mph.

Location

Although the entire Commonwealth may be considered at risk to the hazard of severe winter storms, higher snow accumulations appear to be prevalent at higher elevations in Western and Central Massachusetts, and along the coast where snowfall can be enhanced by additional ocean moisture. Ice storms occur most frequently in the higher-elevation portions of Western and Central Massachusetts. Coastal communities of the Commonwealth are more susceptible to the impacts of a Nor'easter, which can bring heavy snow. Overall, winter storms can affect the entirety of Massachusetts, including the geographic extent of North Attleborough.

Previous Occurrences

Winter storms occur somewhat regularly in Massachusetts. Five of the disasters declared in Massachusetts from 2012 through 2024 were associated with winter storms, although only four covered Bristol County and therefore the Town of North Attleborough:

- Massachusetts Severe Winter Storm, Snowstorm, and Flooding (DR-4110-MA)
Incident Period: February 8, 2013 – February 9, 2013
Public Assistance (PA) reimbursements eligible for entire state
North Attleborough received approximately \$189,900 in reimbursements
- Massachusetts Severe Winter Storm (DR-4214-MA)
Incident Period: January 26, 2015 – January 28, 2015
Public Assistance (PA) reimbursements eligible for Worcester County and eastward
North Attleborough and local non-profits received approximately \$211,600 in reimbursements
- Massachusetts Severe Winter Storm and Flooding (DR-4372-MA)
Incident Period: March 2, 2018 – March 3, 2018
Major Disaster Declaration declared on June 25, 2018
PA reimbursements eligible for Norfolk, Essex, Bristol, Plymouth, Cape and Islands
North Attleborough received approximately \$213,000 in reimbursements
- Massachusetts Severe Winter Storm and Snowstorm (DR-4651-MA)
Incident Period: January 28, 2022 – January 29, 2022

Town of North Attleborough, MA Hazard Mitigation Plan Update

Major Disaster Declaration declared on April 18, 2022

PA reimbursements eligible for Suffolk, Norfolk, Plymouth, and Bristol Counties

North Attleborough received approximately \$156,000 in reimbursements

The 2011 Halloween Nor'easter produced unusually early snowfall on trees that were still in leaf, adding extra weight to limbs and causing stress on root systems in ground soft from a preceding warm and rainy period. The storm produced widespread tree damage in North Attleborough.

The PA figures above demonstrate that severe winter storms comprise a notable expenditure for North Attleborough, with reimbursements in the six figures when storms are eligible for reimbursements. The HMPC indicated during planning meetings that only four winter storms of note have occurred in the past three years.

The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists numerous severe winter storm events impacting Bristol County for the period 2014-2024, but North Attleborough is specifically mentioned in only a few entries. These events are provided below.

Table 51. NCEI Severe Storm Database Entries Covering Winter Storms in North Attleborough.

Date	Description
2/5/16	Low pressure traveling along a cold front stalled south of southern New England brought heavy rain, which changed over to heavy snow as temperatures dropped. This snow was extraordinarily wet and heavy, bringing down trees and wires across portions of southern New England. Power outages reached a peak of approximately 107,000 customers without power in Massachusetts during the peak of the storm, mainly across eastern Massachusetts. Six to eleven inches of snow fell across northern Bristol County. In addition, heavy snow downed wires on Park Street in North Attleborough. \$40,000 in damages were reported countywide.
2/7/21	A storm system underwent rapid intensification as it tracked quickly northeastward. A particularly heavy snow band formed from northeast Connecticut to the Metro-West Boston area. During the afternoon, 3 to 4 inch per hour snowfall rates occurred in this band. It was a quick-hitting storm, starting around noon and ending in the early evening. Heavy snow averaged 6 to 8 inches in northern Bristol County. The highest reported total was 9.0 inches, from both Attleboro and North Attleborough. No damages were reported.

According to the CRB report, extreme winter weather events have increased in frequency and severity in North Attleborough. The high winds and snowfall results in fallen trees and downed power lines.

According to the HMPC, the roofs of critical facilities in Town are generally in good shape and there are

no concerns related to snow load or freezing water pipes, although some facilities may need generator transfer switches.

The secondary impacts of snowfall are important considerations. When severe weather shuts down the entire Town, the negative economic impact to businesses is significant. Furthermore, North Attleborough’s aging population means increased vulnerability to prolonged power outages and particularly among the medically vulnerable populations of any age.

Extent

Snowfall is a component of multiple hazards, including nor’easters and severe winter storms. Two scores, the *Regional Snowfall Index (RSI)* and the *NESIS*, are described in this section.

Since 2005, the RSI has become the descriptor of choice for measuring winter events that impact the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale system from 1 to 5. The RSI is like the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes, except that it includes an additional variable: population. The RSI is based on the spatial extent of the storm, the amount of snowfall, and population (NOAA, n.d.).

The RSI is a regional index. Each of the six climate regions (identified by the NOAA National Centers for Environmental Information) in the eastern two-thirds of the nation has a separate index. The RSI incorporated region-specific parameters and thresholds for calculating the index. The RSI is important because, with it, a storm event and its societal impacts can be assessed within the context of a region’s historical events. Snowfall thresholds in Massachusetts (in the Northeast region) are 4, 10, 20, and 30 inches of snowfall, while thresholds in the Southeast U.S. are 2, 5, 10, and 15 inches.

Table 52. RSI Scale.

Category	RSI Value	Event Description
1	1 to 3	Notable
2	3 to 6	Significant
3	6 to 10	Major
4	10 to 18	Crippling
5	18+	Extreme

Source: NOAA

Prior to the use of the RSI, the Northeast Snowfall Impact Scale, developed by Paul Kocin of The Weather Channel and Louis Uccellini of the NWS, was used to characterize, and rank high- impact

Town of North Attleborough, MA Hazard Mitigation Plan Update

northeast snowstorms with large areas of 10-inch snowfall accumulations and greater. In contrast to the RSI, which is a regional index, NESIS is a quasi-national index that is calibrated to Northeast snowstorms. NESIS has five categories. The RSI and NESIS approaches do not include separate scales for ice storms; in general, ice storm extent is expressed on a case-by-case basis, and forecasts will provide the information needed to determine how to prepare and respond.

Meteorologists can often predict the likelihood of a severe storm or nor'easter. This can give several days of warning time. The NOAA's NWS monitors potential events and provides extensive forecasts and information several days in advance of a winter storm to help the state to prepare for the incident.

The RSI and NESIS classification systems coupled with the NWS warning systems are appropriate for North Attleborough, as they have been used for many of the severe winter storms that have occurred in the region and the community. Storms have not been characterized outside of these systems of classification.

According to some resources, the Sperry-Piltz Ice Accumulation Index (SPIA® Index) is becoming a resource for addressing ice events. The index is a copyright product with controlled distribution, according to its developers (refer to <https://spia-index.com/>). The SPIA® Index is "a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness." The index ranges from 0 ("minimal risk of damage to exposure utility systems") to 5 ("catastrophic damage to entire exposure utility systems"). To date, this type of system has not been needed in North Attleborough.

Vulnerability Assessment

Exposure

Heavy snowfall coupled with low temperatures often results in increases in traffic accidents; disruptions in transportation, commerce, government, and education; utility outages due to falling trees, branches, and other objects; personal injuries associated with slippery surfaces and freezing temperatures; and numerous other problems. Specific damages associated with severe winter storm (snow) events include:

- Injuries and fatalities associated with accidents, low temperatures, power loss, falling objects and accidents associated with frozen and slippery surfaces and snow accumulation
- Increases in the frequency and impact of traffic accidents, resulting in personal injuries
- Ice-related damage to trees, building and infrastructure inventory, and utilities (power lines, bridges, substations, etc.)
- Roads damaged through freeze and thaw processes

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Stress on the local shelters and emergency response infrastructure
- Lost productivity that occurs when people cannot go to work, school, or stores due to inclement conditions

The entire Town should be considered exposed to the severe winter storm hazard. Blizzards and heavy snow are considered to be high frequency events, occurring more than once every five years, and the average annual snowfall in North Attleborough is approximately 43 inches. Ice storms are considered to be medium frequency events. The previous North Attleborough HMP (July 2019) noted that the Town does not keep local records of winter storms, and that the best available data is for Bristol County.

Built Environment Impacts

The entire built environment of the Town of North Attleborough is vulnerable to a severe winter storm. New England's climate offers no immunity to the potential damaging effects of severe winter storms. Some minimum damage is anticipated annually, with potential extensive damage occurring about once every 10 years.

As Hazus doesn't support severe winter storms, and in the absence of other readily available severe winter storm models, historical data was used to determine potential losses and probabilities. Review of the data for severe winter storms (including blizzard, freezing fog, frost/freeze, heavy snow, ice storm, winter storm, and winter weather) recorded in the NCEI Storm Events Database reveals that between January 2014 and November 2024 (ten-year lookback), Bristol County experienced 60 winter storm events, with no recorded deaths and one recorded injury (no injuries in North Attleborough). The total property damage recorded was \$315,900 for the winter storm events that occurred in Bristol County from 2014 through 2024. This region's AAL is modeled to be \$31,590.

Population Impacts

The Town's overall vulnerability to heavy snow and blizzards is primarily related to restrictions on travel on roadways, temporary road closures, school closures, and potential restrictions on emergency vehicle access.

Some traffic accidents associated with storm events include injuries and in limited cases, deaths. However, the number of injuries and deaths reported for accidents is generally low. Populations considered most vulnerable to severe winter storm impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations in North Attleborough are particularly susceptible and the Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Severe winter storms can cause damage to parks and other natural areas. Some areas of the Town may be out of service until roads are cleared and trees are removed.

Probability of Future Events

The Massachusetts SHMCAP estimated that as the climate warms, winter snowfall will be reduced and will generally fall later in the winter season. Additionally, snowfall events could decline over time from around five per month during winter to a range of one to three events, but that the frequency of the strongest winter storms may actually increase until winter average temperatures warm above the freezing point late in the century. Overall, the risk of winter storms to people and property was expected to decline.

Notwithstanding the above, the ResilientMass Plan notes that Massachusetts experiences high-impact snowstorms at approximately the rate of three per year over the past 50 years, although there is significant interannual variability in the frequency and severity of winter storms. The Town of North Attleborough should assume that winter storms are likely, even if the impacts of climate change will shift the timing to a shorter winter season. Heavy wet snowfall may be more common in the future. The overall probability of winter storms of all kinds, including blizzards and ice storms, is believed high.

Problem Statements for Severe Winter Storms

Problem statements for severe winter storms are presented in the following table.

Table 53. Problem Statements for Severe Winter Storms.

Assets	Problems Associated with Severe Winter Storms
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may be stranded during a winter storm event and may not be able to travel to emergency services.
Structures (including facilities, lifelines, and critical infrastructure)	• Roof ice dams may cause damage to structures. • The Town is cutting back trees to prevent trees/limbs from coming down on power lines and causing power outages. • The electrical grid and roadways are susceptible to failure and loss of use during storms.

Assets	Problems Associated with Severe Winter Storms
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to road closures.
Natural, historic, and cultural resources	• Severe storms may damage trees in natural areas, and historical and cultural sites.
Activities that have value to the community	• Outdoor activities may be adversely impacted by severe winter storms.

Tornadoes

Tornadoes are a relatively infrequent occurrence but can be very destructive when they occur. While small tornadoes in outlying areas cause little to no damage, larger tornadoes in populated sections of Massachusetts have historically caused significant damage, injury, and death through the destruction of trees, buildings, vehicles, and power lines.

Description

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

Tornadoes can form from individual cells within severe thunderstorm squall lines. They can also form from an isolated supercell thunderstorm. They can be spawned by tropical cyclones or the remnants thereof, and weak tornadoes can even occur from little more than a rain shower if air is converging and spinning upward.

Most tornadoes occur in the late afternoon and evening hours when the heating is the greatest. The most common months for tornadoes to occur are June, July, and August, although the Great Barrington tornado occurred in May 1995 and caused extensive damage.

A waterspout is a rapidly rotating column of air extending from the cloud base (typically a cumulonimbus thunderstorm) to a water surface, such as a bay or the ocean. They can be formed in the same way as regular tornadoes or can form on a clear day with the right amount of instability and wind shear. Tornadic waterspouts can have wind speeds of 60 to 100 mph, but since they do not move very far, they can often be navigated around. They can become a threat to land if they drift onshore.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Location

The U.S. experiences an average of 1,230 tornadoes per year from 1991 to 2020, more than any other country (NOAA, n.d.). Because Massachusetts experiences fewer tornadoes than other parts of the country, residents may be less prepared to react to a tornado. The ResilientMass Plan notes that Massachusetts is located within the FEMA Wind Zone II, with Zone IV typically experiencing the greatest number and strongest tornadoes. According to the FEMA National Risk Index most of the state has a “relatively low” risk of strong wind, with the exception of Worcester County which has a “relatively moderate” risk. The ResilientMass Plan notes that the area at greatest risk for a tornado touchdown runs from central to northeastern Massachusetts. North Attleborough is outside of this area.

Previous Occurrences

The most devastating tornado to occur in New England was the Worcester Tornado of July 9, 1953, a category F4 tornado. The tornado passed through Barre, Rutland, Holden, Worcester, Shrewsbury, Westborough, and Southborough causing 90 deaths and over 1,300 injured. Damage estimates were placed at more than \$52 million. The National Storm Prediction Center has ranked this as one of the deadliest tornadoes in the nation's history.

The most recent severe tornado to impact Massachusetts occurred June 1, 2011, affecting communities in Hampden and Worcester Counties. The EF3 tornado touched down in Westfield and traveled through West Springfield, Springfield, Wilbraham, Monson, Brimfield, and Sturbridge. The tornado caused extensive property damage and resulted in a FEMA disaster declaration.

The previous edition of this plan noted that eight tornadoes have occurred in Bristol County between 1950 and 2018. These include an F1 tornado (“Wilkins Four Corners”) that touched down in North Attleborough on August 9, 1968 near Stanson Drive. Four people were injured and \$25,000 in property damage was reported.

The NOAA Storm Events database (<https://www.ncdc.noaa.gov/stormevents/>) for Bristol County lists three tornadoes for the period 2014-2024, two of which affected North Attleborough and are described below:

- 8/18/23: A high amplitude, negatively tilted trough moving across the Great Lakes and into New England along with cold and warm front provided strong forcing which resulted in flooding, wind damage, and 5 tornadoes. In the warm sector dewpoints surged into the mid-70s which led to torrential downpours. Tornadoes occurred in Scotland, CT, Scituate, RI, North Attleboro, MA, Stoughton, MA, and Weymouth, MA. The tornadoes ranged in intensity from EF-0 to EF-2. The storm that produced the Rhode Island tornado produced a second EF1 tornado as it crossed into Massachusetts, just over the Cumberland line in North Attleborough. Many trees were snapped or uprooted on Mendon Road near the intersection of Monticello Drive. An eyewitness saw

swirling debris before taking shelter in her home. From there, damage was more sporadic. A home on Mary Ann Way had its third floor window blown in. Additionally, there were a number of downed or snapped trees on Lisa Drive. The tornado then lifted briefly before touching back down in Mansfield along Gilbert Street, where it sheared several large trees near their tops, one of which fell on a car. An air conditioning unit, estimated to have weighed 1,000 pounds, was knocked over on the roof of a one-story commercial building. \$30,000 in damages were reported.

- 9/13/23: A frontal system brought a period of heavy rain, flash flooding, and embedded thunderstorms to southern New England from the morning to mid evening. In addition to much tree damage from straight line winds, there was one tornado in Connecticut, two in Rhode Island, and one in Massachusetts. These all occurred in the afternoon. An EF-0 with maximum winds of 75 mph briefly touched down in a rural area of North Attleborough on Ellis Road which caused tree damage south of High Street. The tree damage was limited to the tops of three trees having been twisted off and lofted into nearby pasture. Upon speaking with the homeowners, they described seeing the sheets of rain change direction before seeking shelter in their basement. The tree damage along the path was consistent with wind speeds between 65 and 75 mph, resulting in an EF-0 rating on the Enhanced Fujita Scale.

An additional EF-1 tornado occurred in June 2024, tracking from Lincoln, RI to Cushman Road in North Attleborough. Damage in North Attleborough was primarily limited to tree damage. The HMPC reported that no injuries or deaths were reported during these recent tornadoes, although there was some isolated property damage (e.g., a window was blown out on Mary Ann Way, and a tree fell on a car on Depot Street).

Adding these to the eight tornadoes that occurred between 1950 and 2018, a total of 12 have occurred in Bristol County since 1950 including four in North Attleborough.

Extent

The NWS rates tornadoes using the Enhanced Fujita scale (EF scale), which does not directly measure wind speed but rather the amount of damage created. This scale derives 3-second gusts estimated at the point of damage based on the assignment of 1 out of 8 degrees of damage to a range of different structure types. These estimates vary with height and exposure. This method is considerably more sophisticated than the original Fujita scale, and it allows surveyors to create more precise assessments of tornado severity.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 54. Enhanced Fujita Scale.

EF Rating	Wind Speeds	Expected Damage	
EF-0	65-85 mph	'Minor' damage: 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' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.	
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.	
EF-3	136-165 mph	'Severe' damage: 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' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.	
EF-5	> 200 mph	'Massive/incredible' damage: 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: National Weather Service

Tornado watches and warnings are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

The EF scale and the NWS warning products are applicable to all tornadoes that may strike North Attleborough, as they are used throughout Massachusetts on a routine basis and appropriately characterized the tornado (retroactively) that passed through North Attleborough. Tornadoes have not been characterized outside of the EF scale or the NWS watch/warning system.

Vulnerability Assessment

Exposure

The high winds, heavy rain, lightning, and/or hail associated with tornadoes can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. The entire Town of North Attleborough should be considered exposed to the tornado hazard. Microbursts are also a concern in the Town, as noted in the "Other Severe Weather" section.

Built Environment Impacts

As Hazus doesn't support tornadoes, and in the absence of other readily available tornado models, historical data was used to determine potential losses and probabilities. From 1951 until 2024, thirteen tornado events were recorded in Bristol County, and they resulted in no deaths, five injuries, and a total of \$2.685 million in property damage. The county's average annual loss would be estimated at \$36,780.

Five tornado events were recorded in the NCEI Storm Events Database for Bristol County during the ten-year lookback period (January 2014 to November 2024). One event occurred in North Attleborough on September 13, 2023, with no deaths or injuries recorded as a result of the tornado. The storm, an EF-0 with maximum winds of 75 mph, briefly touched down in a rural area of North Attleborough on Ellis Road, causing tree damage south of High Street. The recorded property damage of \$5,000 included tree damage limited to the tops of three trees having been twisted off and lofted into nearby pasture.

Population Impacts

Populations considered most vulnerable to tornado impacts in the Town of North Attleborough are identified based by a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations in North Attleborough. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Tornadoes can cause damage to parks, and other, natural areas. Some areas of the Town may be out of service until trees are removed.

Probability of Future Events

According to the ResilientMass Plan, the Commonwealth experienced 190 tornadoes from 1950 to 2021, or an average annual occurrence of 2.6 tornado events per year. From 1995 to 2021, the average frequency of these events has been 2.06 events per year (NOAA, 2018). Massachusetts experienced an average of 1.4 tornadoes per 10,000 square feet annually between 1991 and 2010, less than half of the national average of 3.5 tornadoes per 10,000 square feet per year (NOAA, n.d.).

As highlighted in the National Climate Assessment, tornado activity in the U.S. has become more variable, and increasingly so in the last two decades. While the number of days per year that tornadoes occur has decreased, the number of tornadoes on these days has increased. Climate models show projections that the frequency and intensity of severe thunderstorms (which include tornadoes, hail, and winds) will increase (USGCRP, 2017). Overall, it is unclear if tornado frequency will increase with climate change given the difficulty to draw conclusions based on thunderstorm statistics and the difficulty in identifying long-term trends.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Problem Statements for Tornadoes

Problem statements for tornadoes are presented in the following table.

Table 55. Problem Statements for Tornadoes.

Assets	Problems Associated with Tornadoes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may need support seeking protected shelter. Those without cell phones may not get weather alerts. • People without basements are susceptible to tornado impacts.
Structures (including facilities, lifelines, and critical infrastructure)	• Structures and critical infrastructure can all be impacted by tornadoes. • Roadways may be blocked due to downed trees and other debris.
Systems (including networks and capabilities)	• The electric and telephone grids may be impacted by winds and downed trees. The electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power.
Natural, historic, and cultural resources	• Historic and cultural resources may be impacted by tornado winds. • Winds may damage trees and cause natural areas to close for cleanup.
Activities that have value to the community	• Outdoor events could be impacted by potential tornado activity.

Wildfires/Brushfires

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

Description

Town of North Attleborough, MA Hazard Mitigation Plan Update

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

According to the National Fire Protection Agency, several elements (known as the fire tetrahedron) must be present in order to have any type of fire:

- Fuel: Without fuel, a fire will stop. Fuel can be removed naturally (when the fire has consumed all burnable fuel) or manually by mechanically or chemically removing fuel from the fire. In structure fires, removal of fuel is not typically a viable method of fire suppression. Fuel separation is important in wildfire suppression and is the basis for controlling prescribed burns and suppressing other wildfires. The type of fuel present in an area can help determine overall susceptibility to wildfires. According to the Forest Encyclopedia Network, four types of fuel are present in wildfires:
 - Ground Fuels: organic soils, forest floor duff, stumps, dead roots, buried fuels
 - Surface Fuels: the litter layer, downed woody materials, dead and live plants to 2 meters tall
 - Ladder Fuels: vine and draped foliage fuels
 - Canopy Fuels: tree crowns
- Heat: Without sufficient heat, a fire cannot begin or continue. Heat can be removed through the application of a substance, such as water, powder, or certain gases that reduce the amount of heat available to the fire. Scraping embers from a burning structure also removes the heat source.
- Oxygen: Without oxygen, a fire cannot begin or continue. In most wildland fires, this is commonly the most abundant element of the fire triangle and is therefore not a major factor in suppressing wildfires.
- Uninhibited Chain Reaction: The chain reaction is the feedback of heat to the fuel to produce the gaseous fuel used in the flame. In other words, the chain reaction provides the sustained heat necessary to maintain the fire. Fire suppression techniques, such as dry chemical extinguishers, break up the uninhibited chain reaction of combustion to stop a fire.

Location

The ResilientMass Plan identified areas in Barnstable, Essex, and Plymouth counties with the highest wildfire potential in the state. The ecosystems that are most susceptible to the wildfire hazard include pine barrens in the Connecticut River Valley, marshes inundated with *Phragmites*, pine barrens and maritime grasslands in Martha's Vineyard, Nantucket, and Cuttyhunk, and the Myles Standish State

Town of North Attleborough, MA Hazard Mitigation Plan Update

Forest. Other portions of the Commonwealth are also susceptible to wildfire, particularly at the urban-wildland interface. Notwithstanding the location of North Attleborough in eastern Massachusetts, the presence of wildland interface makes North Attleborough a location with wildfire risk.

According to the previous plan, the areas of greatest wildfire risk in North Attleborough include the Bragg & McDonald Memorial Town Forest in the northeast corner of the Town and the World War I Memorial Park in the northeast section of the Town between Route 1 and Interstate 95. The HMPC confirmed that these areas continue to have the highest potential for a wildfire. Nevertheless, structure fires continue to be a primary concern for North Attleborough as the density of development could lead to a small fire on a windy day ultimately affecting multiple multi-unit structures.

Previous Occurrences

Several notable wildfires have occurred in Massachusetts history, although none has ever resulted in a FEMA disaster declaration. Smaller fires such as brush fires are somewhat easier to characterize. According to statewide data sets (<https://www.mass.gov/service-details/fire-data-and-statistics>), the number of brush fire events per year from 2012 through 2019 ranged from about 3,000 in 2019 to almost 8,000 in the drought year of 2016.

Table 56. Statewide Brush Fire Counts.

Year	Total # of Events	Injuries/deaths (civilians and fire service)	Losses
2019	2,974	12/0	\$136,357
2018	3,253	1/5	\$493,145
2017	4,206	20/0	\$215,156
2016	7,834	40/0	\$1,526,654
2015	6,962	35/0	\$323,211
2014	4,627	25/0	\$209,857
2013	4,968	31/3	\$297,854
2012	5,857	38/0	\$705,457

According to this statewide data set, fire event counts back to 2012 were as follows for North Attleborough:

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 57. Outdoor and Total Fire Event Figures for North Attleborough.

Year	Total Outdoor Fires	Total Fire Events	Reported Losses for All Fires
2012	29	68	\$471,000
2013	18	49	\$52,856
2014	20	42	\$834,500
2015	21	46	\$218,400
2016	32	67	\$314,200
2017	21	40	\$84,600
2018	10	48	\$90,550
2019	22	56	\$475,000
2020	32	54	Not available
2021	31	62	Not available

Applying the fraction of outdoor fire incidents that are typically brush fires in Massachusetts (52%) and the fraction of fire losses that are typically from brush fires in Massachusetts (0.2%), an alternate set of figures for brush fires in North Attleborough is presented below.

Table 58. Estimated Brush Fire Event Figures for North Attleborough.

Year	Estimated Brush Fires	Estimated Brush Fire Losses
2012	15	\$942
2013	9	\$106
2014	10	\$1,669
2015	11	\$437
2016	17	\$628
2017	11	\$169

Town of North Attleborough, MA Hazard Mitigation Plan Update

Year	Estimated Brush Fires	Estimated Brush Fire Losses
2018	5	\$181
2019	11	\$950
2020	17	\$31*
2021	16	\$178*

*Estimated from Countywide figures

According to the Massachusetts DCR Bureau of Forest Fire Control and Forestry⁶¹, October 2024 saw 588 acres burned across Massachusetts through 185 separate fires as of October 29th. The majority of the fires occurred during the last week of the month⁶². The HMPC confirmed that several brush fires occurred in North Attleboro during the fall of 2024.

The previous plan did not quantify wildfire risk and instead primarily focused on structure fires. Overall, North Attleborough experiences a small number of brush fires and wildfires each year. The previous edition of this plan additionally noted that the average acreage burned per year in North Attleborough is 0.3 acres.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>. No line items related to wildfires in Bristol County were identified during this time period.

During the meetings that were convened for this plan update, the HMPC noted that urban fires continue to be the primary concern in North Attleborough. The downtown area is heavily populated with multiple 3-4 story wood frame homes with multiple apartments. These houses are very close in proximity, and fire could spread from house to house quickly.

There have been a few brush fires in recent years which were of low to medium concern. According to the HMPC, the most significant brush/wildfire occurred on Easter Sunday in 2022 in the rear of the Martin conservation area and burned 10 acres. The HMPC further explained that previous areas with brush fire challenges have included:

⁶¹ "Massachusetts Wildfire Activity Briefing, October 29, 2024, as of 17:00", <https://www.wvlp.com/wp-content/uploads/sites/26/2024/10/Massachusetts-Wildfire-Activity-Briefing-10-29-24.pdf>.

⁶² <https://www.masslive.com/news/2024/10/wildfires-spread-across-massachusetts-amid-dry-windy-weather.html>

Town of North Attleborough, MA Hazard Mitigation Plan Update

- End of Cliff Drive along the power lines which goes to Landry Ave and Elmwood Street.
- Upper High Street in the area of Ellis Road and the farms.
- End of Wild Acres Road. This is a large area of open land along the Falls Pond and continues parallel with Old Post Road to Route 295.
- Town Forest on Plain Street.
- Power lines along McKeon Drive and Hoyle Drive.

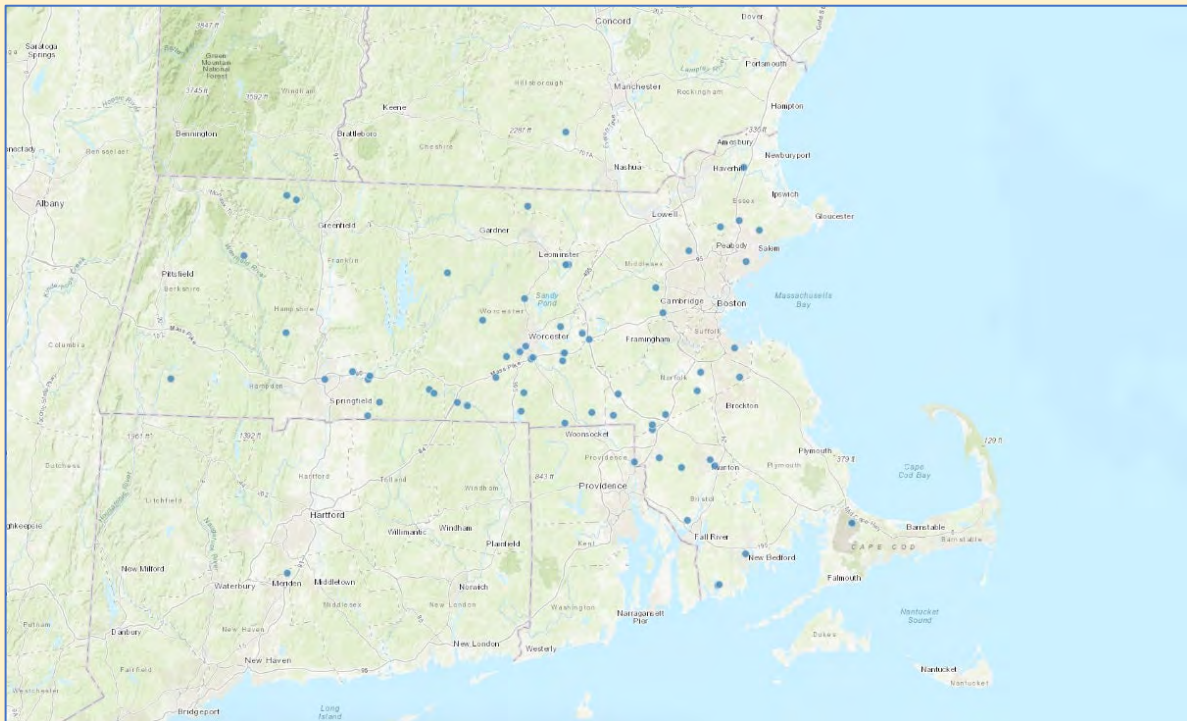
The fall 2024 wildfire season eclipsed the occurrences of the last few years in terms of the number of wildfires; a description is provided in the text box below.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Weather in October 2024 resulted in “abnormally dry” or “moderate drought” conditions across Massachusetts, resulting in multiple wildfires. Conditions were particularly susceptible to wildfires during the last week of the month. The NWS issued a Red Flag warning on Friday, October 25. Over the weekend, 126 brush fires were reported burning over 548 acres across Massachusetts into the following week:

- The Cain Hill brush fire burned over 133 acres in Salem, Lynn, Peabody, and other communities. Two other multi-acre fires also occurred in Salem.
- The Middleton Pond brush fire burned over 250 acres in Middleton, North Reading, and Breakheart Reservation in Saugus.
- A brush fire in Millbury killed a woman in an encampment where the fire was believed to have started.
- The Papas 32-acre brush fire occurred in Canton.
- Other areas with brush fires include Brockton, Devens, Haverhill, Holden, Leominster, Milton, New Bedford, North Andover, Springfield, Sutton, Westfield, Weston, Wilmington, Worcester

A major challenge for firefighters was limited resources with so many other fires occurring at the same time. The statewide Fire Mobilization Plan was activated to organize firefighting resources. The state National Guard was deployed to provide water drops onto the larger fires. Air quality was affected throughout the region, particularly on the North Shore with the worst air quality found in Lynn, Saugus, Swampscott, and Salem. Salem High School shut down classes early on Tuesday, 10/29 due to poor air quality, and the annual Trick or Treat festival in Reading was cancelled due to air quality concerns.



Wildfires in Massachusetts as of October 28, 2024. (National Interagency Fire Center)

Extent

Unfragmented and heavily forested areas of the state are vulnerable to wildfire, particularly during droughts. The greatest potential for significant damage to life and property from fire exists in areas designated as wildland-urban interface areas. A wildland-urban interface area defines the conditions where highly flammable vegetation is adjacent to developed areas.

Fires can be classified by physical parameters such as their fireline intensity, or Byram's intensity, which is the rate of energy per unit length of the fire front (BTU [British thermal unit] per foot of fireline per second) (NPS, n.d.). Following a fire event, the severity of the fire can be measured by the extent of mortality and survival of plant and animal life aboveground and belowground and by the loss of organic matter (NPS, n.d.).

The National Wildfire Coordinating Group defines seven classes of wildfires:

- Class A: 0.25 acre or less
- Class B: more than 0.25 acres, but less than 10 acres
- Class C: 10 acres or more, but less than 100 acres
- Class D: 100 acres or more, but less than 300 acres
- Class E: 300 acres or more, but less than 1,000 acres
- Class F: 1,000 acres or more, but less than 5,000 acres
- Class G: 5,000 acres or more

Early detection of wildfires is a key part of the overall efforts of the Massachusetts Bureau of Forest Fire Control. Early detection is achieved by trained Bureau observers who staff 22 of the 42 operating fire towers statewide. During periods of high fire danger, the Bureau conducts county-based fire patrols in forested areas. These patrols assist cities and Towns in prevention efforts and allow for the quick deployment of mobile equipment for suppression of fires during their initial stage. If a fire breaks out and spreads rapidly, residents may need to evacuate within days or hours. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

The various wildfire classification systems coupled with the detection and warning systems are believed appropriate for North Attleborough given the fact that extensive wildfires have occurred in the community. Wildfires have not been characterized outside of these systems of classification.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Vulnerability Assessment

Exposure

To help identify potential wildfire areas for North Attleborough, the U.S. Forest Service's Wildfire Risk to Communities spatial data was downloaded. This data was developed in 2020 using the vegetation and wildland fuels from the LANDFIRE 2014 model with the burn probability coming from the Forest Service Fire Simulation System (FSim). To create a product with a finer resolution, the data was upsampled to the native 30m resolution of the LANDFIRE fuel and vegetation data spreading the values of the modeled burn probability into developed areas represented in LANDFIRE fuels as non-burnable. The areas with a 0.013% annual probability of burning were identified and overlaid with the critical facilities and other buildings. No critical facilities were identified in the 0.013% burn probability areas. Table 59 shows the results of this analysis.

Table 59. Buildings in 0.0133% Annual Chance Area.

Building Type	Number of Buildings in 0.0133% Annual Chance Area (Total in Town)	Building Value in 0.0133% Annual Chance Area (Total in Town)
Single Family	12 (9,136)	\$7,836,908 (\$4,889,307,818)
Mobile Home	0 (2)	\$0 (\$68,342)
Multi-Family	0 (1,276)	\$0 (\$1,252,281,272)
Commercial	1 (626)	\$12,626,786 (\$1,657,764,307)
Agricultural	1 (139)	\$26,448 (\$25,431,249)
Educational	0 (20)	\$0 (\$483,493,391)
Government	0 (47)	\$0 (\$61,981,105)
Religious/Non-Profit	0 (17)	\$0 (\$70,945,581)
Industrial	0 (86)	\$0 (\$286,554,435)
Garage/Outbuilding	0 (236)	\$0 (\$20,792,076)
Total	14 (11,585)	\$20,490,142 (\$8,748,619,576)

The residential properties (i.e., the 12 single family buildings included in the table above or approximately 0.13% of all homes in the Town) located within the higher burn probability area represent the population exposed to the wildfire hazard. The population exposed to the 0.0133% or greater annual chance of wildfire is further broken down into demographic segments in Table 60. There is a younger population exposed to the wildfire hazard compared to the Town's overall demographics.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 60. Population Exposed to 0.0133% Annual Chance Wildfire (2020 U.S. Census).

Demographics	Population in and Adjacent to Wildfire-Prone Areas	Total Population
Population	945	30,834
Households	356	12,551
White	830 (87.8%)	25,824 (83.8%)
Black	11 (1.2%)	944 (3.1%)
American Indian	0 (0%)	40 (0.1%)
Asian	37 (3.9%)	1,822 (5.9%)
Pacific Islander	0 (0%)	4 (0.01%)
Other Race	15 (1.6%)	524 (1.7%)
Two or More Races	52 (5.5%)	1,676 (5.4%)
Hispanic or Latino:	38 (4.0%)	1250 (4.1%)
Population under 18	311 (32.9%)	6,822 (22.1%)
Population over 64	109 (11.5%)	4,704 (15.3%)
Annual Income < \$30K/year	42 (11.8%)	1,651 (13.2%)
Population in EJ Zone*	0 (0%)	7,478 (24.3%)

Information included in the previous Town of North Attleborough HMP (July 2019) indicated that the greatest wildfire risks included the Bragg & MacDonald Memorial Town forest in the northeast corner of Town and the WWI Memorial Park in the northeast section of Town, between Route 1 and I-95. Based on past occurrences, wildland fires were identified as medium frequency events in North Attleborough.

The NOAA National Centers for Environmental Information (NCEI) Storm Events Database recorded no wildfire events in Bristol County, Massachusetts, during the ten-year lookback period (January 2014 through November 2024).

During the North Attleborough HMPC #1 meeting (October 21, 2024), it was noted that a significant brush fire occurred in 2022 on Easter Sunday, impacting ten acres of the Martin Conservation Area. It was also mentioned that in the Bragg Memorial Forest, improvements have been made, including the addition of a dog park and numerous trails.

Figure 20 shows the areas within the Town boundary by annual burn probability.

