

Town of Brookline, New Hampshire
Hazard Mitigation Plan Update 2024



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Emergency Management



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Acknowledgements

The 2024 Town of Brookline, NH Hazard Mitigation Planning Committee

The Nashua Regional Planning Commission and the Town of Brookline wish to thank the following individuals for serving on the Town's Hazard Mitigation Committee and for their assistance in the development of this Plan:

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Jeffrey Stewart	Chief, Brookline Ambulance Service
Charles Corey	Chief, Fire Department
JP Royea	Fire Inspector
William Quigley	Chief, Police Department
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Mike Wenrich	Director, Public Works Department
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EXECUTIVE SUMMARY

Jurisdiction and Scope of the Plan

This plan addresses the Town of Brookline, NH. The Plan addresses the following types of Hazards:

- Drought
- Earthquake
- Extreme Temperatures
- Flooding
- Severe Wind
- Lightning & Hail
- Severe Winter Weather
- Tornado
- Wildfire
- Solar Storms and Space Weather
- Infectious Disease

Hazard Mitigation Goals

The first step in developing a mitigation strategy is to establish goals that reflect what the municipality wishes to achieve through the implementation of its Hazard Mitigation Plan. The Brookline Hazard Mitigation Team established the following goals and objectives, based on its desire to protect the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property. These goals provided the basis for identifying and prioritizing mitigation actions.

Goal 1—Prevent the impacts of natural hazards on the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property whenever possible.

- Objective 1.1—Manage development of known hazard areas to avoid the risks associated with natural hazards.
- Objective 1.2—Plan to incorporate hazard mitigation into capital improvements and other future initiatives.
- Objective 1.3—Ensure building codes and other standards include requirements that make new construction more disaster resistant.
- Objective 1.4—Support the maintenance of this hazard mitigation plan.

Goal 2—Protect the Town's existing critical facilities, infrastructure, and private property from the impacts of natural hazards through cost effective mitigation activities.

- Objective 2.1—Modify existing structures to reduce damage from future natural hazard events.
- Objective 2.2—Perform cost effective flood hazard mitigation measures to protect private property.

Goal 3—Educate and inform the Town’s residents to help them become more resilient to natural hazards impacting the community. 7

- Objective 3.1—Utilize educational methods to change the perception from “disaster losses are acceptable” to “many disaster losses are preventable if mitigation practices are followed.”
- Objective 3.2—provide educational opportunities across all age ranges.
- Objective 3.3—Develop and distribute public awareness materials regarding the relative risk of natural hazards and practical mitigation measures to reduce damages and injuries.

Goal 4—Address the challenges of natural resource degradation and the associated increased risk from hazards.

- Objective 4.1—Ensure development in hazard areas does not destroy natural barriers to damage, such as floodplains and vegetation.
- Objective 4.2—Protect or recreate environmental assets to help safeguard the built environment.

Goal 5—Protect emergency services, critical facilities, and other critical capabilities from hazard damage in order for them to remain operational.

- Objective 5.1—Identify critical facilities, infrastructure, and emergency services and their vulnerabilities to natural hazards.
- Objective 5.2— Develop and implement programs to promote hazard mitigation actions that protect the provision of emergency services in Town.
- Objective 5.3—Identify, maintain, and protect evacuation routes from hazard damage so they are usable when needed.

CHAPTER 1. PLANNING PROCESS

Section 1.1 ~ Overview of Planning Process

The Brookline Hazard Mitigation Plan Update 2024 was prepared by the Nashua Regional Planning Commission (NRPC) for the Town of Brookline, NH. NRPC staff worked closely with the Brookline Hazard Mitigation Team to write this plan. The Brookline Hazard Mitigation Team includes:

- Charles Corey, Fire Chief, Town of Brookline, NH
- Jeffrey Stewart, Brookline Ambulance Service Chief, Town of Brookline, NH
- Mike Wenrich, Director, Public Works, Town of Brookline, NH
- David Coffey, Director, Emergency Management, Town of Brookline, NH
- Scott Butcher, Town Administrator, Town of Brookline, NH
- William Quigley, Chief of Police, Town of Brookline, NH
- Michele Decoteau, Town Planner, Town of Brookline, NH
- J.P. Royea, Fire Inspector, Town of Brookline, NH

NRPC staff will meet with the Brookline Hazard Mitigation Team for a series of 4 meetings in order to prepare the Brookline Hazard Mitigation Plan Update 2017. Agendas from these meetings appear in the Appendix to this Plan. In between meetings, NRPC worked directly with Brookline Hazard Mitigation Team members to obtain additional information needed to write the Plan.

The primary differences between the 2024 Plan and the 2017 Plan are 1) Infectious Disease is now recognized by the State as a hazard, and 2) Solar and Space Weather is now recognized by the State as a hazard.

Section 1.2 ~ Involvement of Neighboring Communities and Local/Regional Agencies

At the first Hazard Mitigation Team meeting, held on October 4th, 2022, the group discussed who should be invited to participate on the planning team that was not currently represented. It was determined that the current Team provided adequate representation and no additional members were necessary. The Team provided additional contacts to notify about the plan update including the Brookline and Nashua Airports, SMART Hazardous Materials Response Team, Granite State Critical Incident Stress management Team (CISD), Brookline Public Welfare Officer, Brookline Community Emergency Response Team (CERT), Brookline Lions Club, Rotary Club of Hollis-Brookline, Brookline Event Center and Auction Gallery, Bingham Lumber, and Absolute Mechanics. The Team also discussed who should be informed about the Plan, such as neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, and others. It was concluded that the following entities should be informed of the Plan update:

- Milford Family Medicine (Dartmouth Hitchcock), Milford, NH
- Milford Medical Center (St. Joseph Medical Center), Milford, NH
- NH Dept of Homeland Security and Emergency Management, Danielle Morse, Field Representative, Concord, NH
- American Red Cross, Nashua NH and Manchester, NH

- Southern NH Medical Center, Nashua, NH
- St. Joseph Medical Center, Nashua, NH
- Eversource, Manchester, NH
- Manchester-Boston Regional Airport, Manchester, NH
- Nashua Airport Authority, Nashua, NH
- Brookline Airport, Brookline, NH
- Board of Selectmen, Town of Mason, NH
- Board of Selectmen, Town of Milford, NH
- Board of Selectmen, Town of Brookline, NH
- Board of Selectmen, Town of Hollis, NH
- Board of Selectmen, Town of Townsend, MA
- Board of Selectmen, Town of Pepperell, MA
- Nashua Community College, Nashua, NH
- Franklin Pierce College, Rindge, NH
- Southern NH University, Nashua, NH
- SMART Hazardous Materials Response Team, Nashua, NH
- Granite State Critical Incident Stress Management Team (CISD), Manchester, NH
- Brookline Public Welfare Officer, Brookline, NH
- Brookline Community Emergency Response Team (CERT), Brookline, NH
- Brookline Lions Club, Brookline, NH
- Rotary Club of Hollis-Brookline, Hollis, NH
- Brookline Event Center and Auction Gallery, Brookline, NH
- Bingham Lumber, Brookline, NH
- Absolute Mechanics, Brookline, NH

A number of these entities, especially the American Red Cross and the Brookline Public Welfare Officer, work with/provide support to underserved communities and the socially vulnerable making notification of this plan update imperative.

A copy of the letter that was sent to these entities appears in the Appendix to this Plan. The American Red Cross sent staff to participate in the fourth meeting with the Brookline Hazard Mitigation Committee. No other entities attended.

Section 1.3 ~ Public Participation

During the first Hazard Mitigation Team meeting, held on October 4th, 2022, the Team brainstormed all the methods currently employed to notify the public of Town meetings and news. These methods include the Town's website (<http://www.brookline.nh.us/>) and Brookline's Public Access TV Channel (<http://www.brookline.nh.us/channel-192>). Additionally, NRPC was able to put together a post for social media platforms used by the Brookline Police Department, Brookline Fire Department, and Brookline EMS and was shared on their individual Facebook pages to share information regarding the Plan update. The Team determined that these methods should also be used to encourage public participation in the Hazard Mitigation Plan update process. In addition, announcements were made at

various televised Board of Selectmen meetings regarding the update process. There was no public response to provide input to the Brookline Hazard Mitigation Plan Update 2024 process.

NRPC staff also developed a webpage for the Brookline Hazard Mitigation Plan Update 2024 (https://www.nashuarpc.org/about_nrpc/our_region_communities/brookline_hazard_mitigation_plan_update/index.php), which allows members of the public to participate in the update process even if they cannot attend meetings. The webpage was updated throughout the planning process and includes the 2017 Brookline Hazard Mitigation Plan and Hazard Mitigation Plan Review Guide. It also provides team members, meeting times, locations, agendas, and homework assignments. The Town of Brookline's Facebook page shared links to this webpage. The Nashua Regional Planning Commission will keep the website active and will add information about ongoing updates over the next 5 years. A screenshot of the website appears in the Appendix to this Plan.

Section 1.4 ~ Existing and Potential Authorities, Policies, Programs, and Resources

At the first Hazard Mitigation Team meeting, held on October 4th, 2022, the Team discussed Brookline's existing authorities, policies, programs, and resources related to hazard mitigation and its ability to expand and improve on these. The purpose of this discussion was to determine the ability of the Town to implement its hazard mitigation strategies and to identify potential opportunities to enhance specific policies, programs, or projects. The evaluation of Brookline's existing authorities, policies, programs, and resources includes planning and regulatory capabilities, emergency management capabilities, floodplain management capabilities, administrative and technical capabilities, and fiscal capabilities. Each of these areas provides an opportunity to integrate hazard mitigation principles and practices into the local decision-making process.

Specifically, the 2024 Hazard Mitigation Team is comprised of select individuals that represent various Town functions and capabilities that will be needed to expand on and improve existing policies and programs, as well as be the responsible parties to implement mitigation strategies.

- Emergency Management Director – The EMD will facilitate any update to emergency operations and plans/programs. Many hazard mitigation actions involve providing education and services to residents, which falls under the jurisdiction of emergency management.
- Fire Chief – The Fire Chief implements improvements to programs and policies of the Fire Department to support mitigation strategies and priorities.
- Ambulance Service Chief – The Ambulance Service chief implements improvements to programs and policies of the Brookline Ambulance Service to support mitigation strategies and priorities.
- Public Works Director – The Public Works Director provides insight on existing conditions and deficiencies in municipal infrastructure as well as directs Public Works Department functions such as maintenance of transportation and stormwater infrastructure. Many mitigation actions include infrastructure maintenance and improvement as well as implementation of new programs.

- Town Administrator – The Town Administrator is a central contact for all departments and will assist in implementing department-wide changes and mitigation actions.
- Chief of Police – The Chief of Police interacts with the public on a regular basis and will directly support expansion and improvement programs involving public education, protection, and communication as well as the Police Department in general.
- Town Planner – The Town Planner will work with the town Planning and Zoning Boards to implement new regulatory changes that support hazard mitigation and goals.
- Fire Inspector – The Fire Inspector ensures that buildings meet safety requirements.

Planning and Regulatory Capabilities

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate Brookline’s commitment to guiding and managing growth in a responsible manner. The following is a summary of the relevant local plans, ordinances, and programs already in place in the Town of Brookline. Each one should be considered as an available mechanism for incorporating the recommendations of the Brookline Hazard Mitigation Plan Update 2024.

- [Wetlands Conservation District](#)—the purpose of the Wetlands Conservation District is to protect the public health, safety, and general welfare by controlling and guiding the use of land areas which have been found to be subject to high water tables for extended periods of time.
- [Floodplain Ordinance](#)—regulations in the Brookline Floodplain Ordinance apply to all lands designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its “Flood Insurance Study for the County of Hillsborough, NH” dated September 25, 2009 or as amended, together with the associated Flood Insurance Rate Maps dated September 25, 2009 or as amended.
- [Aquifer Protection Ordinance](#)—the Town of Brookline adopted this ordinance for the promotion of the health, safety, and general welfare of its residents by preserving, maintaining, and protecting from contamination the existing and potential groundwater resources of the Town and protecting the surface waters that are fed by groundwater.
- [Open Space Development](#)—the purpose of this ordinance is to promote the conservation of the natural environment and the development of the community in harmony with the natural features of the land.
- [Brookline Master Plan 2011](#)
- [Land Use Zoning Ordinance](#)
- [Non-Residential Site Plan Regulations](#)
- [Subdivision Regulations](#)
- [International Building Code](#) and [International Residential Code](#) – Using 2015 currently, in the process of transitioning to 2018 code
- [National Flood Insurance Program](#)

Emergency Management Capabilities

Hazard mitigation is a key component of emergency management, along with preparedness, response, and recovery. Opportunities to reduce potential losses through mitigation practices are typically implemented before a hazard event occurs, such as enforcement of policies to regulate development

that is vulnerable to hazards due to its location or design. Existing emergency management capabilities for the Town of Brookline include:

Emergency Management Plans

- [Brookline Hazard Mitigation Plan 2017](#)—this document provides a guide for the community to reduce the impact of natural hazards on its residents and the built environment.
- [Brookline Emergency Operations Plan](#)—this document outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.
- [Regional Public Health Emergency Response Annex](#)—in 2016 Brookline collaborated with the Nashua Public Health Emergency Preparedness Program to develop this document, which describes critical operational functions during an emergency and what entities are responsible for carrying them out.

Emergency Management Departments, Facilities, Personnel, and Volunteers

- [Brookline Emergency Management](#), [Brookline Ambulance Service](#), [Brookline Fire Department](#), [Brookline Police Department](#)—these departments provide policies, programs, and resources related to hazard mitigation and emergency preparedness.
- Souhegan Fire Mutual Aid—provides fire assistance for Brookline, NH; Pepperell, MA; Townsend, MA; and Ashby, MA.
- Statewide Fire Mutual Aid
- Brookline Police also have mutual aid agreements with Pepperell, MA and Townsend, MA.
- Brookline Community Emergency Response Team (CERT)—an all-volunteer group whose members are trained in emergency procedures to enable them to assist the local Emergency Services during an emergency and through the recover stage of the event.
- Emergency Operations Center—located at the Safety Complex (backup EOC at Fire Station); provides radio, computer, and phone support in conjunction with the State EOC for allocation of resources, equipment, and personnel during an emergency situation.

Emergency Management Communications

Dispatch—primary dispatch is through Town of Hollis, NH with backup provided by Milford, NH. If needed, Brookline can provide its own dispatch through its radios. Since the last Plan update the Emergency Operations Center (EOC) at the Public Safety Complex added radios that can communicate with all the town's emergency services and the mutual aid units that may come to assist in a major incident, the radios power system is backed up by the Public Safety Complex whole building generator. In addition, Brookline can activate the Ambulance and Fire department pagers from the EOC also. The EOC radios are mounted in a portable cabinet and that unit can be removed and installed in the Emergency Management SUV and can provide long term communications from anywhere in town, the communication equipment is powered by a portable generator in the SUV. Brookline maintains an amateur (ham) radio unit at the Emergency Operations Center (EOC) at the Public Safety Complex and at the Brookline Fire Station. The amateur (ham) radio units can communicate with each other and with amateur radio units with area EOC's and with the state Emergency Operations Center

- Two antenna sites in Brookline with backup generators for emergency communications.