Town of North Attleborough, MA Hazard Mitigation Plan Update

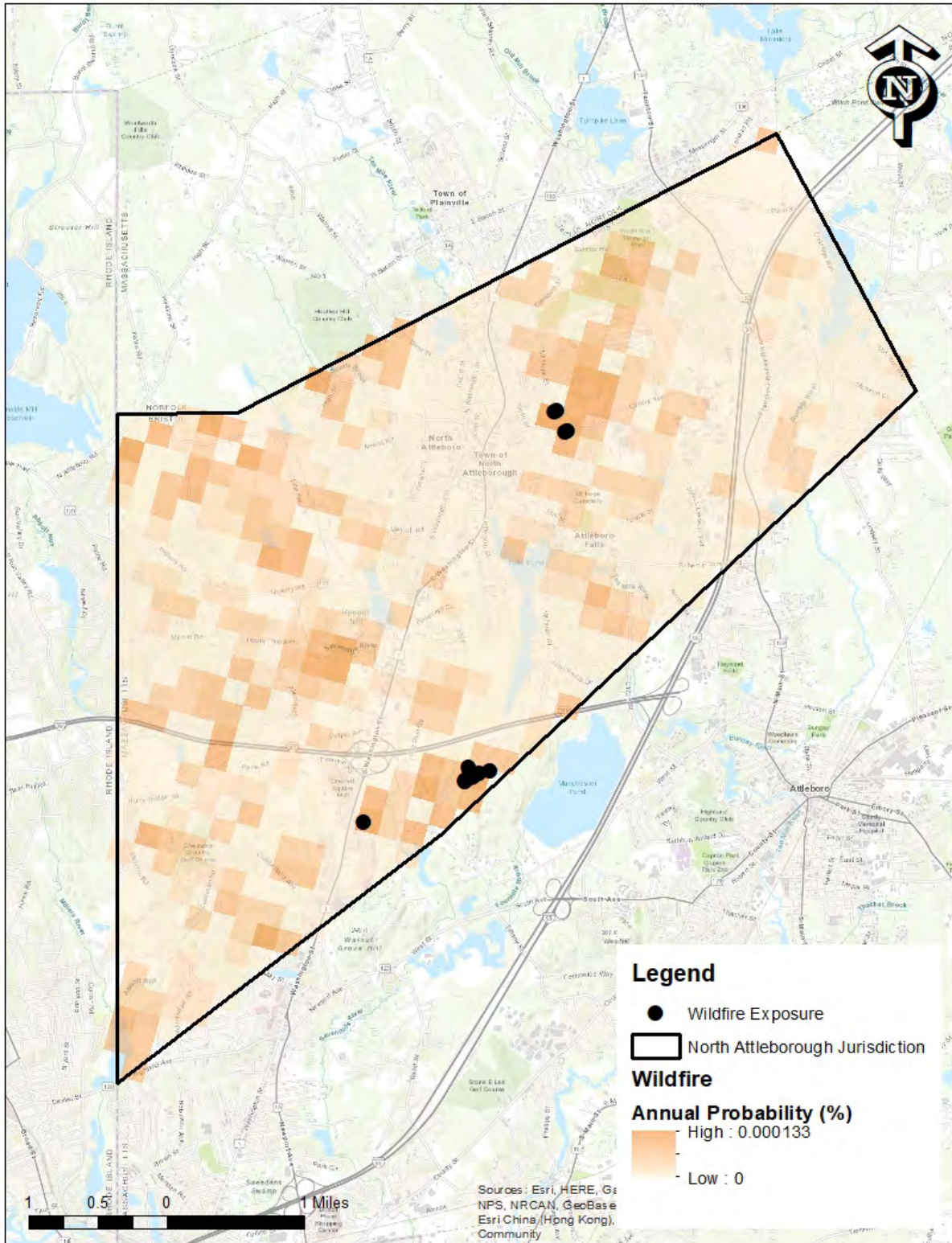


Figure 20. Wildfire Burn Probability Map.

Built Environment Impacts

A major out-of-control wildfire can damage property, utilities, and forested land; create smoke that can cause breathing problems; and injure or kill people. Other associated concerns are debris management issues, including debris removal and identification of disposal sites.

Participants in the North Attleborough HMPC #2 meeting (January 6, 2025) noted that the risk of urban fires is high due to the density of some residential areas with 6-12-unit homes that are close together.

Review of the NCEI Storm Events Database indicates that no wildfire events were recorded in Bristol County from January 2014 through November 2024. Accordingly, no property damage, injuries, or deaths have been reported associated with wildfires in Bristol County during the same period, 2014-2024. Using the wildfire probabilities and building values, a loss estimate was produced for the .0133 scenario. The losses are \$20,490,142 for the .0133% event and the AAL will be \$2,725.

Climate change will increase the probability of brushfires, which could lead to additional property damage. Future development in forested and other high-fuel areas also could lead to additional increases in the probability of brushfires.

Population Impacts

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations in North Attleborough are particularly susceptible to wildfires. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Air quality can also be impacted due to major wildfires. The Canadian wildfires in 2022 impacted the air quality of communities throughout Massachusetts, and the Canadian wildfires ongoing in 2024 have impacted the air quality in counties in western and central Massachusetts. Individuals with asthma and smoke-sensitivity could be severely impacted by poor air quality leading to life and business disruption. Animals kept outside could also be impacted by poor air quality.

With the increased probability of brushfires outside of the Town in the future due to climate change, populations may be impacted more often due to air quality issues.

Environment Impacts

Many of the natural features in the Town are susceptible to wildfire, including trees and forested areas, parks, and recreation areas. According to the ResilientMass Plan, the ecosystems most at risk from wildfires in the Commonwealth are pitch pine, scrub oak, and oak forests.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Probability of Future Events

It is difficult to predict the likelihood of wildfires in a probabilistic manner because a number of factors affect fire potential and because some conditions (e.g., ongoing land use development patterns, location, and fuel sources) exert changing pressure on the wildland-urban interface zone. The Massachusetts Climate Change Assessment report suggests that wildfire risk will increase over time in association with extreme heat events and changing precipitation and droughts.

The ResilientMass Plan projects summer rainfall to decrease as much as 15% in the next decades. In combination with higher temperatures and winds, this drop in precipitation would contribute to additional fire risk. Climate change may increase winds that spread fires. Faster fires are harder to contain and thus are more likely to expand into residential neighborhoods. Reduced stream flows and pond depths may also impact the number and quality of access points for rural firefighting. Overall, the risk of wildfires to people and property can be expected to increase as a result of climate change.

Problem Statements for Wildfires

Problem statements for wildfires are presented in the following table.

Table 61. Problem Statements for Wildfires.

Assets	Problems Associated with Wildfires
People (including underserved communities and socially vulnerable populations)	• Populations with severe asthma may be adversely impacted by wildfires in the vicinity. • Fire poses direct risks to structures, emergency workers, and people living in or near exposed areas, as well as indirect risks to public health due to smoke.
Structures (including facilities, lifelines, and critical infrastructure)	• Some structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires. Areas noted by the Town include: ✓ End of Cliff Drive along the power lines which goes to Landry Ave and Elmwood Street. ✓ Upper High Street in the area of Ellis Road and the farms. ✓ End of Wild Acres Road. This is a large area of open land along the Falls Pond and continues parallel with Old Post Road to Route 295. ✓ Town Forest on Plain Street.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Assets	Problems Associated with Wildfires
	✓ Power lines along McKeon Drive and Hoyle Drive.
Systems (including networks and capabilities)	Wildfires often cause roads to be closed requiring detours impacting emergency services.
Natural, historic, and cultural resources	- Wildfires may adversely impact forested and other vegetated areas of the Town of North Attleborough. - The economic consequences of wildfires can be substantial, due to the initial loss of structures, and to the loss of revenue from business and tourism, and natural heritage.
Activities that have value to the community	Recreational activities may be adversely impacted by wildfires, depending on location.

National Flood Insurance Repetitive Loss Properties

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

According to FEMA, repetitive loss properties are those for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. Severe repetitive loss properties are residential properties that have at least four NFIP payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building.

According to data provided by MEMA, there are two repetitive loss properties consisting of single-family homes and no severe repetitive loss properties located in North Attleborough. A summary of the Town's participation and compliance with the NFIP, including current policy and historical claims statistics, is provided in Chapter 5 (Capability Assessment).

REPETITIVE LOSS STRUCTURE means a structure covered under an NFIP flood insurance policy that (1) has incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the value of the structure at the time of each such flood event; and (2) at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Town of North Attleborough, MA Hazard Mitigation Plan Update

A summary of the Town's participation and compliance with the NFIP, including current policy and historical claims statistics, is provided in Chapter 5 (Capability Assessment).

Hazard Ranking

Ranking hazards helps the Town set goals and mitigation priorities. To compare the risk of different hazards, and prioritize which are more significant, requires a scoring system for equalizing the units of analysis. As not all hazards assessed in this plan have precisely quantifiable probability or impact data, a scoring system based on multi-criteria decision analysis (MCDA) methodology was developed to rank all the hazards. This multi-criteria ranking analysis approach prioritizes hazard risk based on a blend of quantitative factors from the available data, such as historical data, local knowledge, public survey, and Hazus assessment. This hazard ranking analysis assigns varying degrees of risk to five categories for each of the hazards, including: probability (how often it can occur), impact (economic, social, and environmental loss), spatial extent (the size of the area affected), warning time (how long does a community have to prepare for the event), and duration. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor derived from a review of best practice plans. Some of these hazard characteristics, like probability and impact, are more important than others and are weighted more heavily.

SEVERE REPETITIVE LOSS structure means a structure that is covered under an NFIP flood insurance policy and has incurred flood-related damage (1) for which four or more separate claims have been made under flood insurance coverage, with the amount of each claim (including building and contents payments) exceeding \$5,000 and with the cumulative amount of such claims payments exceeding \$20,000; or (2) for which at least two separate flood insurance claims payments (building payments only) have been made, with cumulative amount of such claims exceeding the value of the insured structure.

To calculate a rank score value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories represents the final rank score, as demonstrated in the following equation:

$$\text{Hazard Score Value} = [(Probability \times 30\%) + (Impact \times 30\%) + (Spatial Extent \times 20\%) + (Warning Time \times 10\%) + (Duration \times 10\%)]$$

Table 62 provides the hazard characteristic, level description, level criteria, level index value, and weighting value.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 62. Hazard Ranking Criteria.

Hazard Characteristic	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in the affected areas damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected areas damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in the affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	Long	More than 24 hours	1	10%
	Moderate	12 to 24 hours	2	
	Short	6 to 12 hours	3	
	Very short or no warning	less than 6 hours	4	
Duration	Very short	Less than 6 hours	1	10%
	Short	Less than 24 hours	2	
	Moderate	Less than one week	3	
	Long	More than one week	4	

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 63 provides the final hazard ranking for North Attleborough. Each hazard characteristic is assigned a value between 1 (lowest value) and 4 (highest value). When the risk values were calculated, if the value was 2.8 or greater, it was assigned as a high-risk hazard. If the value was greater than 2.0 and less than or equal to 2.7, it was assigned as a moderate risk. If the value was less than or equal to 2.0, it was assigned as a low-risk hazard. The flooding from precipitation, severe winter storms, and other severe weather hazards were ranked highest. The average and extreme temperatures, hurricanes/tropical storms, drought, flooding from dam failure and overtopping, tornado, and wildfire hazards were all ranked as moderate. The earthquake hazard is ranked as low. This ranking is the average for the year with an understanding that some of the hazards become a greater concern with specific environments and seasons.

Table 63. Final Hazard Ranking of Hazards for North Attleborough.

Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Value	Rank
Flooding from Precipitation	4	3	3	3	2	3.2	High
Severe Winter Storms	4	2	4	1	3	3.0	High
Other Severe Weather	4	2	4	2	1	2.9	High
Droughts	3	2	4	1	4	2.8	High
Average and Extreme Temperatures	4	1	4	1	2	2.6	Mod.
Hurricanes/Tropical Storms	3	2	4	1	2	2.6	Mod.
Flooding from Dam Failure or Overtopping	1	4	2	3	2	2.4	Mod.
Tornadoes	2	4	1	3	1	2.4	Mod.
Wildfires/Brushfires	2	3	2	2	3	2.4	Mod.
Invasive Species	4	1	2	1	4	2.4	Mod.
Earthquakes	1	1	4	4	1	1.9	Low

The following table summarizes changes in population patterns and land use and development and how those impact hazards.

Table 64. Impacts from Population and Land Use.

Hazards	Changes in Population Patterns	Changes in Land Use and Development
Flooding Including Dam Failures and Ice Jams	There is a growing elderly population exposed to the floodplain:	Existing codes and regulations in the SFHA will help to keep flood impacts low.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazards	Changes in Population Patterns	Changes in Land Use and Development
	- Between Francis J Kelley Boulevard and Oakridge Avenue. - North of Falls Pond which also has a growing low-income population.	New development areas may produce additional flooding due to the addition of impervious surfaces.
Droughts	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	All new developments will create more demand for limited water resources.
Extreme Temperatures	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	All new developments will exacerbate heat island effect if the development includes tree removal and adding black surfaces such as asphalt and roofs.
Wildfires	There is a growing elderly population and lower income population north of Landry Avenue exposed to a moderate wildfire/brushfire hazard.	Development in or adjacent to a forested or brushland area can lead to a higher risk of wildfire.
Invasive Species	Should not be impacted by population changes.	Should not be impacted by changes in land use and development.
Hurricanes and Tropical Storms	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	Should not be impacted by changes in land use and development.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazards	Changes in Population Patterns	Changes in Land Use and Development
Severe Winter Storms	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	Should not be impacted by changes in land use and development.
Tornadoes	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	Should not be impacted by changes in land use and development.
Other Severe Weather	The Town's elderly population has increased from 15.1% in 2010 to 15.3% in 2020. The number of people living below the poverty line has increased slightly from 5.3% in 2010 to 5.4% in 2020.	Should not be impacted by changes in land use and development.
Earthquakes	Not considered.	Not considered.

Problem Statements Summary

The following problem statements reflect a summary of the problem statements included at the end of each hazard profile. They were designed to briefly summarize the key hazard risks and vulnerabilities to the community based on potential impacts and losses from future events. They are among the issues of greatest concern and were used to assist in the identification and analysis of potential mitigation actions for Chapter 6 (Mitigation Strategy). These problem statements will be reviewed and revised as needed during plan updates to reflect the most current information resulting from the risk assessment.

Table 65. Problem Statements Summary.

Hazard	Problem Summary
Flooding from Precipitation	Older populations and lower income households in the floodplain may have difficulty evacuating. The Town has a significant Senior

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
	Community, including senior housing at Circle Court, 22 South Washington Street (six-story building), and Elm Terrace. The Town has a lower income housing area off Falmouth Street that is managed by the Housing Authority. • Concentrations of mobile homes along Route 1 and along the Plainville Town Line are vulnerable populations. • Approximately 567 buildings are in the floodplain, including residential, commercial, industrial, and government buildings. • Road closures may interrupt community systems. • The Town of North Attleborough, which was incorporated in 1887, includes a Town Forest (Bragg & MacDonald Memorial Town Forest) with walking/hiking trails, two Town Beaches, the Harold Burns Memorial Wildlife Arboretum, the Woodcock Historical Cemetery, numerous playgrounds, recreational areas, and parks, including a Veterans Memorial Park, World War I Memorial Park and Zoo, and a World War II Memorial Swimming Pool, as well as many historic homes and sites. • Several road closures may disrupt community events.
Severe Winter Storms	• Vulnerable populations may be stranded during a winter storm event and may not be able to travel to emergency services. • Roof ice dams may cause damage to structures. • The electrical grid and roadways are susceptible to failure and loss of use during storms. The electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power. • First responders may have difficulty reaching people if roads are closed due to road closures. • Severe storms may damage trees in natural areas, and historical and cultural sites.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
Other Severe Weather	- Outdoor activities may be adversely impacted by severe winter storms. - People in North Attleborough have been disrupted by severe weather events (rain, snow, sleet, ice) and other more frequent wind and thunderstorm events. Vulnerable populations may be isolated if roads are closed. - Given the frequency of events in and around North Attleborough, the impacts occur often and can occur anywhere in the Town. - As noted above, the electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power. - First responders may have difficulty reaching people if roads are not plowed/treated or are closed due to tree debris. - Natural, historic, and cultural resources can be adversely impacted depending on the specific locations of damage. - Activities can be adversely impacted depending on the specific locations of damage.
Droughts	- The public water supply wells are shallow, 25 to 35 feet deep. - Vulnerable communities may have difficulty accessing potable water during an emergency drought event. If the water sources are at emergency levels, having a plan to get vulnerable people water should be considered. If rates are increased to lower water demand, this may also adversely impact underserved and vulnerable communities. - Water supply infrastructure may need to be shut down and water quality may become substandard. Businesses requiring water for daily operations may have their operations limited due to water restrictions. - Outdoor water use restrictions and other water conservation measures during periods of extreme drought can be challenging to enforce, even when mandated through local declaration.

Hazard	Problem Summary
	• Water quality may be adversely impacted by major droughts. • Agricultural users may have difficulty obtaining water for products and livestock forage. • Use of parks and recreational areas may be adversely impacted by droughts due to the effects on plants, trees, and surface water bodies.
Average and Extreme Temperatures	• Extreme heat will be a significant public health threat to all residents, but especially for vulnerable populations living in older homes or homes without air conditioning. • The elderly and those with mobility issues may not be able to leave their homes and travel safely. • People working in businesses without air conditioning may be at risk of heat illness. • First responders may also be impacted by extreme temperatures. • Pets may be adversely impacted by extreme heat. • Older homes without insulation and single-pane glass are difficult to heat and cool and may not provide safe living conditions. • Businesses that require refrigerated trucks or refrigeration units may see business losses and increased utility costs. • The electric grid may become stressed and fail during extreme heat events. • Extreme heat mitigation and adaptation have not been fully integrated into existing local plans and regulations for new development, though progress is being made. • Extreme heat may lead to, or exacerbate, impacts to natural systems related to wildfires and invasive species (refer to those sections). • Extreme heat may lead to water quality concerns.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
	• Risk of wildfires increases as the number of days greater than 90°F are expected to increase significantly. Coupled with changes in precipitation, less water may be available to fight the wildfires. • Recreational activities may be adversely impacted by extreme heat.
Hurricanes/Tropical Storms	• Vulnerable populations may need to be evacuated and could be displaced from their homes. • Wind may cause trees to fall into structures and infrastructure, and roadways. • Wind damage to wind-susceptible buildings such as communication antennas, aerial utilities, solar arrays, greenhouses, pavilions, gazebos, and open-walled buildings. Additional damage to commercial buildings with HVAC located on roofs. • As noted above, the electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power. • First responders may have difficulty reaching people if roads are closed due to tree debris. • Historic buildings may experience damage during high wind events, especially the roofing and windows. Water entering these buildings could impact important historic and cultural artifacts. • A severe hurricane wind and rain event could negatively impact outdoor activities in the Town.
Flooding from Dam Failure or Overtopping	• Older and lower income populations in the potential downstream inundation area may have difficulty evacuating, particularly in a short time frame. • Local officials do not routinely receive copies and updates of EAPs for privately owned dams. Without these documents, it is harder for emergency personnel to characterize the potential downstream risks and prepare for a potential breach event.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
	• When engineered, dam spillways were often designed to pass a discharge for a particular historic storm recurrence interval. As the frequency and magnitude of precipitation events changes, these spillways are becoming undersized relative to their design standard which places downstream areas at increased risk of experiencing inundation from a dam failure. • Roads may be impacted by a dam breach, potentially impacting Town capabilities to respond to events. • Several historic sites may be impacted during a dam breach. • Road closures may disrupt community events. • Failure of a dam may result in the dewatering of impoundments, impacting passive and active recreational opportunities.
Tornadoes	• Vulnerable populations may need support seeking protected shelter. Those without cell phones may not get weather alerts. • People without basements are susceptible to tornado impacts. • Structures and critical infrastructure can all be impacted by tornadoes. • Roadways may be blocked due to downed trees and other debris. • As noted above, the electric grid may go down during a high wind event, affecting the major electricity transmission into the community. The middle school and high school can be run from a gas-fired generator that powers the entire campus, but other critical facilities have their own traditional standby power. • Historic and cultural resources may be impacted by tornado winds. • Winds may damage trees and cause natural areas to close for cleanup. • Outdoor events could be impacted by potential tornado activity.
Wildfires/Brushfires	• Populations with severe asthma may be adversely impacted by wildfires in the vicinity. • Fire poses direct risks to structures, emergency workers, and people living in or near exposed areas, as well as indirect risks to public health

Hazard	Problem Summary
	due to smoke. The downtown area continues to be a high priority for managing fires. - Some structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires. Areas noted by the Town include: ✓ End of Cliff Drive along the power lines which goes to Landry Ave and Elmwood Street. ✓ Upper High Street in the area of Ellis Road and the farms. ✓ End of Wild Acres Road. This is a large area of open land along the Falls Pond and continues parallel with Old Post Road to Route 295. ✓ Town Forest on Plain Street. ✓ Power lines along McKeon Drive and Hoyle Drive. - Wildfires often cause roads to be closed requiring detours impacting emergency services. - Wildfires may adversely impact forested and other vegetated areas of the Town of North Attleborough. - The economic consequences of wildfires can be substantial, due to the initial loss of structures, and to the loss of revenue from business and tourism, and natural heritage. - Recreational activities may be adversely impacted by wildfires, depending on location.
Invasive Species	- Knotweed may need additional attention in the coming years. - Spotted Lanternfly is an emerging concern, and outreach is underway.
Earthquakes	- Vulnerable populations located in unreinforced masonry structures may sustain injuries. - Elderly people may fall during events. - Unreinforced masonry and utility lifelines impacted. - Multi-story masonry residential buildings are present in the Town.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
	• Utility systems impacted. • Historic buildings constructed out of unreinforced masonry are susceptible and may be impacted.

Chapter 5: Capability Assessment

Overview

The capability assessment is an evaluation of the existing tools and resources available to the Town of North Attleborough for increasing its resilience to hazards, with the primary purpose of identifying opportunities to improve or enhance these capabilities. Coupled with the risk assessment, the capability assessment serves as the foundation for designing an actionable and effective hazard mitigation strategy.

As in any planning process, it is important to establish which goals or actions are feasible based on the organizational capacity of those agencies or departments tasked with plan implementation. This capability assessment helps determine which types of mitigation actions are practical and likely to be completed over time based on North Attleborough's existing authorities, policies, programs, and resources available to support them. It also helps identify any critical capability gaps or limitations to address through corrective actions, as well the key strengths or positive measures in place that should continue to be supported or expanded upon to improve local mitigation capabilities.

This capability assessment was completed to not only help establish the goals and actions for the Town of North Attleborough's hazard mitigation plan, but to also help ensure that those goals and actions are realistically achievable under current local conditions. As highlighted in FEMA's 2022 Local Mitigation Planning Policy Guide, *"describing the current capabilities provides a rationale for which mitigation projects can be undertaken to address the vulnerabilities identified in the Risk Assessment."*⁶³

The capability assessment for the Town of North Attleborough includes a comprehensive examination of several components as summarized in Table 66. It was prepared using the latest guidance and worksheets provided in FEMA's 2023 Local Mitigation Planning Handbook.⁶⁴

Table 66. Capability Assessment Components.

Components	Description
Planning and Regulatory Capabilities	Local plans, policies, codes, and ordinances that are relevant to reducing the potential impacts of hazards.
Administrative and Technical Capabilities	Local human resources and their skills/tools that can be used to support mitigation activities.

⁶³ Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 25.

⁶⁴ Local Mitigation Planning Handbook. FEMA. May 2023. PP. 79-92 and Worksheets 4-5.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Components	Description
Financial Capabilities	Fiscal resources the community has access to for helping to fund hazard mitigation projects.
Education and Outreach Capabilities	Local programs and methods already in place that can be used to support mitigation activities.
NFIP Participation and Compliance	Summary of information relevant to the community's participation in the NFIP and continued compliance with NFIP requirements.

Review and Incorporation of Existing Plans, Studies, and Reports

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

The first step in completing the updated capability assessment was to gather and review any relevant local plans, studies, or reports completed or updated since the previous hazard mitigation plan was adopted in 2019. This information was used to help gain a current understanding of the Town's current ability to mitigate risk, and how local capabilities may have changed over the past five years. The 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (the "ResilientMass" Plan), as well as other plans adopted by the Town of North Attleborough in the recent past, were reviewed for consistency as well as opportunities for plan integration. The goal of this review was to support updates to this plan that easily align with and possibly incorporate key aspects of relevant plans at the state and local level.

Table 67 provides a summary of the most relevant plans, studies, reports, or sources of other technical information consulted as part of this process and how they were incorporated into this plan update. This plan does not reference the most recent effective FIS and FIRM regulatory flood mapping products because it was completed prior to July 2025. Future updates of the plan will include this data.

Table 67. Relevant Plans, Studies, and Reports for Incorporation.

Plan / Study / Report	Summary Description / Incorporation
ResilientMass Plan: The Massachusetts State Hazard Mitigation and	The 2023 ResilientMass Plan is an update to the Commonwealth's innovative State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) that was developed in a highly collaborative manner to fully integrate a hazard mitigation plan and a climate change adaptation plan. The ResilientMass Plan identifies strategies and specific, measurable actions state agencies can

Plan / Study / Report	Summary Description / Incorporation
Climate Adaptation Plan (2023)	take—individually or through interagency partnerships—to address risks to the human health and safety, communities, critical assets and infrastructure, natural resources, governance, and economy of the Commonwealth. The ResilientMass Plan aims to ensure the Commonwealth is prepared to withstand, rapidly recover from, adapt to, and mitigate natural hazard events. Through the ResilientMass Plan, the Commonwealth is advancing its mission to increase its capacity for addressing natural and other hazards and climate impacts through preparation, mitigation, adaptation, and risk reduction. The ResilientMass Plan includes six (6) overarching goals which were developed through a collaborative process involving the interagency ResilientMass Action Team (RMAT) and local, regional, and community partners. It also integrates the findings of the 2022 Climate Assessment with additional analysis on all current hazards that may impact the Commonwealth, as well as future risks that will increase the likelihood, frequency, and duration of hazards. Of perhaps most relevance to local communities, the ResilientMass Plan identifies the most urgent priority impacts of these risks to various regions across the Commonwealth. The ResilientMass Plan was incorporated as a key source of information for this plan update. This included the integration and consideration of the latest climate data and information for 15 hazards impacting the Commonwealth now and, in the future, with particular emphasis on those unique impacts determined for the Eastern Inland region. In addition, the goals and actions included in Chapter 7 (State Strategy, Actions, and Implementation Plan) were reviewed and considered as part of the update process for North Attleborough’s Hazard Mitigation Plan to help ensure the Town’s own goals and objectives are in alignment with and can be mutually supportive of the Commonwealth’s overall strategy. As can be seen in Chapter 6 of this plan, several of the goals and actions identified for North Attleborough’s updated plan address the key themes identified in the ResilientMass Plan.
Master Plan (2023)	The Town’s 2023 Master Plan serves as a ten-year strategy document that outlines a roadmap to help the Town build on its many assets and address its challenges. Prepared in partnership with the Southeastern Regional Planning and Economic Development District (SRPEDD), the Plan is a technical document that considers population, market, and land use changes to chart where the Town currently is and its course for tomorrow. It is also a policy

Town of North Attleborough, MA Hazard Mitigation Plan Update

Plan / Study / Report	Summary Description / Incorporation
	document that lays out a consensus vision for North Attleborough and articulates the strategies and actions that will help the Town meet its goals. These strategies and actions are organized across various elements including but not limited to land use, housing, economic development, open space and preservation, and natural and cultural resources. The Plan addresses natural hazards in several areas, including through a specific chapter on “Climate & Resilience” which includes goals and strategies to increase climate resilience through a variety of measures (for example, instituting climate resilient bylaws and plans, mitigating extreme heat for vulnerable populations, investing in green infrastructure for stormwater management, and addressing flooding and flood storage concerns along the Ten Mile River and Downtown). The Master Plan was reviewed and considered a critical document for incorporating into this hazard mitigation plan update. The description of key features and figures for the community helped inform the capability and risk assessments. In addition, specific implementation actions for building resilience to climate change and natural hazards were incorporated into discussions with the HMPC as it relates to the updated mitigation strategy, with an emphasis on integrating and prioritizing actions that are consistent and mutually supportive of both plans.
Open Space and Recreation Plan (2021-2032)	The Town recently completed an update to its Open Space and Recreation Plan (OSRP) as a comprehensive update to the 2013 OSRP. The purpose of the OSRP is to reaffirm the commitment of the Town to protect and enhance the community’s natural and cultural resources and improve access to open spaces and recreational facilities. The included action plan is intended to provide a framework for municipal officials and residents to accomplish the Town’s conservation and recreation objectives over the next seven years by prioritizing goals, setting tasks, fostering collaborative relationships with other local, state, and federal agencies, and seeking a multitude of funding sources. The plan also serves the purpose of giving residents a singular, comprehensive document focused on the vast natural resources and cultural and historical features that make North Attleborough so unique. Although the focus of the Plan is not reducing hazard risks, the co-benefits of natural resource protection and hazard mitigation and climate resiliency are recognized in several areas (for example, preserved open space being vital for

Town of North Attleborough, MA Hazard Mitigation Plan Update

Plan / Study / Report	Summary Description / Incorporation
	flood control and mitigating the impacts of stormwater runoff). The plan addresses several hazards in detail under “Environmental Challenges,” including chronic flooding, erosion, and sedimentation. It also describes problems and concerns related to stormwater management, development impacts, climate change, and forestry issues including invasive pests. The actions and priorities expressed in the OSRP’s seven year action plan support long-term risk reduction, making it an effective tool for supporting future hazard mitigation efforts. The OSRP is an effective tool for supporting North Attleborough’s open space preservation goals while also addressing some specific natural hazards identified in the plan. It served as a key source of information related to the community’s natural environment and development patterns, with specific content regarding natural hazards and mitigation activities also being incorporated into this updated plan. This includes details on the environmental challenges listed above being incorporated into the risk assessment. This also includes information on existing goals and recommended actions that will help the community to mitigate hazards or adapt to climate change for the mitigation strategy.
Town of North Attleborough Municipal Vulnerability Preparedness (MVP) / Community Resilience Building (CRB) Summary of Findings Report (2020)	The Commonwealth’s Municipal Vulnerability Preparedness (MVP) program provides support for cities and towns in Massachusetts to plan for resiliency and implement key climate change adaptation actions for resiliency. In 2018, North Attleborough was awarded an MVP Planning Grant to assess its vulnerability to and prepare for climate change impacts, build community resilience, and receive designation from the Executive Office of Energy and Environmental Affairs (EEA) as an MVP Community. Communities with this designation become eligible for MVP Action Grant funding and other opportunities to support the implementation of priority climate adaptation actions. In completing the MVP planning process, the Town of North Attleborough followed the Community Resilience Building (CRB) framework with technical assistance provided by a state-certified MVP Provider, BETA Group, Inc. The CRB methodology is an “anywhere at any scale” format that draws on stakeholders’ wealth of information and experience to foster dialogue about a community’s strengths and vulnerabilities. A CRB Workshop, divided into two four-hour sessions, was held on May 7th and May 9th, 2019, with the following central objectives:

Town of North Attleborough, MA Hazard Mitigation Plan Update

Plan / Study / Report	Summary Description / Incorporation
	1. Define top local natural and climate-related hazards of concern. 2. Identify existing and future strengths and vulnerabilities. 3. Develop prioritized actions for North Attleborough. 4. Identify immediate opportunities to collaboratively advance actions to increase resilience. The resulting Summary of Findings Report and supporting materials served as a primary source of information and community-based input for incorporation into the update of this plan. These inputs include the identification of top climate-influenced hazards (flooding, extreme winter weather, nor'easters/high wind, and dam failure) and vulnerable areas or community assets (infrastructural, societal, and environmental), current community concerns and challenges presented by these hazards, current strengths and assets, and specific, prioritized recommendations to improve resilience in North Attleborough.
FEMA Flood Insurance Study for Bristol County (2023)	Last revised by FEMA on February 3, 2023, this report constitutes the revised preliminary Flood Insurance Study (FIS) report for Bristol County. This latest FIS revises and updates information from the currently effective (2021) FIS report on the existence and severity of flood hazards for the study area, which includes the Town of North Attleborough. The studies described in this report provide flood hazard data that will, once formally adopted as final/effective, be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management. The FIS and accompanying Flood Insurance Rate Maps (FIRMs) include relevant data and information on flood hazards for North Attleborough, including but not limited to descriptions of principal flood problems, flooding sources, FEMA flood zone designations, base flood elevations, and discharge rates of flooding sources. This data and information were reviewed and incorporated into the plan update process by informing the risk assessment, especially as it relates to the hazard profile and GIS-based vulnerability assessment that was prepared for the flood hazard.

In addition to the above plans which were determined to be most relevant for incorporation into the hazard mitigation plan update, the following plans, studies, reports, and other technical documents were reviewed to gain a clearer understanding of local capabilities and their existing or potential effects on hazard risk reduction. More information on some of these documents is provided in Table 68 in the next section.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- **Annual Town Report (FY2023)** – The Annual Town Report contains updated facts about North Attleborough along with a compilation of individual reports and information provided by the Town’s various departments, boards, commissions, and other officials.
- **Housing Production Plan (2023)** – The Housing Production Plan is aimed at supporting the production and preservation of affordable housing within North Attleborough and in compliance with MGL Chapter 40B, a state statute which enables local Zoning Boards of Appeals to approve affordable housing developments under flexible rules if at least 20-25% of the units have long-term affordability restrictions. The Plan consists of a comprehensive housing needs assessment, a set of affordable housing goals, and accompanying implementation strategies. It serves as a sister document to North Attleborough’s Master Plan as described in Table 67.
- **Comprehensive Emergency Management Plan (2022)** – The Town’s Comprehensive Emergency Management Plan (CEMP) provides a framework for a community-wide emergency management system to ensure a coordinated response to emergencies and coordinated support of certain pre-planned events. The CEMP addresses the roles and responsibilities of all community departments, agencies, government organizations, volunteers, and other community partners that may be involved in response operations, and identifies regional, state, federal, private sector, and other resources that may be activated to address disasters and emergencies in the community. Although the plan is focused on actions and activities in response to an emergency or disaster event, it does provide general guidance on the roles and responsibilities of Town departments and partners for the prevention and mitigation of anticipated incidents. The CEMP also includes a summary of a threat, hazard, and vulnerability analysis completed by the Town that briefly summarizes potential impacts to the community.
- **Stormwater Management Plan (2019)** – The Town’s SWMP is maintained in compliance with MS4 permit requirements as administered by the U.S. Environmental Protection Agency and Massachusetts Department of Environmental Protection (MassDEP). The SWMP describes and details the activities and measures that will be implemented to meet the terms and conditions of the MS4 permit. It is focused on reducing pollutants in stormwater runoff versus mitigating flood hazards. The main elements of the Town’s stormwater management program are (1) a public education program in order to affect public behavior causing stormwater pollution, (2) an opportunity for the public to participate and provide comments on the stormwater program, (3) a program to effectively find and eliminate illicit discharges within the MS4 (4) a program to effectively control construction site stormwater discharges to the MS4, (5) a program to ensure that stormwater from development projects entering the MS4 is adequately controlled by the construction of stormwater controls, and (6) a good housekeeping program to ensure that stormwater pollution sources on municipal properties and from municipal operations are minimized.
- **Complete Streets Prioritization Plan (2019)** – The Town developed this prioritization plan through MassDOT’s Complete Streets program. A Complete Street is one that provides safe and accessible options for all travel modes - walking, biking, transit, and motorized vehicles - for

Town of North Attleborough, MA Hazard Mitigation Plan Update

people of all ages and abilities. More broadly, embedding Complete Streets principles in policy and practice help promote more livable communities. The Town's Complete Streets Prioritization Plan is based off a comprehensive Needs Assessment and Gap Analysis to help better understand and prioritize improvements in the Town's intermodal infrastructure. The current plan includes 50 priority projects for the Town to implement with varying locations, construction costs and durations, and is being used by the Town to apply for funding made available from MassDOT and other sources.

- **Historic Preservation Plan (2017)** – The Town's Historic Preservation Plan is an action-oriented, community-wide plan designed to improve the preservation of historic and cultural resources within the community. It serves as a planning document for Town boards and commissions and community residents for cultural and historic preservation and planning projects; provides a clear mission statement for the Historical Commission; and provides guidance for public and private stakeholders seeking to recognize, preserve, and protect the Town's significant historic resources and archaeological sites.
- **Ten Mile River Study: Phase I – Preliminary Investigation and Report (2014)** – This report summarizes the preliminary evaluation and recommendations for a stepped approach to identify improvements to the flood storage capacity of the Ten Mile River. The portion of the river in the study area extends from Whiting Pond dam and outlets to Falls Pond. This study was the first step in an overall approach developed to ultimately relieve flooding along the river, which the Town continues today through its ongoing Ten Mile River Flood Mitigation Project.

Planning and Regulatory Capabilities

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

Table 68 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to document and review the current planning and regulatory capabilities of the Town including local plans, policies, codes, and ordinances that are relevant to reducing the potential impacts of hazards. Some additional information on how effectively these plans and regulatory tools are being used for hazard mitigation purposes can be found under the Safe Growth Survey and NFIP Participation and Compliance sections of this chapter.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 68. Planning and Regulatory Findings.