- Code Red—emergency alert system used during major power outages which has also been used to transmit COVID and severe weather information.
- Local emergency warning system- Airhorn
- Regional communications system- The region has individual communications centers serving their specific communities and our current radios are able to communicate with those facilities that are located nearby.
- Brookline Community Access Television—emergency management announcements
- [Brookline Municipal Website](#)—emergency management announcements and education
- [Brookline Emergency Management Facebook](#) page
- Emergency Operations System- The Town of Brookline Emergency Management Department maintains a permanent Emergency Operations Center (EOC) at the Public Safety Complex. The EOC is the central location for department representatives and the town’s senior management during an event that affects the citizens of Brookline. Adjacent to the EOC is the Brookline Community Room that can be used as a cooling or warming center during adverse weather events. In addition, the Captain Samuel Douglas Academy (24 Townsend Hill Road) has been designated as a local shelter. The facility has a generator back up, shelter area, restrooms, and food preparation area.

Floodplain Management Capabilities

The Town of Brookline participates in the National Flood Insurance Program (NFIP). This provides full insurance coverage based on risk as shown on detailed Flood Insurance Rate Maps (FIRMs). Brookline joined the NFIP on May 19, 1987. As a participant in the NFIP, communities must agree to adopt a floodplain management ordinance and enforce the regulations found in the ordinance. Brookline has adopted the “Floodplain Ordinance,” found in Section 1200 of the [Town of Brookline, NH Zoning and Land Use Ordinance](#). The Floodplain Ordinance is enacted to prevent the development of buildings and uses in areas that are unsatisfactory and hazardous due to the threat of flooding, protect natural flows and drainage, and comply with the requirements of the National Flood Insurance Act of 1968 (P.L. 90-488, as amended). Additional information on the Floodplain Ordinance and Brookline’s participation in the NFIP will be located in Section 3.5 of this Plan.

Administrative and Technical Capabilities

Brookline’s ability to develop and implement mitigation projects, policies, and programs is closely related to the staff time and resources it allocates to that purpose. Administrative capability can be improved by coordinating across departments and integrating mitigation planning into existing Town procedures. The following departments, boards, and personnel are critical to Brookline’s hazard mitigation administrative and technical capabilities:

- Planning Department
- Fire Department
- Police Department
- Emergency Management
- Brookline Ambulance Service
- Building Inspector

- Health Officer
- Town Administrator
- Board of Selectmen
- Zoning Board
- Planning Board
- Conservation Commission
- Finance Committee

Fiscal Capabilities

In addition to administrative and technical capabilities, the ability of the Town of Brookline to implement mitigation actions is closely associated with the amount of money available for these projects. Mitigation actions identified in this Plan, including those that will appear in Table 12—Implementation and Administration, may utilize the following funding sources.

- [Congestion Mitigation and Air Quality \(CMAQ\) Program](#)—this program is administered by the Federal Highway Administration and was implemented to support surface transportation projects and related efforts that contribute to air quality improvements and provide congestion relief.
- [FEMA Hazard Mitigation Grant Program](#)—the Hazard Mitigation Grant Program provides grants to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the Program 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.
- [FEMA Pre-Disaster Mitigation Program](#)—the Pre-Disaster Mitigation Program provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster.
- Community Development Block Grant Program—the Community Development Block Grant (CDBG) program, administered through the US Department of Housing and Urban Development, provides communities with resources to address a wide range of unique community development needs, including Disaster Recovery Assistance. HUD provides flexible grants to help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.
- Brookline Capital Improvements Plan 2017-2022— the Brookline Capital Improvements Plan (CIP) links local infrastructure investments with long-term planning. As authorized by RSA 674:5-8 the CIP is the responsibility of the Planning Board or a formally appointed capital improvements program committee, to prepare and amend a recommended program of municipal capital improvements projected over a period of at least six years. The following funding methods may be used:
 - 1-Year Appropriation—most commonly used financing option and refers to those projects that are to be funded by property tax revenues within a single fiscal year. Funds for projects that are financed using this method are most often included in the Town’s operating budget, but can appear as warrant articles to be voted on individually.
 - Capital Reserve—a capital reserve account is a non-lapsing savings account, separate from the General Fund. Voters can deposit funds into with approval of a warrant article, with the intent of withdrawing the funds to use for the specific purpose or purchase for which the

account was established. This method requires appropriations over more than one year, with the actual project being accomplished only when the total appropriations meet the project cost.

- Lease Purchase—lease purchasing an item allows a municipality to spread the cost over a period of years, generally no more than 7. A municipal lease typically allows for Town ownership at the end of the lease term and usually enjoys lower tax-exempt interest rates. Unlike a bond or loan, a municipal lease has a “non-appropriation clause” that allows the town to cancel the lease if the annual payment is not appropriated. The town then loses the equipment that was financed. In Brookline, lease purchasing is typically used by departments to purchase vehicles.
- Bonding—bonding allows the municipality to negotiate the purchase of goods or services at a set price and then pay for that item or service over a period of time. Bonds, unlike capital reserve accounts, allow the town to utilize the item being purchased or constructed while payments are being made. The most important part of a bond transaction is the promise of the town to repay the debt with interest. There are two major types of bond: general obligation and special revenue. General Obligation Bonds typically have lower interest rates than other types of long-term debt. Revenue Bonds rely on a set revenue source or sources as security for the bond. In Brookline, bonding is generally limited to the most expensive capital projects, such as major renovations, additions, or construction of new school or municipal buildings and facilities.
- Impact fees—these fees are collected from new development to pay for new facility capacity. Money collected is placed in a fund until it is either expended within six years or returned to the party from whom it was collected.

Summary and Analysis of Brookline's Existing Authorities, Policies, Programs, and Resources

Measures of Effectiveness are defined as follows:

- Excellent—the existing program works as intended and is exceeding its goals
- Good—the existing program works as intended and meets its goals
- Average—the existing program works as intended but could be improved to meet higher standards
- Poor—the existing program does not work as intended, often falls short of its goals, and/or may present unintended consequences

Capability	Description	Area of Town Covered	Responsible Entities	Effectiveness	Changes or Improvements Needed
Planning and Regulatory	Wetlands Conservation District, Floodplain Ordinance, Aquifer Protection Ordinance, Open Space Development, Land Use Zoning Ordinance, Non-Residential Site Plan Regulations, Subdivision, Regulations, Brookline Master Plan 2011, IBC, IRC, NFIP, Nashua Regional Water Resiliency Action Plan	Entire jurisdiction	Planning Board, Zoning Board, Town Planner	Good	Ordinances should be reviewed on a regular basis to ensure they are consistent with goals outlined in the Master Plan and Hazard Mitigation Plan. Consider conducting a Town specific vulnerability assessment to improve local resiliency to climate change impacts.
Emergency Management	Plans; Departments, Facilities, Personnel, and Volunteers; Communications	Entire jurisdiction	Brookline Fire Dept.; Brookline Police Dept.; Brookline Police Mutual Aid; Brookline Ambulance; Souhegan Fire Mutual Aid; Statewide Fire Mutual Aid; Fire Mutual Aid with Townsend, MA; CERT Team	Excellent	Utilize a variety of communications methods to ensure all residents are educated about emergency preparedness and hazard mitigation measures they can take.
Floodplain	Floodplain	Designated	Brookline	Good	Revise/adopt

Management	Ordinance, NFIP	Flood Hazard Areas in Brookline	Planning Board		regulations to improve floodplain management if needed according to findings from 2017 regulatory audit. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.
Administrative and Technical	Planning Dept., Fire Dept., Police Dept., Emergency Management, Ambulance Service, Building Inspector, Health Officer, Road Agent, Town Administrator, Board of Selectmen, Zoning Board, Planning Board, Conservation Commission, Finance Committee	Entire jurisdiction	Entities listed in Description	Good	Promote communication across all departments and committees to ensure Hazard Mitigation Plan goals and actions are implemented.
Fiscal	Grant funding, Capital Improvements Program (CIP)	Entire jurisdiction	Board of Selectmen, Capital Improvements Committee, Planning Board	Good	Hazard mitigation actions should be considered for inclusion in the CIP and departmental budgets. Brookline's Hazard Mitigation Plan should be updated at least every 5 years in order to maintain eligibility for FEMA grants.

Section 1.5 ~ Review and Incorporation of Existing Documents

All existing documents were reviewed and incorporated into the Brookline Hazard Mitigation Plan Update 2024. The Brookline Zoning Ordinance was used to provide information on where and how the Town builds. This was particularly helpful when mapping critical facilities corridors (Section 3.3). The Brookline Capital Improvements Plan was used to help document the Town's fiscal capabilities (Section 1.4). The Brookline Master Plan provided insight on future development patterns (Section 2.1) and helped to inform the analysis and prioritization of mitigation actions (Section 4.3). The Brookline Emergency Operations Plan was also used to inform the analysis and prioritization of mitigation actions. The State of New Hampshire Multi-Hazard Mitigation Plan Update 2013 provided insight when developing the description of natural hazards (Section 3.1), description of previous hazards (Section 3.2), probability of future hazards (Section 3.3), vulnerability by hazard (Section 3.5), and goals to reduce vulnerabilities (Section 4.1). The City of Nashua's Comprehensive Emergency Management Plan was referenced to write the hazard descriptions used to determine Brookline's vulnerability by hazard (Section 3.5). Finally, the Nashua Regional Planning Commission's "Nashua Regional Water Resiliency Action Plan" provided insight when developing the description of natural hazards (Section 3.1), probability of future hazards (Section 3.3), vulnerability by hazard (Section 3.4), and goals to reduce vulnerabilities (Section 4.1). It was used to inform the analysis and prioritization of mitigation actions (Section 4.3).

Section 1.6 ~ Updating the Plan

Plan Evaluation

In coordination with the Nashua Regional Planning Commission, the Brookline Emergency Management Director will call meetings of all responsible town parties to review plan progress annually on the anniversary of plan adoption and as needed, based on occurrence of hazard events, and report outcomes to the Selectboard. The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting. Meetings will entail the following actions:

- Review previous hazard events to discuss and evaluate major issues, effectiveness of current mitigation, and possible mitigation for future events.
- Assess how the mitigation strategies of the plan can be integrated with other Town plans and operational procedures, including the Zoning & Land Use Ordinance.
- Review and evaluate progress toward implementation of the current mitigation plan based on reports from responsible parties.
- Amend current plan to improve mitigation practices.
- Meetings will involve evaluation and assessment of the plan, regarding its effectiveness at achieving the plan's goals, stated purpose, and priorities. The following questions will serve as the criteria that is used to evaluate and update the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?

- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or Federal sources about the impact of previous hazard events, or any new data for the probability of future occurrences? If so, this information should be incorporated into the plan?

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effect of any recent hazard events?
- Has there been any damage to property since the plan was last reviewed?
- How could the existing mitigation strategies be improved to reduce the impact from recent occurrences of hazards?

Proposed Mitigation Strategies

- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any completed mitigation strategies reduced the Town's vulnerability and impact from hazards that have occurred since the strategy was completed? If not and if they have been tested, what changes need to make them more effective?
- Should the criteria for prioritizing the proposed strategies be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources, or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? How could it be improved?
- Are there any Town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them or integrated with other Town planning tools and operational procedures, including the Zoning & Land Use Ordinance and the Capital Improvement Plan?

Following these discussions, it is anticipated that the planning team may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan.

Plan Update

The Emergency Management Director will be responsible for a complete update of the Plan every five years and incorporating the results of Brookline's plan monitoring and evaluation procedures. The next

update of the plan is anticipated to begin in calendar-year 2028, with the goal of adoption in 2029. A first meeting, initiated by the EMD, is anticipated in November 2028. The plan update may begin earlier following a significant natural hazard event within the town and region, such as a federally declared disaster.

The public meetings of the hazard mitigation team shall be publicized through legal notices in local newspapers, posted fliers, and on the town and regional planning commission websites. Written and email comments shall be directed to the EMD. The updated plan will incorporate input from the public, other municipalities and government agencies. The Selectboard is responsible for approving the plan submission to FEMA and for adoption of the plan.

The update will likely follow a similar planning process and the outline to the current planning process, making deviations when needed.

CHAPTER 2. CHANGES FROM PREVIOUS PLAN

Section 2.1 ~ Changes in Development

There have been no significant changes in development patterns in Brookline since the 2017 Hazard Mitigation Plan. Most of the Town's commercial and industrial development continues to be located along Route 13 and Route 130. Residential development has increased slightly and is concentrated in a handful of locations. There were 23 residential building permits issued in 2018, 24 permits in 2019, 23 permits in 2020, 17 permits in 2021, and 19 permits in 2022. However, there have been no significant changes in development that have occurred in hazard prone areas that have increased Brookline's vulnerability to hazards.

Section 2.2 ~ Progress on Local Mitigation Efforts

The mitigation actions and implementation framework identified in the Brookline Hazard Mitigation Plan Update 2024 have been revised to reflect progress in local mitigation efforts. Progress has been made on a number of local mitigation efforts identified in the 2017 Plan, including create a regional communication system with radio interoperability on the same frequency; survey elderly population and develop database of information; install generator at Ball Hill Cell Tower; ensure the SMART develops a notification, evacuation, and contingency plan that addresses hazardous materials spills along the roads and neighboring water bodies; distribute Community Hazard Guides to the general public; reconfigure the intersections at South Main Street/State Rt. 13 and Cross Road/State Rt. 130; and upgrade radio communications systems for fire department.

To assess progress on local mitigation efforts, the Hazard Mitigation Team reviewed the actions originally presented in the Brookline Hazard Mitigation Plan 2017 and determined if they had been completed, deleted, or deferred. Progress on each action and its current priority level were also evaluated to determine if it should continue to be included in the mitigation actions identified in this Plan update.

Table 1—Status of Previous Actions

Mitigation Action	Status	Explanation
Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.	Deferred	This is a mitigation action (Prevention). This action will continue to be tracked in the Hazard Mitigation Plan Update 2024.
Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.	Ongoing	<u>This is a mitigation action (Public Education)</u> . Brookline’s Emergency Management Director maintains an internal, confidential list of vulnerable residents. Although it has been completed, the database will need to be updated to account for changes in the population. As such, it will continue to be tracked in the Hazard Mitigation Plan Update 2024.
Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquakes, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media.	Ongoing	<u>This is a mitigation action (Public Education)</u> . Because new residents move into town and education is a lifelong process, this action will continue to be tracked in the Hazard Mitigation Plan Update 2024.
Assess past flooding events around West Hill Rd. Consider costs and benefits of a variety of infrastructure upgrades. Conduct needed infrastructure repairs or replacements to mitigate future flooding.	Completed	This is a mitigation action. Because it has been completed, this action will not be tracked in future hazard mitigation plans.
Engineer and upgrade Bond Street Bridge.	Completed	This is a mitigation action. Because it has been completed, this action will not be tracked in future hazard mitigation plans.
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event.	Completed	This is a mitigation action. Because it has been completed, this action will not be tracked in future hazard mitigation plans.
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	Ongoing	<u>This is a mitigation action (Public Education)</u> . This action will be completed on an ongoing basis throughout the life of this Plan. As such, this action will continue to be tracked in the Hazard Mitigation Plan

Mitigation Action	Status	Explanation
		Update 2024.
Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline according to findings from 2017 regulatory audit. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.	Deferred	<u>This is a mitigation action (Flooding, Property Protection).</u> This action was not completed over the span of the 2017 Hazard Mitigation Plan and will be moved to the Hazard Mitigation Plan Update 2024.
Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least 2 public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.	Deferred	<u>This is a mitigation action (Prevention).</u> This action was not completed over the span of the 2017 Hazard Mitigation Plan and will be moved to the Hazard Mitigation Plan Update 2024.
Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators. Drought	Ongoing	<u>This is a mitigation action (Public Education).</u> This action will be completed on an ongoing basis throughout the life of this Plan. As such, this action will continue to be tracked in the Hazard Mitigation Plan Update 2024.

Mitigation Action	Status	Explanation
regions and updates on the drought status may be found here.		
Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station	Ongoing	<u>This is a mitigation action (Prevention, Human Lives)</u> . This action will be completed on an ongoing basis throughout the life of this Plan. As such, this action will continue to be tracked in the Hazard Mitigation Plan Update 2024.
Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.	Deferred	<u>This is a mitigation action (Lightning, Property Protection)</u> . This action was not completed over the span of the 2017 Hazard Mitigation Plan and will be moved to the Hazard Mitigation Plan Update 2024.
Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.	Ongoing	<u>This is a mitigation action (Prevention, Property Protection)</u> . This action was not completed over the span of the 2017 Hazard Mitigation Plan and will be moved to the Hazard Mitigation Plan Update 2024.

Section 2.3 ~ Changes in Priorities

The following mitigation actions rose in priority level from the 2017 Plan to the 2024 Plan:

- Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.
- Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station
- Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.

The following mitigation actions dropped in priority level from the 2017 Plan to the 2024 Plan:

- Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.
- Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to

conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.

- Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquakes, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media.
- Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline according to findings from 2017 regulatory audit. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.
- Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least 2 public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.
- Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators. Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.
- Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.

Table 2—Changes in Mitigation Priorities

Mitigation Action	Current Status	Priority Level in 2017 Plan	Priority Level in 2024 Plan
Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.	Deferred	STAPLEE Score = 10 Rank = 8 out of 13	STAPLEE Score = 10 Rank = 9 out of 14
Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.	Ongoing	STAPLEE Score = 15 Rank = 5 out of 13	STAPLEE Score = 12 Rank = 7 out of 14
Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquakes, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV,	Ongoing	STAPLEE Score = 16 Rank = 3 out of 13	STAPLEE Score = 15 Rank = 4 out of 14

Mitigation Action	Current Status	Priority Level in 2017 Plan	Priority Level in 2024 Plan
Brookline website, and social media.			
Assess past flooding events around West Hill Rd. Consider costs and benefits of a variety of infrastructure upgrades. Conduct needed infrastructure repairs or replacements to mitigate future flooding.	Completed	STAPLEE Score = 3 Rank = 13 out of 13	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2024 Plan update.
Engineer and upgrade Bond Street Bridge.	Completed	STAPLEE Score = 18 Rank = 1 out of 13	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2024 Plan update.
Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm event.	Completed	STAPLEE Score = 3 Rank = 13 out of 13	This action has been completed and is no longer considered a priority. A similar action was not identified in the 2024 Plan update.
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	Ongoing	STAPLEE Score = 14 Rank = 6 out of 13	STAPLEE Score = 14 Rank = 5 out of 14
Incorporate flood mitigation into local planning. Revise/adopt	Deferred	STAPLEE Score = 8 Rank = 10 out of 13	STAPLEE Score = 8 Rank = 11 out of 14

Mitigation Action	Current Status	Priority Level in 2017 Plan	Priority Level in 2024 Plan
regulations to improve floodplain management in Brookline according to findings from 2017 regulatory audit. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.			
Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be	Deferred	STAPLEE Score = 8 Rank = 10 out of 13	STAPLEE Score = 6 Rank = 13 out1 of 14

Mitigation Action	Current Status	Priority Level in 2017 Plan	Priority Level in 2024 Plan
given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least 2 public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.			
Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators. Drought regions and updates on the drought status may be found here.	Ongoing	STAPLEE Score = 12 Rank = 7 out of 13	STAPLEE Score = 11 Rank = 8 out of 14
Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station	Ongoing	STAPLEE Score = 16 Rank = 3 out of 13	STAPLEE Score = 17 Rank = 2 out of 14
Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on	Deferred	STAPLEE Score = 9 Rank = 9 out of 13	STAPLEE Score = 9 Rank = 10 out of 14

Mitigation Action	Current Status	Priority Level in 2017 Plan	Priority Level in 2024 Plan
critical electronic equipment at Safety Complex and Fire Station.			
Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.	Ongoing	STAPLEE Score = 17 Rank = 2 out of 13	STAPLEE Score = 18 Rank = 1 out of 14

CHAPTER 3. HAZARD IDENTIFICATION AND RISK ASSESSMENT

Section 3.1 ~ Description of Natural Hazards

The Town of Brookline is susceptible to a variety of natural hazards, which are outlined in Table 3. For each hazard type, the hazard location within the Town, extent, and impact are also noted. Extent refers to how bad the hazard can be; it is not the same as location. Examples of extent include potential wind speed, depth of flooding, and existing scientific scales (ex. Fujita Tornado Damage Scale). Impact refers to damages or consequences resulting from the hazard.

Hazards Not Included in this Plan

The State of New Hampshire identifies avalanches, landslides, and solar storms & space weather as hazards in the State Multi-Hazard Mitigation Plan Update of 2018.

Landslides and avalanches have not been included in the Brookline Hazard Mitigation Plan Update 2024. “A landslide is the downward or outward movement of earth materials on a slope that is reacting to a combination of the force of gravity and a predisposed weakness in the material that allows the sliding process to initiate” (State of NH Multi-Hazard Mitigation Plan Update 2018, pg. 115). “An avalanche is a slope failure consisting of a mass of rapidly moving, fluidized snow that slides down a mountainside. The flow can be composed of snow, ice, water, soil, rocks, and trees. An avalanche can be comparable to a landslide; only with snow instead of earth.” (State of NH Multi-Hazard Mitigation Plan Update 2018, pg. 48). Brookline has relatively stable terrain and there have been no historic landslide or snow avalanche events in town. As such, the Hazard Mitigation Team did not feel it was necessary to include these hazards in this Plan.

The State of New Hampshire also identifies Solar Storms & Space Weather as hazards. As described by the State of NH Multi-Hazard Mitigation plan (State of NH Multi-Hazard Mitigation Plan Update 2018, page 137), “The term space weather is relatively new and describes the dynamic conditions in the Earth’s outer space environment, similar to how the terms “climate” and “weather” refer to the conditions in the Earth’s lower atmosphere. Space weather includes any and all conditions and events on the sun, in the solar wind, in near-Earth space, and in our upper atmosphere that can affect space-borne and ground-based technological systems. Solar activity (solar storms) refers to solar flares, coronal mass ejections, high-speed solar wind, and energetic solar particles. Any of these events may occur for a few minutes to several hours, have the ability to affect Earth for days to weeks. All solar activity is driven by the solar magnetic field. A solar flare is an intense burst of radiation resulting from the release of sunspot magnetic energy, which can occur for minutes to hours. Solar prominence is a large, bright feature that extends outward from the sun’s surfaces. A coronal mass ejection (CME) occurs when the outer solar atmosphere’s magnetic field is closed, resulting in a confined atmosphere that suddenly explodes, releasing bubbles of gas and magnetic fields. The surface of the sun is hot electrified gas boiling up from the interior of the sun out into space- this is referred to as high-speed solar wind. Solar wind travels at 800,000 to 5 million miles per hour and carries mass the size of Utah’s Great Salt Lake into space every second; however, solar wind is 1000 million times weaker than the winds that we experience on Earth.” There have been no documented occurrences of Solar Storms &

Space weather impacting the Town, and the Brookline Hazard Mitigation team did not have enough knowledge to determine if solar storms and space weather deserved to be recognized in this plan update as a hazard.

Ice jams are described as “a backup of water into areas adjacent to floodplains can occur when a river or stream is blocked by the build-up of ice. Ice in waterways forms naturally from the freezing of water during the winter months. Melt and/or storm water may then encounter these ice formations causing them to break up and move down the river. Ice may apply lateral and/or vertical force on structures and infrastructure. Moving ice and erosion may scour abutments and riverbanks, and ice may also create temporary dams. These dams may create flood hazard conditions where no flood hazard previously existed” (State of NH Multi-Hazard Mitigation Plan Update 2018, page 69). Ice jams were not considered independently of flooding in this plan.

Erosion, as defined by FEMA’s National Flood Insurance Program, is the process of the gradual wearing away of land masses. In Brookline, erosion is largely due to riverine flooding. In this plan, erosion was not considered independently of flooding.

The Town will re-evaluate the need to include additional hazards to this plan during subsequent updates of the Plan.

Table 3—Natural Hazards in Jurisdiction

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
Climate Change	Entire jurisdiction.	See Hazard Extent descriptions for each hazard.	See Impact descriptions for each hazard.
Drought	Entire jurisdiction.	<u>NH DES Drought Management Plan</u> • Level 1—Alert • Level 2—Warning • Level 3—Emergency • Level 4—Disaster <u>US Drought Monitor</u> • D0—Abnormally Dry • D1—Moderate Drought • D2—Severe Drought • D3—Extreme Drought • D4—Exceptional Drought • S—Short term, typically less than 6 months • L—Long term, typically more than 6 months	<u>D0</u> • short term dryness slowing planting, growth of crops • some lingering water deficits • crops not fully recovered <u>D1</u> • some damage to crops • streams, reservoirs, or wells low, some water shortages developing or imminent • voluntary water-use restrictions requested <u>D2</u> • crop losses likely • water shortages common

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
			- water restrictions imposed <u>D3</u> - major crop losses - widespread water shortages or restrictions <u>D4</u> - Exceptional & widespread crop loss - Shortages of water in reservoirs, streams, & wells creating water emergencies <u>S</u> - impacts on agriculture <u>L</u> - impacts on hydrology & ecology
Earthquake	Entire jurisdiction.	<u>Richter Scale</u> <3.4—detected only by seismometers >8—total damage, surface waves seen, objects thrown in air For full definitions of Richter Scale, see Section 3.5 Vulnerability by Hazard	Structural damage or collapse of buildings. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Loss of water for fire protection. Increased risk of fire (gas break). Risk to life, medical surge.
Extreme Temperatures	Entire jurisdiction.	Extreme heat—period of 3 consecutive days when air temperature reaches 90°F or higher on each day. Extreme cold— period of 3 consecutive days of minimum temperatures at or below 0°F.	Overburdened power systems may experience failures due to extreme heat. Shortages of heating fuel in extreme cold due to high demand.

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
			Medical surge. Loss of municipal water supply for drinking water and fire protection due to freezing temperatures.
Flooding	Floodplains cover approximately 7.6% of Brookline—7.6% of Brookline is located in 1% annual floodplain and 0% of Brookline is located in the 0.2% annual floodplain. Areas prone to flooding include: • West Hill Rd • Dupaw Gould Rd • Mason Rd by Lake Potanipo bridge • Main St at General Store • Bohannon Bridge • Bond St at Nissitissit River See Section 3.5 for additional information on flood-prone areas.	FEMA flood probabilities: • 1% possibility per year • 0.2% possibility per year State of NH Dam Hazard Potential Classification system (for flooding resulting from dam/levee failure): • Class S—significant hazard • Class H—high hazard • Class L—low hazard • Class NM—non-menace For full definitions of Dam Hazard Classes, see Section 3.5 Vulnerability by Hazard	Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding.
Lightning & Hail	Entire	Lightning Activity Level:	Smoke and fire damage to

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
	jurisdiction. Areas with large populations present outdoors and large open spaces are particularly vulnerable.	• Level 1 • Level 2 • Level 3 • Level 4 • Level 5 • Level 6 For full definitions of Lightning Activity Level, see Section 3.5 Vulnerability by Hazard	structures and property. Hail damage to roofs and vehicles. Disruption to power lines, municipal communications, and 911 communications. Damage to critical electronic equipment. Injury or death to people involved in outdoor activity.
Severe Wind	Entire jurisdiction.	Saffir-Simpson Hurricane Wind Scale: • Category 1—sustained winds 74-95 mph • Category 2—sustained winds 96-110 mph • Category 3—sustained winds 111-129 mph • Category 4—sustained winds 130-156 mph • Category 5—sustained winds 157 mph or higher	Wind damage to structures and trees. Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Isolation of neighborhoods resulting from flooding. Water pressure, quality, and capacity issues impacting fire protection. Loss of natural resources.
Severe Winter Weather	Entire jurisdiction.	Depth of snow in a given time frame (ex. 2 or more inches per hour over a 12-hour period). Blizzard—violent snowstorm with minimum winds of 35 mph and visibility less than ¼ mile for 3	Disruption to road network. Damage to trees municipal communications, and 911 communications. Structural damage to

Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
		hours. Ground snow load factor. Ice Storm—Sperry-Piltz Ice Accumulation Index: • 0—little impact • 5—catastrophic damage to exposed utility systems For full definitions of Sperry-Plitz Ice Accumulation Index, see Section 3.5 Vulnerability by Hazard	roofs/collapse. Increase in CO, other hazards.
Tornado/Down burst	Entire jurisdiction.	Enhanced Fujita Tornado Damage Scale: • EF0—winds 65-85 mph • EF1—winds 86-110 mph • EF2—winds 111-135 mph • EF3—winds 136-165 mph • EF4—winds 166-200 mph • EF5—winds >200 mph	Wind damage to structures and trees. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, 911 communications, radio system. Environmental hazards resulting from damage. Medical surge. Loss of natural resources.
Wildfire	Areas particularly prone to wildfire include forested areas near residential development.	NWCG Fire Size Classification: • A—greater than 0 but less than or equal to 0.25 acres • B—0.26 to 9.9 acres • C—10.0 to 99.9 acres • D—100-299 acres • E—300 to 999 acres • F—1,000 to 4,999 acres • G—5,000 to 9,999 acres • H—10,000 to 49,999 acres • I—50,000 to 99,999 acres • J—100,000 to 499,999 acres • K—500,000 to 999,999 acres	Smoke and fire damage to structures in wild land/urban interface. Damage to habitat. Impacts to air quality. Impact to roadways. Loss of natural resources.