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Plans		
Master/Comprehensive Plan	Yes	The Town's Master Plan serves as a ten-year strategy document that outlines a roadmap to help the Town build on its many assets and address its challenges (see Table 67 for a complete description). It addresses natural hazards in several areas, including through a specific chapter on "Climate & Resilience" which includes goals and strategies to increase climate resilience through a variety of measures. The Plan aligns with previous MVP planning efforts and can effectively be used to support future hazard mitigation and climate adaptation actions. Last updated in 2023.
Open Space & Recreation Plan	Yes	The Town's Open Space and Recreation Plan (OSRP) highlights the concerns and challenges facing the Town, identifies and prioritizes open space and recreation goals, and identifies specific actions to help meet those goals over the next seven years (see Table 67 for a complete description). The actions and priorities expressed in the OSRP's seven year action plan support long-term risk reduction, making it an effective tool for supporting future hazard mitigation efforts. Last updated in 2022.
Climate Adaptation Plan	Yes	Not a plan per se, however climate adaptation is addressed in the Town's MVP Summary of Findings Report. It identifies North Attleborough's top climate change hazards (flooding, extreme winter weather, nor'easters/high wind, and dam failure) and vulnerable areas or community assets (infrastructural, societal, and environmental), current community concerns and challenges presented by these hazards, current strengths and assets, and specific, prioritized recommendations to improve the Town's resilience. The report's findings and recommendations can be

Town of North Attleborough, MA Hazard Mitigation Plan Update

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		used to support the implementation of mitigation actions. Report was published in 2019.
Floodplain Management Plan	No	No standalone plan, however, floodplain management is addressed by the Town through other plans (HMP, Master Plan, MVP, OSRP, etc.) and regulations as described above and elsewhere in this survey.
Stormwater Management Plan	Yes	The Town's Stormwater Management Plan (SWMP) describes and details the activities and measures that will be implemented to meet the terms and conditions of its MS4 permit (see narrative following Table 67 for a complete description). It is more focused on reducing pollutants in stormwater runoff than mitigating flood hazards. The SWMP plan was last updated in 2019.
Capital Improvements Plan	Yes	The Capital Improvement Program (CIP) is a multi-year planning tool used by the Town to identify capital needs that eventually become capital projects. The CIP forecasts future needs and financial requirements 5 years in advance. Capital projects are then vetted for funding and timing to maximize returns to the public. The CIP is a comprehensive look at the Town's needs, financing methods, costs, revenues, and linkage to identified goals.
Housing Production Plan	Yes	The Town's existing Housing Production Plan was last updated in 2023 (see narrative following Table 67 for a complete description). Although hazards are not addressed in the plan, future updates could help support hazard risk reduction in terms of promoting strategies for resilient housing in the face of natural hazards, climate change, and other future conditions.
Transportation Plan	No	No stand-alone plan but the Town does address transportation in a dedicated element within its Master Plan (Chapter 8: Transportation & Circulation). The Town also has a Complete Streets Prioritization Plan and a draft downtown bicycle network plan.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Economic Development Plan	No	No stand-alone plan but the Town does address economic development in a dedicated element within its Master Plan (Chapter 3: Economic Development). The Town has also two active downtown business groups: Downtown Associates of North Attleborough and Downtown North Attleborough Collaborative.
Historic Preservation Plan	Yes	The Town's Historic Preservation Plan was last updated in 2017 (see narrative following Table 2 for a complete description).
Emergency Operations Plan	Yes	The Town's Comprehensive Emergency Management Plan (CEMP) focuses on emergency preparedness and response to hazards (see narrative following Table 67 for a complete description). Last updated in 2022.
Continuity of Operations Plan	Yes	Every Town department is required to have a COOP plan in place to help the Town effectively resume its day-to-day core services and functions following potential emergencies or disasters.
Community Wildfire Protection Plan	No	No CWWP in place, however the Fire Department works with the area Fire Warden to remain vigilant regarding wildfire danger. Local dispatchers announce fire danger updates every day during fire season.
Other special plans?	Yes	The Health Department has plans to address responses to communicable disease and specific community risks from natural disasters (flooding, etc.). The Municipal Electric Department has an Emergency Plan in place to respond to various levels of emergencies impacting the local distribution system.
Building Code, Permitting, and Inspections		
Building Code	Yes	Version/Year: MA State Building Code (780 CMR), Ninth Edition, 2017
ISO Building Code Effectiveness Grading	Not reported	BCEGS Commercial Class: Unknown BCEGS Residential Class: Unknown

Town of North Attleborough, MA Hazard Mitigation Plan Update

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Schedule (BCEGS®) Classification		
ISO Public Protection Classification (PPC®)	Yes	PPC Grade (Community Classification): 3/3x <i>* Due for update and the Town is aiming for improvement to 2/2x</i>
Special Permit / Site Plan Review Requirements	Yes	Per the Town's Zoning Bylaw (§ 290-26), site plan reviews are conducted to ensure proper provisions for stormwater management, safe vehicular and pedestrian access, fire safety, and more. Very effective in supporting hazard risk reduction. For example, all site plan applications must meet MassDEP's Stormwater Management Regulations and be submitted by a certified engineer. Applications are required to provide a SWPPP or NPDES plan to install erosion controls during construction, and stormwater must be managed during construction. As part of the site plan review process a pre-construction meeting is required at Town Hall prior to construction.
Zoning, Land Use, and Development Regulations		
Zoning Bylaw	Yes	Adopted as Chapter 290 of Town Code for the purpose of promoting the health, safety, convenience, morals or welfare of community members. Other relevant stated purposes include that land deemed subject to seasonal or periodic flooding shall not be used for residence or other purposes in such a manner as to endanger the health or safety of the occupants thereof, and that zoning regulations and restrictions shall be designed to secure safety from fire, panic and other dangers. Very effective in supporting hazard risk reduction, especially through provisions that specifically address site plan reviews, floodplain and stormwater management regulations, and other mitigation techniques as described elsewhere in this table.
Subdivision Regulations	Yes	The Town's Rules and Regulations Governing the Subdivision of Land were adopted for the purpose of

Town of North Attleborough, MA Hazard Mitigation Plan Update

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		protecting the safety, convenience, and welfare of community members by regulating the laying out and construction of ways in subdivisions providing access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions in subdivisions and in proper cases parks and open areas. The regulations include standards with due regard for the provision of adequate access to all of the lots in a subdivision by ways that will be safe, and for securing safety in the case of fire, flood, panic and other emergencies. These include design standards, stormwater management provisions, natural resource protection requirements, and other specifications that help reduce the risk of creating hazards during the subdivision process. Last amended in 2012 and administered by the Planning Board.
Floodplain Regulations	Yes	Per the Zoning Bylaw (§ 290-6), the Town has established a Floodplain District which requires all development to be in compliance with NFIP and state building code requirements for construction in FEMA-mapped special flood hazard areas. Considered effective and reflective of the latest Flood Insurance Rate Map (FIRM) provided by FEMA, dated July 6, 2015. Last amended in 2023 and considered very effective in reducing flood risk within known high risk areas.
Wetlands Protection Regulations	Yes	The Town does not have its own municipal Wetlands Protection Bylaw but does administer the regulations required under the State's Wetland Protection Act (WPA). The Conservation Commission presides over cases involving activities proposed in protected areas including wetlands, floodplains, and other areas subject to control under the WPA. The Commission has also adopted policies that exceed WPA regulations, including a minimum "25-foot No Disturbance Zone" and the use of NOAA Atlas 14 precipitation frequencies for stormwater management calculations. The

Town of North Attleborough, MA Hazard Mitigation Plan Update

Planning/Regulatory Tool	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		Commission's approval process effectively prevents reckless development in some of the community's most flood-prone areas, helping to mitigate the risk of flood losses caused by new or improved development.
Stormwater Management Regulations	Yes	The Town has adopted a Stormwater Management and Land Disturbance bylaw that is under purview of the Conservation Commission. Also, all site plan applications must meet the MassDEP Stormwater Management Regulations (MassDEP Handbook) as incorporated by reference in Town bylaws. At site plan review, the Planning Board and Conservation Commission submit the application for independent peer review (outsourced to a consulting engineering company), which reviews the project's compliance for stormwater management regulations.

Massachusetts State Building Code

All municipalities in the state must adopt and enforce the current Massachusetts State Building Code (MSBC). The MSBC consists of a series of international model codes and any state-specific amendments adopted by the Board of Building Regulations and Standards (BBRS). The BBRS regularly updates the state building codes as new information and technology becomes available, and change is warranted.

The MSBC is separated into two distinct volumes: The Residential volume regulates all one- and two-family structures and townhouses that are three stories or less, as well as their accessory structures. The Base volume regulates all structures that are not covered by the Residential regulations.

The current version of the MSBC is the tenth edition, which became effective on October 11, 2024, with a concurrency period with the ninth edition until July 1, 2025. The tenth edition is based on modified versions of the following 2021 codes as published by the International Code Council (ICC), which is a significant improvement over the ninth edition which was based off 2015 codes.

- The International Building Code (IBC)
- International Residential Code (IRC)
- International Existing Building Code (IEBC)
- International Mechanical Code (IMC)

Town of North Attleborough, MA Hazard Mitigation Plan Update

- International Energy Conservation Code (IECC)
- International Swimming Pool and Spa Code (ISPSC)
- Portions of the International Fire Code (IFC)

The Commonwealth of Massachusetts requires mandatory enforcement of the MSBC and does not allow local amendments to the residential code. In addition, the Commonwealth adopts a plumbing and electrical code. The Commonwealth also has a program in place for code official certification, which includes taking code classes prior to examination and certification, requires continuing education, and allows consumers to file complaints against inspectors. Massachusetts also requires licensing of general, plumbing, electrical, and roofing contractors; requires licensing candidates to pass an examination prior to licensing; and requires continuing education.

Massachusetts continues to perform well in terms of objective assessments of the MSBC. For example, in its most recent “Rating the States” report, the Insurance Institute for Business and Home Safety (IBHS) ranked Massachusetts 9th (scoring 77 out of a possible 100 points on the IBHS scale). Now in its fifth edition, IBHS’s 2024 report evaluates the 18 states along the Atlantic and Gulf coasts, all vulnerable to catastrophic hurricanes, based on building code adoption, enforcement, and contractor licensing. Massachusetts was a state with a downward trend in its IBHS scores since the program began in 2012 due to various actions that have weakened the MSBC, however it is expected that the 2024 adoption of higher standards, including those based on the latest (2021) International Codes through the tenth edition, will result in score increases.

The tenth edition of the MSBC also contains a series of requirements for flood-resistant design and construction that are in accordance with the ASCE 24 standard, which incorporates—and in certain areas exceeds—FEMA’s NFIP construction standards. Highlights of ASCE 24 that complement the NFIP minimum requirements include requirements for building performance; flood-damage-resistant materials, utilities and service equipment, and siting considerations. Specific requirements for design flood elevations and the use of flood-resistant materials may be found in the ASCE 24 Tables included in 780 CMR. Under the tenth edition of the MSBC, a higher regulatory standard that affects development and redevelopment within mapped flood zones is the requirement that new or substantially improved buildings must be elevated so that the lowest floor surface is 2-3 feet above the FEMA base flood elevation (1% chance storm elevation from the FEMA Flood Insurance Rate Map) depending on the situation. This requirement raised the minimum freeboard standards by an additional foot from the ninth edition of the MSBC to allow for the uncertainties of mapping as well as increasing precipitation and sea level rise.

Safe Growth Survey

As part of the assessment for planning and regulatory capabilities, the Town Planner completed a *Safe Growth Survey*. This unique survey instrument was drawn from the Safe Growth Audit concept

Town of North Attleborough, MA Hazard Mitigation Plan Update

developed for the American Planning Association (APA) to help communities evaluate the extent to which they are positioned to grow safely relative to natural hazards. The survey covered six topic areas including the following:

- Land Use
- Transportation
- Environmental Management
- Public Safety, Zoning Ordinance
- Subdivision Regulations
- Capital Improvement Program and Infrastructure Policies

While somewhat of a subjective exercise, the Safe Growth Survey was used to provide some measure of how adequately existing planning mechanisms and tools for the Town of North Attleborough were being used to address the notion of safe growth. In addition, the survey instrument was aimed at further integrating the subject of hazard risk management into the dialogue of local community planning and to possibly consider and identify new actions as it relates to those local planning policies or programs already in place or under development. It is anticipated that the Safe Growth Survey will be used again during future plan updates to help measure progress over time and to continue identifying possible mitigation actions as it relates to future growth and community development practices, and how such actions may better be incorporated into local planning mechanisms.

The results of the Safe Growth Survey are summarized in Table 69. This includes describing how strongly the Town's planning staff agrees or disagrees with 25 statements as they relate to North Attleborough's current plans, policies, and programs for guiding future community growth and development, according to the following scale:

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

Table 69. Safe Growth Survey Results.

MASTER/COMPREHENSIVE PLAN					
Land Use					
1. The master/comprehensive plan includes a future land use map that clearly identifies natural hazard areas.	☒ 1	2	3	4	5
2. Current land use policies discourage development and/or redevelopment within natural hazard areas.	1	2	☒ 3	4	5

Town of North Attleborough, MA Hazard Mitigation Plan Update

3. The master/comprehensive plan provides adequate space for expected future growth in areas located outside of natural hazard areas.	1	2	3	4	5
Transportation					
4. The transportation element limits access to natural hazard areas.	1	2	3	4	5
5. Transportation policy is used to guide future growth and development to safe locations.	1	2	3	4	5
6. Transportation systems are designed to function under disaster conditions (e.g., evacuation, mobility for fire/rescue apparatus, etc.).	1	2	3	4	5
Environmental Management					
7. Environmental features that serve to protect development from hazards (e.g., wetlands, riparian buffers, etc.) are identified and mapped.	1	2	3	4	5
8. Environmental policies encourage the preservation and restoration of protective ecosystems.	1	2	3	4	5
9. Environmental policies provide incentives to development that is located outside of protective ecosystems.	1	2	3	4	5
Public Safety					
10. The goals and policies of the master/comprehensive plan are related to and consistent with those in the hazard mitigation plan.	1	2	3	4	5
11. Public safety is explicitly included in the master/comprehensive plan's growth and development policies.	1	2	3	4	5

Town of North Attleborough, MA Hazard Mitigation Plan Update

12. The monitoring and implementation section of the master/comprehensive plan covers safe growth objectives.	1	2	3	4	5
ZONING BYLAWS					
13. The zoning bylaws conform to the master/comprehensive plan in terms of discouraging development and/or redevelopment within natural hazard areas.	1	2	3	4	5
14. The bylaws contain natural hazard overlay zones that set conditions for land use within such zones.	1	2	3	4	5
15. The bylaws require or encourage resilient development through density bonuses, flexibility with setback requirements, or other incentives for projects outside of natural hazard areas.	1	2	3	4	5
16. The bylaws prohibit development within, or filling of, wetlands, floodways, and floodplains.	1	2	3	4	5
SUBDIVISION REGULATIONS					
17. The subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas.	1	2	3	4	5
18. The regulations provide for conservation subdivisions or cluster subdivisions to conserve environmental resources.	1	2	3	4	5
19. The regulations allow density transfers where natural hazard areas exist.	1	2	3	4	5
CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES					
20. The capital improvement program limits expenditures on projects that would encourage development and/or redevelopment in areas vulnerable to natural hazards.	1	2	3	4	5

Town of North Attleborough, MA Hazard Mitigation Plan Update

21. Infrastructure policies limit the extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.	1	2	3	4	5
22. The capital improvements program provides funding for hazard mitigation projects identified in the hazard mitigation plan.	1	2	3	4	5
OTHER					
23. Economic development and/or redevelopment strategies include provisions for mitigating natural hazards or otherwise enhancing social and economic resiliency to hazards.	1	2	3	4	5
24. Local plans, policies, or regulations promote the use of green infrastructure, low impact development, or other nature-based solutions for managing stormwater and other climate hazards.	1	2	3	4	5
25. The community considers and addresses potential impacts of its plans, policies, or regulations on Environmental Justice (EJ) neighborhoods or other socially vulnerable populations.	1	2	3	4	5

Administrative and Technical Capabilities

Table 70 is based off Worksheet 4 from FEMA’s Local Mitigation Planning Handbook. It was used by the HMPC to document and review the current administrative and technical capabilities of the Town. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Table 70. Administrative and Technical Findings.

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Local Boards/Committees		
Planning Board	Yes	The Planning Board's primary responsibilities are to administer the Subdivision Control Law and to issue certain special permits and site plan approval under the Town’s Zoning Bylaw to ensure the public safety, interest and welfare of the residents of the Town. Other important functions include considering and

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		preparing amendments to the Zoning Bylaw or other development regulations and to develop and update the Town's Master Plan. Effective at supporting risk reduction through planning and regulatory oversight.
Conservation Commission	Yes	The Conservation Commission, a seven-member volunteer board, serves to protect the community's natural resources and to acquire land for conservation and passive recreation. The Commission's other primary responsibility is to administer the Massachusetts Wetlands Protection Act (MGL, Chapter 131, Section 40), a law that protects wetlands and the public interests they serve, including flood control and the prevention of pollution and storm damage. The Commission also manages Falls Pond and Whittings Pond, both acquired by the Town in the 1960s for recreation and flood control purposes. The dams at both ponds (upper Falls and Whittings) are controlled by the Commission in coordination with the Department of Public Works. Very effective.
Capital Planning Committee	Yes	The Town's Capital Budget represents the first year of the 5-year Capital Improvement Program (CIP). It is comprised of projects to be started in the coming fiscal year, though some may span several budget years. The Capital Budget is incorporated into the Town's Annual Budget and appropriates funds for projects that the Town Manager nominates, and the Town Council approves the funding allocation. The Capital Improvement Planning Committee is made up of Public Works Director, Park and Recreation Director, Fire Chief, and Assistant Town Manager.
Climate Action Committee	No	N/A
Other relevant boards/committees?	Yes	North Attleborough/Ten Mile River Flood Mitigation Advisory Group – An advisory group of community representatives from the Town, impacted property owners, affiliated professionals and associated agencies

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		formed in August 2024. The purpose of the group is to review the Ten Mile River Flood Mitigation Project details, milestones, and public outreach efforts and for the project team to receive feedback to ensure that the project is informed directly from local sources about problems, concerns, and potential solutions. Other relevant boards include the Board of Public Works, the North Attleborough Electric Board of Commissioners, Forestry Commission, Health Department, and Board of Health.
Staff		
Community Planner	Yes	Full-time Town Planner supported by an Administrative Assistant. Implements current and best practices in land use planning, zoning, and design, while providing technical assistance to encourage a high standard and positive impact in new development. Provides technical assistance to the Planning Board, Zoning Board of Appeals, Historical Commission, Town Council, and all departments as needed or required. Also works toward accomplishing goals as set forth in the Master Plan, Open Space and Recreation Plan, and other strategic views from the Town. Considered very effective, especially at site plan review, to improve hazard risk reduction and the preservation of natural resources.
Chief Building Official	Yes	The Town has a Building Commissioner and one Building Inspector. Very effective in supporting hazard risk reduction through enforcement of the MSBC and other codes and standards as applicable.
Civil Engineer	Yes	The Department of Public Works (DPW) has one engineer on staff. The DPW, Planning Board, and Conservation Commission communicate regularly and on applications during review and construction which helps to support hazard risk reduction.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Emergency Manager	Yes	The Fire Chief serves as the Emergency Management Director. Effectively supports hazard risk reduction.
Floodplain Administrator	No	Although no formal designation for the official position of Floodplain Administrator has been made, this role is jointly supported by a combination of the Building Commissioner and Town Planner by administering and enforcing the floodplain management provisions in Town's Zoning Bylaw and MSBC. Very effective.
Sustainability/Climate Coordinator	No	N/A
GIS Coordinator	Yes	The North Attleborough Electric Department (NAED) has a GIS Coordinator. The GIS Coordinator works solely for NAED but at times will assist with other Town departments. The DPW engineer performs some GIS related work for Public Works. Could be more effective through more formal process for coordination of GIS mapping and analysis for the Town Planner and other staff in support of hazard risk reduction efforts.
Public Information Officer/Specialist	Yes	The Town's Communications Officer is responsible for website and social media communications, which can be very effective in supporting hazard awareness and risk reduction efforts.
Technical		
Grant writing	Yes	The Town Planner assists in grant writing across all departments. Department heads are also responsible for grant writing for their own projects.
GIS mapping and analysis	Yes	As noted above, NAED has a GIS Coordinator that works for the Electric Department only. However, she can assist other departments. The DPW Engineer performs some GIS related work for Public Works.
Hazard data and information	Yes	Flood zones are included in the Town's online GIS system that helps identify hazards. It also includes other data on environmental features such as wetlands,

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		vernal pools, etc. More hazard data can be added to the GIS system following events.
Maintenance programs to reduce risk (e.g., tree trimming, drainage clearance)	Yes	The DPW has a maintenance plan, and NAED has a tree maintenance program for vulnerable electric infrastructure. Risk is reduced through both recurring tree pruning (4-year cycle) in addition to pre-event trimming and rapid storm response, which include the removal of hazardous trees and limbs. NAED is also focused on upgrading electric distribution infrastructure to include hardening and other measures to reduce risk to hazard impacts. New developments are required by the Town to provide and complete a Stormwater Operation and Maintenance Plan, that details the annual maintenance for the drainage on the site. However, the Town does not have enough resources to inspect or request this. The Town should investigate maintenance plans for the Ten Mile River and for the Town Forest. The Department of Public Works (DPW) has continued to inspect and repair point problems in the stormwater system, improve chronic flooding problems, and began implementing a program on the 10-Mile River to determine short- and long-term solutions for seasonal flooding in this area.
Acquisition of land for open space, recreation, and other public use	Yes	The Conservation Commission has the ability to acquire open space for recreation and other public use. It would have to request funding from the Town.
Warning systems/services (e.g., Reverse 911, outdoor warning signs)	Yes	The Town has a reverse 911 system and mobile portable signs. The Town uses CodeRED but plans to switch to Everbridge for push notifications and automated calls to residents that are managed by the IT Department, Communications and Information Officer, and Town Manager. Town Hall also has an electronic sign in front of Town Hall that displays messages. The

Town of North Attleborough, MA Hazard Mitigation Plan Update

Administrative/Technical Resource	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		Town also has agreements in place for highway billboards on Route 95 to show messages.
Mutual Aid Agreements	Yes	The Fire Department has mutual aid agreements with neighboring municipalities. The Health Department has a mutual aid agreement with Attleboro and belongs to a 6 town Alliance. NAED has a mutual aid agreement in place with Northeast Public Power Association (NEPPA). The Town has also opted in with MEMA under both statewide mutual aid agreements (Public Safety and Public Works).
Other relevant technical resources?	Yes	The Fire Department has a drone. The Town also uses SeeClickFix, an online platform on the Town website, where residents can report problems and submit pictures through their phone, and it is geocoded. The appropriate department is flagged. During recent flooding events, the Town added a temporary flooding category to it that helped it identify impacts and risks.

Financial Capabilities

Table 71 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to identify and review the Town's eligibility and access to funding sources that can be used to support the implementation of hazard mitigation projects.

Table 71. Financial Findings.

Financial Tool/Source	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
General funds	Yes	The Town has a dam maintenance program where every three years work it is budgeted for work to be on them for their upkeep. The DPW has used general funds to improve drainage (e.g., increase culverts). The Town is requesting funds for brush clearing at the Ten Mile River. In addition to general funds the Town's Electric Enterprise has segregated operational funds.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Financial Tool/Source	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Capital Improvement Program (CIP) funding	Yes	The FY2025-2029 CIP includes nearly \$9 million in forecast investment expenses over the next year (FY25), including \$1.5 million through bonding to support the Ten Mile River Dredging Program. This CIP continues to be a very effective tool for prioritizing and funding projects that support hazard mitigation.
Special purpose taxes	No	N/A
Fees for water, sewer, gas, or electric services	Yes	The Electric Enterprise has segregated depreciation funds and rate stabilization funds.
Stormwater utility fee	No	N/A
Development impact fees	No	Development impact fees have been added to projects through the Planning Board but not necessarily for hazard mitigation (e.g., traffic mitigation).
General obligation bonds and/or special purpose bonds	Yes	The Town may periodically issue debt obligations to finance the construction, reconstruction, or acquisition of infrastructure and other assets or to refinance existing debt. It has used general government bonding as a funding mechanism for approved capital improvements, and
FEMA Hazard Mitigation Assistance (HMA) funds	Yes	In 2022, the Town was awarded a FEMA Pre-Disaster Mitigation (PDM) grant to revisit the findings and recommendations of previous assessments and reports and develop an updated, long-term plan of improvements to reduce the severity and frequency of flood damage along this segment of the Ten Mile River and adapt to the changing climate. FEMA's current HMA grant programs (BRIC, FMA, HMGP) remain a good source of external funding for implementing eligible and cost-effective mitigation projects in coordination with MEMA. The Town will continue to explore and apply for FEMA HMA funding for eligible mitigation projects identified in this plan.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Financial Tool/Source	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
HUD Community Development Block Grant (CDBG) funds	No	The Town is not a CDBG entitled community.
Other federal funding programs	Yes	In 2022, Congressman Jake Auchincloss secured \$1,500,000 in funding as part of the House Appropriations Committee's omnibus spending bill to supplement the costs of North Attleborough's Ten Mile River dredging project. The Town is using the funds to design and work to dredge the Ten Mile River as a flood prevention measure. NOAA, EPA, USACE, and other federal agencies do make grant funding available for a variety of resilience-themed projects and initiatives that the Town may be eligible to pursue in the future. This includes both pre- and post-disaster funding programs that can be very effective in supporting the implementation of cost-effective hazard mitigation projects, many of which are described in FEMA's Mitigation Resource Guide.⁶⁵
Massachusetts Municipal Vulnerability Preparedness (MVP) Action Grant funds	Yes	The MVP Action Grant offers financial resources to communities aiming to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts. As a designated "MVP Community" the Town is eligible to apply for grants on its own, or as part of a regional partnership of multiple municipalities provided that the lead applicant is MVP-designated.
Massachusetts Community Preservation Act (CPA) funds	No	The Town has not adopted the Community Preservation Act. Discussions have been ongoing for years among Town staff regarding adopting the CPA and/or establishing a land acquisition fund. These options could be a means by which the Town could directly fund, or provide match funding for grants or

⁶⁵ Mitigation Resource Guide. FEMA. March 2021.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Financial Tool/Source	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		partnership efforts, to address conservation, historical preservation, community housing, and recreational needs while also supporting hazard risk reduction efforts. According to the Town's latest Open Space and Recreation Plan, residents continue to support the passage of the CPA, with 73% of survey respondents in favor of adopting the CPA in North Attleborough.
Other state funding programs	Yes	The Commonwealth makes a variety of funding programs available on a routine basis to support local risk reduction projects. Some of the most applicable opportunities for the Town include MVP Action Grants and other annual grant programs through EEA, such as the Culvert Replacement Municipal Assistance Grant Program. Others may include Community Compact grants, Green Communities grants, etc. depending on the scope and scale of specific projects.
Private or non-profit grants, loans or funding	No	N/A

Education and Outreach Capabilities

Table 72 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to identify and review existing education and outreach programs that can be used or expanded upon to support local mitigation activities.

Table 72. Education and Outreach Findings.

Education & Outreach Program/Method	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Community newsletter(s)	Yes	North Star Reporter, however, has limited production and timing (weekly newspaper).
Web-based / social media	Yes	The Town maintains a website and uses social media platforms (Facebook, X, Instagram) to conduct outreach and communicate with community members. The Town's website has a spotlight section and built-in social media on its homepage. Also, emergency alert

Town of North Attleborough, MA Hazard Mitigation Plan Update

Education & Outreach Program/Method	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		sign-ups are available through the site which have been useful for hazard-related communications.
Public Access TV, radio, etc.	Yes	NorthTV is the community's public access television and serves North Attleborough & Plainville. The website (northtv.net) does a good job in showing board meetings and has special programs for events and special occasions. The Town has also delivered a podcast in coordination with FEMA to educate community members on existing flood hazards and mitigation activities to reduce future impacts.
Community gatherings, festivals, celebrations, or other events	Yes	Popular events are held in front of the Town Hall. The Town has a weekly farmers market during the summer. Concerts and movie nights, a block party, kids' day, and food truck events are also held. At the farmers market, committees and non-profit organizations as well as vendors can rent a space. The Town also hosts an Annual Turkey Trot on Thanksgiving Day.
Hazard awareness campaigns (e.g., <i>Severe Weather Awareness Week</i>)	Yes	The Town runs hazard awareness campaigns on its Town website and social media page (e.g., hurricane season). National Fire Prevention Week is scheduled for the second week of October each year.
Organizations that represent, advocate for, or interact with underserved or vulnerable populations	Yes	Lenore's Pantry is a local non-profit organization that runs a food bank at Town Hall. They are stationed in the Town Hall basement and are moving to a new Town building, 451 Elm Street, formerly owned by Fisher College. Lenore's Pantry advocates for underserved populations and works closely with the Health Department. The Veterans Department also supports these efforts. The Town bought 451 Elm Street and is renovating it to become a Social Services Center with the Health Department, Lenore's Pantry, and Veteran's Department there. An outreach worker is based in the Health Department and a second outreach worker at the Council on Aging. Multiple Town departments are routinely engaged in activities that support vulnerable

Town of North Attleborough, MA Hazard Mitigation Plan Update

Education & Outreach Program/Method	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
		populations. For example, the Fire Department runs the “Bucket Brigade” program in partnership with the Public Works Department by supplying buckets with sand for senior residents during the winter months.
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, etc.	Yes	Keep North Attleborough Beautiful is a local citizen group focused on maintaining the Town’s open space. They are also involved in adding recreational activities. For example, they have built recreational trails and bog bridges.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness)	Yes	The Fire Department runs a series of public education awareness programs, such as organizing Fire Prevention Week activities and coordinating other community education and safety training events. The Health Department keeps brochures available from Ready.Gov on preparedness. The Department of Public Works publishes educational material quarterly as part of the MS4 Permit.
Natural disaster or safety-related school programs	Yes	The Fire Department participates in the Student Awareness of Fire Education (SAFE) program which provides resources to help teach fire safety in schools.
StormReady® certification	No	N/A
Firewise USA® certification	No	N/A
Public-private partnership initiatives addressing disaster-related issues	Yes	The Town has partnered with Project Rubicon during the recent flooding event, who helped with damaged homes.
Other programs/methods?	Yes	The Department of Public Works offers free sandbags to residents that can be picked up during hurricane season and/or in advance of heavy rain events.

National Flood Insurance Program (NFIP) Participation and Compliance

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

The National Flood Insurance Program (NFIP) is a program created by the United States Congress in 1968. The NFIP has two purposes: to share the risk of flood losses through flood insurance and to reduce flood damages by restricting floodplain development. The program enables property owners in participating communities to purchase insurance protection, administered by the government, against losses from flooding, and requires flood insurance for all federally backed loans or lines of credit that are secured by existing buildings, manufactured homes, or buildings under construction, that are in FEMA-mapped special flood hazard areas in a community that participates in the NFIP. The availability of NFIP policy coverage is limited to communities that adopt adequate land use and control measures with effective enforcement provisions to reduce flood damages by restricting development in areas exposed to flooding. There are now more than 20,000 participating communities across the United States and its territories.

The Town of North Attleborough has participated in the NFIP since 1975. As summarized in Table 73, the HMPC used Worksheet 5 from FEMA's *Local Mitigation Planning Handbook* to collect information regarding the Town's participation in and compliance with the NFIP. This worksheet, in addition to a separate *NFIP Survey* for the Town Planner, helped the HMPC to identify areas for improvement and other ideas that could be potential mitigation actions. This plan does not reference the most recent effective FIS and FIRM regulatory flood mapping products because it was completed prior to July 2025. Future updates of the plan will include this data.

Table 73. NFIP Participation and Compliance Findings.

NFIP Topic	Source of Information	Comments
Insurance Summary		
How many NFIP policies are in the community? What is the total premium and coverage?	FEMA NFIP Services, Flood Insurance Data and Analytics; State NFIP Coordinator	As of December 31, 2024, a total of 337 NFIP policies are in force. The total premium is \$331,461 for a total of \$93,886,200 in coverage.
How many claims have been paid in the community?	FEMA NFIP Services, Flood	There has been a total of 64 claims paid since 1975, totaling \$591,596 in losses. There has been

Town of North Attleborough, MA Hazard Mitigation Plan Update

NFIP Topic	Source of Information	Comments
What is the total amount of paid claims? How many of the claims were for substantial damage?	Insurance Data and Analytics (HUDEX report)	one claim paid for substantial damage.
How many structures are exposed to flood risk within the community?	GIS analysis (FEMA FIRMs + building footprint data)	It has been estimated that 568 structures are at risk to the 1-percent annual chance flood, and 681 are at risk to the 0.2 percent annual chance flood for a combined total of 1,249 structures exposed to flood risk.
Are there any repetitive or severe repetitive loss structures in the community?	MEMA / FEMA	Yes – 2 repetitive loss properties which have experienced 4 insured losses that total \$51,928 in NFIP claims payments.
Describe any areas of flood risk with limited NFIP policy coverage	HMPC	No address-specific data has been made available by FEMA, but it is generally assumed that owners of property located in special flood hazard areas are underinsured when it comes to flood insurance coverage (based on only 337 current policies under the NFIP in comparison to 1,249 structures estimated to be exposed to moderate to high flood risk).
Staff Resources		
Who is responsible for floodplain management in the community? Do they serve any roles other than Community Floodplain Administrator (FPA)?	HMPC	The duties of floodplain management and implementation of the commitments and requirements of the NFIP are shared by the Building Commissioner and Town Planner by administering and enforcing the floodplain management provisions in Town's Zoning Bylaw and MSBC.
Is the Community FPA or NFIP Coordinator a Certified Floodplain Manager?	HMPC	No
Is floodplain management an auxiliary function?	HMPC	Yes, for the Building Commissioner and Town Planner.

Town of North Attleborough, MA Hazard Mitigation Plan Update

NFIP Topic	Source of Information	Comments
Explain NFIP administration services (e.g., permit review, GIS, inspections, engineering capability).	HMPC	All new or substantially improved developments in the Floodplain District (as defined in the Zoning Bylaw), including structural and non-structural activities, are reviewed for compliance with the Town's Zoning Bylaws and other applicable rules and regulations described in this chapter. The Town complies with the NFIP by enforcing floodplain regulations, maintaining up-to-date floodplain maps, and providing information to property owners and builders regarding floodplains and building requirements. The Building Department offers FIRMs and other relevant information for those considering the purchase of flood insurance. The Town also shares current flood zones as a layer on the Town's GIS website for residents to view with other geographic information. The Planning Board and Conservation Commission also have a few posters and pamphlets on flood zones posted outside their offices for residents.
What are the barriers to running an effective NFIP program in the community, if any?	HMPC	None identified, though more staffing would be helpful should the Town want to do go beyond NFIP minimum requirements (i.e., participate in FEMA's Community Rating System, etc.).
Compliance History		
Is the community in good standing with the NFIP?	Community FPA, State NFIP Coordinator, FEMA	Yes
Are there any outstanding compliance issues (i.e., current violations)?	HMPC	No
When was the most recent Community Assistance Visit	State NFIP Coordinator, FEMA (CIS)	Last CAC was 4/27/2021 Last CAV was 6/14/2016

Town of North Attleborough, MA Hazard Mitigation Plan Update

NFIP Topic	Source of Information	Comments
(CAV) or Community Assistance Contact (CAC)?		
Is a CAV or CAC scheduled or needed?	HMPC	Not at this time.
Regulation		
When did the community enter the NFIP?	State NFIP Coordinator, FEMA (CIS)	9/14/1979 (Regular Entry) 2/10/1975 (Emergency Entry)
Are the FIRMs digital or paper?	HMPC	Digital (updated as of July 16, 2015)
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	HMPC	Floodplain regulations are administered through the enforcement of the Town's Zoning Bylaws which exceed current FEMA/NFIP minimum requirements. These regulations will be routinely updated as necessary to maintain compliance with existing NFIP and State minimum standards for floodplain management. As described earlier in this chapter, higher regulatory standards are also met through the Town's enforcement of the Massachusetts State Building Code. Other NFIP development requirements are included in the Town's administration of the Commonwealth's Wetlands Protection Act Regulations (CMR 10) and Title V (310 CMR 15) requirements for sewage treatment and disposal. Also, any project (not just in special flood hazard areas) must comply with the Town's Stormwater Management and Erosion Control requirements per its zoning bylaw and site plan review process.
How does the community enforce local floodplain regulations and monitor compliance? Explain the permitting process.	HMPC, Community Records	The Town requires a permit for all development in the Floodplain District, including structural and nonstructural activities, to ensure compliance with all applicable regulations. Building permit applications are required for all

Town of North Attleborough, MA Hazard Mitigation Plan Update

NFIP Topic	Source of Information	Comments
		new construction, renovations, alterations, and major repairs to existing buildings including commercial, and one and two family buildings. Permit reviews and site plan reviews are also conducted by the Planning Board and Conservation Commission as applicable under Zoning Bylaw and wetlands protection regulations. Substantial monitoring and compliance activities are also performed under the Building Department's administration of the State Building Code. Inspection and certification of lowest floor elevation is required by the SBC. Applicants are required to submit plans that include the Special Flood Hazard Area and proposed elevations of the proposed structures.
Community Rating System (CRS)		
Does the community participate in CRS? If so, what is the community's CRS Class?	FEMA	No
What categories and activities provide CRS points and how can the class be improved?	Insurance Services Office, Inc.	N/A
Does the plan include CRS planning requirements	Yes	Yes, many of the planning requirements under CRS Activity 510 are included in the plan update.

Table 74 provides some additional information in response to the updated requirements included in FEMA's 2022 Local Mitigation Planning Policy Guide (Element C2-a).⁶⁶

Table 74. Additional NFIP Participation and Compliance Information.

Required Information	Response
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⁶⁶ Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 26.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Adoption of NFIP minimum floodplain management criteria via local regulation.	Adopted per the Town's Zoning Bylaw at Section 290-6 (Floodplain District), which requires all development to be in compliance with NFIP and state building code requirements for construction in FEMA-mapped special flood hazard areas. Last updated in 2023.
Adoption of the latest effective Flood Insurance Rate Map (FIRM), if applicable.	The Town's Zoning Bylaw at §290-6 B establishes the Floodplain District as shown on the official Flood Insurance Rate Map (FIRM) for the Town of North Attleborough dated July 16, 2015.
Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.	See explanation of the Town's permitting process provided in Table 73.
Appointment of a designee or agency to implement the addressed commitments and requirements of the NFIP.	The Town's Building Commissioner and Town Planner are generally tasked with implementing the commitments and requirements of the NFIP, making sure North Attleborough remains in compliance with all relevant codes and standards for floodplain management.
Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.	The Town's Building Commissioner will implement the SI/SD provisions of the Town's floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 through 65) and Massachusetts State Building Code (780 CMR). The Town will also coordinate with State Flood Hazard Management Program staff to assure that proper practices are followed and that a post-disaster plan will be in place to implement all SI/SD provisions.

Summary and Conclusions

The Town of North Attleborough is a bustling suburban community with relatively strong capabilities and resources to support the implementation of hazard mitigation actions. This chapter provides documentation on the existing local authorities, policies, programs, and resources to support mitigation actions and build community resilience to natural hazards.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Some of the strongest hazard mitigation capabilities for North Attleborough are found through the adoption and maintenance of local plans and the routine administration and enforcement of strong codes and regulations. As evidenced by the recent update to the Town's Master Plan, which includes a chapter dedicated to "Climate & Resilience," there is a strong local awareness and commitment to mitigating the risks posed by natural hazards and climate change. Relevant goals and strategies to building community resilience can be found across all plan elements, including those that are focused on existing hazards such as chronic flooding along the Ten Mile River in addition to concerns about future climate conditions that will bring more intense storms, extreme heat, and other hazards. The Town also continues to review and update its regulations and procedures that can help reduce natural hazard risks. This includes the administration of zoning regulations, building codes, and site plan review procedures that ensure new or improved development projects address risk reduction through various provisions such as stormwater and floodplain management, erosion control, wetlands protection, and more.

The Town employs staff across numerous departments to administer existing local programs, regulations, and other activities, who are supported by many local boards and committees as described earlier in this chapter. The oversight and enforcement of local codes and regulations is considered very effective, as is the routine maintenance of key infrastructure and other Town-owned assets. The Town's Department of Public Works manages these assets through a maintenance plan and is supported by others, including the North Attleborough Electric Department (NAED) for hazardous tree maintenance and other risk reduction activities for its electrical power grid. Local task forces and advisory groups have also bolstered the Town's capabilities and resources for identifying and advancing mitigation solutions, such as the North Attleborough/Ten Mile River Flood Mitigation Advisory Group. Increased funding and staff support would allow the Town to do more in this area, but existing technical and administrative capabilities are relatively strong for a community its size.

The Town's financial capabilities are also relatively strong in terms of its ability to leverage local and external funding sources to support hazard mitigation projects. It has successfully utilized its annual budget and capital planning process to fund hazard risk reduction projects, such as dam maintenance and repairs, stormwater drainage improvements, brush clearing, and dredging projects along the Ten Mile River. Through its Capital Improvements Plan the Town also aims to limit expenditure on projects that would encourage development and/or redevelopment in areas vulnerable to natural hazards. To complement these local investments, the Town has also had success with leveraging available grant funding from FEMA and other federal agencies for mitigation projects, in addition to state assistance through MEMA, EEA, and others. The Town is also fortunate to have a variety of methods and tools to support public education and outreach initiatives that can support hazard mitigation, such as a regularly maintained website, social media, public access TV, and community gathering events. Several Town departments, especially Fire and Public Works, conduct regular outreach campaigns and/or deliver educational programming and individual assistance to vulnerable populations that support increased risk awareness and emergency preparedness for a variety of hazards.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Although the Town of North Attleborough has strong capabilities and is well-positioned to mitigate the natural hazard risks faced by the community, it can expand and improve the capabilities described in this chapter. Some general and specific opportunities to address existing gaps or limitations in local capabilities to reduce risk have been identified for each capability type and are further described below. Each of these opportunities were then considered by the HMPC during the plan update process as potential new mitigation actions to be included in the Mitigation Strategy.

Opportunities to Expand and Improve Capabilities to Reduce Risk

Planning and Regulatory Capabilities

- Develop a future land use map that clearly identifies natural hazard areas for incorporation into the next update to the Town's Master Plan.
- Conduct regulatory reviews and updates to the following Town bylaws and regulations to require or promote hazard resistant, climate-adaptive standards for new development. Use existing methods or tools for incorporating green infrastructure, low impact development, and other nature-based solutions (such as Mass Audubon's Bylaw Review Tool).
 - Floodplain District (Zoning Bylaw §290-6) – Review and revise language to be consistent with the State's latest Model Floodplain Bylaw.
 - Stormwater Management and Land Disturbance (Chapter 246) – Incorporate design standards that better account for future climate conditions, such as the latest updates to NOAA's precipitation frequency data presented in Atlas 14.
 - Subdivision Regulations – last amended in 2012, can do more in terms of stormwater management and flood hazard avoidance through promoting conservation/clustering, allowing density transfers, or other methods to restrict or prohibit the subdivision of land within or adjacent to natural hazard areas.
 - Wetlands Protection – consider adopting Town-specific regulations that go beyond the minimum standards set forth by the Massachusetts Wetlands Protection Act, such as increasing required buffer zones or minimum natural vegetative buffer strips. This could also codify existing Conservation Commission policies regarding no disturbance zones and the use of NOAA Atlas 14 precipitation frequencies for stormwater management calculations.
- Consider using the Plan Integration for Resilience Scorecard (PIRS) to better understand and discuss any inconsistencies or gaps across the Town's local planning framework by spatially evaluating the network of local plan documents and existing vulnerabilities. PIRS is a tool developed to assist local practitioners to assess the degree to which networks of local plans target geographic areas most prone to hazards and evaluate the coordination of local plans.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Require the Stormwater Operations and Maintenance Plan for site plans to be submitted to the Conservation Commission and Planning Department on an annual basis. Make this a special condition of site plan approval.
- Develop a comprehensive floodplain/stormwater management plan that is focused on assessing and prioritizing efforts required to reduce flooding, including those flood mitigation and maintenance (dredging) projects along the Ten Mile River, in addition to other capital projects such as upgrading culverts and other drainage systems and installing green infrastructure and other nature-based solutions.
- Prioritize areas within the Ten Mile River floodplain for the Town's future open space preservation and acquisition efforts.
- Begin evaluating opportunities to address extreme heat through further study and tree management, planning, and policy development.
- Review and update emergency evacuation and sheltering plans in the event of downtown flooding, including the use of communications, signage, and operational procedures for vulnerable populations with limited mobility or other concerns.

Administrative and Technical Capabilities

- Create a more formal process for coordinating the Town's internal GIS services across departments, especially as it relates to mapping and analysis needs for the Planning Department.
- Formally designate a local Floodplain Administrator.
- Develop system/process for maintaining local hazard risk, impact, and loss data. More hazard data can be added to the Town's existing GIS system before and following events.
- Increase funding and staff support for the Town's Emergency Management Agency and explore the potential of designating a full-time Emergency Management Director.
- Continue supporting and investing in local firefighting and fire protection/mitigation services to maintain and improve the Town's Public Protection Classification (PPC®) of 3/3x as issued by Verisk/ISO. Insurance companies use PPC information to help establish premiums for fire insurance and generally offer lower premiums in communities with better protection.
- Develop information/knowledge management systems to (1) help maintain coordination between departments on resilience-themed projects or maintenance activities, and (2) better cope with staff turnover or other disruptions to routine government functions.
- Provide more specialized training and professional development opportunities for Town employees who are engaged in resilience planning and the implementation of hazard mitigation and/or climate adaptation projects.

Financial Capabilities

- Build internal staff capacity to identify and pursue external sources of grant funding for mitigation projects through training/professional development and the ability to invest more time on grant writing, grants management, and related administrative tasks.
- Prioritize available grant funding opportunities to pursue (FEMA Hazard Mitigation Assistance, EEA MVP Action Grants, DER's Culvert Replacement Municipal Assistance Grant Program, etc.).
- Continue to coordinate with SRPEDD and neighboring communities on positioning the Town to pursue and capture future grant funding for regional resilience and risk reduction projects.
- Continue to explore the local adoption of the MA Community Preservation Act (CPA) to support open space acquisition and/or restorations, green infrastructure installations, or other projects that advance flood mitigation and watershed management in addition to other CPA objectives.

Education and Outreach Capabilities

- Increase use of the Town's website and social media platforms, North TV, and other readily available outreach mechanisms to promote low-cost public education initiatives on emergency preparedness and hazard mitigation actions for homeowners, business owners, etc.
- Participate annually in National Flood Safety Awareness Week and other emergency preparedness campaigns by using MEMA's social media toolkits and other readily available communication materials to promote risk awareness and mitigation.
- Develop and post/email a Town newsletter to provide more timely information and updates than currently available through the North Star Reporter.
- Identify and seek to address any unmet needs related to targeted outreach and education for the community's more vulnerable populations (i.e., environmental justice communities, seniors, residents with special needs, etc.).
- Promote the availability of flood insurance to all property owners and renters, especially those with structures located in areas of high to moderate flood risk.
- Increase volunteerism among community members by reinvigorating the Community Emergency Response Team (CERT) and Medical Reserve Corps.
- Expand the Fire Department/EMA's ongoing public education programs to address natural hazards and mitigation topics.
- Partner with North Attleborough Public Schools to incorporate hazard and climate resilience into existing curriculum and educational programming for K-12 students.

Possible New Actions Related to NFIP Participation and Compliance

- Update the Town's Floodplain District Regulations (Section 290-6 of Zoning Bylaw) to be aligned with the State's latest (2020) Model Floodplain Bylaw.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Participate in regional efforts that consider advantages to managing hazards at a watershed scale, especially where the Town is experiencing challenges in finding local solutions.
- Review the State's Local Floodplain Action Guide for possible additional regulatory or administrative improvements.
- Develop a post-disaster substantial damage plan based on the latest guidance from FEMA and the State's Flood Hazard Management Program.
- Explore the potential of joining FEMA's Community Rating System (CRS) in the future based on Town staff capabilities, NFIP policy counts, and updated program requirements.

Chapter 6. Mitigation Strategy

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

Mitigation Goals

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

HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?

Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include both hazard mitigation policies (such as land use regulations) and hazard mitigation projects (such as

structure or infrastructure projects). To develop goals for this Town of North Attleborough, MA Hazard Mitigation Plan Update the HMPC reviewed the North Attleborough Hazard Mitigation Plan 2019, the North Attleborough Municipal Vulnerability Preparedness Plan 2019 plan goal statements, and the goals of the State's Hazard Mitigation and Climate Adaptation Plan (SHMCAP).

GOALS are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.

The HMPC developed the goal statements in Figure 21 to represent their vision and priorities for the Town of North Attleborough in terms of hazard mitigation. All the hazards identified in this plan, while not named specifically in the goals, are implied and many are named specifically in the mitigation actions. When achieved by way of implementing the mitigation actions identified in this plan, the Town will mitigate risk posed by all identified hazards.

Save Lives and Property

Reduce risk to life, property, infrastructure, natural and cultural resources from natural hazards and climate change.

High Hazard Potential Dams

Assess and fortify high-hazard dams, ensuring risk reduction while promoting ecological resilience.

Local Plans and Regulations

Institute climate resilient and risk reduction plans and policies to promote smart growth and low impact development.

Buildings and Infrastructure

Develop Town facilities and infrastructure to increase climate resilience and risk reduction from natural hazards.

Natural Resources

Preserve lands with flood- and climate-resilience, agricultural, and habitat value.

Education

Expand education and awareness programs for Town employees and residents to support the implementation of hazard mitigation and climate adaptation throughout the Town.

Figure 21. Goal Statements.

E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?
(Requirement §201.6(d)(3))

The North Attleborough Hazard Mitigation Plan 2019 included 18 mitigation actions. For the purposes of this plan, all the actions were reviewed for their status and relevance. Table 75 shows the previous plan’s 18 mitigation actions and the status of each. In addition to their status, if an action was moved forward to this plan the final column indicates the title of the new action.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 75. Status of Previous Plan's Hazard Mitigation Actions.

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
1	Review backup power supply needs for town facilities	Partially Completed / In Progress	Did purchase portable generators but need permanent.	YES - updated/revised description provided at right, if applicable	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
2	Dredge and widen the Ten Mile River to increase flood storage and capacity	Delayed	Funding received in July 2024 to begin work. Under Permitting now.	YES - updated/revised description provided at right, if applicable	Dredge and widen the Ten Mile River to increase flood storage and capacity.
3	Develop stormwater bylaw in compliance with MS4 regulations	Completed	Adopted in February 2020.	NO - explanation provided at left	
4	Widen the Chestnut Street Bridge and lower the bottom of the bridge	Completed	Completed in 2022.	NO - explanation provided at left	
5	Review and improve dam operation and maintenance plans to address climate impacts	Partially Completed / In Progress	Discussions with City of Attleboro regarding operation notifications.	YES - updated/revised description provided at right, if applicable	Review and improve dam operation and maintenance plans to address climate impacts.
6	Install hydrants on streets with dead end water mains	Partially Completed / In Progress	Have installed several hydrants. More to be done.	YES - updated/revised description provided at right, if applicable	Install hydrants on streets with dead end water mains.
7	Clean culverts: Elm Street at Route 1 and Orne Street at Route 1	Delayed	Funding received in July 2024 to begin work. Under Permitting now.	NO - explanation provided at left	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
8	Maintain and clean drainage pipes downtown	Completed + To Be Continued	Drain Lines were TV inspected and jetted in 2023. Will continue to inspect and clear basins.	YES - updated/revised description provided at right, if applicable	Maintain and clean drainage pipes downtown to prevent flooding.
9	Review and revise evacuation and emergency action plans in the event of downtown flooding	Canceled	The Town puts up barricades and closes downtown if necessary.	NO - explanation provided at left	
10	Review and revise town emergency communication systems and educate residents on available systems	Completed + To Be Continued	Currently using Code Red however, Town is in a review phase to update to a new system.	YES - updated/revised description provided at right, if applicable	Review and revise Town emergency communication systems and educate residents on available systems.
11	Develop local wetlands protection bylaw	Delayed	The Town has not been interested in adopting this bylaw.	YES - updated/revised description provided at right, if applicable	Develop a local Wetlands Protection Bylaw.
12	Develop stormwater management program for private entities	Completed + To Be Continued	Stormwater Bylaw and Planning Regulations cover most entities. Some small private projects fall within gap.	YES - updated/revised description provided at right, if applicable	Develop stormwater management regulations for private entities as a way to mitigate flood risk.
13	Purchase equipment to perform drainage system maintenance	Partially Completed / In Progress	New Jet Truck for Sewer Department in FY27 will allow old truck to be moved down to Highway for drain work.	YES - updated/revised description provided at right, if applicable	Purchase equipment to perform drainage system maintenance and repairs.
14	Engineering study and inspection on culverts	Partially Completed / In Progress	Received Grant for Study.	YES - updated/revised	Conduct an engineering study and inspection on culverts in Town to

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
				description provided at right, if applicable	determine which need repair or replacement.
15	Public outreach and education program in compliance with MS4 regulations	Completed + To Be Continued	Part of MS4 is public outreach to residents and businesses. It is performed quarterly and reported on in the Town's Annual Report.	NO - explanation provided at left	
16	Construct water storage tank on the western side of town to provide adequate pressure for firefighting capabilities	Delayed	Waiting for Developer to propose project on this side of Town to make them pay for some of the project.	YES - updated/revised description provided at right, if applicable	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
17	Create and post designated evacuation route	Partially Completed / In Progress	For flooding this is possible but for other hazards would use Code Red to inform people what direction to go to.	YES - updated/revised description provided at right, if applicable	Create and post designated evacuation routes.
18	Create stormwater utility fee and bylaw	Completed	Bylaw created, but only permit fees are taken. No Stormwater Enterprise was developed.	NO - explanation provided at left	

Municipal Vulnerability Preparedness Plan

The North Attleborough Municipal Vulnerability Preparedness Plan (MVP) 2019 includes eight overall recommendations. The MVP is part of a Massachusetts state-wide initiative through the Executive Office of Energy and Environmental Affairs (EEA) to provide support to cities and towns to plan for resiliency and implement climate change adaptation actions. The recommendations identified in North Attleborough's MVP were reviewed and considered when developing mitigation actions for this plan update. Below is the list of MVP Recommendations with notes regarding their status and relevance in the Hazard Mitigation Plan.

Table 76. Status of MVP Recommendations.

MVP Recommendation	Notes / Comments
Top Overall Actions	
Dredge and widen the Ten Mile River to increase flood storage and capacity	Very long-term plan (10-20 years) without an influx of funding.
Widen and lower the bridge on Chestnut Street	Completed
Clean culverts at Elm St at Rte. 1 and Route 1 at Orne Street	In Progress
Review and improve the operation and maintenance plans for dams to address climate impacts	Completed and will continue
Maintain and clean drainage pipes downtown	Annual Program under NPDES Stormwater
Review and revise evacuation plan in the event of downtown flooding	In Progress
Review and revise the town communication system as necessary	Going to new system
Educate residents on existing town communication systems	Continue to promote signup and use for various projects.

Comprehensive Range of Mitigation Actions

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

Identifying a range of mitigation actions was a process that included identifying and analyzing problem statements developed in Chapter 4 (Risk Assessment) for each hazard profiled. The HMPC considered 5 key assets when defining problem statements for the Town of North Attleborough. These are:

1. People (including underserved communities and socially vulnerable populations)

Town of North Attleborough, MA Hazard Mitigation Plan Update

2. Structures (including facilities, lifelines, and critical infrastructure)
3. Systems (including networks and capabilities)
4. Natural, historic, and cultural resources
5. Activities that have value to the community.

A MITIGATION ACTION is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment.

In addition to problem statements, Chapter 4 (Risk Assessment) considered Changes in Population Patterns and Changes in Land Use and Development for each hazard profiled.

Chapter 5 (Capability Assessment) included potential actions in each of FEMA's mitigation action categories (plans and regulations, structure and infrastructure, natural resources protection, and education and awareness).

The HMPC considered the problem statements, changes in population and land use, Capability Assessment recommendations and the status of previously identified mitigation actions and MVP Recommendations to develop a list of mitigation actions for this plan update. The HMPC sought to solve problems identified with the mitigation actions.

This process is illustrated in the figure below. The first column Hazards, indicates the natural hazards considered in the plan in the order of High, Medium, or Low Risk, as reviewed in the Risk Assessment (Chapter 4). The second column, Problems to Assets, indicates that the hazards caused problems in the categories of people, structures, systems, natural, historic, and cultural resources, and activities that have value to the community. The third column, Mitigation Actions, shows the four categories or types of mitigation action.

Town of North Attleborough, MA Hazard Mitigation Plan Update



Figure 22. Process of Identifying a Range of Mitigation Actions.

The HMPC and the public considered four mitigation action categories defined in Figure 23 below when considering solutions to identified problems.

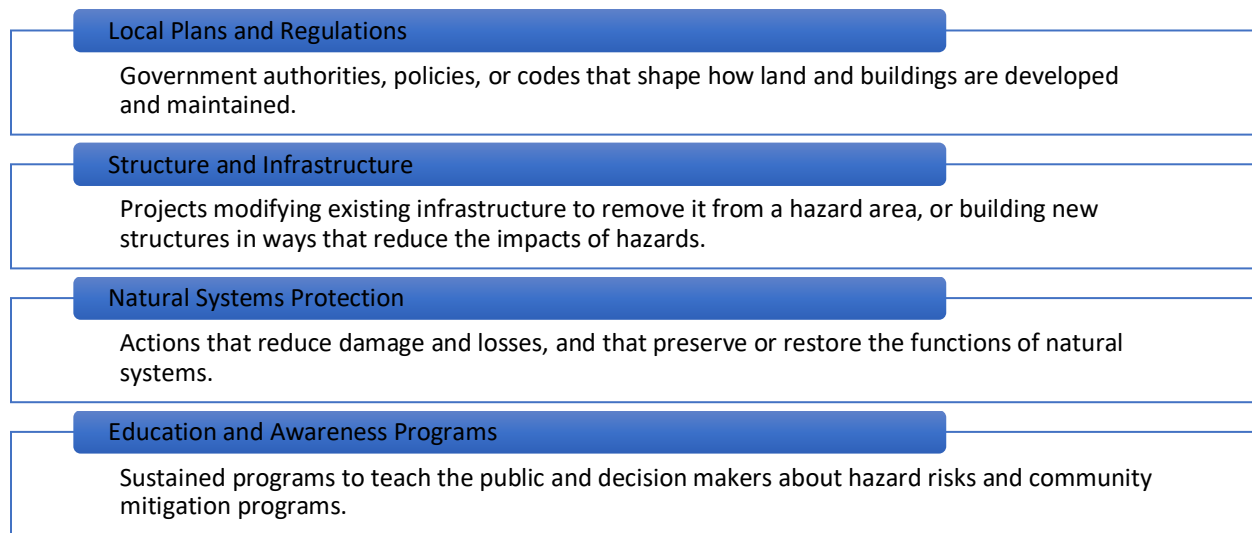


Figure 23. Types of Mitigation Actions.

Examples of actions in each of the above categories are shown in the table below.

Table 77. Examples of Mitigation Actions in Each Category.

Mitigation Action Category	Examples of Mitigation Actions
Local Plans and Regulations	- Comprehensive plans - Land use ordinances

Town of North Attleborough, MA Hazard Mitigation Plan Update

Mitigation Action Category	Examples of Mitigation Actions
	• Subdivision regulations • Development review • Building codes and enforcement • NFIP Community Rating System • Capital improvement programs • Open space preservation • Stormwater management regulations and master plans
Structure and Infrastructure Projects	• Acquisitions and elevations of structures in flood-prone areas • Utility undergrounding • Structural retrofits • Floodwalls and retaining walls • Detention and retention structures • Culverts
Natural Systems Protection	• Sediment and erosion control • Stream corridor restoration • Forest management • Conservation easements • Wetland restoration and preservation
Education and Awareness Programs	• Radio or television spots • Websites with maps and information • Real estate disclosure • Presentations to school groups or neighborhood organizations • Mailings to residents in hazard-prone areas

The HMPC also included specific dam risk mitigation activities such as those shown in Table 78 below taken from FEMA's Hurricane and Flood Mitigation Handbook for Public Facilities (https://www.fema.gov/sites/default/files/documents/fema_p-2181-fact-sheet-2-3-dams-and-reservoirs_0.pdf).

Town of North Attleborough, MA Hazard Mitigation Plan Update

Table 78. Dam Risk Mitigation Activities.

Type of Dam Risk Mitigation Activity	Description
Emergency Action Plans	• Develop and practice an Emergency Action Plan (EAP). EAPs include actions dam owners take to mitigate risk, coordinate with emergency management, issue early warnings, create inundation maps, and delineate responsibilities for those who manage an incident.
Improve Dam Stability	• Reduce the Slope • Use Buttressing • Use Anchoring
Increase Spillway Capacity	• Expand Existing Spillway • Add a New Spillway
Increase Temporary Storage Capacity	• Raise the Dam Height
Control Surface Erosion	• Use Armoring • Build a Parapet Wall • Build a Cutoff Wall to Address Headcutting
Reduce Seepage and Internal Erosion	• Install a Blanket Drain • Install a Filter Diaphragm • Install a Reverse Filter • Install a Seepage Cutoff Wall
Address Foundation Issues	• Install a Grout Curtain • Install a Foundation Cutoff Wall

The Association of State Dam Safety Officials (<https://damsafety.org/Roadmap>) includes the following recommendations for mitigating risk. The HMPC considered each of these.

Dam Owners Should:

- Maintain and operate dams to assure that they do not fail. Work with state and local officials to mitigate the consequences of failures and incidents.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Inform local officials of risks associated with dams.
- Develop emergency action plans (EAP) for every high-hazard potential dam. Use a nationally accepted model/guide. Integrate exercising into the planning process.
- Have a dam failure inundation map created as part of the EAP development process. Share plans and maps with local planners and first responders.
- Work with the state or federal regulator to comply with safety standards.
- Hire experienced professional engineers to oversee dam safety engineering issues.
- Attend educational programs when offered by organizations and agencies.

Emergency and Floodplain Managers Should:

- Open lines of communication with State and Federal dam safety agencies to improve planning and preparedness for dam failures or incidents.
- Participate in educational programs to become more aware of dams and how they intersect with emergency and floodplain management.
- Encourage improved land use planning at the local level so that communication about how dams affect local areas is more accurately known and considered in future planning.

Additional mitigation actions considered by the HMPC for dams included:

- Rehabilitation or removal
- Adopting or enforcing land use ordinances in inundation zones
- Elevating structures in inundation zones
- Adding flood protection measures such as berms, floodwalls, and floodproofing in inundation zones
- Managing the watershed to reduce erosion and sediment inflow.
- Public education.

In addition to this quantitative approach to identifying mitigation actions, the HMPC took a qualitative approach through the public outreach and engagement process to identify mitigation actions. Mitigation actions supporting underserved communities and environmental justice communities were specifically considered by the HMPC. They also focused on actions to the built environment both buildings and infrastructure as well as future development or redevelopment. The resulting list of mitigation actions includes at a minimum one action for each hazard identified. In several instances multiple actions address an identified hazard and problem.

Potential mitigation actions for each identified hazard and problem identified in the Risk Assessment are shown Table 79 below. Hazards are listed in order of risk. Some of these mitigation actions are included

Town of North Attleborough, MA Hazard Mitigation Plan Update

in the Action Plan; some were not included because of cost-benefit-analysis outcomes or inconsistency with Town priorities. The HMPC considered the pros and cons of all possible mitigation actions.

Table 79. Possible Mitigation Actions for Each Hazard.

Hazard	Problem Summary
Flooding from Precipitation	- Dredge and widen the Ten Mile River. - Develop stormwater management regulations for private entities to mitigate flood risk.
Severe Winter Storms	- Review all Town owned critical facilities for adequate back-up power. - Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
Other Severe Weather	Collaborate with SRPEDD and neighboring communities to pursue grant funding for regional risk reduction projects.
Droughts	- Adopt the Community Preservation Act. - Develop a Water Use Ordinance to control usage during times of drought.
Average and Extreme Temperatures	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
Hurricanes/Tropical Storms	Create and post designated evacuation routes.
Flooding from Dam Failure or Overtopping	- Review and improve dam operation and maintenance plans to address climate impacts. - Prevent unauthorized access to Whiting Pond Dam.
Tornadoes	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
Wildfires/Brushfires	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
Invasive Species	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Hazard	Problem Summary
Earthquakes	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.

Mitigation Action Plan

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

HHPD4: Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?

The HMPC then had the job to create a cost-effective mitigation action plan that included projects to address the identified hazards, areas of risk and vulnerable assets. An online Mitigation Action Tracker was developed for the Town to track the implementation of each mitigation action. The Mitigation Action Tracker was an online spreadsheet with separate cells showing each action's essential details. These column labels (essential details) listed below are included to facilitate the Town's ability to sort through the actions as well as to apply for grant funding.

Table 11. Essential Details for Mitigation Actions.

Essential Details	Detail Description
Action Title	Typically, a short description of the mitigation action.
Action Description	A detailed description of the action that includes the purpose or what natural hazard or problem may be mitigated by implementing the mitigation action.
Action Lead	A position in Town government responsible for implementing the action.
Supporting Organizations	A possible list of supporting partners, these may be Town departments, regional organizations, state agencies or adjacent communities.
Potential Funding Source(s)	A list of possible grant sources or the location in the Town's budget for the funding necessary to implement the mitigation action.
Implementation Schedule	A timeline within 5 years (the life of the plan) that the Town hopes to implement the action.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Essential Details	Detail Description
Estimated Cost	An estimated cost designated as high, medium, or low. The Town considered these cost “buckets” because it is impossible to identify an exact cost for each mitigation action.
Hazard(s) Addressed	All the natural hazards that the action may mitigate are listed.

The priority order was chosen based on weighing costs versus benefits. It was imperative for the Town to determine if the costs associated with an action were reasonable compared to the corresponding benefits. To do this, the HMPC developed a prioritization table that included eight categories of criteria; these are detailed in the table below. Each category was assigned points with priority criteria given the highest points. The most points an action could earn was 22. Actions that scored 16 points or higher were ranked as High priority. Actions that scored between 13-15 points were considered Medium, and actions that scored under 12 points were considered low priority. High Hazard Dams were given their own prioritization ranking due to their significance as a critical asset.

Table 12. Priority Ranking System.

	Criteria Category	Description	Detailed Ranking and Associated Points
1	Hazards Addressed	What level of hazards does the measure provide protection against?	High (Flood from Precipitation, Severe Winter Storms, Other Severe Weather) = 3 Medium (Droughts, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Average/Extreme Temperatures, Hurricanes/Tropical Storms, Invasive Species) = 2 Low (Earthquakes) = 1
2	High Hazard Dams	How much does the measure mitigate dam risk?	Specific Risk Mitigation = 3 Some Risk Mitigation = 2 No Risk Mitigation = 0
3	Approximate Cost	How much will the measure cost to implement?	Low (Under \$250k) = 3 Medium (\$25k - \$250k) = 2 High over \$250k) = 1

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Criteria Category	Description	Detailed Ranking and Associated Points
4	Equity Focus	Does the measure provide support to Environmental Justice (EJ) and other Vulnerable Populations?	Direct Support = 3 Indirect Support = 2 No Support = 0
5	Protection of Lives	How effective is the measure in protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Direct Support = 3 Moderate Indirect Support = 2 Minor Indirect Support = 1 None = 0
6	Protection of Critical Facilities or Infrastructure	Does the measure provide protection of critical facilities and infrastructure?	Yes = 3 No = 0
7	Natural Resource Protection	Does the measure provide protection of natural resources?	Yes = 2 No = 0
8	Alignment with Objectives	Does the measure align with the HMP objectives?	Yes = 2 No = 0

All the actions are listed in Table 80 in order of priority with the actions corresponding details. Additional tables are included in Appendix B. The breakdown of priority ranking points for each action is included in Appendix B. Readers of this Plan must understand that the mitigation action list is aspirational, it does not mean that the HMPC is confident that all actions may be implemented in the span of five years.

Table 80. North Attleborough Hazard Mitigation Actions.

1	Maintain and improve the Fire Department's insurance rating.	
High	Action Description	The Fire Department aspires to become a Class 2, the current ISO rating is class 3/3x. Improving this rating is a reflection of the Fire Department's increased capacity to mitigate risk as well as respond to disasters.
	Lead Position	Fire Chief / Emergency Management Director

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Supporting Agencies	Fire Department/Town management
	Cost	Low
	Potential Funding Sources	Fire Department Budget
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Invasive Species, Earthquakes
	Implementation Schedule	2025-2030

2	Review and revise Town emergency communication systems and educate residents on available systems.	
High	Action Description	The Town requires a system review to ensure redundancies. In addition, some residents may not be aware of the Code Red system in place and how to sign-up for alerts.
	Lead Position	Fire Chief / Emergency Management Director
	Supporting Agencies	Fire Department, Health Department, School Department, Senior Center
	Cost	Medium
	Potential Funding Sources	Massachusetts Emergency Management Agency (MEMA): Emergency Management Performance Grant (EMPG), State 911 Department Development Grant
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Invasive Species, Earthquakes
	Implementation Schedule	2026-2028

3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.	
High	Action Description	The schools and other Town owned buildings need backup power to function as shelters, heating/cooling centers, and to maintain business continuity during natural disasters and power outages.
	Lead Position	Facilities Director
	Supporting Agencies	All Departments with Facilities, North Attleborough Electric
	Cost	Low

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Potential Funding Sources	Town Capital Investment Program
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Tornadoes, Wildfires/Brushfires, Earthquakes
	Implementation Schedule	2025-2027

4	Review and improve dam operation and maintenance plans to address climate impacts.	
High	Action Description	To prevent flooding, study potential effects of alternate dam operations to better control the flow of the 10-Mile River.
	Lead Position	Conservation Administrator
	Supporting Agencies	Department of Public Works
	Cost	Very High
	Potential Funding Sources	Massachusetts Dam and Seawall Repair or Removal Program, FEMA's National Dam Safety Program State Assistance Grants, FEMA's High Hazard Potential Dams (HHPD) Grant Program, USDA Natural Resources Conservation Service (NRCS) Watershed Rehabilitation Program
	Hazards	Dam Failure or Overtopping
	Implementation Schedule	2025-2028

5	Maintain and clean drainage pipes downtown to prevent flooding.	
High	Action Description	Annual inspection of all basins and drain lines is necessary to prevent sediment in the 10-Mile River which leads to flooding.
	Lead Position	Director Department of Public Works
	Supporting Agencies	0
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Environmental Protection (MassDEP): §319 Nonpoint Source Competitive Grants, §604b Water Quality Management Planning Grants, Sewer Overflow and Stormwater Reuse Municipal Grants (OSG)
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Implementation Schedule	2025-2026
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6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.	
High	Action Description	The Riverview Mobile Home Park sits directly below the Hoppin Hill Dam, a community for people over the age of 55. Residents need to be made aware of the risk and evacuation routes. There are also other residences and businesses in the dam inundation zone. An effort to educate and alert people is necessary as well as maintenance of the dam.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Emergency Management Director, City of Attleboro, Council on Aging
	Cost	High
	Potential Funding Sources	MVP Grants Program. Collaboration with City of Attleboro
	Hazards	Flooding from Dam Failure or Overtopping, Wildfires/Brushfires
	Implementation Schedule	2026-2028

7	Conduct tabletop exercises for dam breach and flooding.	
High	Action Description	Ensure readiness of the Town and emergency management to respond and recover from flooding
	Lead Position	Fire Chief / Emergency Management Director
	Supporting Agencies	Fire, Police, Department of Public Works, Town Management, Conservation, MA Emergency Management Agency
	Cost	Medium
	Potential Funding Sources	EMPG Grant and grant opportunities through SRPEDD
	Hazards	Flooding and response
	Implementation Schedule	2025-2030

8	Add alternative access to properties along Greenwood Lake Dam.	
High	Action Description	There is only one road with access to the Greenwood Lake Dam. If this road is blocked due to downed trees, heavy snow or another disaster, residents along the dam would not have an escape route and the Town would not have access to them.
	Lead Position	Director Department of Public Works

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Supporting Agencies	Emergency Management Director
	Cost	High
	Potential Funding Sources	Collaborate with Mass Fish and Game. MVP Grant Program
	Hazards	Flooding from Dam Failure or Overtopping, Wildfires/Brushfires
	Implementation Schedule	2026-2028

9	Install hydrants on streets with dead end water mains.	
High	Action Description	To facilitate the work of the Fire Department, review and prioritize a list of roads that do not have hydrants at or near the end of the street.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Fire Department
	Cost	Low
	Potential Funding Sources	Water Enterprise
	Hazards	Wildfires/Brushfires
	Implementation Schedule	2025-2028

10	Purchase equipment to perform drainage system maintenance and repairs.	
Medium	Action Description	The Town needs a Vactor/jet Truck to maintain and repair drainage systems to mitigate flood risk.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Town Manager
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Transportation (MassDOT): 2024-2028 Capital Investment Plan
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping
	Implementation Schedule	2025-2028

Town of North Attleborough, MA Hazard Mitigation Plan Update

11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.	
Medium	Action Description	Residents need to be aware of how invasive elements may impact the aquifer.
	Lead Position	Conservation Administrator
	Supporting Agencies	Conservation and Communications Public Information Officer
	Cost	Low
	Potential Funding Sources	Massachusetts Department of Environmental Protection (MassDEP): Drinking Water Supply Protection Grant Program, Massachusetts Environmental Education Society (MEES) Grant
	Hazards	Invasive Species
	Implementation Schedule	2026-2030

12	Formally designate a local Floodplain Administrator.	
Medium	Action Description	The Town does experience flooding and is interested in proactively mitigating the flood risk and educating the community. A Floodplain Administrator can facilitate these activities.
	Lead Position	Town Manager
	Supporting Agencies	Department of Public Works
	Cost	Medium
	Potential Funding Sources	Town Manager's Budget
	Hazards	Flooding from Precipitation, Flooding from Dam Failure or Overtopping
	Implementation Schedule	2025-2027

13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.	
Medium	Action Description	Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities may assist with identifying and developing grant applications for regional risk reduction projects.
	Lead Position	Town Manager
	Supporting Agencies	Southeastern Regional Planning & Economic Development District (SRPEDD), Building Department, Department of Public Works
	Cost	Low

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Potential Funding Sources	Town Manager's Budget
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Invasive Species, Earthquakes
	Implementation Schedule	2026-2030

14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.	
Medium	Action Description	To prevent flooding, control erosion, and protect infrastructure the Town needs to study the viability of culverts and identify those that need replacement or repair. Properly functioning culverts are necessary for environmental health and infrastructure stability when considering water flow.
	Lead Position	Director Department of Public Works
	Supporting Agencies	
	Cost	High
	Potential Funding Sources	Massachusetts Division of Ecological Restoration (DER): Culvert Replacement Municipal Assistance Grant Program, Executive Office of Energy and Environmental Affairs (EEA): Municipal Vulnerability Preparedness (MVP): Action Grant, Federal Emergency Management Agency (FEMA): Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC)
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping
	Implementation Schedule	2025-2027

15	Create and post designated evacuation routes.	
Medium	Action Description	It may be necessary due to a dam breach or other natural hazard for residents to need to evacuate. There are some lower income residents living in dam inundation areas. Posting signs and educating residents about risk and evacuation routes is necessary to protect lives.
	Lead Position	Fire Chief / Emergency Management Director
	Supporting Agencies	Department of Public Works

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Cost	Medium
	Potential Funding Sources	Massachusetts Emergency Management Agency (MEMA): Emergency Management Performance Grant (EMPG), Massachusetts Department of Transportation (MassDOT): Shared Streets and Spaces Grant Program, Federal Emergency Management Agency (FEMA): Preparedness Grants
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Invasive Species, Earthquakes
	Implementation Schedule	2026-2027

16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.	
Medium	Action Description	This area experiences repetitive flooding. Implementing a larger drainage system should mitigate the flood issues.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Town Manager, Emergency Management Director
	Cost	High
	Potential Funding Sources	Flood Mitigation Assistance Program (FMA), National Culvert Removal, Replacement, & Restoration Grant (NCRRRG), Long term capital planning, Chp. 90 funds
	Hazards	Flood from Precipitation, Severe Winter Storms, Other Severe Weather, Flooding from Dam Failure or Overtopping, Hurricanes/Tropical Storms
	Implementation Schedule	2025-2028

18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.	
Medium	Action Description	Locate land and construct water storage tank on Fales Road to provide firefighting pressures.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Fire Chief / Emergency Management Director
	Cost	High
	Potential Funding Sources	Massachusetts Executive Office of Public Safety and Security (EOPSS) Grants, Federal Emergency Management Agency (FEMA): Assistance to Firefighters Grant (AFG) Program

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Hazards	Wildfires/Brushfires
	Implementation Schedule	2026-2028

19	Prevent unauthorized access to Whiting Pond Dam.	
Medium	Action Description	A Whiting Pond Dam breach would include flooding of the downtown area and residential properties along the 10-Mile River. Unauthorized access threatens to safety and functionality of the dam.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Emergency Management Director
	Cost	High
	Potential Funding Sources	Town Capital Program
	Hazards	Flooding from Dam Failure or Overtopping, Wildfires/Brushfires
	Implementation Schedule	2026-2028

20	Develop a plan to transport seniors and vulnerable residents to shelters.	
Medium	Action Description	Seniors may need assistance during many kinds of natural disasters and the Town needs to be prepared to get them to safety.
	Lead Position	Executive Director, Senior Center
	Supporting Agencies	Town Manager, North Attleborough Council on Aging, Greater Attleboro Taunton Regional Transit Authority (GATRA)
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Transportation (MassDOT): Community Transit Grant Program, Greater Attleboro Taunton Regional Transit Authority (GATRA)
	Hazards	Severe Winter Storms, Other Severe Weather, Extreme Temperatures, Hurricanes/Tropical Storms, Tornadoes, Wildfires/Brushfires
	Implementation Schedule	2025-2027

21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.	
Medium	Action Description	In addition to the Water Use Ordinance, create educational messaging so people understand how to conserve water and how to stay cool during times of extreme heat..
	Lead Position	Conservation Administrator

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Supporting Agencies	Senior Center, Emergency Management Director
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Environmental Protection (MassDEP): Massachusetts Water Management Act Grant Program
	Hazards	Drought, Extreme Temperatures
	Implementation Schedule	2025-2030

22	Create a flood awareness education and outreach campaign.	
Medium	Action Description	Provide outreach and education to homeowners who could be impacted by flood and other natural hazards. Work with regional partners to expand Town's capacity for engagement.
	Lead Position	Conservation Administrator
	Supporting Agencies	Council on Aging
	Cost	Low
	Potential Funding Sources	Massachusetts Executive Office of Energy and Environmental Affairs (EEA): Municipal Vulnerability Preparedness (MVP) Program, Massachusetts Drought Resilience and Water Efficiency Grant Program
	Hazards	Flooding from Precipitation and Dam Failure
	Implementation Schedule	2026-2030

23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.	
Low	Action Description	Develop requirements to force private entities to maintain their detention basins as a way to prevent flooding.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Conservation Commission, Planning Board
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Environmental Protection (MassDEP): §319 Nonpoint Source Competitive Grants, §604b Water Quality Management Planning Grants, Executive Office of Energy and Environmental Affairs (EEA): Municipal Vulnerability Preparedness (MVP): Action Grant

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping
	Implementation Schedule	2026-2028

24	Dredge and widen the Ten Mile River to increase flood storage and capacity.	
Low	Action Description	Clear Ten-Mile River of sediment and re-establish wetlands adjacent to the 10-Mile River.
	Lead Position	Director Department of Public Works
	Supporting Agencies	Conservation Commission
	Cost	Very High
	Potential Funding Sources	Massachusetts Executive Office of Economic Development: Massachusetts Inland Dredging Pilot Program, U.S. Army Corps of Engineers (USACE): Water Resources Development Act (WRDA)
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping
	Implementation Schedule	2025-2030

25	Adopt the Community Preservation Act (CPA).	
Low	Action Description	Adoption of the CPA would provide the Town with revenue to use toward open space preservation and affordable housing.
	Lead Position	Town Planner
	Supporting Agencies	Conservation Commission
	Cost	Low
	Potential Funding Sources	Exploration of adoption needs no funding
	Hazards	Flood from Precipitation, Severe Winter Storms, Other Severe Weather, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Average/Extreme Temperatures, Hurricanes/Tropical Storms
	Implementation Schedule	2026-2027

26	Add floodproofing to Town Hall which has experienced flooding.	
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Town of North Attleborough, MA Hazard Mitigation Plan Update

Low	Action Description	For the Town to maintain continuity of service the Town Hall needs to remain operational regardless of natural hazards. Heavy rains have flooded the Town Hall in the past.
	Lead Position	Town Manager
	Supporting Agencies	0
	Cost	High
	Potential Funding Sources	Town Capital Program
	Hazards	Flooding from Precipitation
	Implementation Schedule	2027-2029

27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.	
Low	Action Description	To reduce damages from extreme temperatures, it is necessary to educate homeowners and business owners how to mitigate risk to pipes and roofs.
	Lead Position	Fire Chief / Emergency Management Director
	Supporting Agencies	Senior Center
	Cost	Low
	Potential Funding Sources	department budgets
	Hazards	Severe Winter Storms, Extreme Temperatures
	Implementation Schedule	2026-2030

28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.	
Low	Action Description	During severe winter storms or periods of high winds, snow blows and drifts onto roadways impacting travel. Snow fences or natural resources such as trees or bushes would prevent snow from impacting roadways.
	Lead Position	Director Department of Public Works
	Supporting Agencies	\$0
	Cost	Low

Town of North Attleborough, MA Hazard Mitigation Plan Update

	Potential Funding Sources	Department of Public Works Budget
	Hazards	Severe Winter Storms
	Implementation Schedule	2026-2030

29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.	
Low	Action Description	Conduct a study which identifies ways that these buildings can meet the Massachusetts State Building Code seismic standards.
	Lead Position	Building Inspector
	Supporting Agencies	\$0
	Cost	Low
	Potential Funding Sources	National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP)
	Hazards	Earthquakes
	Implementation Schedule	2028-2030

30	Develop a local Wetlands Protection Bylaw.	
Low	Action Description	To balance the interest in development with conservation and the protection of natural ecosystems, flood protection, and water quality, the Town needs a Wetlands Protection Bylaw.
	Lead Position	Conservation Administrator
	Supporting Agencies	Planning Board, Department of Public Works, Town Council
	Cost	Medium
	Potential Funding Sources	Massachusetts Department of Environmental Protection (MassDEP): Wetlands Program, Executive Office of Energy and Environmental Affairs (EEA): Municipal Vulnerability Preparedness (MVP): Action Grant, Massachusetts Division of Ecological Restoration (DER) Grants
	Hazards	Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Invasive Species
	Implementation Schedule	2025-2027

31	Buy-out properties that have repetitive flood losses.	
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Town of North Attleborough, MA Hazard Mitigation Plan Update

Low	Action Description	Properties that repetitively flood create a risk to residents and a drain on Town resources. Buying these properties mitigates this risk and potentially saves lives and property.
	Lead Position	Town Manager
	Supporting Agencies	Planning Board
	Cost	Very High
	Potential Funding Sources	FEMA Hazard Mitigation Grant Program (HMGP), FEMA Flood Mitigation Assistance (FMA) Program, HUD Community Development Block Grant – Disaster Recovery (CDBG-DR), Executive Office of Energy and Environmental Affairs (EEA), Municipal Vulnerability Preparedness (MVP) Program
	Hazards	Flooding from Precipitation
	Implementation Schedule	2026-2030

Table 81 shows the mitigation actions that specifically target vulnerable populations and Table 82 shows the mitigation actions that specifically target buildings and infrastructure. Each table lists the actions in order of priority.