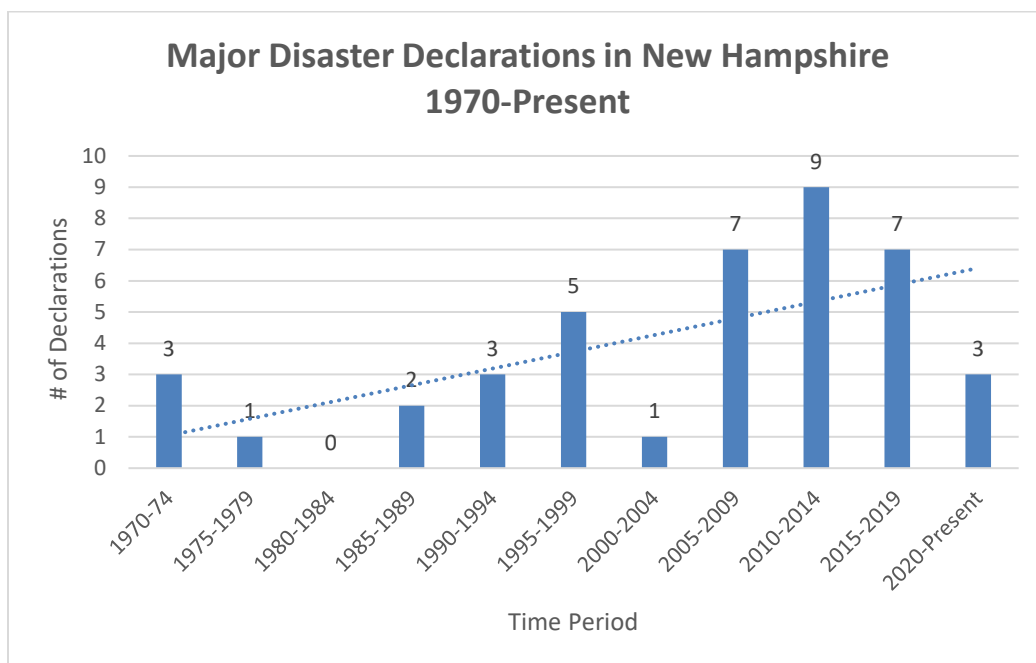
Hazard Type	Hazard Location within Jurisdiction	Hazard Extent	Impact
		L—1,000,000+ acres	
Infectious Diseases	Entire Jurisdiction. Vulnerable populations are especially at risk.	Center for Disease Control Disease Occurrence: - Endemic – Constant presence and/or usual prevalence of a disease or infection agent in a population within a geographic area - Hyperendemic – The persistent, high levels of disease occurrence - Cluster – Aggregation of cases grouped in place and time that are suspected to be greater than the number expected even though the expected number may not be known - Epidemic – An increase, usually sudden, in the number of cases of a disease above what is normally expected - Outbreak – The same as epidemic, but over a much smaller geographical area - Pandemic – Epidemic that has spread over several countries or continents, usually affecting many people	Burden on healthcare facilities, medical surge. Risk to life.

Section 3.2 ~ Probability of Future Hazard Events

After documenting the occurrence of previous hazard events in the Town of Brookline and the surrounding region, the Hazard Mitigation Team used this information to calculate the annual probability of these events occurring in the future. The first step was to determine how many times a particular hazard had occurred in a given number of years. The number of occurrences was then divided by the number of years to determine annual probability. For example, if history shows that a particular hazard typically occurs 1 time every 4 years, the annual probability is 25%. Because climate change is impacting how often future hazard events may occur, annual probability was calculated twice for each hazard. First, annual probability was calculated since the first recorded historic occurrence of the event. Second, annual probability was calculated based on occurrences since 2010 to reflect potential recent changes in hazard event occurrence rates. The probability of future hazard events for each hazard type in the Town of Brookline is outlined in Table 4.

Hazard Probability and Climate Change

Climate change is not identified as a natural hazard in this plan; however, it does have an impact on weather patterns that influence hazards identified in this plan. FEMA acknowledges in the State Mitigation Plan Review Guide, that “the challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels, could significantly alter the types and magnitudes of hazards impacting states in the future¹.” The Table below shows an overall increase in the frequency of Major Disaster Declarations in the state of New Hampshire, potentially an impact of climate change. Communities in New Hampshire are becoming more aware of the impacts of climate change on the local hazards already experienced, especially increased flooding events. Brookline is anticipating an increase in natural hazard (Drought, Extreme Temperatures, Flooding, Lightning, Severe Wind, Severe Winter Weather, Tornado/Downburst, and Wildfire) probability and severity in the future.



Source: New Hampshire Department of Safety, Declared Disaster Information as of 3/13/2024.
(<https://www.nh.gov/safety/divisions/hsem/disaster/documents/NHDisasterInfo.pdf>)

Municipal Impacts of Climate Change

Increased probability and severity of natural hazards can create a much larger impact on the critical facilities within a municipality, especially utility and transportation systems. Severe winter weather and severe wind events can result in long-term utility outages and create transportation impediments. The general population would also experience additional impacts with the increase of natural hazard probability and severity. More damage to critical facilities and municipal systems can result in extended periods of time without water, heating/cooling, and lack of access to basic services, which can be devastating to vulnerable populations.

¹ State Mitigation Plan Review Guide, FEMA, Released March 2025, Effective March 2018, Section 3.2, page 13.

Table 4—Probability of Future Hazard Events

Hazard Type	Probability of Future Event	Source
Climate Change— Drought	The frequency of short-term drought (1-3 months) in New Hampshire is predicted to increase 2-3 times in the long term (2070-2099) under the higher emissions scenario. The state will experience a more significant increase in medium-term drought (3-6 months) during this period. Short- and medium-term droughts are primarily caused by evapotranspiration as a result of hotter summers. The frequency of long-term drought (6 plus months) does not change significantly in the future under the low or high emissions scenario compared to past long-term drought events in New Hampshire (Wake et al., “Climate Change in Southern New Hampshire,” pg. 30-31).	“Climate Change in Southern New Hampshire,” Sustainability Institute, University of New Hampshire, 2014
Climate Change— Increased Precipitation	Annual average precipitation is predicted to increase 17-20% in southern New Hampshire by the end of the century under both the low and high emissions scenarios. Larger increases in precipitation are expected in the winter and spring, while summer and fall will only experience slight increases (Wake et al., “Climate Change in Southern New Hampshire,” pg. 29). Southern New Hampshire can also expect more extreme precipitation events, defined as those where more than 1 inch of rain falls within 24 hours, or more than 2-4 inches falls in 48 hours. Under both low and high emissions scenarios, the frequency of extreme precipitation events is predicted to more than double by the end of the century (Wake et al., “Climate Change in Southern New Hampshire,” pg. 29).	“Climate Change in Southern New Hampshire,” Sustainability Institute, University of New Hampshire, 2014

Hazard Type	Probability of Future Event	Source
Climate Change— Warmer Temperatures	Temperatures in southern New Hampshire will continue to rise under a lower or higher future emissions scenario. In the short-term (2010-2039), average annual temperatures are predicted to increase by approximately 2°F. Under a higher emissions scenario, long-term (2070-2099) average annual temperatures are predicted to increase by 8 to 9°F. If a lower emissions scenario is achieved, long-term average annual temperatures are predicted to increase by 4°F (Wake et al., “Climate Change in Southern New Hampshire,” pg. 23). The region is also predicted to experience more extreme heat events. From 1970-1999, southern New Hampshire had an average of seven days above 90°F each year. In the long-term under a higher emissions scenario, southern New Hampshire is predicted to have over 54 days per year above 90°F. Under a lower emissions scenario, the region is predicted to have 23 days per year above 90°F in the long-term (Wake et al., “Climate Change in Southern New Hampshire,” pg. 25).	“Climate Change in Southern New Hampshire,” Sustainability Institute, University of New Hampshire, 2014
Drought	18 years of drought from 1960 through 2023. 18 events in 63 years = .29 events per year Annual Probability = 29% 7 years of drought from 2010 through 2023. 2 events in 13 years = .15 Annual Probability = 15%	NH DES Current Drought Conditions http://des.nh.gov/organization/divisions/water/dam/drought/drought-conditions.htm US Drought Monitor http://droughtmonitor.unl.edu/Home.aspx

Hazard Type	Probability of Future Event	Source
Earthquake	History shows no known earthquakes centered in Brookline. However, this hazard is still possible. 7 magnitude 5.0 or greater earthquakes felt in NH from 1940 through 2023. 7 events in 83 years = .08 events per year Annual Probability = 8% 2 magnitude 5.0 or greater earthquakes felt in NH from 2010 through 2023. 2 events in 13 years = .15 events per year Annual Probability = 15%	US Geological Survey http://earthquake.usgs.gov/earthquakes/search/
Extreme Temperatures	28 extreme heat events from 2010 through 2023. 28 events in 13 years = 2.15 event per year Annual Probability = 100% 17 extreme cold events from 2010 through 2023. 17 events in 13 years = 1.31 event per year Annual Probability = 100%	NOAA National Climatic Data Center https://www.ncdc.noaa.gov/cdo-web/search
Flooding	14 flooding events in Hillsborough County from 1927 through 2023. 14 events in 96 years = .15 events per year Annual Probability = 15% 1 flooding events in Hillsborough	Local knowledge FEMA Presidential Disaster Declaration https://www.fema.gov/disasters/grid/year

Hazard Type	Probability of Future Event	Source
	County from 2010 through 2023. 1 event in 13 years = .08 events per year Annual Probability = 8%	
Severe Wind	12 hurricanes/tropical storms from 1938 through 2023. 12 events in 85 years = .14 events per year Annual Probability = 14% 5 hurricanes/tropical storms from 2010 through 2023. 5 events in 13 years = .38 events per year Annual Probability = 38%	Local knowledge FEMA Presidential Disaster Declaration https://www.fema.gov/disasters/grid/year National Hurricane Center http://www.nhc.noaa.gov/data/tcr/index.php?season=2014&basin=atl
Lightning & Hail	0 lightning strike events recorded in Brookline 0 significant hail events recorded in Brookline Annual Probability = 0-25%	Local knowledge and public input
Severe Winter Weather	21 severe winter weather events from 1888 through 2023. 21 events in 135 years = .16 events per year Annual Probability = 16% 4 severe winter weather events from 2010 through 2023. 4 events in 13 years = .31 events per year Annual Probability = 31%	Local knowledge FEMA Presidential Disaster Declaration https://www.fema.gov/disasters/grid/year
Tornado/Downburst	16 tornados and 1 downburst in Hillsborough Co. from 1961 through 2023.	Tornado History Project (Joshua Lietz, Storm Prediction Center, National Climatic Data Center) and public input

Hazard Type	Probability of Future Event	Source
	17 events in 62 years = .27 events per year Annual Probability = 27% 0 tornados and 0 downbursts in Hillsborough Co. from 2010 through 2023. 0 events in 13 years = 0 events per year Annual Probability = 0-25%	http://www.tornadohistoryproject.com
Wildfire	0 wildfire events have been recorded in Brookline. Annual Probability = 0-25%	Local knowledge and public input
Infectious Disease	Like the rest of the state, the Town of Brookline experiences seasonal outbreaks that occur annually such as Influenza. There is a 100% annual probability that Brookline will continue to experience some extent of infectious disease.	Local knowledge NH DHHS Infectious Disease Control https://www.dhhs.nh.gov/programs-services/disease-prevention/infectious-disease-control

Section 3.3 ~ Critical Facilities and their Vulnerability

The next step in determining Brookline’s overall vulnerability was to inventory the Town’s community assets and determine what assets would be affected by each type of hazard event. The Hazard Mitigation Team began by reviewing the Brookline Zoning Ordinance to provide information on where and how the Town builds and to identify the corridors where critical facilities would likely be located. The Team then identified the broad categories of important assets within Brookline, including critical facilities essential to health and welfare; vulnerable populations, such as children and the elderly; economic assets and major employers; areas of high-density residential and commercial development; and historic, cultural, and natural resources. The Team then further divided the Town’s critical facilities into the following categories:

1. General Occupancy

- a. Commercial
- b. Education
- c. Government
- d. Recreation
- e. Religious

- f. Residential
- 2. Essential Facilities**
 - a. Fire Station
 - b. Police Station
 - c. Department of Public Works
 - d. Schools
 - e. Emergency Operations Centers
 - f. Medical Care Facilities
- 3. Transportation Systems**
 - a. Highway Systems—Roads
 - b. Highway Systems—Bridges
 - c. Airport Systems
- 4. Utility Systems**
 - a. Communications
 - b. Electric
 - c. Water
- 5. High Potential Hazard Facilities**
 - a. Dams/Levees
- 6. Hazardous Materials Facilities**
 - a. EPA Toxics Release Inventory facilities (<http://www2.epa.gov/toxics-release-inventory-tri-program>)

The critical facilities within each category appear in Tables 5.1-5.6 below. Each table includes the critical facility's name, content vulnerability, and locational vulnerability to hazards. Note that Climate Change is not included as a hazard in this analysis because its effects on critical facilities are included under the hazards of Drought, Extreme Temperatures, and Flooding.

Table 5.1—General Occupancy Critical Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Commercial—Big Bear Lodge, 106 Rte 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Brookline Event Center, 32 Proctor Hill Rd	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Scribbles Early Learning Center, 181 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Stateline Convenience Mart, 44 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Lace’s Dance, Tumble & Cheer, 12 Main St	Potentially large population present, located in 1% annual floodplain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial—Fine Lines Auto Body, 194 Rte. 13	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Rt13 Service & Repair, 102 Rte. 13	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial – NH Superior Repair, 103 Rte. 13	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Caryn’s Convenience Store, 75 Rte. 13	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Bingham Lumber, 89 Rte. 13	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Sports Stop, 86 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Commercial—Chrysanthi's Restaurant, 204 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Dunkin Donuts, 176 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—C.L. Farwell Construction, 104 Rte. 13	Potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—Brookline Animal Hospital, 49 S Main St	Potentially large population present, contents valuable to animal health	✓	✓	✓		✓	✓	✓	✓	✓	✓
Commercial—American Legion Post 74, 38 Main St	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Education—Littleones Family Childcare, 12 Laurel Crest Drive	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Education—Creative Imaginations Child Care Center, 108 Rte. 13	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Government—Brookline Public Library, 16 Main St	Official records and documents, potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Government—Brookline Historical Society, 17 Meetinghouse Hill Rd	Official records and documents	✓	✓	✓		✓	✓	✓	✓	✓	✓
Government—Brookline Post Office, 2 Post Office Dr	Contents important to communications	✓	✓	✓		✓	✓	✓	✓	✓	✓
Recreation— Oak Hill Ball Park, Oak Hill Rd	Potentially large population present	✓		✓			✓				
Recreation— Mountain Road Ballfield, Mountain Rd	Potentially large population present	✓		✓			✓				
Recreation—Cohen Memorial Grove, 3 Mason Rd	Potentially large population present, located in the 1% annual floodplain	✓		✓	✓		✓				

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Recreation—Camp Tevya, 1 Mason Rd	Potentially large population present, located in the 1% annual floodplain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Recreation— Brookline Ballpark, 11 Frances Dr	Potentially large population present	✓		✓			✓				
Religious—Brookline Community Church, 2 Main St	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Religious—Brookline Chapel/Brusch Hall, 36 Main St	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Residential—Field & Stream RV Park, 7 Dupaw Gould Rd	Large population present, contents have personal value to owners	✓	✓	✓		✓	✓	✓	✓	✓	✓
Residential—Multifamily Home, 17 Main St	Large population present, contents have personal value to owners	✓	✓	✓		✓	✓	✓	✓	✓	✓

Table 5.2—Essential Facilities

Facility Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Brookline Safety Complex—Police and Ambulance, 3 Post Office Dr	Contents and staff valuable to emergency management, generator	✓	✓	✓		✓	✓	✓	✓	✓	✓
Brookline Fire Department – 4 Bond St	Contents and staff valuable to emergency management, generator	✓	✓	✓		✓	✓	✓	✓	✓	✓
Brookline Public Works – 42 N Mason Rd	Contents valuable to municipal operations, potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓

Facility Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Brookline Town Hall – 1 Main St	Contents valuable to municipal operations, parcel located in 1% annual floodplain (building footprint is outside of floodplain)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Captain Samuel Douglass Academy – 24 Townsend Hill Rd	Potentially large population present, generator	✓	✓	✓		✓	✓	✓	✓	✓	✓
Richard Maghakian Memorial School – 22 Milford St	Potentially large population present	✓	✓	✓		✓	✓	✓	✓	✓	✓
Brookline Transfer Station – 38 N Mason Rd	Potentially large population present, potentially hazardous materials present	✓	✓	✓		✓	✓	✓	✓	✓	✓

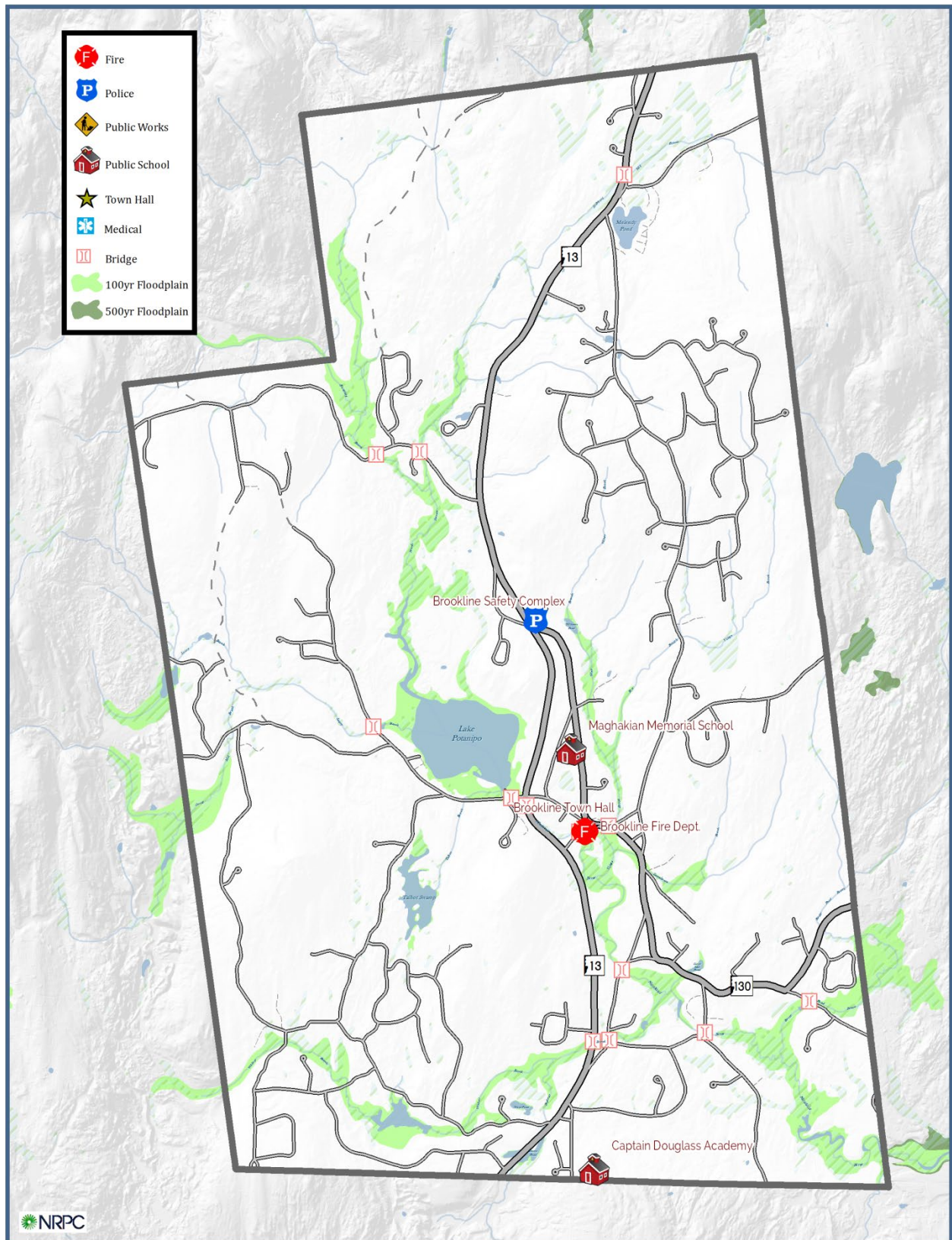


Table 5.3—Transportation Critical Facilities

Transportation infrastructure is particularly vulnerable to flooding hazards. Flooding events frequently cause culvert failures and undermine bridges and roads. Brookline has a total of 67.95 road miles, of which 8.68 miles or 13% are located in the 1% annual floodplain.

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Highway System—Proctor Hill Road Bridge	Structure valuable to motor vehicle travel and safety		✓			✓		✓	✓		
Highway System—Main Street Bridge	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Route 13 Bridge, near Averill Road	Structure valuable to motor vehicle travel and safety		✓			✓		✓	✓		
Highway System—Route 13 Bridge, near South Main Street	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Route 13 Bridge, near Mason Road	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Route 13 Bridge, near Hood Road	Structure valuable to motor vehicle travel and safety		✓			✓		✓	✓		
Highway System—Bond Street Bridge	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—West Hill Road culvert	Structure valuable to motor vehicle travel and safety, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—North Mason Road	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Mason Road	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Highway System—Route 13	Structure valuable to motor vehicle travel, evacuation route, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Bond Street	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Main Street	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—South Main Street	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Pepperell Road	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Highway System—Averill Road	Structure valuable to motor vehicle travel, portions located in 1% annual floodplain		✓		✓	✓		✓	✓		
Brookline Airport	Structure valuable to air traffic		✓			✓	✓	✓	✓	✓	

Table 5.4—Utility Systems

Facility Type and Name	Content Vulnerability										
		Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Communication—AT&T Communications Tower, North Mason Rd	Structure valuable to communications and emergency management		✓			✓	✓		✓	✓	
Communication—US Cellular Tower, Ball Hill	Structure valuable to communications and emergency management		✓			✓	✓		✓	✓	
Communication—US Cellular Tower, Potanipo Hill	Structure valuable to communications and emergency management		✓			✓	✓		✓	✓	
Electric (Eversource)—critical facilities are limited to distribution system (poles & wires), including transformers and other electrical equipment. Eversource has no substations or transmission lines in Brookline.	Structure valuable to utility network		✓			✓	✓	✓	✓	✓	
Water—there are no community water supplies in Brookline. Water supply systems include private wells, transient non-community wellheads, and non-transient non-community wellheads.	Structures valuable to water supply, 6 transient non-community wellheads in 1% floodplain, 3 non-transient non-community wellheads in 1% floodplain, 11 active wellheads in 1% floodplain, 4 active pump houses in 1% floodplain	✓			✓						

Table 5.5—High Potential Hazard Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Name—Potanipo Pond Dam Dam # D033004 Hazard Class—NM Water body—Nissitissit River Owner—privately held	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Name—Pierce Pond Dam Dam # D033006 Hazard Class—H Water body—Wolf Brook Owner—Town of Brookline	Structure valuable to flood control		✓			✓		✓	✓		
Name—Pultz Dam Dam # D033009 Hazard Class—NM Water body—Rocky Pond Brook Owner—privately held	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Name—Rocky Pond Brook Dam Dam # D033010 Hazard Class—NM Water body—Rocky Pond Brook Owner—privately held	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	✓		✓	✓		
Name—Scabbard Brook Dam Dam # D033011 Hazard Class—NM Water body—Scabbard Brook Owner—privately held	Structure valuable to flood control		✓			✓		✓	✓		
Name—Mountain Road Estates Dam Dam # D033012 Hazard Class—NM Water body—unnamed stream Owner—privately held	Structure valuable to flood control		✓			✓		✓	✓		

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Name—Taylor Pond Dam Dam # D033013 Hazard Class—L Water body—Talbot Brook Owner—Brookline Conservation Commission	Structure valuable to flood control		✓			✓		✓	✓		
Name—Birch Hill Estates Det Pond Dam Dam # D033017 Hazard Class—NM Water body—runoff Owner—privately held	Structure valuable to flood control		✓			✓		✓	✓		
Name—Williams Pond Dam Dam # D033018 Hazard Class—NM Water body—West Brook Owner—privately held	Structure valuable to flood control, located in 1% annual floodplain		✓		✓	✓		✓	✓		

Table 5.6—Hazardous Materials Facilities

Facility Type and Name	Content Vulnerability	Drought	Earthquake	Extreme Temperatures	Flooding	Severe Wind	Lightning & Hail	Severe Winter Weather	Tornado	Wildfire	Infectious Disease
Hydraulic Equipment Inc. – 197 Rte. 13	Chemical and hazardous materials release could have impacts on public health and environmental quality. To date, no chemicals have been released by this facility.	✓	✓			✓	✓	✓	✓	✓	✓
Two Daves Auto Inc. – 1 Averill Rd	Chemical and hazardous materials release could have impacts on public health and environmental quality. To date, no chemicals have been released by this facility. Portions of this site are located in the 1% floodplain.	✓	✓		✓	✓	✓	✓	✓	✓	

Climate Change

Climate change in southern New Hampshire will impact the environment, ecosystem services, economy, public health, and quality of life. According to a 2014 study by the Sustainability Institute at the University of NH, southern NH is expected to become warmer and wetter over the next century with more extreme precipitation events. This weather pattern puts significant stress on the region's already aging water infrastructure. Furthermore, climate change is likely to cause a number of public health impacts on NH's most vulnerable residents, including heat stress; flood related deaths and injuries; respiratory and cardiovascular illness, including asthma; allergies; vector, food, and water-borne disease; chronic disease; and mental health and stress-related disorders. Despite efforts taking place to slow the rate of climate change, some level of change is inevitable. Therefore, municipalities must make sound decisions to help their communities adapt to a new climate normal.

Temperatures in southern New Hampshire will continue to rise under a lower or higher future emissions scenario. In the short-term (2010-2039), average annual temperatures are predicted to increase by approximately 2°F. Under a higher emissions scenario, long-term (2070-2099) average annual temperatures are predicted to increase by 8 to 9°F. If a lower emissions scenario is achieved, long-term

average annual temperatures are predicted to increase by 4°F (Wake et al., “Climate Change in Southern New Hampshire,” pg. 23). The region is also predicted to experience more extreme heat events. From 1970-1999, southern New Hampshire had an average of seven days above 90°F each year. In the long-term under a higher emissions scenario, southern New Hampshire is predicted to have over 54 days per year above 90°F. Under a lower emissions scenario, the region is predicted to have 23 days per year above 90°F in the long-term (Wake et al., “Climate Change in Southern New Hampshire,” pg. 25).

Annual average precipitation is predicted to increase 17-20% in southern New Hampshire by the end of the century under both the low and high emissions scenarios. Larger increases in precipitation are expected in the winter and spring, while summer and fall will only experience slight increases (Wake et al., “Climate Change in Southern New Hampshire,” pg. 29). Southern New Hampshire can also expect more extreme precipitation events, defined as those where more than 1 inch of rain falls within 24 hours or more than 2-4 inches falls in 48 hours. Under both low and high emissions scenarios, the frequency of extreme precipitation events is predicted to more than double by the end of the century (Wake et al., “Climate Change in Southern New Hampshire,” pg. 29).

The frequency of short term drought (1-3 months) in New Hampshire is predicted to increase 2-3 times in the long term (2070-2099) under the higher emissions scenario. The state will experience a more significant increase in medium-term drought (3-6 months) during this period. Short and medium term droughts are primarily caused by evapotranspiration as a result of hotter summers. The frequency of long-term drought (6 plus months) does not change significantly in the future under the low or high emissions scenario compared to past long-term drought events in New Hampshire (Wake et al., “Climate Change in Southern New Hampshire,” pg. 30-31).

Climate Change Hazard Loss Estimate

Because the impacts of climate are wide ranging and have little historic data to draw from, it is beyond the scope of this Plan to estimate the dollar value of losses to the municipality resulting from climate change.

Some insights on the municipality’s vulnerability to climate change may be gained by examining the results of the Nashua Region Water Vulnerability Assessment, conducted by the Nashua Regional Planning Commission in 2016. Based on the results of the vulnerability assessment, the Nashua Region is most vulnerable to threats related to warmer temperatures and threats that affect water supply.

Threats related to warmer temperatures are highly likely to occur, are broad ranging, have critical severity, and moderately effective mitigation options. In addition, while the region has experience with flooding (and drought to a smaller extent), the region has no experience with warming temperatures to provide historical guidance.

Threats that affect water supply are likely to occur, have moderate to critical severity, will likely affect between 10 and 50% of the region’s population, and have moderately effective mitigation options. There are numerous threats in this category, and they have broad implications from public health and safety to agriculture and the economy.

It may also be helpful to review the Drought, Extreme Temperatures, and Flooding sections in this Plan for more insight on the municipality's vulnerability to climate change.

There have been no State disaster declarations since the last plan update.

Drought

Hydrological drought is evidenced by extended periods of negative departures from normal rainfall. New Hampshire has been under several drought warnings, including a drought emergency, since 1999. The most severe drought conditions occurred between 1960 and 1969; the event had a greater than 25-year recurrence interval. The southern New Hampshire region experienced a 100-year drought event from 1964 to 1965.

Southern New Hampshire also experienced a 50-year drought event beginning in the summer of 2016. In September 2016, Brookline was under Long-term (L), Extreme Drought (D3) conditions, according to the US Drought Monitor. As of May 9, 2023, Brookline is no longer experiencing drought conditions.

Although drought is not likely to damage structures, low water levels can have a negative impact on existing and future home sites, especially those that depend on groundwater for water needs. Additionally, the dry conditions of a drought may lead to an increase wildfire risk. Drought can cause the most significant impact to agricultural land and assets.

On September 26, 2016, the Brookline Selectmen adopted an ordinance prohibiting any residential lawn watering, per RSA 41:11-d. It became effective on October 2, 2016, and remains in effect as of the writing of this Plan. The ordinance was adopted in response to the historic drought, which left some Brookline residents experiencing water supply shortages.