Table 81. Actions that Target Vulnerable Populations.

Action #	Action Title
2	Review and revise Town emergency communication systems and educate residents on available systems.
3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
9	Install hydrants on streets with dead end water mains.
20	Develop a plan to transport seniors and vulnerable residents to shelters.
21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.

Table 82. Actions that Target Buildings and Infrastructure.

Action #	Action Title
3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
4	Review and improve dam operation and maintenance plans to address climate impacts.
5	Maintain and clean drainage pipes downtown to prevent flooding.
6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
8	Add alternative access to properties along Greenwood Lake Dam.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Title
9	Install hydrants on streets with dead end water mains.
10	Purchase equipment to perform drainage system maintenance and repairs.
14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
17	Prevent unauthorized access to Falls Pond Dam.
18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
19	Prevent unauthorized access to Whiting Pond Dam.
26	Add floodproofing to Town Hall which has experienced flooding.
28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.
31	Buy-out properties that have repetitive flood losses.

Table 83. Mitigation Actions that Target Dam Safety.

Action #	Action Title
1	Maintain and improve the Fire Department's insurance rating.
4	Review and improve dam operation and maintenance plans to address climate impacts.
6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
7	Conduct tabletop exercises for dam breach and flooding.
8	Add alternative access to properties along Greenwood Lake Dam.
12	Formally designate a local Floodplain Administrator.
16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
17	Prevent unauthorized access to Falls Pond Dam.
19	Prevent unauthorized access to Whiting Pond Dam.
22	Create a flood awareness education and outreach campaign.

Possible Funding Sources

All the mitigation actions included in this plan have identified one or more potential funding sources. The HMWG focused on projects eligible for MVP Grant funding and FEMA BRIC funding. Below is a list of some of the federal and state funding mechanisms that may assist in implementing mitigation actions.

Federal Emergency Management Agency (FEMA) Mitigation Grants

The Federal Emergency Management Agency (FEMA) makes grant funding available for a range of mitigation activities via several Hazard Mitigation Assistance (HMA) programs. These grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property

Town of North Attleborough, MA Hazard Mitigation Plan Update

from future disaster damages. They are not intended to fund repair, replacement, or deferred maintenance activities but are rather designed to assist in developing long-term, cost-effective improvements that will reduce risk to natural hazards.

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

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

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

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

- **Rehabilitation of High Hazard Potential Dams**

The President signed the [Water Infrastructure Improvements for the Nation Act](#) or the "WIIN Act," on Dec. 16, 2016, which adds a new grant program under FEMA's National Dam Safety Program ([33 U.S.C. 467f](#)). Section 5006 of the Act, Rehabilitation of High Hazard Potential Dams, provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. This is an annual funding opportunity. Town governments as well as private dam owners are eligible for the program which is managed by the state.

Additional funding opportunities to support Dam Removal

- NOAA- Community Based Restoration Grant Program
- U.S. Fish and Wildlife Service – National Fish Passage Program

Town of North Attleborough, MA Hazard Mitigation Plan Update

- U.S. Army Corps of Engineers – Section 206 Aquatic Ecosystem Restoration Program
- U.S. Forest Service – Support for Dam Removal

Municipal Vulnerability Preparedness Action Grants⁶⁷

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

Responses to the RFR may be submitted by municipalities who have received designation from the Executive Office of Energy and Environmental Affairs (EEA) as a Climate Change Municipal Vulnerability Preparedness (MVP) Community, or “MVP Community.” All projects are required to provide monthly updates, project deliverables, a final project report, and a brief project summary communicating lessons learned. The municipality is also required to match 25% of total project cost using cash or in-kind contributions. All proposals must include the following:

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

Project types include:

- ***Detailed Vulnerability and Risk Assessment*** – In-depth vulnerability or risk assessment of a particular sector, location, or other aspect of the municipality.
- ***Public Education and Communication*** – Projects that increase public understanding of climate change impacts within and beyond the community and foster effective partnerships to develop support.
- ***Local Bylaws, Ordinances, Plans, and other Management Measures*** – Projects to develop, amend, and implement local ordinances, bylaws, standards, plans, and other management measures to reduce risk and damages from extreme weather, heat, flooding, and other climate change impacts.
- ***Redesigns and Retrofits*** – Engineering and construction projects to redesign, plan, or retrofit vulnerable community facilities and infrastructure (e.g., wastewater treatment plants, culverts,

⁶⁷ State of Massachusetts. *MVP Action Grant*. <https://www.mass.gov/service-details/mvp-action-grant>.

and critical municipal roadways/evacuation routes) to function over the life of the infrastructure given projected climate change impacts.

- **Energy Resilience Strategies** — Projects that incorporate clean energy generation, such as micro grids, and that are paired with resilience enabling technology to maintain electrical and/or heating and cooling services at critical facilities.
- **Chemical Safety and Climate Vulnerabilities** — Projects that seek to engage the business and manufacturing community through assistance or training on identifying vulnerabilities to chemical releases due to severe weather events, reducing use of toxic or hazardous chemicals, outreach to improve operations and maintenance procedures to prevent chemical releases and accidents, outreach to improve emergency and contingency planning, and/or identifying existing contaminated sites that pose chemical dispersion risks during flood events.
- **Nature-Based Storm-Damage Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques** – Projects that utilize natural resources and pervious surfaces to manage coastal and inland flooding, erosion, and other storm damage, such as stormwater wetlands and bio-retention systems, and other Smart Growth and Low Impact Development techniques.
- **Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality** – Projects that utilize natural resources, vegetation, and increasing pervious surface to reduce ambient temperatures, provide shade, increase evapotranspiration, improve local air quality, and otherwise provide cooling services within the municipality.
- **Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts** – Nature-based projects that address other impacts of climate change such as extreme weather, damaging wind and power outages, and increased incidence of pests and vector-borne illnesses and other public health issues.
- **Acquisition of Land to Achieve a Resiliency Objective** — Land purchases are eligible for grant funding if the parcel has been identified through a climate vulnerability assessment as an appropriate location for a specific eligible adaptation activity to occur, such as accommodating an infrastructure or facility redesign or retrofit project, providing natural flood storage to reduce downstream flooding, or removal of pavement and planting of trees to reduce flooding and heat island effects.
- **Ecological Restoration and Habitat Management to Increase Resiliency** — Projects that repair or improve natural systems for community and ecosystem adaptation, such as right-sizing culverts, dam removal, restoration of coastal wetlands, etc.

- ***Subsidized Low Income Housing Resilience Strategies*** — Investments in resiliency measures for affordable housing to protect vulnerable populations that may not have the resources to recover from an extreme climate event.
- ***Mosquito Control Districts*** — Projects to reduce the risk to public health from mosquito-borne illness and to increase mosquito surveillance and control capacity by incentivizing municipalities not in an organized mosquito control project or district to form a new mosquito control district or join an existing mosquito control district. Also funding for municipalities currently in a mosquito control district for new or proactive mosquito control measures.

Chapter 7. Plan Integration and Maintenance

The Town's Fire Chief is the primary point of contact for the Hazard Mitigation Plan's implementation and maintenance. The Hazard Mitigation Planning Committee (HMPC) will implement the mitigation strategy and specific mitigation actions outlined in this plan, and update and maintain the plan according to the guidelines below. They will do this with the support of the Joint Local Emergency Planning Committee (LEPC). The HMPC includes key stakeholders in the Town, who will use the plan's goals, as well as continued analysis of hazard risks and capabilities, to weigh the available resources against the costs and benefits for each mitigation action. The Town understands the value of this plan and its positive mitigation impact and intends to continue updating this plan and implementing its strategies.

Continued Public Participation

D1. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan is implemented and updated over time. Based on the high level of interest in the mitigation planning process and in the Municipal Vulnerability Preparedness project, Town residents and stakeholders are interested in hazard mitigation and climate adaptation. The HMPC included several education and outreach mitigation actions designed to engage the public. The Town intends to involve the public throughout the five-year implementation of this plan, as well as in the reviewing and updating processes. The Town's Communications and Information Officer will take the lead in soliciting participation from the public with support from other Town departments and the LEPC. This participation will take multiple forms, including all of those outlined in Chapter 3 (Planning Process) of this plan. Efforts to involve the public include:

- Advertising on the Town's website and through standard meeting laws.
- Posting news and announcements on the Town's social media pages.
- Conducting outreach to local community organizations and businesses.
- Hosting public presentations and meetings throughout the plan's process to acquire feedback and input from stakeholders.
- Post copies of the plan on the Town's website and keep a hard copy in Town Hall for public review.
- Continue to work with vulnerable populations, local organizations, private industry, regional agencies, and adjacent communities as this plan is implemented.

Method and Schedule for Keeping the Plan Current

D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

The HMPC and the Town of North Attleborough recognize the importance of keeping the mitigation plan up to date. The HMPC will meet twice a year for the purposes of implementing and maintaining the Hazard Mitigation Plan. They will notify the public prior to meetings. This work includes monitoring, evaluating, and updating the plan over a five-year period. Overall, the responsibility for monitoring the Plan rests with the Fire Chief.

Process to Track Actions

The Fire Chief and the HMPC will maintain the Mitigation Action Tracker (a tool to record the status of each mitigation action). They will send a reminder email with a link to the web-based Mitigation Action Tracker on a semi-annual basis (January and July) to all Department Heads responsible for a mitigation action and to relevant Town committees. They may also distribute the Mitigation Action Progress Worksheet (shown in Appendix C) for Department Heads who prefer a form over a digital spreadsheet.

MONITORING means tracking the implementation of the plan over time.

If the Town experiences a large-scale disaster, the Fire Chief will assemble an HMPC meeting to update the list of mitigation actions and review their order based on current priorities.

Process to Evaluate Effectiveness of the Plan

The HMPC has agreed to meet on a bi-annual basis to review the implementation of the mitigation plan. The first meeting will take place in July; the second, in January.

EVALUATING means assessing the effectiveness of the plan at achieving its stated purpose and goals.

At the first meeting (July 2025), the HMPC will review the effectiveness of the planning process, public and stakeholder engagement, risk analysis, and the mitigation strategy, including its implementation. It is recommended that the HMPC use the worksheet provided in Appendix C. Beyond considering the planning process, the HMPC will seek to answer the following questions to determine if the plan is effective at mitigating risk to Town residents, the built environment, and the natural environment.

- Can the HMPC identify success stories of losses avoided because of hazard mitigation measures implemented? Can the HMPC identify political, social, and economic successes?

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Have the mitigation actions implemented achieved benefits beyond the cost of mitigation?
- Have the implemented mitigation actions saved lives or protected property?
- Does the list of mitigation actions coincide with the Town's priorities? Do additional actions need to be added?

Process to Update the Plan

At each semi-annual meeting, the HMPC will review the plan's goal statements and mitigation action status. If necessary, the goal statements and mitigation actions may be revised to reflect current Town priorities. In addition, the HMPC will discuss methods for continuing to integrate the mitigation plan with other plans, processes, and projects in the Town.

UPDATING means reviewing and revising the plan at least once every five years.

Year 1	Year 2	Year 3	Year 4	Year 5
•Seek grant funding for mitigation actions •Gather the HMPC in January and July	•Seek grant funding for mitigation actions •Gather the HMPC in January and July	•Seek FEMA BRIC funding for plan update •Seek grant funding for mitigation actions •Gather the HMPC in January and July	•Begin the plan update process •Seek grant funding for mitigation actions •Gather the HMPC in January and July	•Complete the plan update process - adopt the new plan •Seek grant funding for mitigation actions •Gather the HMPC in January and July

Figure 20. Plan Update and Implementation Schedule.

The National Dam Safety Program Act has authorized FEMA to provide High Hazard Potential Dams (HHPD) Rehabilitation Grant Program assistance for the rehabilitation of dams that do not meet minimum safety standards and pose substantial risk to life and property.⁶⁸ The Town of North Attleborough is interested in accessing the HHPD grant funds and have designed this plan to meet criteria outlined in Element G: High Hazard Potential Dams. To continue meeting the requirements of Element G the HMPC will answer the following questions during plan update meetings:

⁶⁸ Local Mitigation Planning Policy Guide, FEMA, Effective April 19, 2023, p.32.

Town of North Attleborough, MA Hazard Mitigation Plan Update

- Do we have new or updated plans, studies, reports or technical information regarding the HHPDs?
- How does the risk assessment need to be updated to accurately reflect dam risk?
- Have the mitigation goals related to the HHPDs been implemented and do they need to be amended to reflect current conditions and priorities in the Town?
- Have the mitigation actions that addressed HHPDs been implemented and do new actions aimed at reducing vulnerabilities from HHPDs need to be added?

Responsible Parties for Plan Implementation and Maintenance

North Attleborough, MA

Christopher Coleman

Fire Chief/Emergency Management Director

Fire Headquarters

50 Elm Street, North Attleborough, MA 02760

Phone: 508-699-0140

Email: ccoleman@nattleboro.com

For State resources:

Massachusetts Emergency Management Agency

Address: 400 Williamstown Road, Framingham, MA 01702-5399

Phone: 508-820-2000 (MEMA Headquarters and Communications Center)

or 978-328-1500 (MEMA Region 1 Office)

Website: <https://www.mass.gov/orgs/massachusetts-emergency-management-agency>

For Federal resources:

Federal Emergency Management Agency

Address: 220 Binney Street, Cambridge, MA 02142

Phone: 877-336-2734

Email: fema-r1-info@fema.dhs.gov

Website: <https://www.fema.gov/region-i-ct-me-ma-nh-ri-vt>

Plan Integration

D3. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))

For the Town of North Attleborough to succeed in reducing hazard risks over the long term, the information, ideas, conclusions, and strategic recommendations of this hazard mitigation plan should be integrated throughout government operations. Effective integration means to include mitigation principles, vulnerability information, and mitigation actions into other existing community planning mechanisms to leverage activities that have co-benefits, reduce risk, and increase resilience. Many other local plans and processes will present opportunities to address hazard mitigation in a way that can support multiple community objectives, so an important part of maintaining and implementing this hazard mitigation plan will be to identify and capitalize on these opportunities to leverage activities that have co-benefits (including but not limited to risk reduction). The Town's recent incorporation of "Climate & Resilience" as a standalone element in its 2023 Master Plan demonstrates this type of integration by stressing the importance of hazard mitigation and climate resilience strategies across various elements of this separate planning document. This overarching 10-year strategy document notably states that "the Town should prioritize preparing for potential disasters and more frequent weather events related to climate change, such as extreme heat events and increased rainfall volume."

The HMPC will remain tasked with helping to ensure that all new or updated local plan documents are informed by and consistent with the goals and actions of this hazard mitigation plan and will not contribute to increased hazard vulnerability in North Attleborough. Specifically, this includes but is not limited to the implementation or future updates to the following local plans as identified and further described in Chapter 5 (Capability Assessment):

- Master Plan (2023)
- Housing Production Plan (2023)
- Open Space and Recreation Plan (2021-2032)
- Municipal Vulnerability Preparedness / Community Resilience Building Summary of Findings Report (2020)
- Stormwater Management Plan (2019)
- Historic Preservation Plan (2017)

Additional opportunities to integrate the requirements of this plan into other local planning mechanisms shall continue to be identified through future meetings of the HMPC and through the five-year review process described in this chapter. Other planning mechanisms include local regulations and existing code enforcement procedures (i.e., zoning bylaws, site plan review, etc.), internal municipal policies, special projects or initiatives, and other routine government or community decision-making activities

Town of North Attleborough, MA Hazard Mitigation Plan Update

such as capital improvement planning and the Town's annual budget process. Emphasis for identifying these integration opportunities will be placed on those governance structures used to manage local land use and community development in both the pre-disaster and post-disaster environment. Also, as it relates to implementing specific mitigation actions identified in this plan, it will be the responsibility of each assigned lead department to determine additional measures that can support action completion or enhancement. This includes integrating mitigation actions from this plan into other local planning documents, processes, or mechanisms as deemed appropriate and most effective.

While it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the routine maintenance of this stand-alone plan is considered by the Town to be the most effective and appropriate method to identify, prioritize, and implement local hazard mitigation actions. In moving forward, however, the Town will consider the incorporation of some other plan documents into the hazard mitigation plan, such as any future iterations of the Town's MVP Plan or related climate adaptation planning efforts.

Acronyms

AAL	Average Annual Loss
AFG	Assistance to Firefighters Grant
APA	American Planning Association
APHIS	Animal and Plant Health Inspection Service
ASCE	American Society of Civil Engineers
BBRS	Board of Building Regulations and Standards
BCEGS	Building Code Effectiveness Grading Schedule
BRIC	Building Resilient Infrastructure and Communities
BTU	British Thermal Unit
C2ES	Center for Climate and Energy Solutions
CAV	Community Assistance Visit
CAC	Community Assistance Contact
CDBG	Community Development Block Grant
CDBG-DR	Community Development Block Grant – Disaster Recovery
CDC	Centers for Disease Control and Prevention
CDD	Consecutive Dry Days
CEMP	Comprehensive Emergency Management Plan
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CIS	Community Information System
CMR	Code of Massachusetts Regulations
COOP	Continuity of Operations Plan
CPA	Community Preservation Act
CRB	Community Resilience Building
CRS	Community Rating System
CZM	Coastal Zone Management
DAR	Department of Agricultural Resources
DCR	Department of Conservation and Recreation
DEM	Digital Elevation Model
DEP	Department of Environmental Protection
DER	Division of Ecological Restoration
DMA	Disaster Mitigation Act
DMP	Drought Management Plan
DMTF	Drought Management Task Force
DOT	Department of Transportation
DPW	Department of Public Works
DRRA	Disaster Recovery Reform Act

Town of North Attleborough, MA Hazard Mitigation Plan Update

DWR	Days Without Rain
EAP	Emergency Action Plan
EF	Enhanced Fujita
EJ	Environmental Justice
EMA	Emergency Management Agency
EMD	Emergency Management Director
EMPG	Emergency Management Performance Grant
EOC	Emergency Operations Center
EOED	Executive Office of Economic Development
EOEEA	Executive Office of Energy and Environmental Affairs
EOPSS	Executive Office of Public Safety and Security
EEA	Energy and Environmental Affairs
EPA	Environmental Protection Agency
EST	Eastern Standard Time
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FPA	Floodplain Administrator
FSim	Forest Service Fire Simulation System
FY	Fiscal Year
GATRA	Greater Attleboro-Taunton Regional Authority
GIS	Geographic Information Systems
HHPD	High Hazard Potential Dam
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMPC	Hazard Mitigation Planning Committee
HUD	United States Department of Housing and Urban Development
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code
IBHS	Insurance Institute for Business and Home Safety
ICC	International Code Council
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IMC	International Mechanical Code
IRC	International Residential Code
ISO	Insurance Services Office, Inc.

Town of North Attleborough, MA Hazard Mitigation Plan Update

ISPSC	International Swimming Pool and Spa Code
IT	Information Technology
LEPC	Local Emergency Planning Committee
MBTA	Massachusetts Bay Transportation Authority
MCDA	Multi-Criteria Decision Analysis
MEES	Massachusetts Environmental Education Society
MEMA	Massachusetts Emergency Management Agency
MGL	Massachusetts General Law
MGD	Million Gallons Per Day
MIPAG	Massachusetts Invasive Plant Advisory Group
MPH	Miles Per Hour
MSBC	Massachusetts State Building Code
MVP	Municipal Vulnerability Preparedness
NAED	North Attleboro Electric Department
NAHC	North Attleborough Historical Commission
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NCRRG	National Culvert Removal, Replacement, & Restoration Grant
NE CASC	Northeast Climate Adaptation Science Center
NEHRP	National Earthquake Hazards Reduction Program's State Assistance Program
NEPPA	Northeast Public Power Association
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flooding Insurance Program
NFIRA	National Flood Insurance Reform Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OSG	Sewer Overflow and Stormwater Reuse Municipal Grant
OSRP	Open Space and Recreation Plan
PA	Public Assistance
PDM	Pre-Disaster Mitigation
PHD	Doctor of Philosophy
PPC	Public Protection Classification
PPQ	Plant Protection and Quarantine
PMF	Probable Maximum Flood
PWAT	Precipitable Water
PWS	Public Water Systems
RFC	River Forecast Center

Town of North Attleborough, MA Hazard Mitigation Plan Update

RMAT	ResilientMass Action Team
RSI	Regional Snowfall Index
SAFE	Student Awareness of Fire Education
SFHA	Special Flood Hazard Areas
SHMCAP	State Hazard Mitigation and Adaptation Plan
SI/SD	Substantial Improvement/Substantial Damage
SMSA	Standard Metropolitan Statistical Area
SPIA	Sperry-Piltz Accumulation Index
SRPEDD	Southeastern Regional Planning and Economic Development District
SWMP	Stormwater Management Plan
SWPPP	Storm Water Pollution Prevention Plan
TD	Tropical Depression
TRI	Toxic Release Inventory
TV	Television
US	United States
USACE	United States Army Corps of Engineers
USC	U.S. Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USGCRP	U.S. Global Change Research Program
WFO	Weather Forecast Office
WPA	Wetlands Protection Act
WRDA	Water Resources Development Act
WWI	World War I

Town of North Attleborough, MA Hazard Mitigation Plan Update

Appendix A. Planning Process Supporting Materials

Hazard Mitigation Planning Committee Meetings

HMPC Meeting Participants

First Name	Last Name	Title	Affiliation	Phone	Email	Kick-Off Meeting 9/16/2024	HMPC #1 10/21/2024	HMPC #2 1/6/2025	HMPC #3 2/10/2025	HMPC #4 4/3/2025
Jon	Antonucci	School Superintendent	Town of North Attleborough	508-643-2100	jantonucci@naschools.net	☐	☐	☐	☐	☐
Michael	Borg	Town Manager	Town of North Attleborough	508-699-0100 x2555	mborg@nattleboro.com	☐	☐	☐	☐	☐
Peter	Clondas	North Attleboro Electric - Assistant Operations Manager	Town of North Attleborough	508-643-6372	pclondas@naelectric.com	☐	☐	☒	☒	☐
Christopher	Coleman	Fire Chief/Emergency Management Director	Town of North Attleborough	508-699-0140 x5620	ccoleman@nattleboro.com	☒	☐	☒	☒	☒
AnneMarie	Fleming	Health Director/Health Nurse	Town of North Attleborough	508-699-0100	amfleming@nattleboro.com	☐	☒	☒	☒	☐
Gil	Hilario	Town Planner	Town of North Attleborough	508-699-0116	ghilario@nattleboro.com	☒	☒	☐	☐	☒
Mark	Hollowell	Director of Public Works	Town of North Attleborough	508-695-9621	mhollowell@nattleboro.com	☒	☒	☒	☒	☒
Carl	Johnson	North Attleborough Electric - Operations Manager	Town of North Attleborough	508-643-6331	cjohnson@naelectric.com	☐	☒	☐	☒	☐
Brian	Kelley	Emergency Medical Services Coordinator - Fire Department	Town of North Attleborough	774-847-4411	bkelley@nattleboro.com	☐	☒	☐	☐	☐
Sandra	McCrary	Conservation Administrator- Conservation Commission	Town of North Attleborough	508-699-0100 x2584	smccrary@nattleboro.com	☐	☐	☒	☒	☒
Rick	McQuade	Police Chief	Town of North Attleborough	508-695-1212	rmcquade@nattleboro.com	☐	☒	☐	☐	☐
Antonio	Morabito	Assistant Town Manager	Town of North Attleborough	508-699-0100 x 2555	amorabito@nattleboro.com	☐	☐	☒	☐	☒
Taylor	O'Neil	Communications and Information Officer	Town of North Attleborough	508-699-0100 x2556	tonell@nattleboro.com	☐	☒	☒	☒	☒
Peter	Schiffman	North Attleboro Electric - General Manager/Electric Power Engineer	Town of North Attleborough	508-643-6300	pschiffman@naelectric.com	☐	☐	☐	☒	☒
Karen	Testa	Council on Aging Director/Senior Center	Town of North Attleborough	508-699-0100 x2631	ktesta@nattleboro.com	☐	☒	☐	☐	☒

HMPC Meeting Agendas

KICK OFF MEETING AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, 09/16/2024

TIME: 10:00-11:00AM

ZOOM: <https://us02web.zoom.us/j/81585206754?pwd=Tj1mymPOnGC21zQgjSn2lhWQR1sxX.1>

Meeting ID: 815 8520 6754

Passcode: 325097

AGENDA ITEMS

- I. Project Introduction
- II. Timeline and Tasks
- III. Developing a Hazard Mitigation Planning Committee (HMPC)
- IV. Sharing GIS Data
- V. Updating Mitigation Actions
- VI. Scheduling a HMPC Meeting for October

ACTION ITEMS

- I. Develop the HMPC
- II. Sharing GIS Data & Relevant Resources
- III. Updating Mitigation Action Tracker with Action Status
- IV. Scheduling a HMPC Meeting for November

HMPC MEETING #1 AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, 10/21/2024

TIME: 9:00-10:30AM

ZOOM: <https://us02web.zoom.us/j/88456268809?pwd=IGNctYpFOUZz1t3OvXdkryj80K7U0y.1>

MEETING ID: 884 5626 8809

PASSCODE: 677636

AGENDA ITEMS

- I. **Introductions**
- II. **Project Introduction**
 - i. What's in a Hazard Mitigation Plan?
 - ii. Project Timeline
 - iii. HMPC Responsibilities
- III. **Public and Stakeholder Engagement**
- IV. **Capability Assessment**
- V. **Hazard Identification**
- VI. **Goals and Mitigation Actions**
- VII. **Next Steps**

ACTION ITEMS

- I. Capability Assessment Surveys
- II. Share GIS Data and Maps
- III. Mitigation Action Meeting with Jamie
- IV. Pictures

HMPC MEETING #2 AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, 01/06/2025

TIME: 10:00-11:30AM

ZOOM: <https://us02web.zoom.us/j/84094954554?pwd=kU0TejphM6dXebp4RHRSBe8DlfbM5Z.1>

MEETING ID: 840 9495 4554

PASSCODE: 794941

AGENDA ITEMS

- I. Project Update and Loose Ends**
- II. Public Meeting Outreach**
 - i. Outreach Efforts
 - ii. Website and Social Media
- III. Capability Assessment Update**
 - i. Key Plans Reviewed
 - ii. Survey Status
 - iii. Where are Strengths and Challenges Discussion
- IV. Risk Assessment**
 - i. Hazards and Critical Facilities Identified
 - ii. Hazus Impacts
 - iii. Problems Identified Including High Hazard Areas
 - iv. Mitigation Actions Discussion
- V. Mitigation Strategy**
 - i. Goal Statements
 - ii. Developing Mitigation Actions
- VI. Town Priorities and Changes in Development**

ACTION ITEMS

- | | |
|--|------------------------------|
| I. HMPC Meeting #3 | V. Mitigation Actions |
| II. Tie Up Loose Ends | |
| III. Pictures | |
| IV. Outreach for Public Meeting | |

HMPC MEETING #3 AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, 02/10/2025

TIME: 10:00-11:30AM

ZOOM: <https://us02web.zoom.us/j/86000206358?pwd=FLYH5MOzQcDdXja8zNKU1cJITbe8Sb.1>

Meeting ID: 860 0020 6358

Passcode: 427448

AGENDA ITEMS

- I. **Project Update**
- II. **Risk Assessment**
 - i. Risk Ranking
 - ii. Problem Statements
- III. **Capability Assessment Update**
 - i. Opportunities Identified
- IV. **Mitigation Strategy**
 - i. Discuss New Actions
- V. **Plan Implementation**

ACTION ITEMS

- I. HMPC #4 Date
- II. New Mitigation Actions

HMPC MEETING #4 AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, 03/31/2025

TIME: 10:00-11:30AM

ZOOM: <https://us02web.zoom.us/j/81496584857?pwd=HV8aUmweyb5b5i7nlqqietg4roagmm.1>

MEETING ID: 814 9658 4857

PASSCODE: 426349

AGENDA ITEMS

- I. Project Update and Loose Ends**
- II. Public Engagement**
 - i. Outreach for Public Meeting and Plan Review
- III. Final Hazard List Ranking**
- IV. Mitigation Actions**
 - i. List Review Including Prioritization
- V. Plan Review**
 - i. Essential Details for New Actions
 - ii. Action Prioritization
- VI. Timeline for Completion**

ACTION ITEMS

- I. Public Meeting Outreach**
- II. Plan Review**

HIGH HAZARD DAMS MEETING

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: 1/14/2025

TIME: 10:00 AM – 11:00 AM

ZOOM: <https://us02web.zoom.us/j/84072817138?pwd=KWgRBbBZhe51QKMcfjEwnU39daukl0.1>

Meeting ID: 840 7281 7138

Passcode: 900422

AGENDA ITEMS

1. Mitigation Planning Introduction

- a. Overview and background to mitigation planning.
- b. Addressing High Hazard Potential Dams in the HMP Update

2. Emergency Action Plans and other Resources

- a. Any additional resources to share?

3. Dam Risk Summaries

- a. Downstream risks

4. Mitigation Strategy

- a. Discuss Potential Mitigation Actions.

5. Next Steps

Public Outreach

Public Meeting 1/29/2025

Christopher Coleman
EMD/Director



*North Attleborough Emergency
Management*

**Joint Local Emergency Planning Committee and Hazard Mitigation Planning
Committee Hybrid Public Meeting**
Wednesday, January 29, 2025, at 10:00 a.m.
JoAnn Cathcart Conference Room, 43 South Washington Street
OR Join via Zoom Meeting
<https://us02web.zoom.us/j/86599539892?pwd=DUeZaU9xyXk5pbrrcNHaFKBoIdliHV.1>
Meeting ID: 865 9953 9892
Passcode: 886406

I. PLEDGE OF ALLEGIANCE

II. ROLL CALL

III. OLD BUSINESS

a. Emergency Management Equipment

b. EOC Upgrades

IV. NEW BUSINESS

a. Hazard Mitigation Plan Update

i. What is Hazard Mitigation? What is a Hazard Mitigation Plan?

ii. Identify Natural Hazards and High Hazard Areas

iii. Identify Critical Facilities

iv. Brainstorm Possible Mitigation Actions

b. Tier 2 Reporting

c. CEMP Plan Update

d. EMAP

V. ADJOURNMENT

TOWN OF NORTH ATTLEBOROUGH, MA



PUBLIC MEETING

SHARE YOUR IDEAS FOR REDUCING RISK TO NATURAL HAZARDS AND CLIMATE CHANGE

Do you wonder if North Attleborough can flood, experience a tornado, or have an earthquake? What can prevent those natural hazards and climate change from wreaking havoc in our community?

Join the meeting to learn about this important project and to share your ideas for making North Attleborough more resilient to natural hazards and climate change.



North Attleborough has formed a Hazard Mitigation Planning Committee to identify risks and projects to mitigate those risks. The Town is working with a consultant hired by the Massachusetts Emergency Management Agency to develop a Hazard Mitigation Plan Update that will be approved by the Federal Emergency Management Agency and adopted by the Town. This plan allows North Attleborough to apply for pre- and post-disaster mitigation funds.



01/29/2025

Time: 10:00am – 11:00am

via Zoom & In-Person

**JoAnn Cathcart Conference Room
43 South Washington St.**

[HTTPS://WWW.NATTLEBORO.COM/](https://www.nattleboro.com/) FOR MEETING DETAILS OR CONTACT CHIEF CHRISTOPHER COLEMAN, FIRE CHIEF & EMERGENCY MANAGEMENT DIRECTOR AT 508-699-0140 X5620 OR CCOLEMAN@NATTLEBORO.COM

Town of North Attleborough, MA Hazard Mitigation Plan Update

**Town of North Attleboro** · Follow
January 21 · 🌐

Community members are invited to share ideas for the Town of North Attleborough's Hazard Mitigation Plan during an upcoming joint hybrid meeting of the Local Emergency Planning Committee and the Hazard Mitigation Planning Committee.

Community members can attend this meeting in person at the JoAnn Cathcart Conference Room, located in the lower level of 43 South Washington St., or virtually. To access the virtual link, visit our calendar on [nattleboro.com](https://www.nattleboro.com).

TOWN OF NORTH ATTLEBOROUGH, MA

PUBLIC MEETING

**SHARE YOUR IDEAS FOR
REDUCING RISK TO
NATURAL HAZARDS AND
CLIMATE CHANGE**

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01/29/2025
Time: 10:00am – 11:00am
via Zoom & In-Person
JoAnn Cathcart Conference Room
43 South Washington St.



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[HTTPS://WWW.NATTLEBORO.COM/](https://www.nattleboro.com/) FOR MEETING DETAILS OR CONTACT CHIEF SHERRYL COLEMAN, FPM, CHIEF OF EMERGENCY MANAGEMENT DIRECTOR, 90 SOUTH WASHINGTON STREET, NORTH ATTLEBOROUGH, MA 01939

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TOWN OF NORTH ATTLEBOROUGH, MA



PUBLIC MEETING

SHARE YOUR IDEAS FOR REDUCING RISK TO NATURAL HAZARDS AND CLIMATE CHANGE

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01/29/2025

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via Zoom & In-Person

JoAnn Cathcart Conference Room

43 South Washington St.



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No comments yet.

[View insights](#)
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6 likes

January 21



Add a comment...



Town of North Attleborough, MA Hazard Mitigation Plan Update

 **Town of North Attleboro** · Follow
January 26 · 🌐

Don't forget to join us at this week's public meetings! To learn more about the dates, times, and locations of our public meetings, visit our calendar at nattleboro.com.

If you miss a meeting, you can now view them for free! Community members can now access and watch all public meetings on North TV's Government Channel.

*Schedule created as of noon on 1/24; subject to change. As a result, some meetings may be missing from this calendar posting. Residents are encouraged to c... [See more](#)



WEEKLY PUBLIC MEETINGS SCHEDULE
27-30 Jan. 2025

27 JAN MONDAY	28 JAN TUESDAY
4 p.m. - Board of Assessors Public Meeting	10 a.m. - Construction Manager Selection Subcommittee Meeting
7 p.m. - Cultural Council Public Meeting	11 a.m. - Northern Bristol County Public Health Alliance Public Meeting
7 p.m. - Town Council Public Meeting	12 p.m. - Construction Manager Selection Subcommittee Meeting - Interviews
	6 p.m. - Board of Health Public Meeting

29 JAN WEDNESDAY	30 JAN THURSDAY
10 a.m. - Construction Manager Selection Subcommittee Meeting - Interviews	ALL DAY - Retirement Board Public Meeting
10 a.m. - Joint Local Emergency Planning Committee and Hazard Mitigation Planning Committee Hybrid Public Meeting	10 a.m. - Construction Manager Selection Subcommittee Meeting
3 p.m. - Curriculum Policy Subcommittee Meeting	
6:30 p.m. - Finance Sub-Committee Public Meeting	

LEPC - Hazard Mitigation
Wed Jan 29, 2025

Sandra M'Crory	- Conservation
Anne Marie Fleming	Health Department
Brendan Domingos	Metelcor Tech USA
Jack Dunkley	Metelcor Tech USA
Bob Ferguson	14580 Washington St.
Michael Borg	Town of North Attleborough
ANTONIO MORABITO	TOWN OF N. ATTLEBORO
DOMINIC LUCE	ONEIDA DR. N. ATTLEBORO
Gil Hilario	City Planning
Chris Coloma	Fire Chief
Mark Hollenell	DPR
Chris McLaughlin	NAPD
Jamie Caplan	Consultant
Taylor O'Neil	NA PRU VENTURE
Peter Clendish (NAPD)	VENTURE
DR. VANNESS (STERN HOSP)	VENTURE

Public Meeting 4/14/2025

PUBLIC MEETING #2 AGENDA

TOWN OF NORTH ATTLEBOROUGH, MA HAZARD MITIGATION PLAN UPDATE

DATE: MONDAY, APRIL 14, 2025

TIME: 10:00-11:00AM

IN-PERSON: Local Emergency Planning Committee Meeting

ZOOM: <https://us02web.zoom.us/j/88520819497?pwd=iVBpkC0gAGJXKfbObb9dzrn0sLDTBe.1>

Meeting ID: 885 2081 9497

Passcode: 691484

AGENDA ITEMS

- I. **Introduction**
 - i. Disaster Preparedness, Mitigation, Response, Recovery
- II. **What is Hazard Mitigation?**
 - i. Benefits of Hazard Mitigation Plan
 - ii. How the Plan was Developed
- III. **Ways to Prepare Your Home and Family**
 - i. Learn and Plan
 - ii. Check and Build
 - iii. Practice and Help
- IV. **Risk Assessment Process**
 - i. Identified Hazards and Critical Facilities
- V. **Hazard Mitigation Strategy**
 - i. Mitigation Plan Goals
 - ii. Review of Actions
- VI. **Plan Review**
 - i. What to Expect and How to Review
- VII. **Timeline for Completion**



DISASTER PREPAREDNESS

**PUBLIC
MEETING**

**TOWN OF
NORTH ATTLEBOROUGH**

APRIL 14, 2025

10:00 – 11:00 AM

In Person:

LEPC Meeting

On Zoom:

<https://bit.ly/4iEIBbK>

Meeting ID: 885 2081 9497

Passcode: 691484

**Learn how to prepare for winter storms,
and other natural disasters.**

**Hear about the Town's plan to mitigate
natural hazard risks.**

For more information visit:
<https://www.nattleboro.com/>

Or Contact:
Chief Christopher Coleman, Fire Dept.
Chief & Emergency Management Director
Phone: 508-699-0140 x5620
Email: ccoleman@nattleboro.com



Do you know where to go if you lose power or how to shelter-in-place safely? Would you like a list of supplies to have on hand in a disaster?