Previous Occurrences of Drought

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
1960-1969	Entire jurisdiction	Long term drought—9 years of less than normal precipitation	Farms had minimal grass for grazing animals and poor crops. Wells went dry for 2 consecutive years in mid-1960s.
1999	Entire jurisdiction	Level 2—Warning. Drought warning issued on June 29, 1999.	Damage to crops. Low water levels in dug wells.
March 2002	Entire jurisdiction	Level 3—Emergency. First time Level 3 Drought Impact Level had been declared.	Damage to crops. Low water levels in dug wells.
2016	Entire jurisdiction	USDA D2 (Severe Drought)	Brookline BOS utilized RSA 41:11-d

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
			to restrict all residential lawn watering. Low water levels in wells.
January-March 2017	Entire jurisdiction	USDA D2 (Severe Drought)	Damage to crops. Low water levels in dug wells.
April 2017	Entire jurisdiction	USDA D1 (Moderate Drought)	Low water levels in wells.
June-July 2018	Entire jurisdiction	USDA D0 (Abnormally Dry)	Damage to crops.
September-October 2019	Entire jurisdiction	USDA D0 (Abnormally Dry)	Damage to crops.
May 26-June 22 2020	Entire jurisdiction	USDA D0 (Abnormally Dry)	Damage to crops.
June 23 - August, 2020	Entire jurisdiction	USDA D1 (Moderate Drought)	Low water levels in wells.
September - October 2020	Entire Jurisdiction	USDA D2 (Severe Drought)	Damage to crops. Low water levels in dug wells.
March 30 – April 12 2021	Entire Jurisdiction	USDA D0 (Abnormally Dry)	Low water levels in wells.
July 2022 – September 26, 2022	Entire Jurisdiction	USDA D1 (Moderate Drought). 90% of the county experienced D2 conditions throughout September. Some southern areas of the state experienced D3 (extreme drought) conditions from mid to late August.	Specialty crops are impacted in both yield and fruit size. Warnings are issued on water use and outdoor burns, and possible poor air quality
October 2022	Entire Jurisdiction	USDA D0 (Abnormally Dry)	Low water levels in wells.

Drought Hazard Loss Estimate

Because the impacts of drought are long lasting and wide ranging, it is beyond the scope of this Plan to estimate the dollar value of losses to Brookline resulting from drought. Instead, the Hazard Mitigation Team estimated the percentage of land in Brookline vulnerable to drought and the percentage of the population vulnerable to drought as a quantitative measure of this hazard's impact.

Total Acres of Land in Brookline	Total Acres of Agricultural Land in Brookline	% of Land in Brookline Vulnerable to Drought
12,756	0	0%

% of population with Public Drinking Water in Brookline	% of population with Private Well Water in Brookline	Water Utility	Primary Water Source	Secondary Water Source
0%	100%	None	Private Wells	None

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Drought Hazard Area	Percentage of this type of Critical Facilities in Drought Hazard Area
General Occupancy	30	30	100%
Essential Facilities	7	7	100%
Transportation	17	0	0%
Utility System	5	1	20%
High Potential Hazard	9	0	0%
Hazardous Materials	1	1	100%

Earthquake

The Richter magnitude scale was developed by Charles F. Richter in 1935 as a way to compare the size of earthquakes. The magnitude of an earthquake is calculated from the logarithm of the amplitude of waves recorded by seismographs.

- Magnitude <2.0—micro-earthquakes. Recorded by seismographs, but not felt or rarely felt by people. Several million occur annually worldwide on average.
- Magnitude 2.0-2.9—felt slightly by some people. No damage to buildings. Over 1 million occur annually worldwide on average.
- Magnitude 3.0-3.9—often felt by people but very rarely cause damage. Shaking of indoor objects can be noticeable. Over 100,000 occur annually worldwide on average.
- Magnitude 4.0-4.9—noticeable shaking of indoor objects and rattling noises. Felt by most people in affected area. Generally causes minimal to no damage. Moderate to significant damage is very unlikely. 10,000-15,000 occur annually worldwide on average.
- Magnitude 5.0-5.9—felt by everyone. Can cause damage of varying severity to poorly constructed buildings; slight to no damage to all other buildings. Few, if any, casualties. 1,000-1,500 occur annually worldwide on average.
- Magnitude 6.0-6.9—felt up to hundreds of miles from epicenter. Strong to violent shaking in epicenter. Damage to many buildings in populated areas. Poorly designed structures have moderate to severe damage. Earthquake-resistant structures have slight to moderate damage. Damage can be caused far from epicenter. Death toll up to 25,000. 100-150 occur annually worldwide on average.
- Magnitude 7.0-7.9—felt in very large area. Damage to most buildings, including partial or complete collapse. Death toll up to 250,000. 10-20 occur annually worldwide on average.

- Magnitude 8.0-8.9—felt in extremely large region. Major damage to buildings over large areas. Structures likely destroyed. Moderate to heavy damage to sturdy or earthquake-resistant buildings. Death toll up to 1 million. 1 occurs annually worldwide on average.
- Magnitude 9.0+ —damage and shaking extends to distant locations. Near or total destruction. Severe damage and collapse to all buildings. Permanent changes in ground topography. 1 occurs every 10-50 years worldwide on average.

Since 1940, there have been 14 earthquakes centered in NH with a magnitude of 3.0 or greater and only two earthquakes with a magnitude of 5.0 or greater. There have been no recorded earthquakes to-date centered in Brookline; however, one could occur.

Previous Occurrences of Earthquakes

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
	There have been no earthquakes centered in Brookline to date. Earthquakes noted below were centered in NH.	Earthquakes noted below had a magnitude of 2.5 or greater.	
December 20, 1940	Lake Ossipee, NH	Magnitude 5.5 on Richter Scale	No damage in Brookline
December 24, 1940	Lake Ossipee, NH	Magnitude 5.5 on Richter Scale	No damage in Brookline
December 4, 1963	Laconia, NH (43.6 latitude, -71.5 longitude)	Magnitude 3.7 on Richter Scale	No damage in Brookline
June 28, 1981	Sanbornton, NH (43.56 latitude, -71.56 longitude)	Magnitude 3.0 on Richter Scale	No damage in Brookline
January 19, 1982	Sanbornton, NH (43.5 latitude, -71.6 longitude)	Magnitude 4.7 on Richter Scale	No damage in Brookline
October 25, 1986	Northfield, NH (43.399 latitude, -71.59 longitude)	Magnitude 3.9 on Richter Scale	No damage in Brookline
October 20, 1988	Milan, NH (44.539 latitude, -71.158 longitude)	Magnitude 3.9 on Richter Scale	No damage in Brookline
November 22, 1988	Milan, NH (44.557 latitude, -71.183 longitude)	Magnitude 3.2 on Richter Scale	No damage in Brookline
April 6, 1989	Berlin, NH (44.511 latitude, -71.144 longitude)	Magnitude 3.5 on Richter Scale	No damage in Brookline
October 6, 1992	Canterbury, NH (43.324 latitude, -71.578 longitude)	Magnitude 3.4 on Richter Scale	No damage in Brookline

June 16, 1995	Lyman, NH (44.286 latitude, - 71.915 longitude)	Magnitude 3.8 on Richter Scale	No damage in Brookline
August 21, 1996	Bartlett, NH (44.184 latitude, - 71.352 longitude)	Magnitude 3.8 on Richter Scale	No damage in Brookline
January 27, 2000	Raymond, NH (43.00 latitude, - 71.18 longitude)	Magnitude 3.0 on Richter Scale	No damage in Brookline
September 26, 2010	Boscawen, NH (43.2915 latitude, - 71.6568 longitude)	Magnitude 3.4 on Richter Scale	No damage in Brookline
October 11, 2013	Contoocook, NH (43.255 latitude, - 71.747 longitude)	Magnitude 2.6 on Richter Scale	No damage in Brookline
March 21, 2016	Contoocook, NH (43.264 latitude, - 71.767 longitude)	Magnitude 2.8 on Richter Scale	No damage in Brookline
February 11, 2017	Bedford, NH (42.946°N latitude, 71.541°W longitude)	Magnitude 2.2 on Richter Scale	No damage in Brookline
February 15, 2018	East Kingston, NH (42.921°N latitude, 71.011°W longitude)	Magnitude 2.7 on Richter Scale	No damage in Brookline
February 4, 2022	Gorham, NH (44.386°N latitude, 71.175°W longitude)	Magnitude 2.9 on Richter Scale	No damage in Brookline
April 25, 2023	Center Sandwich, NH (43.780°N 71.480°W)	Magnitude 2.9 on Richter Scale	No damage in Brookline
December 23, 2023	Chichester, NH (43.217°N latitude 71.445°W longitude)	Magnitude 2.7 on Richter Scale	No damage in Brookline
June 18, 2024	Haverhill, NH (44.016°N latitude 72.035°W longitude)	Magnitude 2.6 on Richter Scale	No damage in Brookline
	Earthquakes noted below were centered outside of NH but were felt by NH municipalities.		
November 18, 1929	Grand Banks, Newfoundland	Magnitude 7.2 on Richter Scale	No damage in Brookline
November 1, 1935	Timiskaming, Canada	Magnitude 6.25 on Richter Scale	No damage in Brookline
June 15, 1973	Near Canadian/NH border	Magnitude 4.8 on Richter Scale	No damage in Brookline
June 23, 2010	Buckingham, Quebec, Canada	Magnitude 5.0 on Richter Scale	No damage in Brookline
August 23, 2011	Washington, DC	Magnitude 5.8 on Richter Scale	No damage in Brookline
October 16, 2012	Hollis Center, ME	Magnitude 4.0 on	No damage in Brookline

		Richter Scale	
May 17, 2013	Shawville, Canada	Magnitude 5.1 on Richter Scale	No damage in Brookline
November 11, 2017	Little Creek, DE	Magnitude 4.1 on Richter Scale	No damage in Brookline
January 15, 2019	Ocean City, MD	Magnitude 4.6 on Richter Scale	No damage in Brookline
November 8, 2020	Bliss Corner, MA	Magnitude 3.6 on Richter Scale	No damage in Brookline
April 5, 2024	Tewksbury, NJ	Magnitude 4.8 on Richter Scale	No damage in Brookline

Earthquake Hazard Loss Estimate

Step 1. Determine potential earthquake strength in Brookline

- US Seismic Hazard, 2% in 50 years PGA is 0.14 to 0.2(g) in Brookline
- Source: [*USGS NH Seismic Map 2014*](#)

Step 2. Determine percent building damage ratio to single family residence from PGA (g) 0.15 earthquake

- Wood Frame Construction with Low general seismic design level = 1.3% building damage
- Source: [*FEMA Identifying Hazards and Estimating Losses*](#), pg. 4-17

Step 3. Determine percent of structures in Brookline that would be damaged by PGA (g) 0.15 earthquake

- 1-5% of structures estimated to be damaged by earthquake
- Source: *Brookline Hazard Mitigation Team (no historical data on earthquake damage in Brookline)*

Step 4. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000
- Source: *Brookline Assessing Department (September 2023)*

Step 5. Determine total loss from PGA (g) 0.15 Earthquake

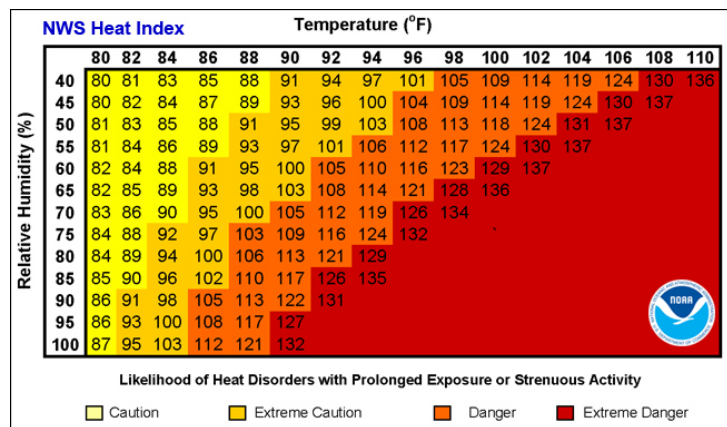
- Total Loss from Earthquake = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Earthquake = \$599,250,000 * .01 * .013 = \$77,902.50
- Total Loss from Earthquake = \$599,250,000 * .05 * .013 = \$389,512.50
- **\$77,903 to \$389,513**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Earthquake Hazard Area	Percentage of this type of Critical Facilities in Earthquake Hazard Area
General Occupancy	30	26	87%
Essential Facilities	7	7	100%
Transportation	17	17	100%
Utility System	5	4	80%
High Potential Hazard	9	9	100%
Hazardous Materials	1	1	100%

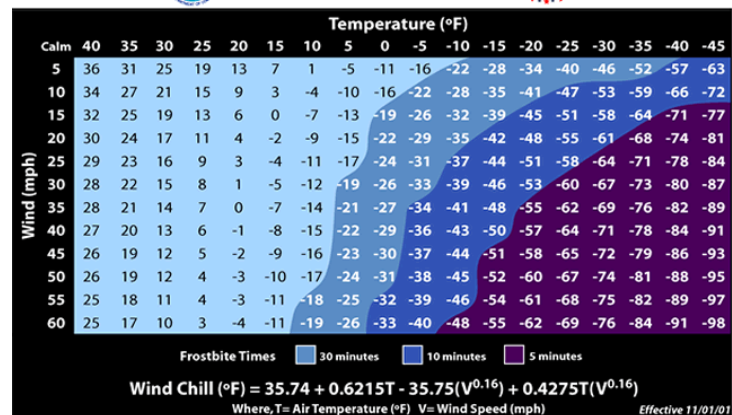
Extreme Temperatures

Extreme temperatures can be broken into both extreme heat and extreme cold. Though the hazards are different, the effects would be similar to vulnerable populations in Brookline.

A heat wave can be defined as a prolonged period of excessive heat, often combined with excessive humidity. Heat kills by pushing the human body beyond its limits. The risk of heat-related illness increases as temperature and humidity levels rise. Extreme heat events can be defined as periods with temperatures of 90 degrees Fahrenheit or higher. Extreme heat should not be confused with a drought (extended periods of negative departures from normal rainfall). Overburdened power networks may experience failures due to the impacts of extreme heat. The National Weather Service (above) illustrates the probability of heat disorders with prolonged exposure or strenuous activity.



Wind Chill Chart



Extreme cold is defined as an extended period where temperatures are at or below 0 degrees Fahrenheit. With the rising costs of heating fuel and electric heat, many low-income or homeless citizens are not able to adequately heat their homes, exposing themselves to cold related emergencies or death. Extremely cold winters can lead to shortages in heating fuels due to high demand. The National Weather Service Windchill Chart (right) depicts the dangers of freezing temperatures and winds.

Extreme Temperatures Hazard Loss Estimate

Because the impacts of extreme temperatures can result in the loss of life, it is beyond the scope of this Plan to estimate the dollar value of losses to Brookline resulting from extreme temperatures. Though the entire Brookline population may experience a thermal emergency, populations without adequate climate control are most at risk. Extreme temperatures are not likely to cause damage to structures, although pipes can burst in extreme cold conditions.

Previous Occurrences of Extreme Temperatures

Hazard	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Extreme Temperature (Cold)	January 16-20, 2000	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 1/16/00: -3°F • 1/17/00: -2°F • 1/18/00: -5°F • 1/19/00: -6°F • 1/20/00: -4°F	No known impact in Brookline
Extreme Temperature (Cold)	January 28-30, 2000	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/28/00: -6°F • 1/29/00: -2°F • 1/30/00: -4°F	No known impact in Brookline
Extreme Temperature (Cold)	January 18-20, 2003	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/18/00: -9°F • 1/19/00: -11°F • 1/20/00: -11°F	No known impact in Brookline
Extreme Temperature (Cold)	January 28-31, 2003	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/28/03: -9°F • 1/29/03: -5°F • 1/30/03: -0°F • 1/31/03: -0°F	No known impact in Brookline
Extreme Temperature (Cold)	February 13-17, 2003	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 2/13/03: -3°F • 2/14/03: -11°F • 2/15/03: -10°F • 2/16/03: -7°F	No known impact in Brookline

			• 2/17/03: -2°F	
Extreme Temperature (Cold)	February 26-28, 2003	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 2/26/03: -4°F • 2/27/03: -6°F • 2/28/03: -1°F	No known impact in Brookline
Extreme Temperature (Cold)	January 9-12, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/9/04: -7°F • 1/10/04: -8°F • 1/11/04: -8°F • 1/12/04: -7°F	No known impact in Brookline
Extreme Temperature (Cold)	January 14-17, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/14/04: -10°F • 1/15/04: -10°F • 1/16/04: -12°F • 1/17/04: -9°F	No known impact in Brookline
Extreme Temperature (Cold)	January 24-27, 2004	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/24/04: -4°F • 1/25/04: -6°F • 1/26/04: -6°F • 1/27/04: -0°F	No known impact in Brookline
Extreme Temperature (Cold)	January 18-25, 2005	Entire jurisdiction	8 consecutive days of minimum temperatures at or below 0°F: • 1/18/05: 0°F • 1/19/05: -8°F • 1/20/05: -3°F • 1/21/05: -5°F • 1/22/05: -12°F • 1/23/05: -9°F • 1/24/05: 0°F • 1/25/05: -1°F	No known impact in Brookline
Extreme Temperature (Cold)	January 28-30, 2005	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 2/28/05: -1°F • 2/29/05: -7°F • 2/30/05: -5°F	No known impact in Brookline

Extreme Temperature (Cold)	January 16-18, 2009	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/16/09: -16°F • 1/17/09: -16°F • 1/18/09: -9°F	No known impact in Brookline
Extreme Temperature (Cold)	January 25-27, 2009	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/25/09: -7°F • 1/26/09: -7°F • 1/27/09: -5°F	No known impact in Brookline
Extreme Temperature (Cold)	January 15-18, 2011	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/15/11: -6°F • 1/16/11: -5°F • 1/17/11: 0°F • 1/18/11: -2°F	No known impact in Brookline
Extreme Temperature (Cold)	January 23-27, 2011	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 1/23/05: -5°F • 1/24/05: -10°F • 1/25/05: -9°F • 1/26/05: -3°F • 1/27/05: -2°F	No known impact in Brookline
Extreme Temperature (Cold)	January 15-17, 2012	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/15/12: -2°F • 1/16/12: -2°F • 1/17/12: 0°F	No known impact in Brookline
Extreme Temperature (Cold)	January 3-5, 2014	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/3/14: 0°F • 1/4/14: -16°F • 1/5/14: -14°F	No known impact in Brookline
Extreme Temperature (Cold)	January 23-25, 2014	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/23/14: -1°F • 1/24/14: -6°F	No known impact in Brookline

			1/25/14: 0°F	
Extreme Temperature (Cold)	February 7-9, 2014	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: 2/7/14: -7°F 2/8/14: -7°F 2/9/14: -2°F	No known impact in Brookline
Extreme Temperature (Cold)	February 11-13, 2014	Entire jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: 2/11/14: -10°F 2/12/14: -10°F 2/13/14: -9°F	No known impact in Brookline
Extreme Temperature (Cold)	March 4-8, 2014	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: 3/4/14: -5°F 3/5/14: -4°F 3/6/14: -4°F 3/7/14: -6°F 3/8/14: -4°F	No known impact in Brookline
Extreme Temperature (Cold)	January 8-12, 2015	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: 1/8/15: -7°F 1/9/15: -7°F 1/10/15: -2°F 1/11/15: -3°F 1/12/15: 0°F	No known impact in Brookline
Extreme Temperature (Cold)	February 1-4, 2015	Entire jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: 2/1/15: -8°F 2/2/15: -8°F 2/3/15: -5°F 2/4/15: -8°F	No known impact in Brookline
Extreme Temperature (Cold)	February 14-19, 2015	Entire jurisdiction	6 consecutive days of minimum temperatures at or below 0°F: 2/14/15: -13°F 2/15/15: -7°F 2/16/15: -6°F 2/17/15: -4°F 2/18/15: -5°F 1/19/15: -5°F	No known impact in Brookline

Extreme Temperature (Cold)	February 28-March 4, 2015	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 2/28/15: -11°F • 3/1/15: -11°F • 3/2/15: 0°F • 3/3/15: -1°F • 3/4/15: 0°F	No known impact in Brookline
Extreme Temperature (Cold)	February 12-16, 2016	Entire jurisdiction	5 consecutive days of minimum temperatures at or below 0°F: • 2/12/16: -7°F • 2/13/16: -7°F • 2/14/16: -13°F • 2/15/16: -13°F • 2/16/16: -12°F	No known impact in Brookline
Extreme Temperature (Cold)	December 28-31, 2017	Entire Jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 12/28/17: -7°F • 12/29/17: -9°F • 12/30/17: -6°F • 12/31/17: -11°F	No known impact in Brookline
Extreme Temperature (Cold)	January 1-3, 2018	Entire Jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/1/18: -5°F • 1/2/18: -14°F • 1/3/18: -13°F	No known impact in Brookline
Extreme Temperature (Cold)	January 31-February 3, 2019	Entire Jurisdiction	4 consecutive days of minimum temperatures at or below 0°F: • 1/31/19: -2°F • 2/1/19: -5°F • 2/2/19: -5°F • 2/3/19: -1°F	No known impact in Brookline
Extreme Temperature (Cold)	January 15-17, 2022	Entire Jurisdiction	3 consecutive days of minimum temperatures at or below 0°F: • 1/15/22: -2°F • 1/16/22: -6°F • 1/17/22: 0°F	No known impact in Brookline
				No known impact in Brookline
Extreme Temperature (Heat)	May 3-5, 2001	Entire jurisdiction*	3 consecutive days of temperatures	No known impact in Brookline

			above 90°F: • 5/3/01—93°F • 5/4/01—92°F • 5/5/01—92°F	
Extreme Temperature (Heat)	June 15-17, 2001	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/15/01—92°F • 6/16/01—95°F • 6/17/01—91°F	No known impact in Brookline
Extreme Temperature (Heat)	July 22-26, 2001	Entire jurisdiction	5 consecutive days of temperatures above 90°F: • 7/22/01—90°F • 7/23/01—90°F • 7/24/01—92°F • 7/25/01—95°F • 7/26/01—93°F	No known impact in Brookline
Extreme Temperature (Heat)	August 7-10, 2001	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 8/7/01—94°F • 8/8/01—97°F • 8/9/01—96°F • 8/10/01—100°F	No known impact in Brookline
Extreme Temperature (Heat)	July 2-5, 2002	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/2/02—90°F • 7/3/02—95°F • 7/4/02—98°F • 7/5/02—97°F	No known impact in Brookline
Extreme Temperature (Heat)	July 30-August 2, 2002	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/30/02—90°F • 7/31/02—91°F • 8/1/02—91°F • 8/2/02—93°F	No known impact in Brookline
Extreme Temperature (Heat)	August 13-20, 2002	Entire jurisdiction	8 consecutive days of temperatures above 90°F: • 8/13/02—94°F • 8/14/02—96°F • 8/15/02—98°F • 8/16/02—95°F • 8/17/02—94°F • 8/18/02—92°F • 8/19/02—94°F • 8/20/02—92°F	No known impact in Brookline
Extreme	June 25-28, 2003	Entire jurisdiction	4 consecutive days	No known impact in

Temperature (Heat)			of temperatures above 90°F: • 6/25/03—90°F • 6/26/03—93°F • 6/27/03—92°F • 6/28/03—92°F	Brookline
Extreme Temperature (Heat)	July 5-7, 2003	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 7/5/03—91°F • 7/6/03—90°F • 7/7/03—91°F	No known impact in Brookline
Extreme Temperature (Heat)	July 17-19, 2006	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 7/17/06—90°F • 7/18/06—93°F • 7/19/06—94°F	No known impact in Brookline
Extreme Temperature (Heat)	August 2-4, 2006	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 8/2/06—96°F • 8/3/06—97°F • 8/4/06—92°F	No known impact in Brookline
Extreme Temperature (Heat)	August 16-20, 2006	Entire jurisdiction	5 consecutive days of temperatures above 90°F: • 8/16/09—90°F • 8/17/09—90°F • 8/19/09—91°F • 8/19/09—93°F • 8/20/09—90°F	No known impact in Brookline
Extreme Temperature (Heat)	July 4-10, 2010	Entire jurisdiction	7 consecutive days of temperatures above 90°F: • 7/4/10—90°F • 7/5/10—90°F • 7/6/10—97°F • 7/7/10—98°F • 7/8/10—97°F • 7/9/10—92°F • 7/10/10—92°F	No known impact in Brookline
Extreme Temperature (Heat)	July 17-20, 2010	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/17/10—93°F • 7/18/10—93°F • 7/19/10—93°F • 7/20/10—90°F	No known impact in Brookline
Extreme Temperature (Heat)	August 30-Sept. 3, 2010	Entire jurisdiction	5 consecutive days of temperatures	No known impact in Brookline

			above 90°F: • 8/30/10—92°F • 8/31/10—91°F • 9/1/10—94°F • 9/2/10—95°F • 9/3/10—96°F	
Extreme Temperature (Heat)	July 21-24, 2011	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/21/11—92°F • 7/22/11—96°F • 7/23/11—101°F • 7/24/11—96°F	No known impact in Brookline
Extreme Temperature (Heat)	June 21-23, 2012	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/21/12—96°F • 6/22/12—94°F • 6/23/12—93°F	No known impact in Brookline
Extreme Temperature (Heat)	July 13-16, 2012	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 7/13/12—92°F • 7/14/12—92°F • 7/15/12—93°F • 7/16/12—91°F	No known impact in Brookline
Extreme Temperature (Heat)	August 3-6, 2012	Entire jurisdiction	4 consecutive days of temperatures above 90°F: • 8/3/12—91°F • 8/4/12—94°F • 8/5/12—95°F • 8/6/12—93°F	No known impact in Brookline
Extreme Temperature (Heat)	June 1-3, 2013	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 6/1/13—93°F • 6/2/13—92°F • 6/3/13—91°F	No known impact in Brookline
Extreme Temperature (Heat)	July 16-21, 2013	Entire jurisdiction	6 consecutive days of temperatures above 90°F: • 7/16/13—90°F • 7/17/13—91°F • 7/18/13—93°F • 7/19/13—93°F • 7/20/13—96°F • 7/21/13—91°F	No known impact in Brookline
Extreme Temperature (Heat)	July 29-31, 2015	Entire jurisdiction	3 consecutive days of temperatures above 90°F:	No known impact in Brookline

			• 7/29/15—90°F • 7/30/15—93°F • 7/31/15—90°F	
Extreme Temperature (Heat)	July 29-31, 2015	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 7/29/15—90°F • 7/30/15—93°F • 7/31/15—90°F	No known impact in Brookline
Extreme Temperature (Heat)	September 8-10, 2015	Entire jurisdiction	3 consecutive days of temperatures above 90°F: • 9/8/15—93°F • 9/9/15—93°F • 9/10/15—94°F	No known impact in Brookline
Extreme Temperature (Heat)	July 23-29, 2016	Entire jurisdiction	7 consecutive days of temperatures above 90°F: • 7/23/16—96°F • 7/24/16—95°F • 7/25/16—90°F • 7/26/16—95°F • 7/27/16—93°F • 7/28/16—94°F • 7/29/16—93°F	No known impact in Brookline
Extreme Temperature (Heat)	June 12-14, 2017	Entire Jurisdiction	3 consecutive days of temperatures above 90°F: • 6/12/17—94°F • 6/13/17—98°F • 6/14/17—96°F	No known impact in Brookline
Extreme Temperature (Heat)	July 20-22, 2017	Entire Jurisdiction	3 consecutive days of temperatures above 90°F : • 7/20/17—93°F • 7/21/17—94°F • 7/22/17—92°F	No known impact in Brookline
Extreme Temperature (Heat)	August 1-4, 2017	Entire Jurisdiction	4 consecutive days of temperatures above 90°F: • 8/1/17—90°F • 8/2/17—92°F • 8/3/17—91°F • 8/4/17—90°F	No known impact in Brookline
Extreme Temperature (Heat)	September 25-28, 2017	Entire Jurisdiction	4 consecutive days of temperatures above 90°F: • 9/25/17—93°F • 9/26/17—91°F • 9/27/17—90°F • 9/28/17—91°F	No known impact in Brookline

Extreme Temperature (Heat)	July 1-7, 2018	Entire Jurisdiction	7 consecutive days of temperatures above 90°F: • 7/1/18—91°F • 7/2/18—95°F • 7/3/18—92°F • 7/4/18—95°F • 7/5/18—92°F • 7/6/18—92°F • 7/7/18—92°F	No known impact in Brookline
Extreme Temperature (Heat)	August 29-31, 2018	Entire Jurisdiction	3 consecutive days of temperatures above 90°F: • 8/29/18—92°F • 8/30/18—93°F • 8/31/18—93°F	No known impact in Brookline
Extreme Temperature (Heat)	July 20-22, 2019	Entire Jurisdiction	3 consecutive days of temperatures above 90°F: • 7/20/19—91°F • 7/21/19—95°F • 7/22/19—93°F	No known impact in Brookline
Extreme Temperature (Heat)	August 10-13, 2020	Entire Jurisdiction	4 consecutive days of temperatures above 90°F: • 8/10/20—91°F • 8/11/20—95°F • 8/12/20—93°F • 8/13/20—93°F	No known impact in Brookline
Extreme Temperature (Heat)	June 5-9, 2021	Entire Jurisdiction	4 consecutive days of temperatures above 90°F: • 6/5/21—92°F • 6/6/21—93°F • 6/7/21—94°F • 6/9/21—95°F	No known impact in Brookline
Extreme Temperature (Heat)	June 27-30, 2021	Entire Jurisdiction	4 consecutive days of temperatures above 90°F: • 6/27/21—91°F • 6/28/21—96°F • 6/29/21—97°F • 6/30/21—96°F	No known impact in Brookline
Extreme Temperature (Heat)	August 11-14, 2021	Entire Jurisdiction	3 consecutive days of temperatures above 90°F: • 7/11/21—92°F • 7/12/21—94°F • 7/13/21—93°F	No known impact in Brookline
Extreme Temperature (Heat)	August 24-27, 2021	Entire Jurisdiction	4 consecutive days of temperatures above 90°F:	No known impact in Brookline

			• 7/24/21—92°F • 7/25/21—92°F • 7/26/21—95°F • 7/27/21—91°F	
Extreme Temperature (Heat)	July 19-24, 2022	Entire Jurisdiction	6 consecutive days of temperatures above 90°F: • 7/19/22—92°F • 7/20/22—96°F • 7/21/22—95°F • 7/22/22—92°F • 7/23/22—95°F • 7/24/22—97°F	No known impact in Brookline
Extreme Temperature (Heat)	August 3-10, 2022	Entire Jurisdiction	8 consecutive days of temperatures above 90°F: • 8/3/22—90°F • 8/4/22—92°F • 8/5/22—99°F • 8/6/22—92°F • 8/7/22—96°F • 8/8/22—97°F • 8/9/22—98°F • 8/10/22—93°F	No known impact in Brookline
Extreme Temperature (Heat)	August 20-22, 2022	Entire Jurisdiction	3 consecutive days of temperatures above 90°F: • 8/20/22—91°F • 8/21/22—96°F • 8/22/22—91°F	No known impact in Brookline

**NOAA does not have a full history of temperature data for the Town of Brookline, NH. Extreme Temperature data is based on readings from NOAA weather station in Nashua, NH.*

Extreme Temperatures Hazard Loss Estimate

Because the impacts of extreme temperatures can result in the loss of life, it is beyond the scope of this Plan to estimate the dollar value of losses to Brookline resulting from extreme temperatures. Though the entire Brookline population may experience a thermal emergency, populations without adequate climate control are most at risk. Extreme temperatures are not likely to cause damage to structures, although pipes can burst in extreme cold conditions.