Do you wonder if North Attleborough can flood, experience a tornado, or have an earthquake? What can prevent those natural hazards and climate change from wreaking havoc in our community?

North Attleborough has formed a Hazard Mitigation Planning Committee to identify risks and projects to mitigate those risks. The Town is working with a consultant hired by the Massachusetts Emergency Management Agency to develop a Hazard Mitigation Plan Update that will be approved by the Federal Emergency Management Agency and adopted by the Town. This plan allows North Attleborough to apply for pre- and post-disaster mitigation funds.

**Join the Meeting to learn about this plan
and to contribute your ideas for making
North Attleborough safer!**

Town of North Attleborough, MA Hazard Mitigation Plan Update

 **Town of North Attleboro** · Follow
April 13 · 🌐

Don't forget to join us at this week's public meetings! To learn more about the dates, times, and locations of our public meetings, visit our calendar at nattleboro.com.

If you miss a meeting, you can now view them for free! Community members can now access and watch all public meetings on North TV's Government Channel.

*Schedule created as of noon on 4/11; subject to change. As a result, some meetings may be missing from this calendar posting. Residents are encouraged to c... [See more](#)



WEEKLY PUBLIC MEETINGS SCHEDULE

14-17 April 2025

14 APR MONDAY	15 APR TUESDAY
10 a.m. - Joint Local Emergency Planning Committee and Hazard Mitigation Planning Committee Hybrid Public Meeting	10 a.m. - Traffic Study Advisory Group Public Meeting
4 p.m. - Board of Assessors Public Meeting	11 a.m. - Council on Aging Public Meeting
6 p.m. - Licensing Board Virtual Public Meeting	12:30 p.m. - Bristol County Public Health Emergency Preparedness Coalition Executive Committee Meeting
6 p.m. - Veterans' Advisory Board Public Meeting	1 p.m. - Southeastern Massachusetts Metropolitan Planning Organization (SMMPO) Virtual Public Meeting
	1:30 p.m. - Bristol County Public Health Emergency Preparedness Coalition Public Meeting

Town of North Attleborough, MA Hazard Mitigation Plan Update

DISASTER PREPAREDNESS

PUBLIC MEETING

TOWN OF NORTH ATTLEBOROUGH

APRIL 14, 2025

10:00 – 11:00 AM

In Person:
LEPC Meeting

On Zoom:
<https://bit.ly/4iEIBbK>
Meeting ID: 885 2081 9497
Passcode: 691484

Learn how to prepare for winter storms, and other natural disasters.

Hear about the Town's plan to mitigate natural hazard risks.

For more information visit:
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Or Contact:
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Chief & Emergency Management Director
Phone: 508-699-0140 x5620
Email: ccoleman@nattleboro.com



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Join the Meeting to learn about this plan and to contribute your ideas for making North Attleborough safer!

townnattleboro

townnattleboro We invite all community members to share their ideas and input for the Town's Hazard Mitigation Plan during an upcoming joint hybrid meeting of the Local Emergency Planning Committee and the Hazard Mitigation Planning Committee.

Monday, April 14
10:00 a.m.
JoAnn Cathcart Conference Room
43 South Washington St. (Lower Level)
Or join us virtually! (Check out our calendar on nattleboro.com for Zoom link)

This is your chance to help shape plans that protect our community from future hazards. Let's build a safer North Attleborough together!

6w

View insights

Boost post

2 likes
April 11

Add a comment...

Participants

- Chief Chris Coleman
- Tony Morabito: Assistant Town Manger
- Mark Hollowell: public Works Director
- Annemarie Fleming: Public Health Director
- Sandra McCrory: Conservation Director
- Gil Hilario: Planning Director
- Taylor Oneil: Communications Director
- Pete Schiffman: Remote from NAED
- Additional audience members

Appendix B. Mitigation Actions.

Priority Ranking Points

Table 84. Priority Ranking Points for Each Action.

Action #	Action Title	Hazards Addressed	High Hazard Dams	Approximate Cost	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
1	Maintain and improve the Fire Department's insurance rating.	3	3	3	0	3	3	2	2	19
2	Review and revise Town emergency communication systems and educate residents on available systems.	3	2	2	3	3	3	0	2	18
3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.	3	0	3	3	3	3	0	2	17
4	Review and improve dam operation and maintenance plans to address climate impacts.	2	3	0	2	3	3	2	2	17

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Title	Hazards Addressed	High Hazard Dams	Approximate Cost	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
5	Maintain and clean drainage pipes downtown to prevent flooding.	3	2	2	2	1	3	2	2	17
6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.	2	3	1	3	3	3	0	2	17
7	Conduct tabletop exercises for dam breach and flooding.	3	3	2	2	2	3	0	2	17
8	Add alternative access to properties along Greenwood Lake Dam.	3	3	1	0	3	3	2	2	17
9	Install hydrants on streets with dead end water mains.	2	0	3	3	3	3	0	2	16
10	Purchase equipment to perform drainage system maintenance and repairs.	3	2	2	0	1	3	2	2	15
11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.	2	0	3	0	3	3	2	2	15
12	Formally designate a local Floodplain Administrator.	3	3	2	0	1	2	2	2	15

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Title	Hazards Addressed	High Hazard Dams	Approximate Cost	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.	3	2	2	2	2	0	2	2	15
14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.	3	2	1	0	1	3	2	2	14
15	Create and post designated evacuation routes.	3	2	2	2	3	0	0	2	14
16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.	3	2	1	0	1	3	2	2	14
17	Prevent unauthorized access to Falls Pond Dam.	2	3	1	0	2	3	0	2	13
18	Construct a water storage tank on the western side of Town to	2	0	1	2	3	3	0	2	13

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Title	Hazards Addressed	High Hazard Dams	Approximate Cost	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
	provide adequate pressure for firefighting capabilities.									
19	Prevent unauthorized access to Whiting Pond Dam.	2	3	1	0	2	3	0	2	13
20	Develop a plan to transport seniors and vulnerable residents to shelters.	3	0	2	3	3	0	0	2	13
21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.	3	0	2	3	3	0	0	2	13
22	Create a flood awareness education and outreach campaign.	3	2	3	2	1	0	0	2	13
23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.	3	2	2	0	1	0	2	2	12
24	Dredge and widen the Ten Mile River to increase flood storage and capacity.	3	2	0	0	2	0	2	2	11
25	Adopt the Community Preservation Act (CPA).	3	0	3	0	1	0	2	2	11

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action #	Action Title	Hazards Addressed	High Hazard Dams	Approximate Cost	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
26	Add floodproofing to Town Hall which has experienced flooding.	3	0	1	0	2	3	0	2	11
27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.	2	0	3	2	2	0	0	2	11
28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.	3	0	3	0	0	3	0	2	11
29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.	1	0	3	0	2	3	0	2	11
30	Develop a local Wetlands Protection Bylaw.	3	0	2	0	1	0	2	2	10
31	Buy-out properties that have repetitive flood losses.	3	0	0	0	3	0	0	2	8

Types of Mitigation Actions

Table 85. Mitigation Actions Sorted by Action Category.

Mitigation Category	Action #	Action Title
Local Plans and Regulations	1	Maintain and improve the Fire Department's insurance rating.
	12	Formally designate a local Floodplain Administrator.
	13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.
	20	Develop a plan to transport seniors and vulnerable residents to shelters.
	21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
	23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.
	25	Adopt the Community Preservation Act (CPA).
	30	Develop a local Wetlands Protection Bylaw.
Structure and Infrastructure Projects	3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
	4	Review and improve dam operation and maintenance plans to address climate impacts.
	5	Maintain and clean drainage pipes downtown to prevent flooding.
	6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
	8	Add alternative access to properties along Greenwood Lake Dam.
	9	Install hydrants on streets with dead end water mains.
	10	Purchase equipment to perform drainage system maintenance and repairs.
	14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
	16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
	17	Prevent unauthorized access to Falls Pond Dam.
	18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
	19	Prevent unauthorized access to Whiting Pond Dam.
	26	Add floodproofing to Town Hall which has experienced flooding.
	28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
	29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.
	31	Buy-out properties that have repetitive flood losses.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Mitigation Category	Action #	Action Title
Natural Systems Protection	11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.
	24	Dredge and widen the Ten Mile River to increase flood storage and capacity.
Education and Awareness Programs	2	Review and revise Town emergency communication systems and educate residents on available systems.
	7	Conduct tabletop exercises for dam breach and flooding.
	15	Create and post designated evacuation routes.
	22	Create a flood awareness education and outreach campaign.
	27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.

Actions Sorted by Goal Statement

Table 86. Mitigation Actions Sorted by Goal Statement.

Goal	Action #	Action Title
Save Lives and Property	1	Maintain and improve the Fire Department's insurance rating.
	2	Review and revise Town emergency communication systems and educate residents on available systems.
	9	Install hydrants on streets with dead end water mains.
	12	Formally designate a local Floodplain Administrator.
	15	Create and post designated evacuation routes.
	18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
	31	Buy-out properties that have repetitive flood losses.
Local Plans and Regulations	13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.
	20	Develop a plan to transport seniors and vulnerable residents to shelters.
	21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
	23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.
	30	Develop a local Wetlands Protection Bylaw.
Buildings and Infrastructure Projects	3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
	5	Maintain and clean drainage pipes downtown to prevent flooding.
	10	Purchase equipment to perform drainage system maintenance and repairs.
	14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
	16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
	26	Add floodproofing to Town Hall which has experienced flooding.
	28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
	29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.
High Hazard Dams	4	Review and improve dam operation and maintenance plans to address climate impacts.
	6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
	7	Conduct tabletop exercises for dam breach and flooding.
	8	Add alternative access to properties along Greenwood Lake Dam.
	17	Prevent unauthorized access to Falls Pond Dam.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Goal	Action #	Action Title
	19	Prevent unauthorized access to Whiting Pond Dam.
Natural Resources	11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.
	24	Dredge and widen the Ten Mile River to increase flood storage and capacity.
	25	Adopt the Community Preservation Act (CPA).
Education	22	Create a flood awareness education and outreach campaign.
	27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Actions Sorted by Hazard

Table 87. Mitigation Actions Sorted by Hazards Addressed.

Specific Hazards Addressed	Action #	Action Title
Flood from Precipitation, Severe Winter Storms, Other Severe Weather, Flooding from Dam Failure or Overtopping, Hurricanes/Tropical Storms	16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
Flood from Precipitation, Severe Winter Storms, Other Severe Weather, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Average/Extreme Temperatures, Hurricanes/Tropical Storms	25	Adopt the Community Preservation Act (CPA).
Earthquakes	29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.
Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping, Tornadoes, Wildfires/Brushfires, Invasive Species, Earthquakes	1	Maintain and improve the Fire Department's insurance rating.
	2	Review and revise Town emergency communication systems and educate residents on available systems.
	13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.
	15	Create and post designated evacuation routes.
Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Droughts, Extreme Temperatures, Hurricanes/Tropical Storms, Tornadoes, Wildfires/Brushfires, Earthquakes	3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
Dam Failure or Overtopping	4	Review and improve dam operation and maintenance plans to address climate impacts.
Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Hurricanes/Tropical Storms, Flooding from Dam Failure or Overtopping	5	Maintain and clean drainage pipes downtown to prevent flooding.
	10	Purchase equipment to perform drainage system maintenance and repairs.
	14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Specific Hazards Addressed	Action #	Action Title
Flooding from Dam Failure or Overtopping, Wildfires/Brushfires	23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.
	24	Dredge and widen the Ten Mile River to increase flood storage and capacity.
	6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
	8	Add alternative access to properties along Greenwood Lake Dam.
	19	Prevent unauthorized access to Whiting Pond Dam.
Flooding and response	7	Conduct tabletop exercises for dam breach and flooding.
Wildfires/Brushfires	9	Install hydrants on streets with dead end water mains.
	18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
Invasive Species	11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.
Flooding from Precipitation, Flooding from Dam Failure or Overtopping	12	Formally designate a local Floodplain Administrator.
Severe Winter Storms, Other Severe Weather, Extreme Temperatures, Hurricanes/Tropical Storms, Tornadoes, Wildfires/Brushfires	20	Develop a plan to transport seniors and vulnerable residents to shelters.
Drought, Extreme Temperatures	21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
Flooding from Precipitation and Dam Failure	22	Create a flood awareness education and outreach campaign.
Flooding from Precipitation	26	Add floodproofing to Town Hall which has experienced flooding.
	31	Buy-out properties that have repetitive flood losses.
Severe Winter Storms, Extreme Temperatures	27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.
Severe Winter Storms	28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Specific Hazards Addressed	Action #	Action Title
Flooding from Precipitation, Severe Winter Storms, Other Severe Weather, Invasive Species	30	Develop a local Wetlands Protection Bylaw.
Flooding from Dam Failure or intentional opening	17	Prevent unauthorized access to Falls Pond Dam.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Actions Sorted by Lead Position

Table 88. Mitigation Actions Sorted by Lead Position.

Action Lead	Action #	Action Title
Town Planner	25	Adopt the Community Preservation Act (CPA).
Building Inspector	29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.
Fire Chief / Emergency Management Director	1	Maintain and improve the Fire Department's insurance rating.
	2	Review and revise Town emergency communication systems and educate residents on available systems.
	7	Conduct tabletop exercises for dam breach and flooding.
	15	Create and post designated evacuation routes.
	27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.
Facilities Director	3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
Conservation Administrator	4	Review and improve dam operation and maintenance plans to address climate impacts.
	11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.
	21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
	22	Create a flood awareness education and outreach campaign.
	30	Develop a local Wetlands Protection Bylaw.
Director Department of Public Works	5	Maintain and clean drainage pipes downtown to prevent flooding.
	6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
	8	Add alternative access to properties along Greenwood Lake Dam.
	9	Install hydrants on streets with dead end water mains.
	10	Purchase equipment to perform drainage system maintenance and repairs.
	14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
	16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
	17	Prevent unauthorized access to Falls Pond Dam.
	18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
	19	Prevent unauthorized access to Whiting Pond Dam.
	23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Action Lead	Action #	Action Title
	24	Dredge and widen the Ten Mile River to increase flood storage and capacity.
	28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
Town Manager	12	Formally designate a local Floodplain Administrator.
	13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.
	26	Add floodproofing to Town Hall which has experienced flooding.
	31	Buy-out properties that have repetitive flood losses.
Executive Director, Senior Center	20	Develop a plan to transport seniors and vulnerable residents to shelters.

Town of North Attleborough, MA Hazard Mitigation Plan Update

Actions Sorted by Implementation Schedule

Table 89. Mitigation Actions Sorted by Implementation Schedule.

Implementation Schedule	Action #	Action Title
2025-2026	5	Maintain and clean drainage pipes downtown to prevent flooding.
2025-2027	3	Review all Town Buildings to determine if they need backup power and determine if portable or standby power is required.
	12	Formally designate a local Floodplain Administrator.
	14	Conduct an engineering study and inspection on culverts in Town to determine which need repair or replacement.
	20	Develop a plan to transport seniors and vulnerable residents to shelters.
	30	Develop a local Wetlands Protection Bylaw.
2025-2028	4	Review and improve dam operation and maintenance plans to address climate impacts.
	9	Install hydrants on streets with dead end water mains.
	10	Purchase equipment to perform drainage system maintenance and repairs.
	16	Redo storm drains on Oneida Drive that frequently become blocked and create flooding.
2025-2030	1	Maintain and improve the Fire Department's insurance rating.
	7	Conduct tabletop exercises for dam breach and flooding.
	21	Develop a Water Use Ordinance to control usage during times of drought and extreme heat.
	24	Dredge and widen the Ten Mile River to increase flood storage and capacity.
2026-2027	15	Create and post designated evacuation routes.
	25	Adopt the Community Preservation Act (CPA).
2026-2028	2	Review and revise Town emergency communication systems and educate residents on available systems.
	6	Mitigate risk to Riverview Mobile Home Park which is in a dam inundation zone.
	8	Add alternative access to properties along Greenwood Lake Dam.
	17	Prevent unauthorized access to Falls Pond Dam.
	18	Construct a water storage tank on the western side of Town to provide adequate pressure for firefighting capabilities.
	19	Prevent unauthorized access to Whiting Pond Dam.
	23	Develop stormwater management regulations for private entities as a way to mitigate flood risk.
2026-2030	11	Develop an education campaign to educate residents on the value of the aquifer and how to protect it.
	13	Collaborate with Southeastern Regional Planning & Economic Development District (SRPEDD) and neighboring communities to pursue grant funding for regional risk reduction projects.

Town of North Attleborough, MA Hazard Mitigation Plan Update

	22	Create a flood awareness education and outreach campaign.
	27	Develop a public education campaign to encourage building maintenance to prevent freezing pipes and ice dams.
	28	Install snow fences such as rows of trees or other vegetation to prevent drifting and blowing snow from impacting critical roadways.
	31	Buy-out properties that have repetitive flood losses.
2027-2029	26	Add floodproofing to Town Hall which has experienced flooding.
2028-2030	29	Inventory unreinforced masonry and brick buildings in Town which may be vulnerable to earthquakes.

Appendix C. Plan Implementation and Review Supporting Materials.

Plan Update Evaluation Worksheet

Table 90. Plan Update Evaluation Worksheet.

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

Mitigation Action Progress Worksheet

Table 91. Mitigation Action Progress Worksheet.

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

Appendix D. Hazus Reports



Hazus: Flood Global Risk Report

Region Name: NorthAttleFlood

Flood Scenario: 100year

Print Date: Friday, September 6, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.



FEMA

RiskMAP
Increasing Resilience Together

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	
General Building Stock	4
Essential Facility Inventory	5
Flood Scenario Parameters	6
Building Damage	
General Building Stock	7
Essential Facilities Damage	9
Induced Flood Damage	10
Debris Generation	
Social Impact	10
Shelter Requirements	
Economic Loss	12
Building-Related Losses	
Appendix A: County Listing for the Region	15
Appendix B: Regional Population and Building Value Data	16



General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Massachusetts

Note:

Appendix A contains a complete listing of the counties contained in the region .

The geographical size of the region is approximately 6 square miles and contains 355 census blocks. The region contains over 12 thousand households and has a total population of 30,819 people. The distribution of population by State and County for the study region is provided in Appendix B .

There are an estimated 7,806 buildings in the region with a total building replacement value (excluding contents) of 4,870 million dollars. Approximately 85.06% of the buildings (and 61.03% of the building value) are associated with residential housing.

Building Inventory

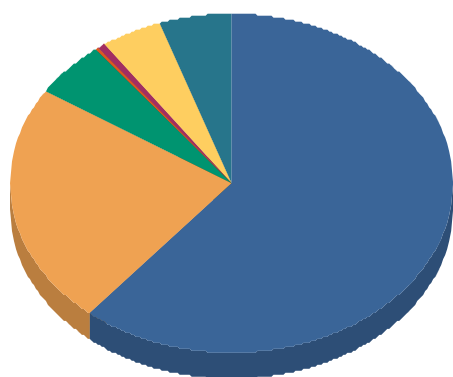
General Building Stock

Hazus estimates that there are 7,806 buildings in the region which have an aggregate total replacement value of 4,870 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure (\$1000)	Percent of Total
Residential	2,972,333	61.0%
Commercial	1,124,106	23.1%
Industrial	261,438	5.4%
Agricultural	8,932	0.2%
Religion	32,292	0.7%
Government	209,082	4.3%
Education	261,732	5.4%
Total	4,869,915	100%

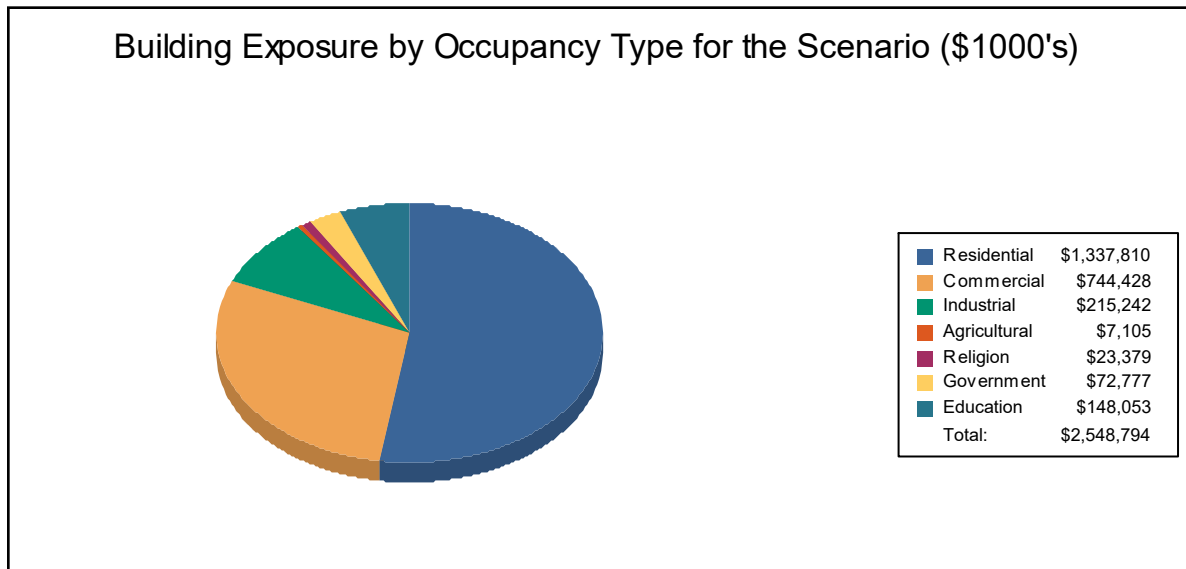
Building Exposure by Occupancy Type for the Study Region
(\$1000's)



■ Residential	\$2,972,333
■ Commercial	\$1,124,106
■ Industrial	\$261,438
■ Agricultural	\$8,932
■ Religion	\$32,292
■ Government	\$209,082
■ Education	\$261,732
Total:	\$4,869,915

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	1,337,810	52.5%
Commercial	744,428	29.2%
Industrial	215,242	8.4%
Agricultural	7,105	0.3%
Religion	23,379	0.9%
Government	72,777	2.9%
Education	148,053	5.8%
Total	2,548,794	100%



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 8 schools, 3 fire stations, 1 police station and 2 emergency operation centers.

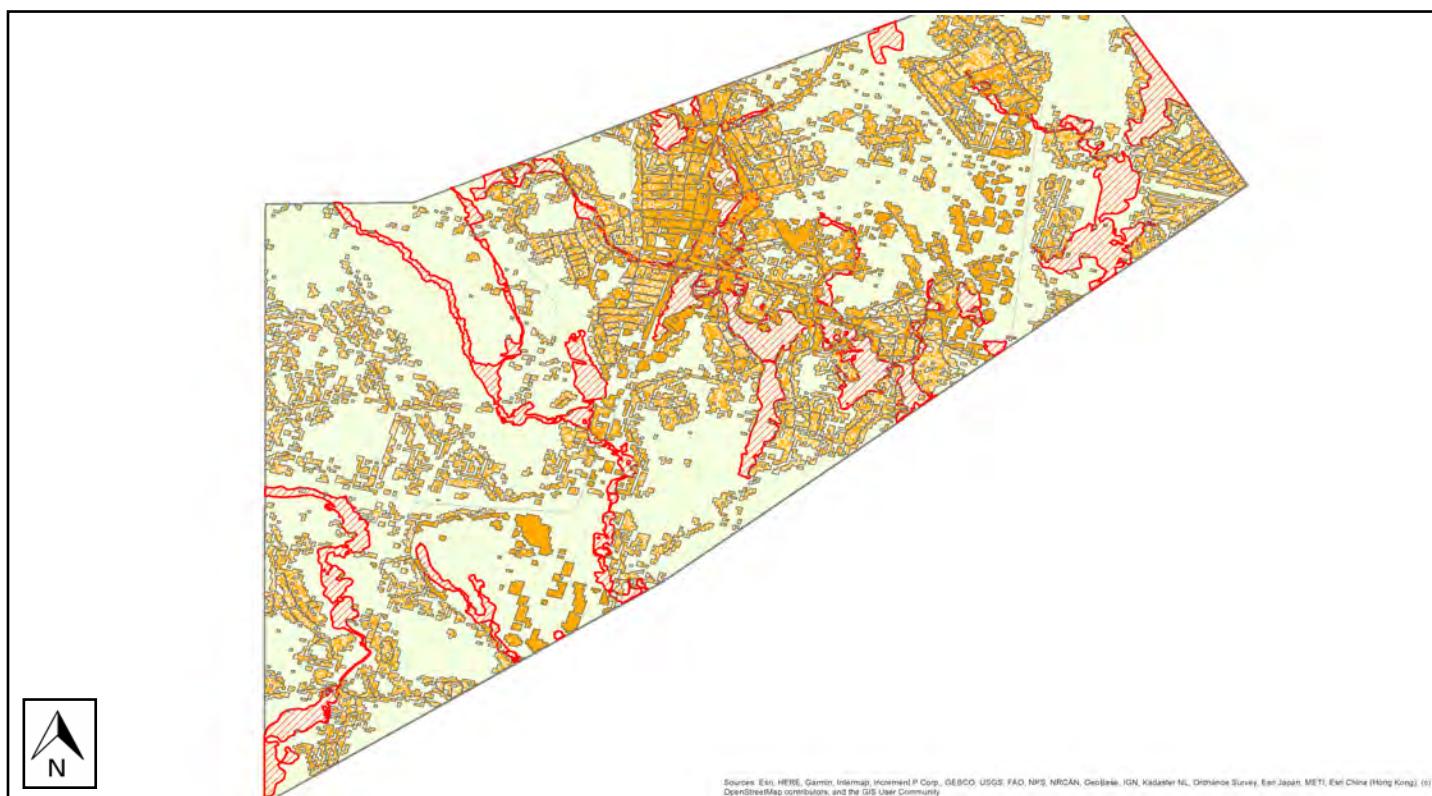
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	NorthAttleFlood
Scenario Name:	100year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



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Building Damage

General Building Stock Damage

Hazus estimates that about 30 buildings will be at least moderately damaged. This is over 77% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = \$300K) Overview Map

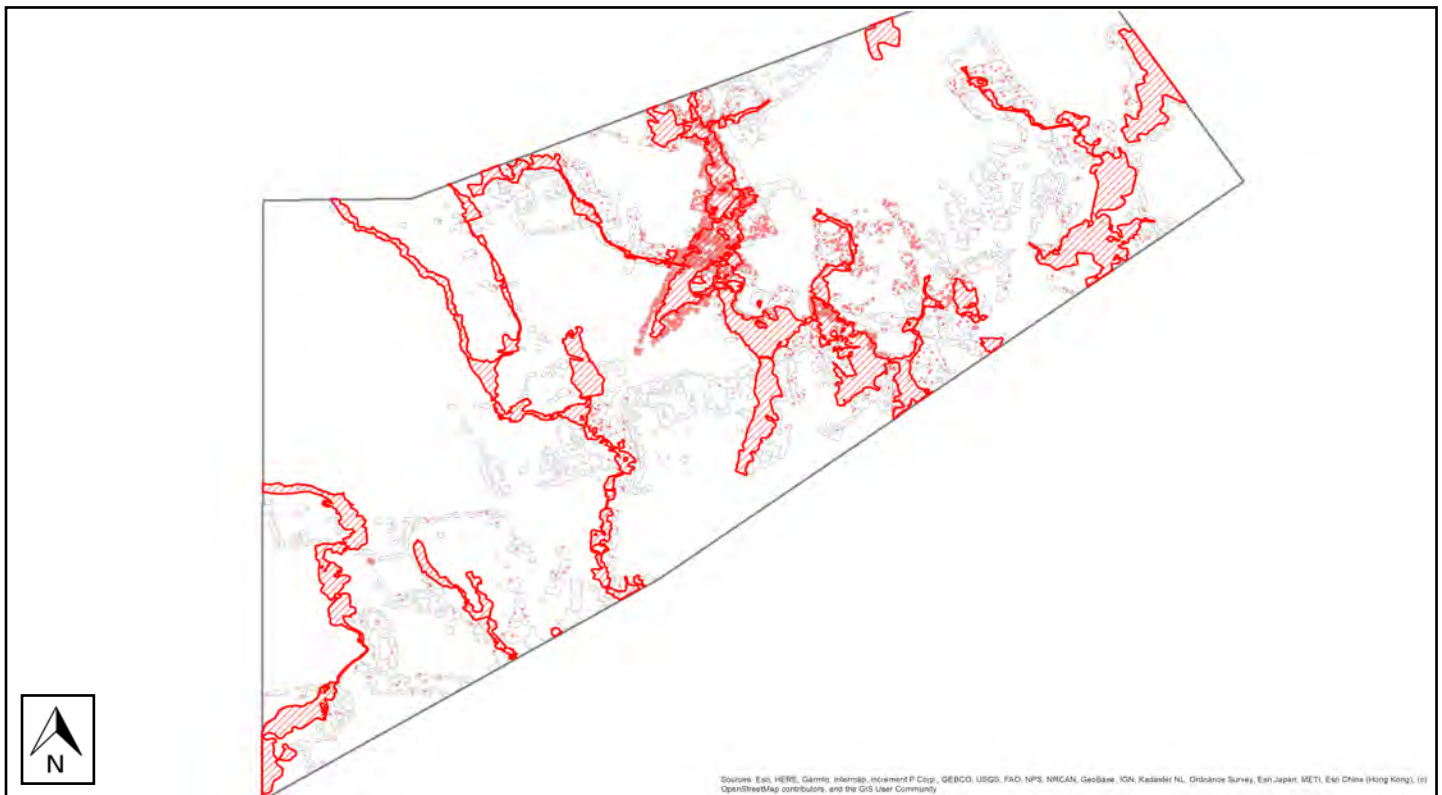


Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	9	75	3	25	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	100	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	62	70	24	27	3	3	0	0	0	0	0	0
Total	72		27		3		0		0		0	

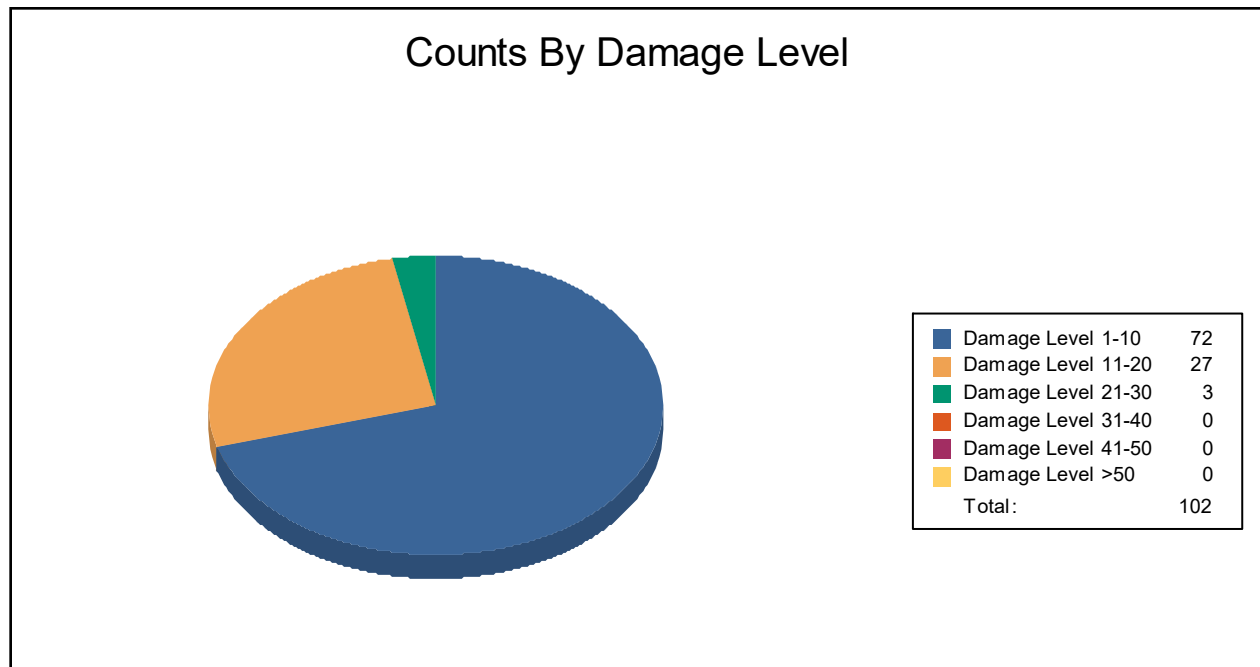


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	3	75	1	25	0	0	0	0	0	0	0	0
Steel	3	75	1	25	0	0	0	0	0	0	0	0
Wood	67	70	26	27	3	3	0	0	0	0	0	0



Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	2	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	8	0	0	0

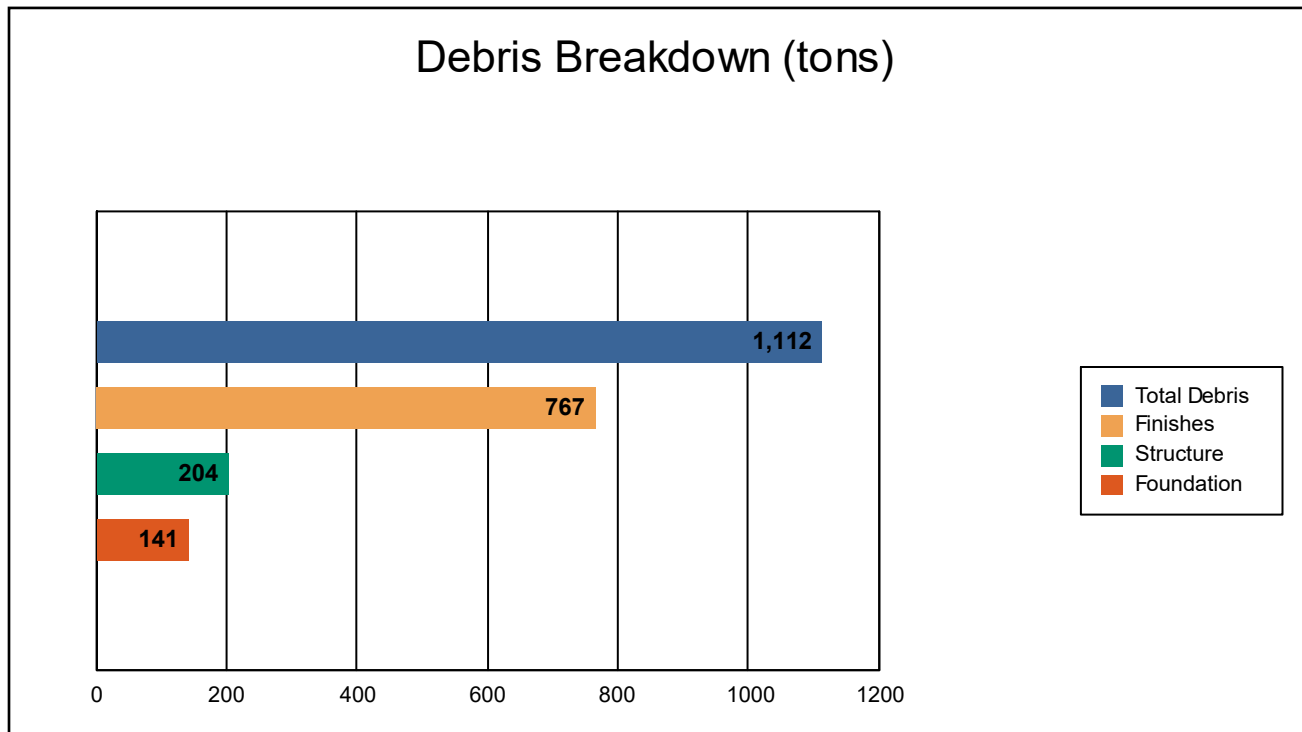
If this report displays all zeros or is blank, two possibilities can explain this.

- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

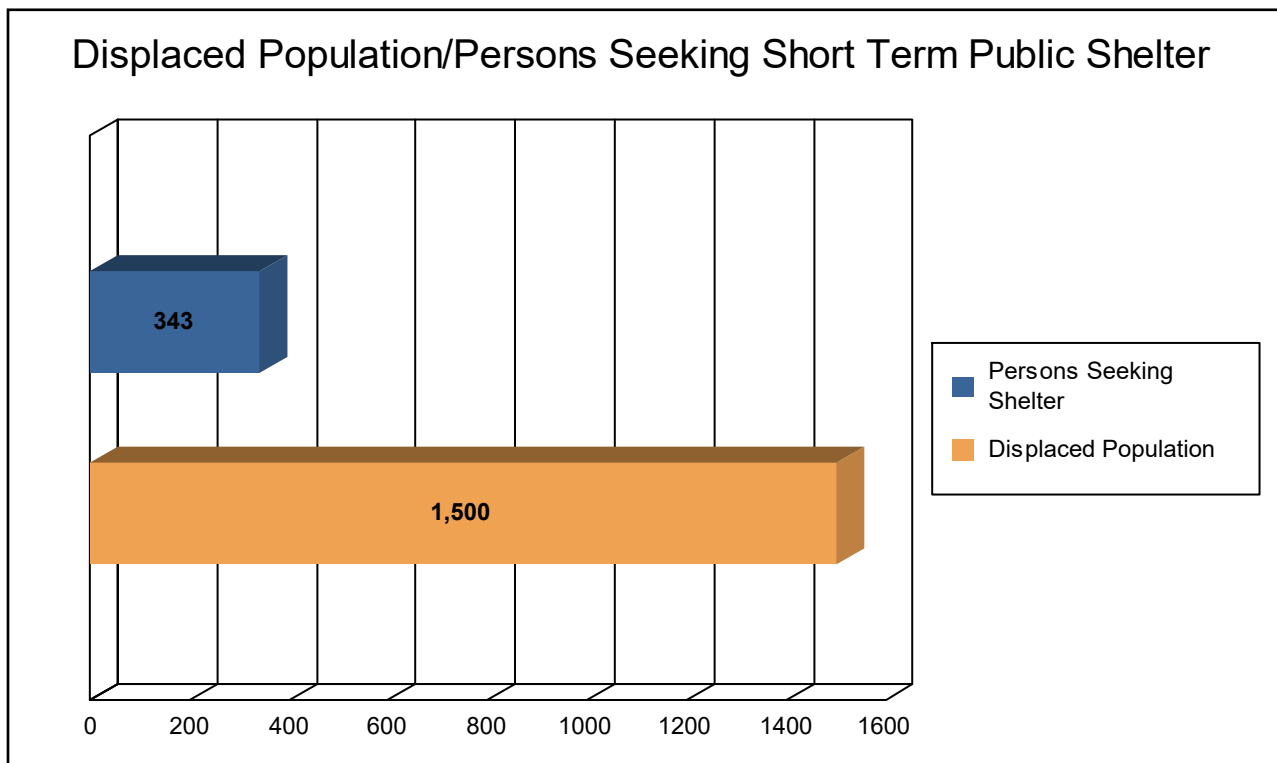


The model estimates that a total of 1,112 tons of debris will be generated. Of the total amount, Finishes comprises 69% of the total, Structure comprises 18% of the total, and Foundation comprises 13%. If the debris tonnage is converted into an estimated number of truckloads, it will require 45 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 500 households (or 1,500 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 343 people (out of a total population of 30,819) will seek temporary shelter in public shelters.





Economic Loss

The total economic loss estimated for the flood is 140.00 million dollars, which represents 5.49 % of the total replacement value of the scenario buildings.

Building-Related Losses

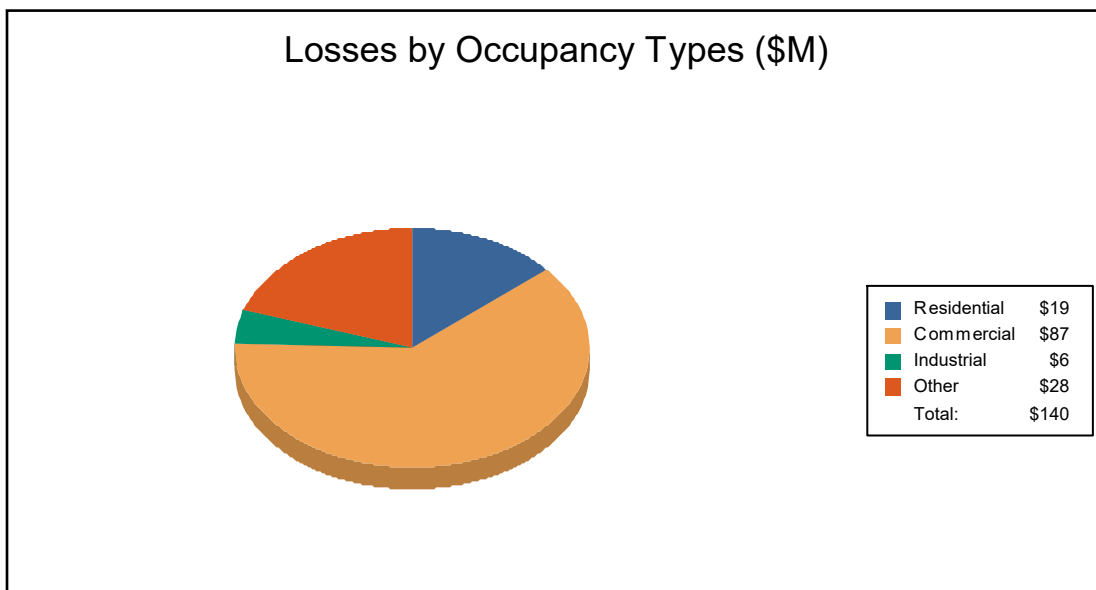
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 46.99 million dollars. 66% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 13.54% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.



Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	7.42	5.19	1.60	0.55	14.76
	Content	4.13	18.08	3.56	3.29	29.06
	Inventory	0.00	2.63	0.52	0.03	3.18
	Subtotal	11.55	25.90	5.68	3.87	46.99
Business Interruption						
	Income	0.10	20.81	0.20	2.13	23.23
	Relocation	4.02	6.41	0.21	1.26	11.90
	Rental Income	3.05	4.41	0.04	0.19	7.68
	Wage	0.24	29.12	0.25	20.57	50.19
	Subtotal	7.41	60.75	0.71	24.14	93.01
ALL	Total	18.96	86.65	6.38	28.01	140.00





Appendix A: County Listing for the Region

Massachusetts

- Bristol





Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Massachusetts				
Bristol	30,819	2,972,333	1,897,582	4,869,915
Total	30,819	2,972,333	1,897,582	4,869,915
Total Study Region	30,819	2,972,333	1,897,582	4,869,915



FEMA

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Increasing Resilience Together

Hazus: Hurricane Global Risk Report

Region Name: NorthAttleWind

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Tuesday, September 17, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Hurricane Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Hurricane Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Massachusetts

Note:

Appendix A contains a complete listing of the counties contained in the region .

The geographical size of the region is 18.15 square miles and contains 7 census tracts. There are over 12 thousand households in the region and a total population of 30,834 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,870 million dollars. Approximately 85% of the buildings (and 61% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 7,806 buildings in the region which have an aggregate total replacement value of Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides distribution of the building value by State and County.

Building Exposure by Occupancy Type

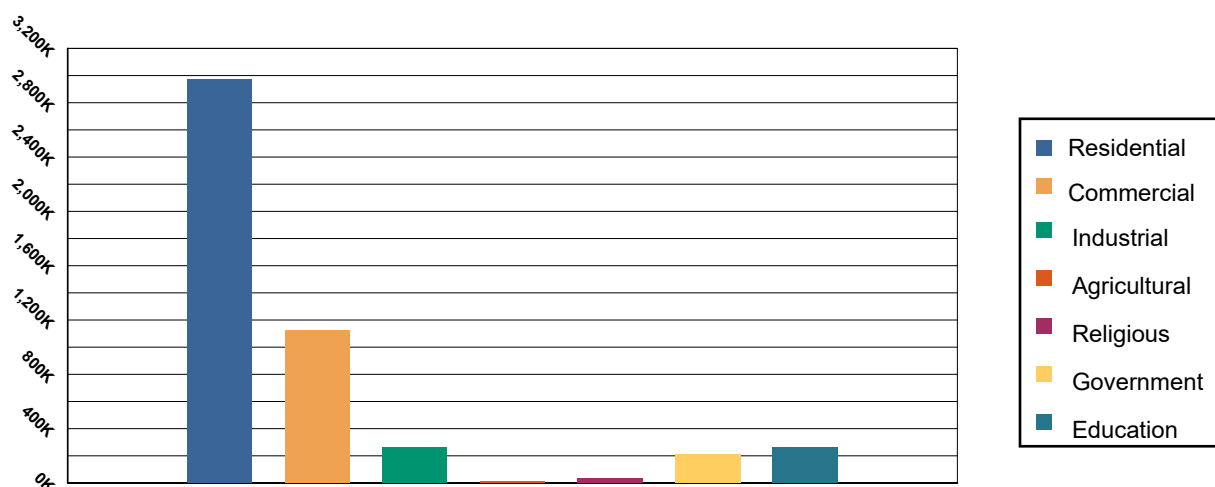


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Tot
Residential	2,972,586	61.03%
Commercial	1,124,273	23.08%
Industrial	261,471	5.37%
Agricultural	8,936	0.18%
Religious	32,306	0.66%
Government	209,107	4.29%
Education	261,738	5.37%
Total	4,870,417	100.00%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 8 schools, 3 fire stations, 1 police stations and 2 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name: Probabilistic

Type: Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 573 buildings will be at least moderately damaged. This is over 7% of the total number of buildings in the region. There are an estimated 60 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Expected Building Damage by Occupancy

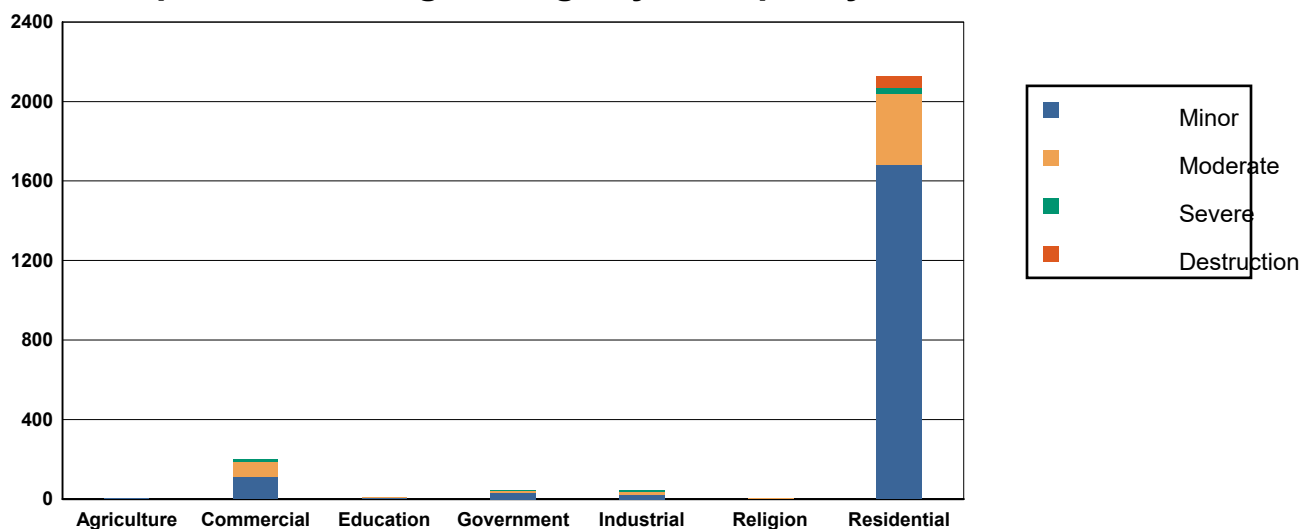


Table 2: Expected Building Damage by Occupancy : 500 - year Event

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	12	79.77	2	13.09	1	4.58	0	2.36	0	0.20
Commercial	570	74.01	114	14.77	72	9.38	14	1.83	0	0.02
Education	17	68.08	4	17.15	4	14.31	0	0.46	0	0.00
Government	137	75.57	30	16.56	13	7.37	1	0.49	0	0.00
Industrial	100	69.59	20	14.13	17	11.88	6	4.35	0	0.05
Religion	24	78.72	5	15.01	2	5.81	0	0.46	0	0.00
Residential	4,514	67.98	1,684	25.37	354	5.33	28	0.42	60	0.90
Total	5,374		1,859		463		50		60	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	39	74.30	9	17.91	4	7.06	0	0.73	0	0.00
Masonry	240	74.86	56	17.42	21	6.69	3	0.86	1	0.17
MH	59	85.10	5	7.63	3	5.05	0	0.28	1	1.95
Steel	227	58.16	64	16.29	83	21.29	17	4.24	0	0.01
Wood	4,988	71.58	1,597	22.92	304	4.37	28	0.40	51	0.73

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

Thematic Map of Essential Facilities

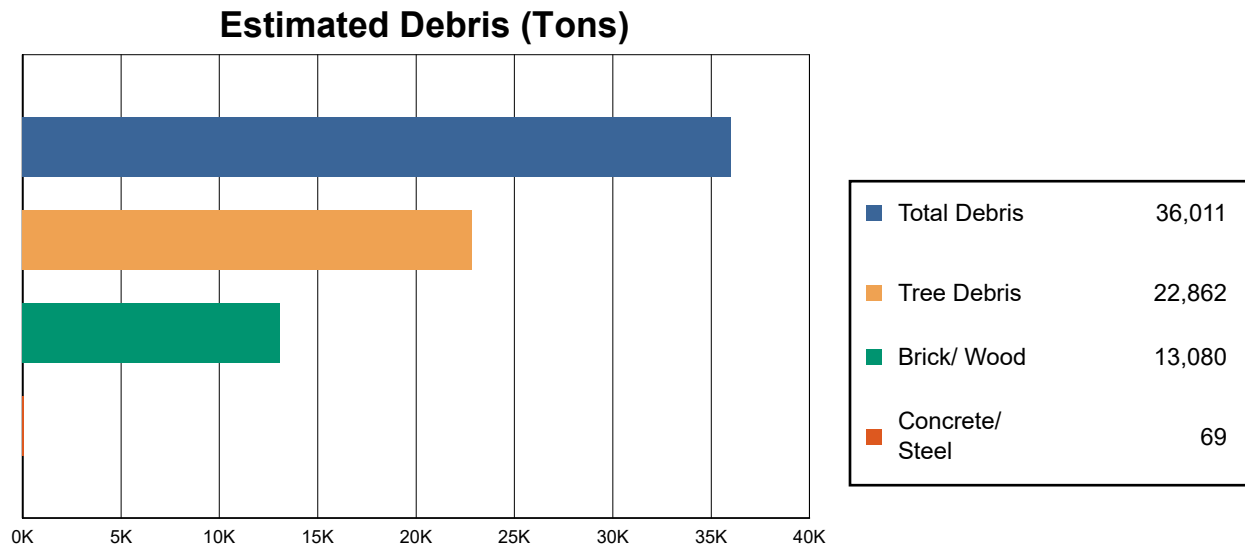


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	2	0	0	2
Fire Stations	3	0	0	3
Police Stations	1	0	0	1
Schools	8	0	0	0

Induced Hurricane Damage

Debris Generation

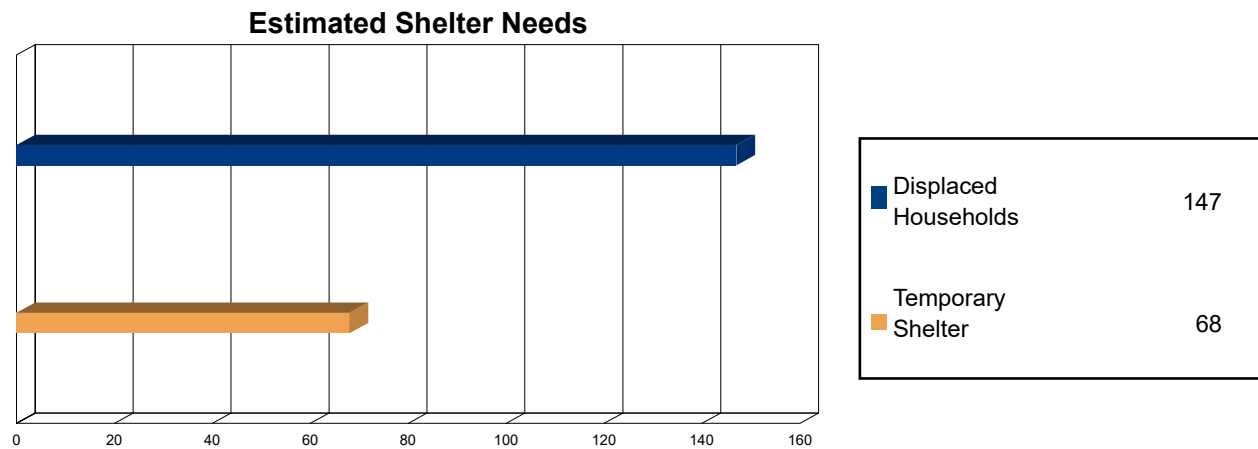


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 36,011 tons of debris will be generated. Of the total amount, 10,427 tons (29%) is Other Tree Debris. Of the remaining 25,584 tons, Brick/Wood comprises 51% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 526 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 12,435 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 147 households to be displaced due to the hurricane. Of these, 68 people (out of a total population of 30,834) will seek temporary shelter in public shelters.

Economic Loss

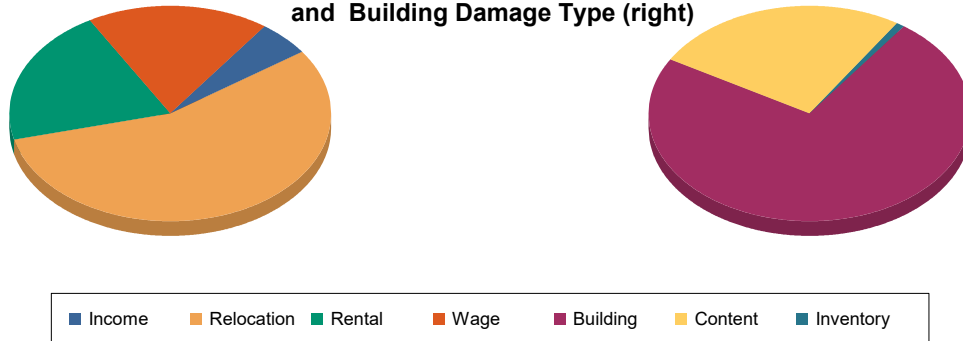
The total economic loss estimated for the hurricane is 202.1 million dollars, which represents 4.15 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 202 million dollars. 10% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 76% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left)
and Building Damage Type (right)



Loss Type by General Occupancy

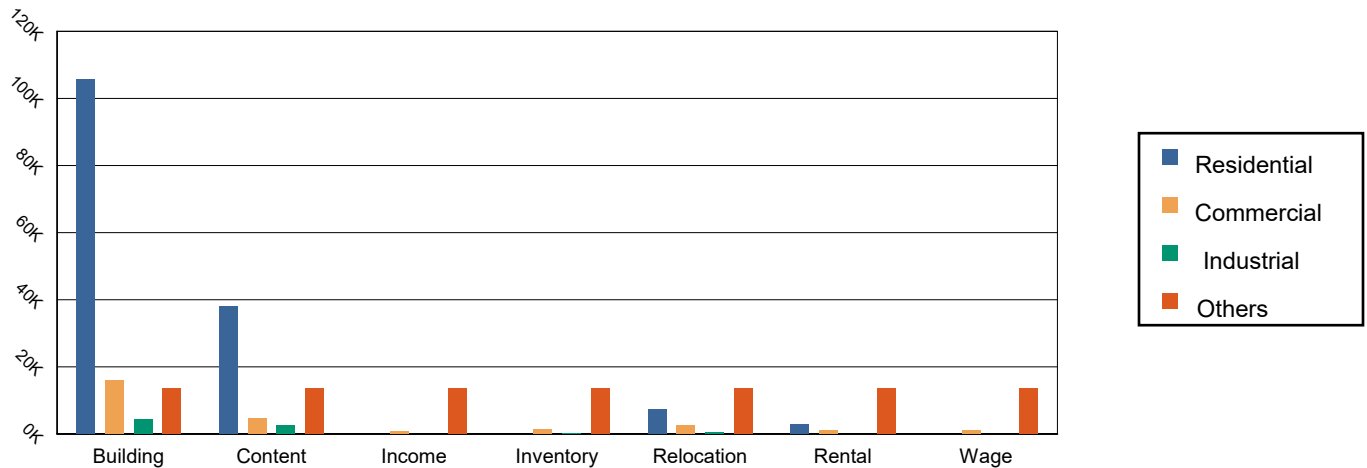


Table 5: Building-Related Economic Loss Estimates
(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	105,724.89	15,879.96	4,422.59	7,195.15	133,222.59
	Content	37,939.84	4,458.98	2,479.89	1,959.62	46,838.32
	Inventory	0.00	1,324.18	279.16	27.96	1,631.30
	Subtotal	143,664.73	21,663.12	7,181.64	9,182.72	181,692.21
Business Interruption Loss						
	Income	0.37	777.81	43.79	251.35	1,073.31
	Relocation	7,245.25	2,489.01	406.49	1,231.13	11,371.87
	Rental	2,813.46	1,183.73	44.79	148.56	4,190.53
	Wage	0.86	1,119.31	61.74	2,582.61	3,764.52
	Subtotal	10,059.93	5,569.85	556.80	4,213.65	20,400.23

Total

Total	153,724.66	27,232.97	7,738.44	13,396.37	202,092.44
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Appendix A: County Listing for the Region

Massachusetts
- Bristol

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Massachusetts				
Bristol	30,834	2,972,586	1,897,831	4,870,417
Total	30,834	2,972,586	1,897,831	4,870,417
Study Region Total	30,834	2,972,586	1,897,831	4,870,417



FEMA

RiskMAP
Increasing Resilience Together

Hazus: Hurricane Global Risk Report

Region Name: NorthAttleWind

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Tuesday, September 17, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique.

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Table of Contents

Section	Page #
General Description of the Region	3
Building Inventory	4
General Building Stock	
Essential Facility Inventory	
Hurricane Scenario Parameters	5
Building Damage	6
General Building Stock	
Essential Facilities Damage	
Induced Hurricane Damage	8
Debris Generation	
Social Impact	8
Shelter Requirements	
Economic Loss	9
Building Losses	
Appendix A: County Listing for the Region	10
Appendix B: Regional Population and Building Value Data	11

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The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Massachusetts

Note:

Appendix A contains a complete listing of the counties contained in the region .

The geographical size of the region is 18.15 square miles and contains 7 census tracts. There are over 12 thousand households in the region and a total population of 30,834 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,870 million dollars. Approximately 85% of the buildings (and 61% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 7,806 buildings in the region which have an aggregate total replacement value of Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides distribution of the building value by State and County.

Building Exposure by Occupancy Type

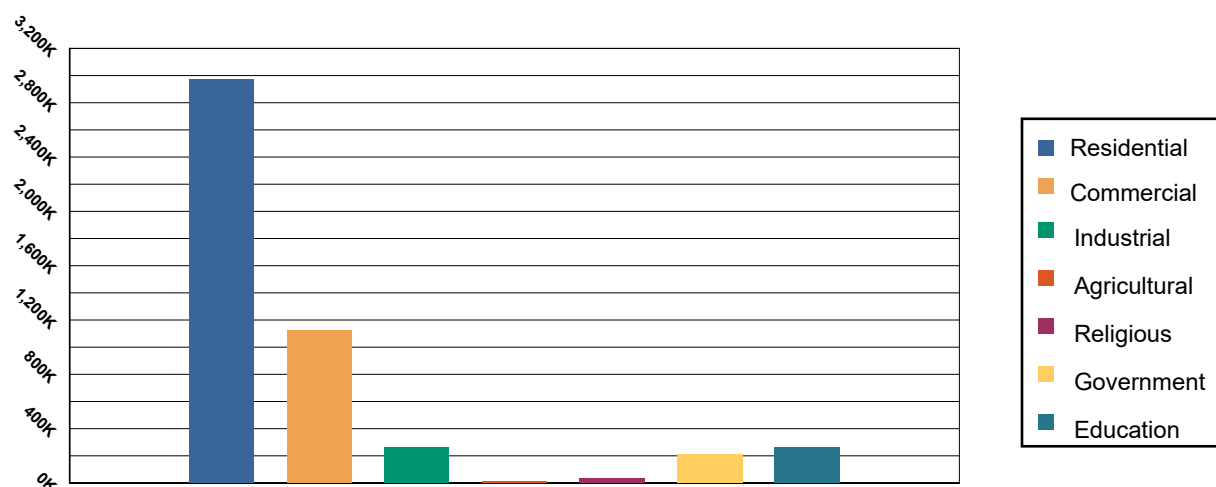


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Tot
Residential	2,972,586	61.03%
Commercial	1,124,273	23.08%
Industrial	261,471	5.37%
Agricultural	8,936	0.18%
Religious	32,306	0.66%
Government	209,107	4.29%
Education	261,738	5.37%
Total	4,870,417	100.00%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 8 schools, 3 fire stations, 1 police stations and 2 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name: Probabilistic

Type: Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 898 buildings will be at least moderately damaged. This is over 12% of the total number of buildings in the region. There are an estimated 133 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Expected Building Damage by Occupancy

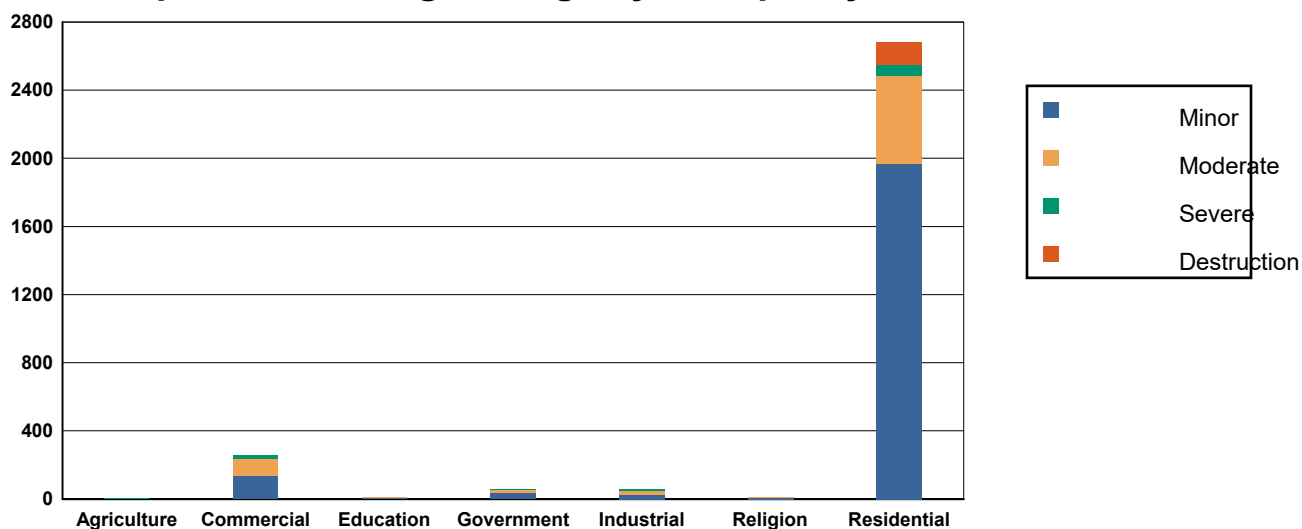


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	11	73.08	3	16.80	1	6.35	1	3.41	0	0.36
Commercial	512	66.45	138	17.90	98	12.74	22	2.87	0	0.05
Education	15	59.74	5	19.78	5	19.29	0	1.19	0	0.00
Government	121	66.89	37	20.24	21	11.55	2	1.31	0	0.00
Industrial	88	61.45	24	16.83	22	15.29	9	6.32	0	0.11
Religion	22	71.53	6	18.83	3	8.67	0	0.97	0	0.00
Residential	3,960	59.63	1,967	29.62	520	7.83	61	0.92	133	2.00
Total	4,729		2,179		669		95		133	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	34	64.61	11	21.51	6	11.90	1	1.98	0	0.00
Masonry	212	66.00	67	20.79	35	10.89	6	1.95	1	0.36
MH	53	77.48	7	10.07	6	8.21	0	0.59	3	3.64
Steel	191	49.07	69	17.80	104	26.79	25	6.30	0	0.04
Wood	4,444	63.77	1,898	27.24	457	6.56	57	0.82	113	1.62

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

Thematic Map of Essential Facilities

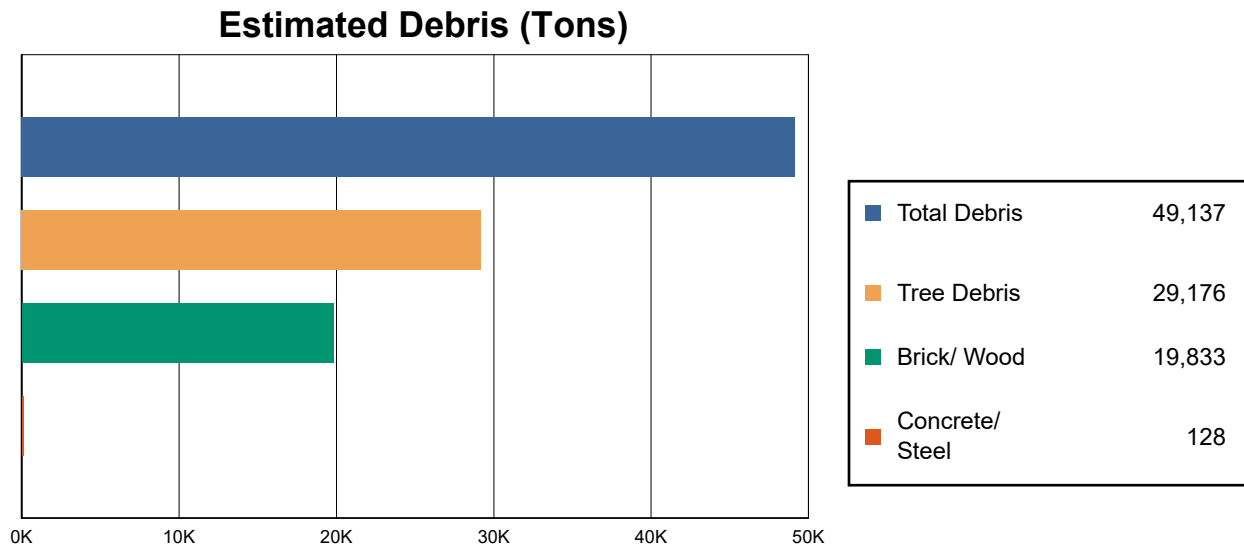


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	2	0	0	2
Fire Stations	3	0	0	3
Police Stations	1	0	0	1
Schools	8	0	0	0

Induced Hurricane Damage

Debris Generation

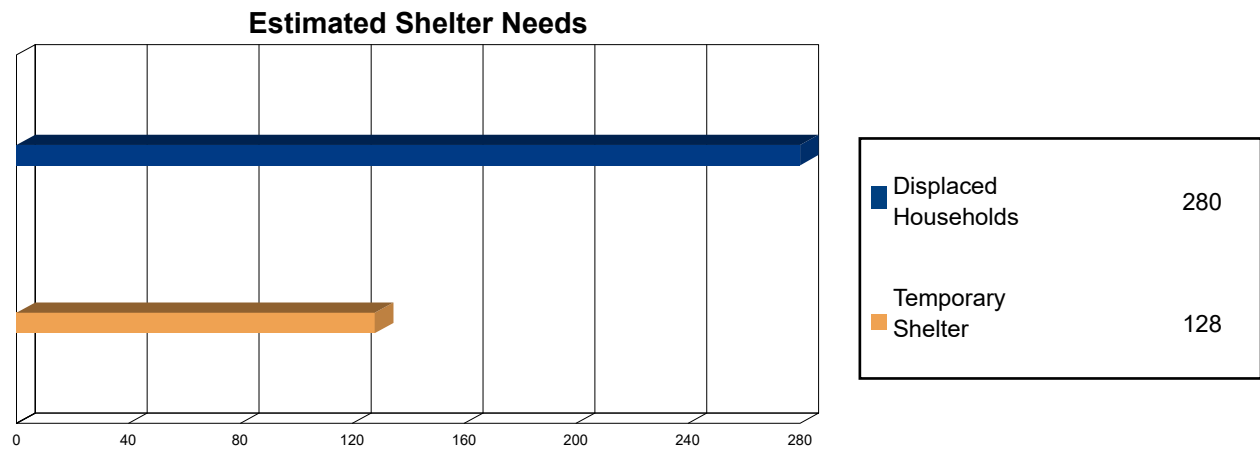


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 49,137 tons of debris will be generated. Of the total amount, 13,296 tons (27%) is Other Tree Debris. Of the remaining 35,841 tons, Brick/Wood comprises 55% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 798 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 15,880 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 280 households to be displaced due to the hurricane. Of these, 128 people (out of a total population of 30,834) will seek temporary shelter in public shelters.

Economic Loss

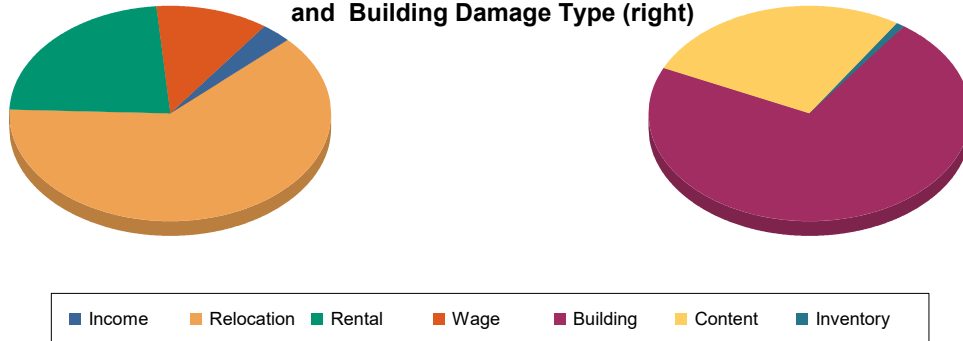
The total economic loss estimated for the hurricane is 320.5 million dollars, which represents 6.58 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 321 million dollars. 10% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 78% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left)
and Building Damage Type (right)



Loss Type by General Occupancy

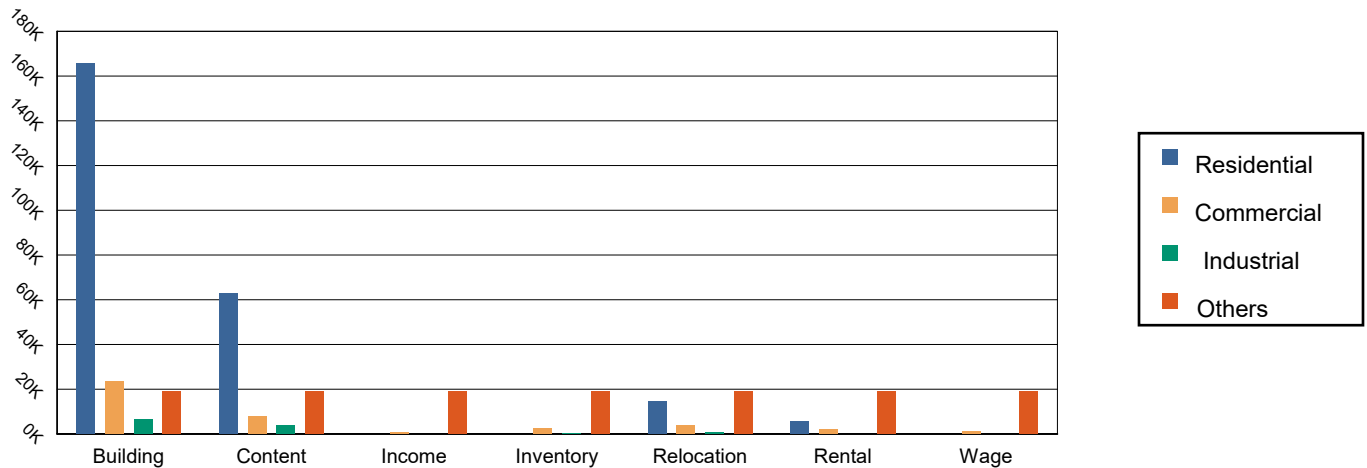


Table 5: Building-Related Economic Loss Estimates
(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	165,875.31	23,468.93	6,505.11	10,671.28	206,520.63
	Content	62,988.74	7,716.77	4,082.15	3,442.16	78,229.83
	Inventory	0.00	2,246.91	459.01	46.94	2,752.86
	Subtotal	228,864.05	33,432.61	11,046.27	14,160.38	287,503.32
Business Interruption Loss						
	Income	4.87	677.86	56.74	244.61	984.08
	Relocation	14,497.43	3,753.63	561.95	1,864.91	20,677.92
	Rental	5,428.56	1,885.90	65.84	250.05	7,630.35
	Wage	11.46	1,046.00	80.47	2,594.97	3,732.90
	Subtotal	19,942.32	7,363.39	765.01	4,954.53	33,025.25

Total

Total	248,806.38	40,796.00	11,811.27	19,114.92	320,528.57
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Appendix A: County Listing for the Region

Massachusetts
- Bristol

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		Total
		Residential	Non-Residential	
Massachusetts				
Bristol	30,834	2,972,586	1,897,831	4,870,417
Total	30,834	2,972,586	1,897,831	4,870,417
Study Region Total	30,834	2,972,586	1,897,831	4,870,417

Hazus: Earthquake Global Risk Report

Region Name: NorthAttEarthquake

Earthquake Scenario: 1500year

Print Date: September 18, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

Section	Page #
General Description of the Region	3
Building and Lifeline Inventory	4
Building Inventory	
Critical Facility Inventory	
Transportation and Utility Lifeline Inventory	
Earthquake Scenario Parameters	7
Direct Earthquake Damage	8
Buildings Damage	
Essential Facilities Damage	
Transportation and Utility Lifeline Damage	
Induced Earthquake Damage	14
Fire Following Earthquake	
Debris Generation	
Social Impact	15
Shelter Requirements	
Casualties	
Economic Loss	17
Building Related Losses	
Transportation and Utility Lifeline Losses	
Appendix A: County Listing for the Region	
Appendix B: Regional Population and Building Value Data	

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 19.38 square miles and contains 7 census tracts. There are over 12 thousand households in the region which has a total population of 30,834 people. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,870 (millions of dollars). Approximately 85.00 % of the buildings (and 61.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 6,669 and 364 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 7 thousand buildings in the region which have an aggregate total replacement value of 4,870 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 8 schools, 3 fire stations, 1 police stations and 2 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 7,033.00 (millions of dollars). This inventory includes over 50.95 miles of highways, 21 bridges, 295.77 miles of pipes.

Table 1: Transportation System Lifeline Inventory

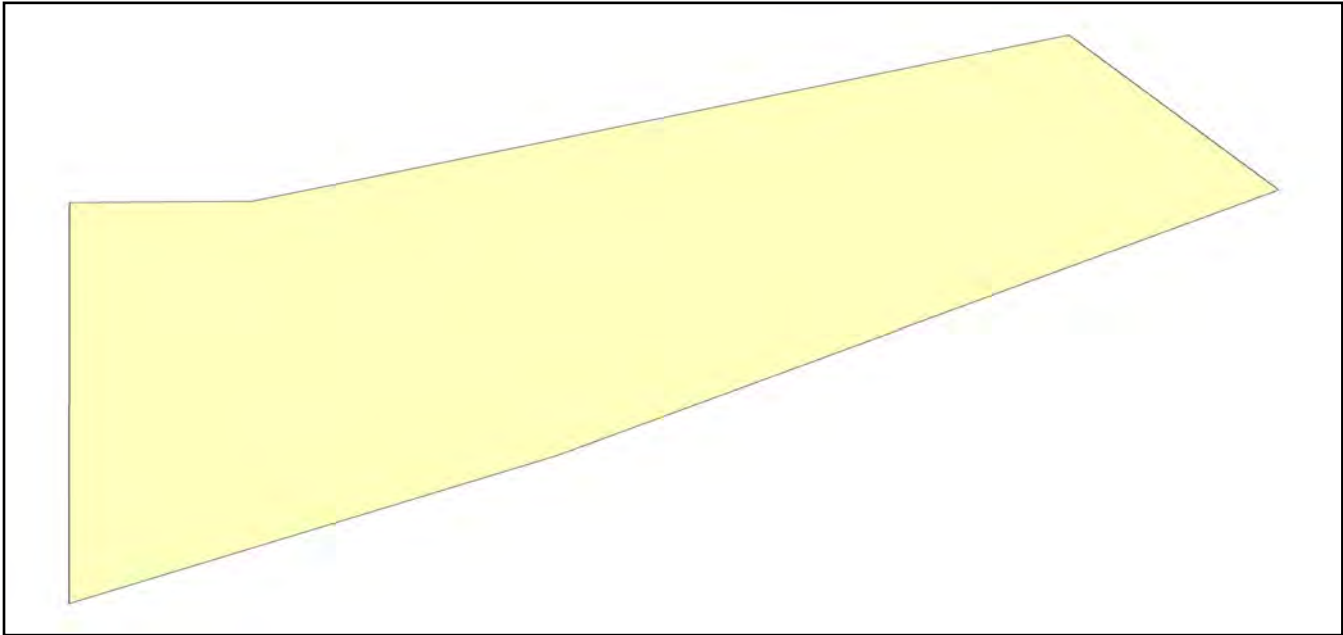
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	21	81.6586
	Segments	42	625.4705
	Tunnels	0	0.0000
	Subtotal		707.1291
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	9	5962.7588
	Tunnels	0	0.0000
	Subtotal		5962.7588
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
	Subtotal		0.0000
Bus	Facilities	0	0.0000
	Subtotal		0.0000
Ferry	Facilities	0	0.0000
	Subtotal		0.0000
Port	Facilities	0	0.0000
	Subtotal		0.0000
Airport	Facilities	0	0.0000
	Runways	0	0.0000
	Subtotal		0.0000
Total			6,669.90

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	5.5634
	Facilities	0	0.0000
	Pipelines	0	0.0000
	Subtotal		5.5634
Waste Water	Distribution Lines	NA	3.3380
	Facilities	1	156.8418
	Pipelines	0	0.0000
	Subtotal		160.1798
Natural Gas	Distribution Lines	NA	2.2253
	Facilities	0	0.0000
	Pipelines	4	196.6210
	Subtotal		198.8463
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
	Subtotal		0.0000
Electrical Power	Facilities	0	0.0000
	Subtotal		0.0000
Communication	Facilities	1	0.1160
	Subtotal		0.1160
		Total	364.70

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	1500year
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	1,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	6.50
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 49 buildings will be at least moderately damaged. This is over 1.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

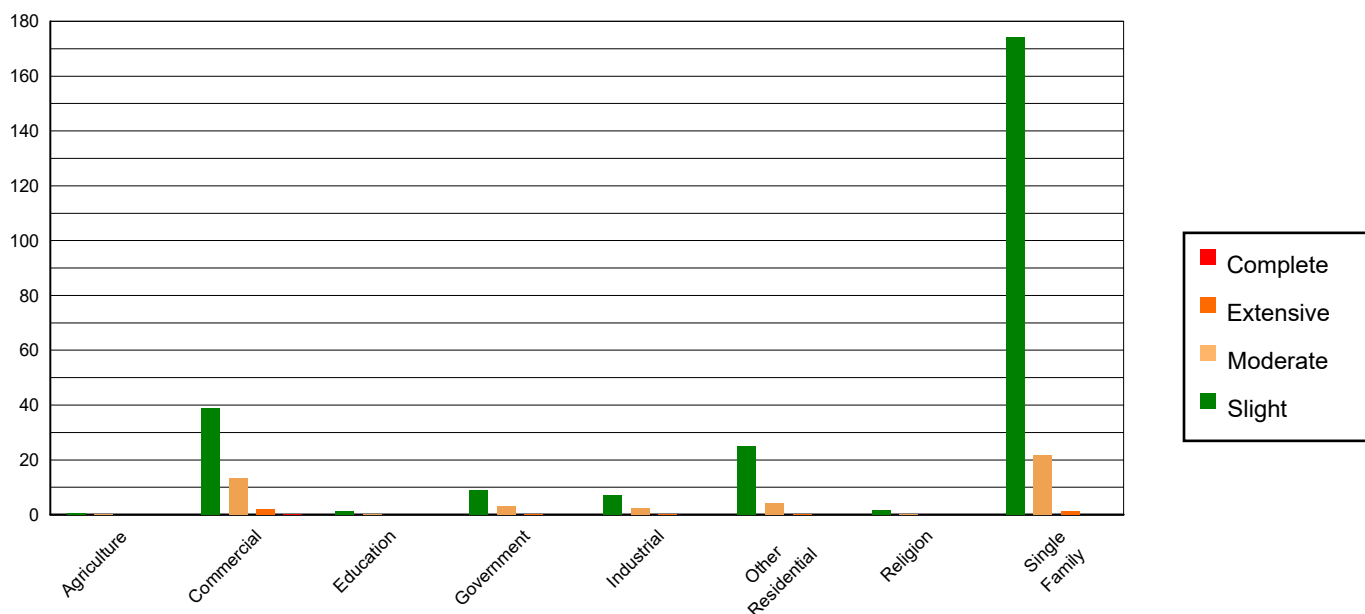


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	14.30	0.19	0.57	0.22	0.12	0.27	0.01	0.29	0.00	0.19
Commercial	715.71	9.54	39.00	15.12	13.14	29.02	2.00	46.93	0.15	56.32
Education	23.36	0.31	1.19	0.46	0.39	0.86	0.05	1.21	0.00	1.70
Government	168.37	2.25	9.12	3.54	3.09	6.81	0.39	9.24	0.02	9.19
Industrial	134.14	1.79	7.10	2.75	2.40	5.29	0.34	7.88	0.02	7.30
Other Residential	793.64	10.58	25.03	9.71	4.13	9.12	0.20	4.59	0.00	0.38
Religion	29.00	0.39	1.53	0.59	0.41	0.90	0.06	1.37	0.01	2.16
Single Family	5619.81	74.95	174.30	67.60	21.62	47.73	1.22	28.47	0.06	22.78
Total	7,498		258		45		4		0	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	6744.94	89.95	204.01	79.12	21.79	48.11	0.70	16.50	0.00	0.00
Steel	365.80	4.88	17.07	6.62	6.31	13.92	0.64	14.95	0.00	0.37
Concrete	31.95	0.43	1.45	0.56	0.48	1.06	0.02	0.53	0.00	0.04
Precast	17.20	0.23	1.24	0.48	0.90	1.99	0.20	4.58	0.00	0.47
RM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
URM	277.18	3.70	29.46	11.42	13.83	30.54	2.58	60.41	0.26	99.12
MH	61.27	0.82	4.62	1.79	1.98	4.38	0.13	3.03	0.00	0.00
Total	7,498		258		45		4		0	

*Note:

RM Reinforced Masonry
 URM Unreinforced Masonry
 MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	8	0	0	8
EOCs	2	0	0	2
PoliceStations	1	0	0	1
FireStations	3	0	0	3

Transportation Lifeline Damage

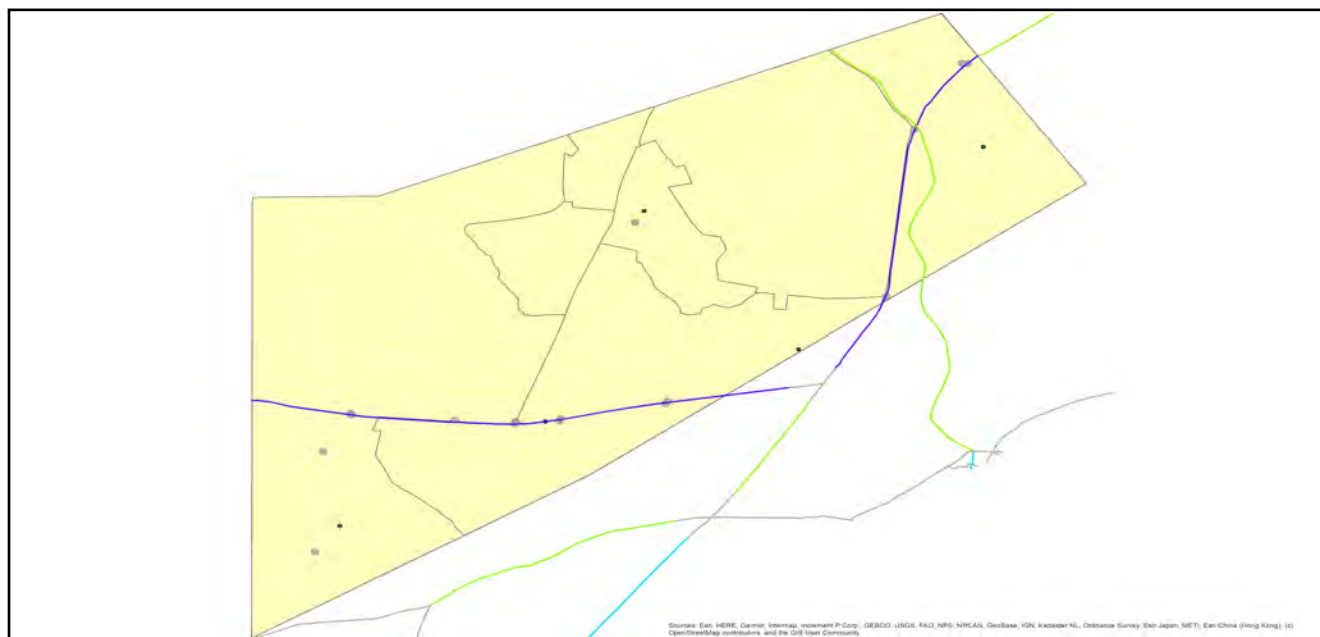


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	42	0	0	40	40
	Bridges	21	0	0	21	21
	Tunnels	0	0	0	0	0
Railways	Segments	9	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	1	0	0	1	1

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	173	1	0
Waste Water	104	0	0
Natural Gas	19	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	12,064	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

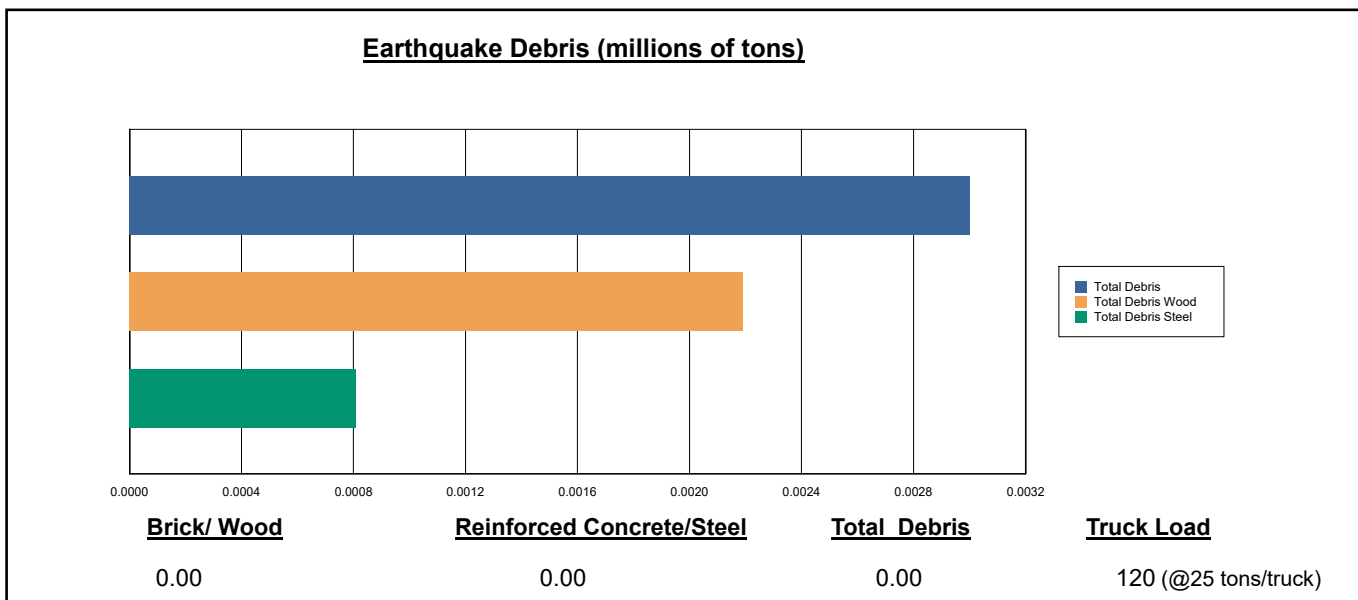
Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 73.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 120 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.



Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 30,834) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households
as a result of the
earthquake

0

Persons seeking
temporary public shelter

0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.04	0.01	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.03	0.00	0.00	0.00
	Other-Residential	0.25	0.02	0.00	0.00
	Single Family	0.59	0.04	0.00	0.00
	Total	1	0	0	0
2 PM	Commercial	2.32	0.30	0.02	0.05
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.43	0.06	0.00	0.01
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.19	0.02	0.00	0.00
	Other-Residential	0.07	0.01	0.00	0.00
	Single Family	0.14	0.01	0.00	0.00
	Total	3	0	0	0
5 PM	Commercial	1.53	0.20	0.02	0.03
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.12	0.01	0.00	0.00
	Other-Residential	0.09	0.01	0.00	0.00
	Single Family	0.22	0.02	0.00	0.00
	Total	2	0	0	0

Economic Loss

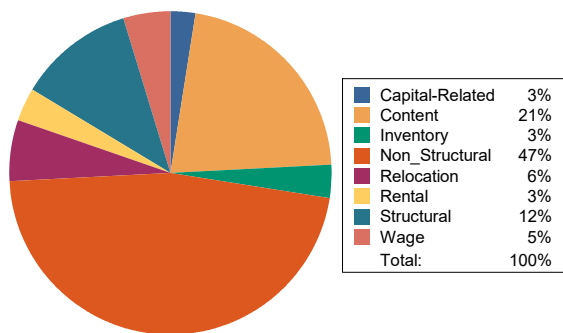
The total economic loss estimated for the earthquake is 21.55 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 19.83 (millions of dollars); 17 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 38 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type (\$ millions)



Earthquake Losses by Occupancy Type (\$ millions)

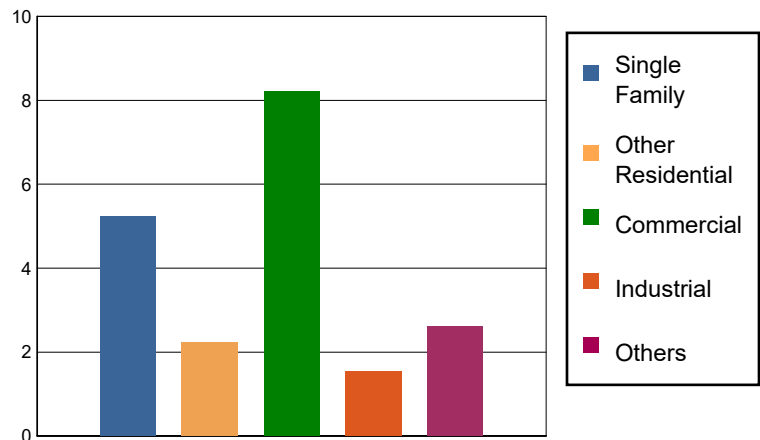


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.1184	0.6405	0.0178	0.1541	0.9308
	Capital-Related	0.0000	0.0504	0.4389	0.0112	0.0158	0.5163
	Rental	0.0563	0.0751	0.4574	0.0117	0.0612	0.6617
	Relocation	0.1796	0.0335	0.6292	0.0722	0.2790	1.1935
	Subtotal	0.2359	0.2774	2.1660	0.1129	0.5101	3.3023
Capital Stock Losses							
	Structural	0.5801	0.1583	1.0486	0.1839	0.3502	2.3211
	Non_Structural	3.2629	1.3681	2.8423	0.6983	1.1243	9.2959
	Content	1.1468	0.4203	1.5902	0.4774	0.6243	4.2590
	Inventory	0.0000	0.0000	0.5756	0.0700	0.0098	0.6554
	Subtotal	4.9898	1.9467	6.0567	1.4296	2.1086	16.5314
Total		5.23	2.22	8.22	1.54	2.62	19.83

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	625.4705	0.0000	0.00
	Bridges	81.6586	0.0186	0.02
	Tunnels	0.0000	0.0000	0.00
	Subtotal	707.1291	0.0186	
Railways	Segments	5962.7588	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	5962.7588	0.0000	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
	Total	6,669.89	0.02	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	5.5634	0.0039	0.07
	Subtotal	5.5634	0.0039	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	156.8418	1.6915	1.08
	Distribution Lines	3.3380	0.0019	0.06
	Subtotal	160.1798	1.6934	
Natural Gas	Pipelines	196.6210	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.2253	0.0007	0.03
	Subtotal	198.8463	0.0007	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Communication	Facilities	0.1160	0.0028	2.41
	Subtotal	0.1160	0.0028	
	Total	364.71	1.70	

Appendix A: County Listing for the Region

Bristol, MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts	Bristol	30,834	2,972	1,897	4,870
Total Region		30,834	2,972	1,897	4,870

Hazus: Earthquake Global Risk Report

Region Name: NorthAttEarthquake

Earthquake Scenario: 2500year

Print Date: September 18, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

Section	Page #
General Description of the Region	3
Building and Lifeline Inventory	4
Building Inventory	
Critical Facility Inventory	
Transportation and Utility Lifeline Inventory	
Earthquake Scenario Parameters	7
Direct Earthquake Damage	8
Buildings Damage	
Essential Facilities Damage	
Transportation and Utility Lifeline Damage	
Induced Earthquake Damage	14
Fire Following Earthquake	
Debris Generation	
Social Impact	15
Shelter Requirements	
Casualties	
Economic Loss	17
Building Related Losses	
Transportation and Utility Lifeline Losses	
Appendix A: County Listing for the Region	
Appendix B: Regional Population and Building Value Data	

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 19.38 square miles and contains 7 census tracts. There are over 12 thousand households in the region which has a total population of 30,834 people. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,870 (millions of dollars). Approximately 85.00 % of the buildings (and 61.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 6,669 and 364 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 7 thousand buildings in the region which have an aggregate total replacement value of 4,870 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 8 schools, 3 fire stations, 1 police stations and 2 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 7,033.00 (millions of dollars). This inventory includes over 50.95 miles of highways, 21 bridges, 295.77 miles of pipes.

Table 1: Transportation System Lifeline Inventory

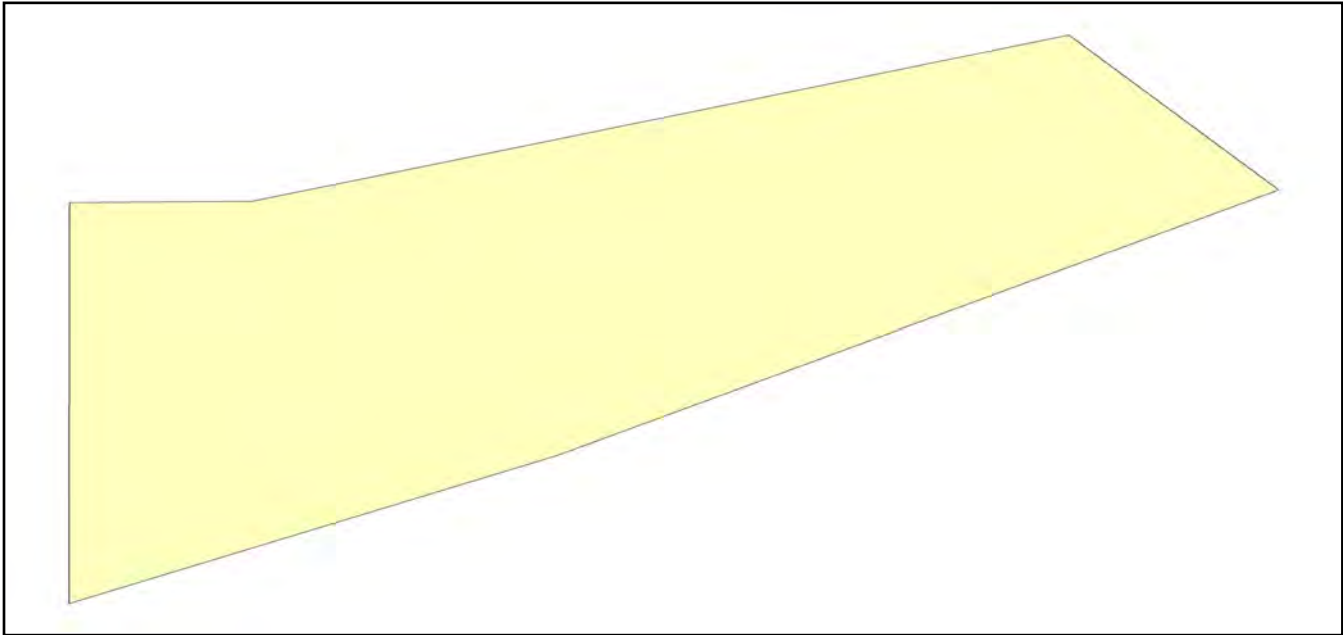
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	21	81.6586
	Segments	42	625.4705
	Tunnels	0	0.0000
	Subtotal		707.1291
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	9	5962.7588
	Tunnels	0	0.0000
	Subtotal		5962.7588
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
	Subtotal		0.0000
Bus	Facilities	0	0.0000
	Subtotal		0.0000
Ferry	Facilities	0	0.0000
	Subtotal		0.0000
Port	Facilities	0	0.0000
	Subtotal		0.0000
Airport	Facilities	0	0.0000
	Runways	0	0.0000
	Subtotal		0.0000
Total			6,669.90

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	5.5634
	Facilities	0	0.0000
	Pipelines	0	0.0000
	Subtotal		5.5634
Waste Water	Distribution Lines	NA	3.3380
	Facilities	1	156.8418
	Pipelines	0	0.0000
	Subtotal		160.1798
Natural Gas	Distribution Lines	NA	2.2253
	Facilities	0	0.0000
	Pipelines	4	196.6210
	Subtotal		198.8463
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
	Subtotal		0.0000
Electrical Power	Facilities	0	0.0000
	Subtotal		0.0000
Communication	Facilities	1	0.1160
	Subtotal		0.1160
		Total	364.70

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	2500year
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	2,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	6.50
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 98 buildings will be at least moderately damaged. This is over 1.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

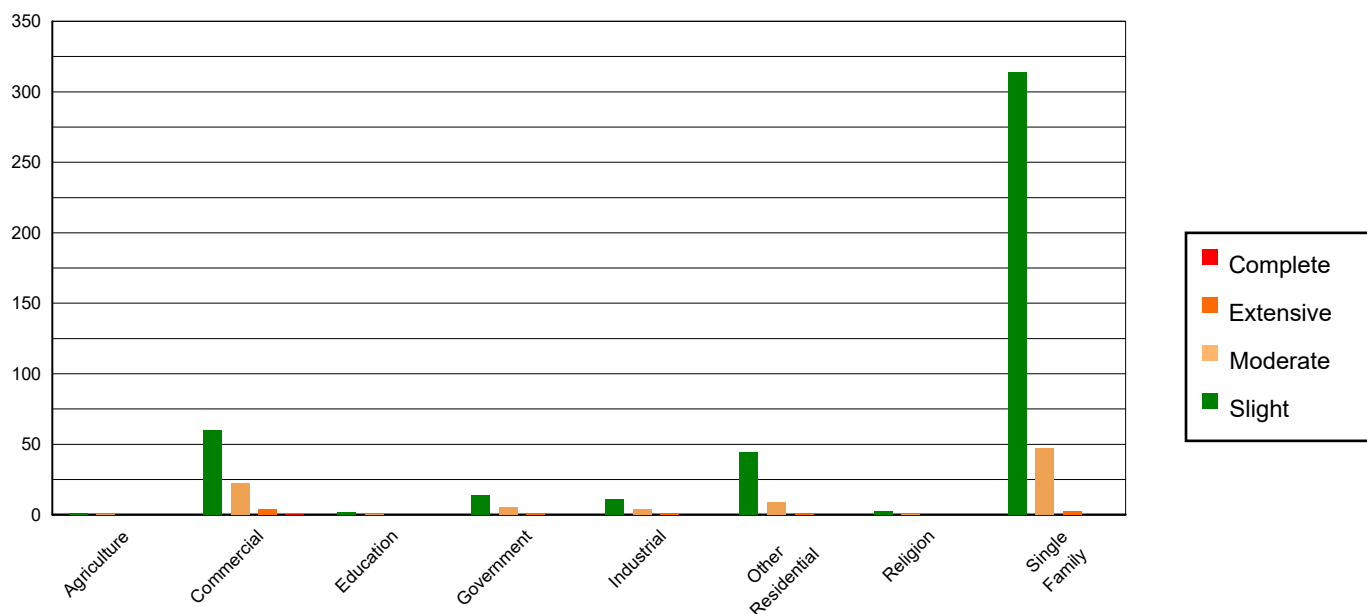


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	13.79	0.19	0.95	0.21	0.23	0.26	0.03	0.30	0.00	0.22
Commercial	683.12	9.41	60.30	13.42	22.45	25.11	3.77	43.26	0.36	56.45
Education	22.36	0.31	1.84	0.41	0.68	0.76	0.10	1.14	0.01	1.75
Government	160.64	2.21	14.03	3.12	5.49	6.14	0.78	8.95	0.06	9.73
Industrial	128.14	1.77	11.00	2.45	4.15	4.65	0.66	7.56	0.05	7.48
Other Residential	769.44	10.60	44.54	9.91	8.55	9.56	0.48	5.47	0.00	0.49
Religion	27.75	0.38	2.42	0.54	0.70	0.79	0.11	1.23	0.01	2.07
Single Family	5452.74	75.13	314.17	69.93	47.15	52.74	2.80	32.09	0.14	21.81
Total	7,258		449		89		9		1	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	6548.16	90.22	371.05	82.59	50.26	56.22	1.97	22.53	0.00	0.00
Steel	349.71	4.82	26.71	5.95	11.93	13.34	1.43	16.42	0.03	4.23
Concrete	30.49	0.42	2.36	0.52	0.99	1.11	0.07	0.76	0.00	0.24
Precast	16.07	0.22	1.70	0.38	1.40	1.57	0.36	4.11	0.00	0.70
RM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
URM	256.66	3.54	40.17	8.94	21.27	23.79	4.61	52.79	0.61	94.76
MH	56.90	0.78	7.25	1.61	3.55	3.97	0.30	3.40	0.00	0.06
Total	7,258		449		89		9		1	

*Note:

RM Reinforced Masonry
 URM Unreinforced Masonry
 MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	8	0	0	8
EOCs	2	0	0	2
PoliceStations	1	0	0	1
FireStations	3	0	0	3

Transportation Lifeline Damage

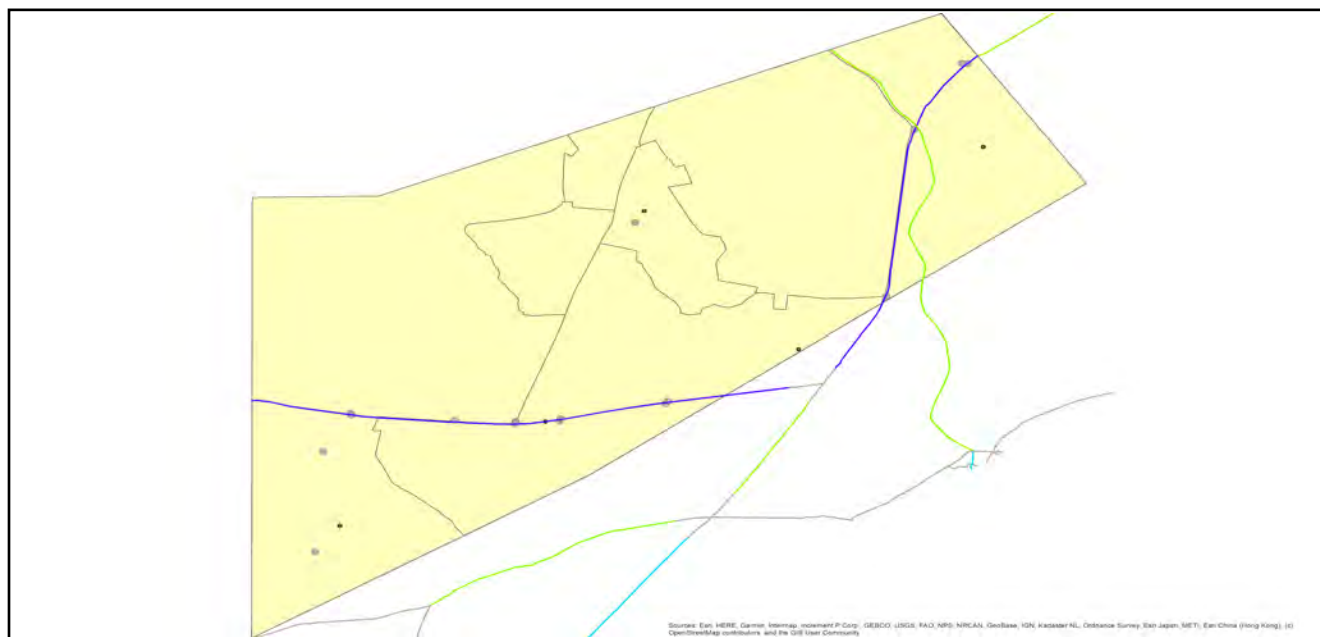


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	42	0	0	40	40
	Bridges	21	0	0	21	21
	Tunnels	0	0	0	0	0
Railways	Segments	9	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	1	0	0	1	1

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	173	2	0
Waste Water	104	1	0
Natural Gas	19	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	12,064	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

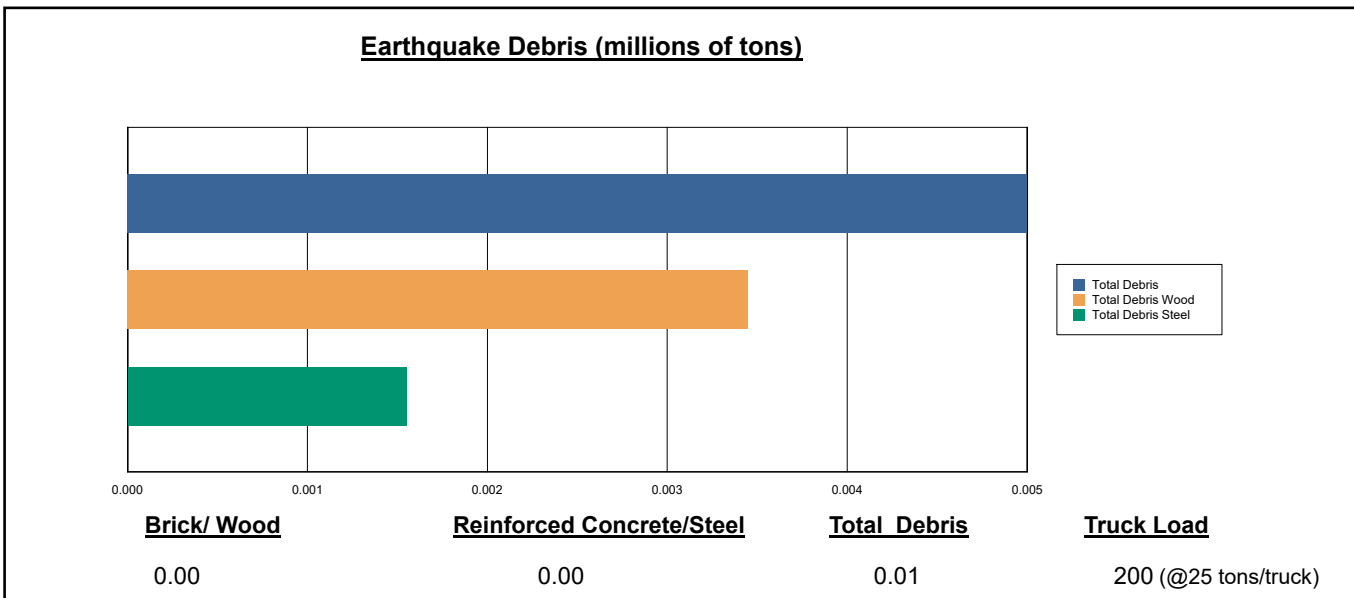
Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

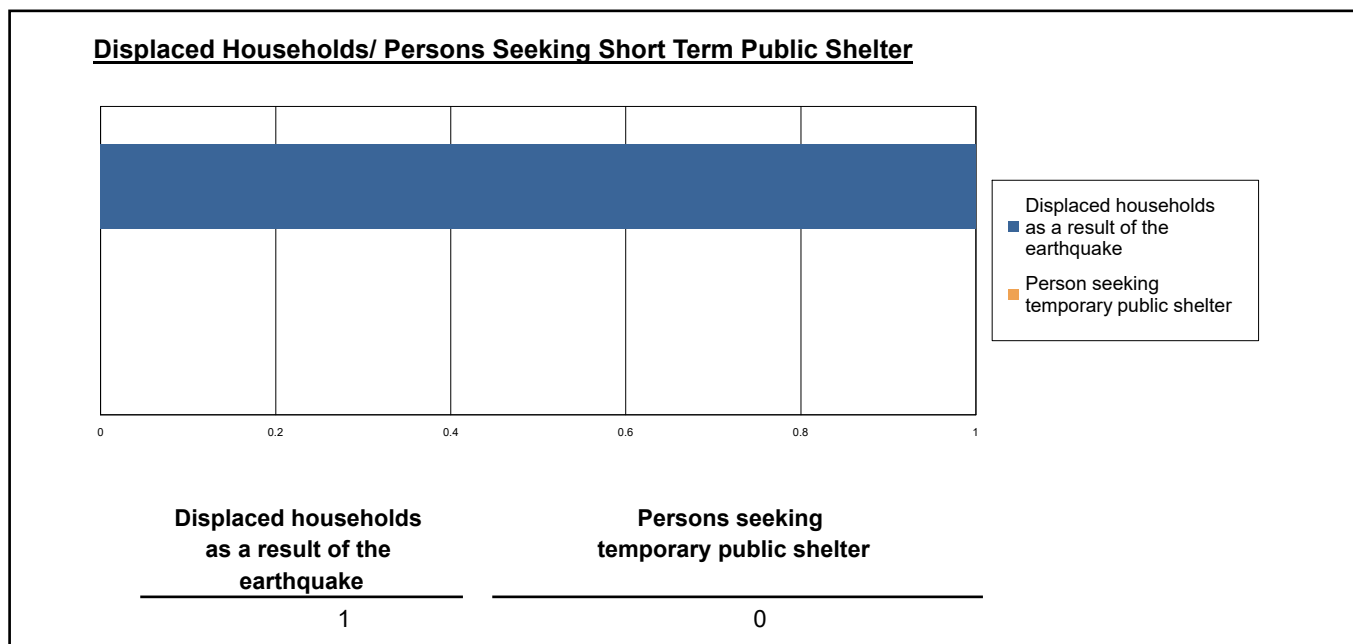
The model estimates that a total of 5,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 69.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 200 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.



Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 30,834) will seek temporary shelter in public shelters.



Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.07	0.01	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.05	0.01	0.00	0.00
	Other-Residential	0.49	0.04	0.00	0.00
	Single Family	1.16	0.09	0.00	0.01
	Total	2	0	0	0
2 PM	Commercial	4.27	0.61	0.06	0.11
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.80	0.11	0.01	0.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.35	0.05	0.00	0.01
	Other-Residential	0.13	0.01	0.00	0.00
	Single Family	0.29	0.02	0.00	0.00
	Total	6	1	0	0
5 PM	Commercial	2.81	0.40	0.04	0.07
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.22	0.03	0.00	0.00
	Other-Residential	0.18	0.01	0.00	0.00
	Single Family	0.44	0.03	0.00	0.00
	Total	4	0	0	0

Economic Loss

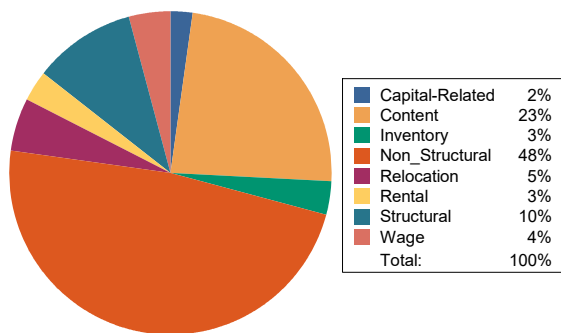
The total economic loss estimated for the earthquake is 44.92 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 40.94 (millions of dollars); 15 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 39 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type (\$ millions)



Earthquake Losses by Occupancy Type (\$ millions)

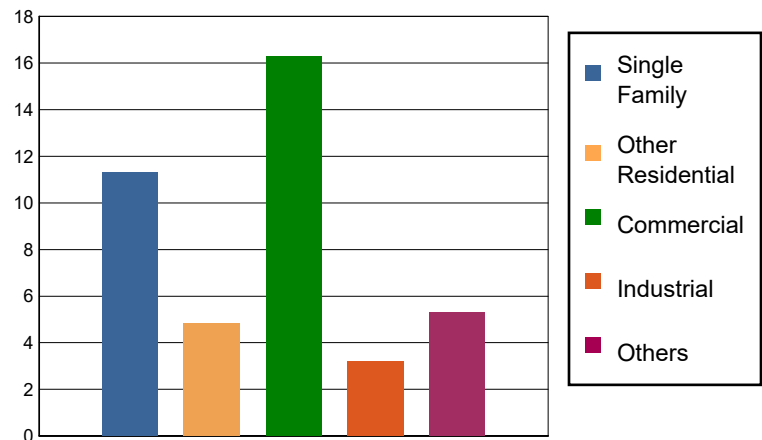


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.2193	1.1546	0.0327	0.2626	1.6692
	Capital-Related	0.0000	0.0934	0.8022	0.0208	0.0274	0.9438
	Rental	0.1189	0.1494	0.7994	0.0206	0.1102	1.1985
	Relocation	0.3945	0.0747	1.1233	0.1282	0.5098	2.2305
	Subtotal	0.5134	0.5368	3.8795	0.2023	0.9100	6.0420
Capital Stock Losses							
	Structural	1.1458	0.3038	1.8652	0.3262	0.6222	4.2632
	Non_Structural	6.9892	2.9996	5.8297	1.4775	2.3306	19.6266
	Content	2.6814	0.9776	3.4898	1.0404	1.4160	9.6052
	Inventory	0.0000	0.0000	1.2314	0.1530	0.0228	1.4072
	Subtotal	10.8164	4.2810	12.4161	2.9971	4.3916	34.9022
	Total	11.33	4.82	16.30	3.20	5.30	40.94

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	625.4705	0.0000	0.00
	Bridges	81.6586	0.0742	0.09
	Tunnels	0.0000	0.0000	0.00
	Subtotal	707.1291	0.0742	
Railways	Segments	5962.7588	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	5962.7588	0.0000	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
	Total	6,669.89	0.07	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	5.5634	0.0077	0.14
	Subtotal	5.5634	0.0077	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	156.8418	3.8779	2.47
	Distribution Lines	3.3380	0.0039	0.12
	Subtotal	160.1798	3.8818	
Natural Gas	Pipelines	196.6210	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.2253	0.0013	0.06
	Subtotal	198.8463	0.0013	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	0.0000	0.0000	
Communication	Facilities	0.1160	0.0066	5.69
	Subtotal	0.1160	0.0066	
	Total	364.71	3.90	

Appendix A: County Listing for the Region

Bristol, MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts	Bristol	30,834	2,972	1,897	4,870
Total Region		30,834	2,972	1,897	4,870