Flooding

Localized Flooding

Localized flooding can result from even minor storms. Runoff overloads the drainage ways and flows into the streets and low-lying areas. Homes and businesses can be inundated, especially basements and the lower part of first floors. Localized flooding poses most of the same problems caused by larger floods, but because it typically has an impact on fewer people and affects small areas, it tends to bring less State or Federal involvement such as funding, technical help, or disaster assistance. As a result, the community and the affected residents or business owners are left to cope with the problems on their

own. Finally, flooding of this type tends to recur; small impacts accumulated over time can become major problems.

Riverine Flooding

Riverine flooding involves the overflowing of normal flood channels, rivers or streams, generally because of prolonged rainfall or rapid thawing of snow cover. It may also be caused by ice jams, which most often occur during mid-winter or spring thaws and can result in rapid and expected flooding above and below the jam. The lateral spread of floodwater is largely a function of the terrain, becoming greater in wide, flat areas, and affecting narrower areas in steep terrain. In the latter cases, riparian hillsides in combination with steep declines in riverbed elevation often force waters downstream rapidly, sometimes resulting in flash floods.

Floodplains cover approximately 7.6% of Brookline; 7.6% of the Town is within the 1% annual floodplain and 0% is within the 0.2% annual floodplain. Floodplains in Brookline are located along Scab Mill Brook, Spaulding Brook, North Stream, Lake Potanipo, Lancy Brook, Talbot Brook, Talbot Swamp, Gould Mill Brook, Wallace Brook, Pierce Pond, Rocky Pond Brook, Nissitissit River, Stonehouse Brook, and Village Brook.

Dam Failure

The NH Department of Environmental Services indicates several failure modes for dams. Most typical include hydraulic failure or the uncontrolled overflowing of water, seepage, or leaking at the dam's foundation or gate; structural failure or rupture; general deterioration; and gate inoperability. These modes vary between dams depending on their construction type.

The State of New Hampshire uses a hazard potential classification to define the extent of a dam breach or failure. All class S (Significant) and H (High hazard) dams have the potential to cause damage if they breach or fail.

Class H—high hazard: dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probably loss of human life as a result of: water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure that is occupied under normal conditions; water levels rising above 1st floor elevation of a habitable residential structure or a commercial or industrial structure that is occupied under normal conditions when the rise due to dam failure is greater than 1 foot; structural damage to an interstate highway, which could render the roadway impassible or otherwise interrupt public safety services; release of a quantity and concentration of material that qualify as “hazardous waste” under RSA 147-A:2 VII; any other circumstance that would more likely than not cause one or more deaths.

Class S—significant hazard: dam has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: no probably loss of lives; major economic loss to structures or property; structural damage to a Class I or Class II road that would render the road impassable or otherwise interrupt public safety services; major environmental or public health losses.

Class L—low hazard: dam has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: no possible loss of life; low economic loss to structures or property; structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassible or otherwise interrupt public safety service; the release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than 2 acre-feet and is located more than 250 feet from a water body or water course; reversible environmental losses to environmentally-sensitive sites.

Class NM—non-menace: dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is less than 6 feet in height if it has a storage capacity greater than 50 acre-feet; or less than 25 feet in height if it has a storage capacity of 15-50 acre-feet.

Brookline has 7 Class NM dams (Non-Menace), 1 Class L dams (Low hazard potential), 0 Class S dams (Significant hazard potential), and 1 Class H dams (High hazard potential). There have been no known dam breaches to-date in Brookline.

Previous Occurrences of Flood

Hazard	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Flooding – Dam Failure	There have been no flooding events caused by dam failure in Brookline to date.			
Flooding	1927	Hillsborough County	No data on extent available	Damage to road network. Mason Road in Brookline flooded and bridge out.
Flooding	March 11-21, 1936	Hillsborough County	25-50 year recurrence interval	\$133,000,000 in property damage and 77,000 homeless throughout New England. Primary impact to structures, infrastructure, and road network. Flooding caused by heavy snowfall totals, heavy rains, and warm weather. Impact listed here are general to Hillsborough County. Specific impacts to Brookline are unknown.

Flooding	July 11, 1973	Hillsborough County	No data on extent available	FEMA Disaster Declaration #399. Specific impacts to Brookline are unknown.
Flooding	July 29-August 10, 1986	Hillsborough County	No data on extent available	FEMA Disaster Declaration #771. Dupaw Gould bridge and North Mason Road bridge in Brookline washed out. Hundreds of tires floated down Nissitissit River near Bahannon bridge in Brookline. DOT worked with Brookline to rebuild and improve Dupaw Gould bridge. Many roads impassable in Hillsborough County.
Flooding	March 30-April 11, 1987	Hillsborough County	25-50+ year recurrence interval	\$4,888,889 in damage in NH. FEMA Disaster Declaration #789. Primary impact to agricultural fields in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	August 7-11, 1990	Hillsborough County	No data on extent available	\$2,297,777 in damage in NH. FEMA Disaster Declaration #876. Primary impact to infrastructure. Series of storms with moderate to heavy rain causing widespread flooding. Impact listed here are general to Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	March 11-21, 1996	Dupaw Gould Road	No data on extent	Dupaw Gould bridge

		area of Brookline	available	in Brookline out.
Flooding	October 20-23, 1996	Hillsborough County	No data on extent available	\$2,341,273 in damage in NH. FEMA Disaster Declaration #1144. Primary impact to structures and infrastructure in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	July 2, 1998	Hillsborough County	No data on extent available	\$3,400,000 in damage in NH, 6 counties impacted including Hillsborough. FEMA Disaster Declaration #1231. Primary impact to structures and infrastructure in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	October 26, 2005	Hillsborough County	50–100-year recurrence interval	5 counties impacted in NH, including Hillsborough. FEMA Disaster Declaration #1610. Primary impact to structures and infrastructure in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	May 12-23, 2006	Hillsborough County	As much as 14 inches of rainfall in region. 100–500-year recurrence interval.	7 counties impacted in NH, including Hillsborough. FEMA Disaster Declaration #1643. Numerous road closures in Hillsborough Co. Specific impacts to Brookline are unknown.
Flooding	April 15, 2007	Hillsborough County	100–500-year recurrence interval	\$27,000,000 in damages in NH; 2,005 homeowners and renters applied

				for assistance in NH. FEMA Disaster Declaration #1695. Primary impact to structures and infrastructure in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	September 6-7, 2008	Hillsborough County	50–100-year recurrence interval	\$6.90 per capita in damages in Hillsborough County. FEMA Disaster Declaration #1799 Primary impact to structures and infrastructure in Hillsborough County. Specific impacts to Brookline are unknown.
Flooding	March 14, 2010	Hillsborough County	50–100-year recurrence interval	\$1,880,685 in FEMA public assistance in NH; \$1.80 per capita in Hillsborough County. FEMA Disaster Declaration #1913 Primary impact to roads and bridges in Hillsborough County. Specific impacts to Brookline are unknown.
There have been no major flooding events in Hillsborough County since 2010.				

Flood Hazard Loss Estimate

Step 1. Determine percent building damage to a 1 or 2 story building with basement

- 1-foot flood depth = 15% building damage
- 2-foot flood depth = 20% building damage
- 3-foot flood depth = 23% building damage
- 4-foot flood depth = 28% building damage
- *Source: FEMA Identifying Hazards and Estimating Losses, pg. 4-13*

Step 2. Determine number of structures in Brookline located in the floodplain

- 82 structures located in 1% floodplain
- 0 structures located in 0.2% floodplain—there are no 0.2% floodplains in Brookline
- *Source: Nashua Regional Planning Commission GIS*

Step 3. Determine total value of structures in Brookline located in 1% floodplain

- Average assessed value of all structures in Brookline = \$249,479
- Total number of structures in Brookline located in 1% floodplain = 82
- Total assessed value of all structures in Brookline in 1% floodplain = \$249,479 * 82
- Total assessed value of all structures in Brookline in 1% floodplain = \$20,457,278
- *Source: Brookline Hazard Mitigation Team calculations based on Brookline Assessing data & NRPC GIS data*

Step 4. Determine total loss from flooding in 1% floodplain

- Total Loss from Flooding = Total Assessed Value of all structures in 1% Floodplain * Percent Building Damage Ratio
- Total Loss from 1-foot flood depth = \$20,457,278 * .15 = **\$3,068,591.70**
- Total Loss from 2-foot flood depth = \$20,457,278 * .20 = **\$4,091,455.60**
- Total Loss from 3-foot flood depth = \$20,457,278 * .23 = **\$4,705,179.94**
- Total Loss from 4-foot flood depth = \$20,457,278 * .28 = **\$5,728,037.84**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in 1% Annual Floodplain	Percentage of this type of Critical Facilities in 1% Annual Floodplain	Number of this type of Critical Facilities in 0.2% Annual Floodplain	Percentage of this type of Critical Facilities in 0.2% Annual Floodplain
General Occupancy	30	3	10%	0	0%
Essential Facilities	7	1	14%	0	0%
Transportation	17	13	76%	0	0%
Utility System	5	1	20%	0	0%
High Potential Hazard	9	4	44%	0	0%

Hazardous Materials	1	0	0%	0	0%
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Severe Wind/Tropical Storm

A hurricane is the term used for tropical cyclones that occur in the Northern Hemisphere east of the International Dateline to the Greenwich Meridian. Tropical cyclones originate over tropical or subtropical waters and are characterized by organized deep convection and a closed surface wind circulation about a well-defined center. The Atlantic hurricane season lasts from June 1 through November 30 and peaks in late August and September. The Saffir-Simpson Hurricane Wind Scale categorizes hurricanes from 1 to 5 based on sustained wind speed. The National Weather Service National Hurricane Center provides the following estimates of potential property damage based on hurricane wind speed (<http://www.nhc.noaa.gov/aboutsshws.php>).

Category 1—sustained winds 74-95 mph. Very dangerous winds will produce some damage. Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.

Category 2—sustained winds 96-110 mph. Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.

Category 3—sustained winds 111-129 mph. Devastating damage will occur. 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.

Category 4—sustained winds 130-156 mph. Catastrophic damage will occur. 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.

Category 5—sustained winds 157 mph 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 possible months. Most of the area will be uninhabitable for weeks or months.

FEMA declared disasters in Hillsborough County during Hurricane Bob (1991) and Hurricane Floyd (1999). Though these were the only formally declared incidents, Brookline has experienced strong remnants of numerous tropical cyclones including Hurricane Carol (1954), Donna (1960), Gloria (1985), Irene (2011), and Sandy (2012).

Previous Occurrences of Severe Wind/Tropical Storm

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Great Hurricane of 1938	Hillsborough County	No data on extent available	\$12,337,643 total damages (not adjusted for inflation), 13 deaths and 494 injuries in NH. Damage to road network and structures caused by flooding.
August 31, 1954 (Carol)	Hillsborough County	Saffir-Simpson Scale Category 3.	Extensive tree and crop damage.
September 12, 1960 (Donna)	Hillsborough County	Saffir-Simpson Scale Category 3	Water damage to structures due to flooding.
September 27, 1985 (Gloria)	Hillsborough County	Saffir-Simpson Scale Category 2	Damage to trees and power lines from high winds.
August 19, 1991 (Bob)	Hillsborough County	Saffir-Simpson Scale Category 1	FEMA Disaster Declaration #917. Damage to structures, trees, and power lines from high winds.
September 16-18, 1999 (Floyd)	Hillsborough County	Tropical Storm (winds 39-73 mph)	FEMA Disaster Declaration #1305. Primary impact to trees, infrastructure, and road network.
February 17-18, 2006	Brookline	No data on extent available	Trees down. Much of Town without power. Emergency Operations Center remained open to provide shelter and food for any of the 649 families without power.
August 28, 2011 (Irene)	Hillsborough County	Tropical Storm (winds 39-73 mph).	FEMA Disaster Declaration #4026. Damage to trees and power lines from high winds. Flash floods.
October 26, 2012 (Sandy)	Hillsborough County	Tropical Storm (winds 39-73 mph).	FEMA Disaster Declaration #4095. Minimal damage.
October 29-November 1, 2017	Hillsborough County	Tropical Storm (winds 39-73 mph).	FEMA Disaster Declaration #4355. A powerful storm

			fed by tropical moisture knocked out power to more than 270,000 homes and business across the state. Parts of the region experienced 2.8 inches of rainfall and widespread power outages. Falling trees severely damaged many homes and electrical infrastructure. Local roads were closed due to downed trees and flash flooding.
August 3-6, 2020 (Isaias)	Hillsborough County	Tropical Storm (winds 39-73 mph).	Tropical storm with extreme wind gusts, flash flooding, high rainfall, tree damage, and power outages.
August 19-27, 2021 (Henri)	Hillsborough County	Tropical Storm (winds 39-73 mph).	Strong tropical storm with flash flooding, high winds, power outages, tree damage, heavy rain between 2 and 4 inches.
There has been no significant damage from tropical-post tropical cyclones (severe wind) in Brookline since 2021.			

Severe Wind/Tropical Storm Hazard Loss Estimate

There are no standard loss estimation models or tables for wind damage (*Understanding Your Risks*, FEMA, pg. 4-30). As such, the Hazard Mitigation Team used data from previous hurricane events to determine damage estimates. Historically, the strongest hurricane seen in NH was a Category 3, so loss estimates were calculated based on a hurricane of that strength. Hurricanes have primarily damaged road networks and infrastructure in NH. It is beyond the scope of this project to estimate the costs of repairing or replacing transportation and utility infrastructure damaged by a hurricane. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from a hurricane.

Step 1. Determine percent building damage ratio to single family residence from Category 3 hurricane

- Wood Frame Construction, Low general hurricane design level = 20% building damage
- *Source: Brookline Hazard Mitigation Team*

Step 2. Determine percent of structures in Brookline that would be damaged by Category 3 hurricane

- 5% of structures estimated to be damaged by Category 3 hurricane
- *Source: Brookline Hazard Mitigation Team (no historical data on hurricane damage in Brookline)*

Step 3. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000
- *Source: Brookline Assessing Department*

Step 4. Determine total loss from Category 3 hurricane

- Total Loss from Hurricane = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Hurricane = \$599,250,000 * .05 * .2 = **\$5,922,500**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Severe Wind Hazard Area	Percentage of this type of Critical Facilities in Severe Wind Hazard Area
General Occupancy	30	26	87%
Essential Facilities	7	7	100%
Transportation	17	17	100%
Utility System	5	5	100%
High Potential Hazard	9	9	100%
Hazardous Materials	1	1	100%

Lightning & Hail

Lightning

By definition, all thunderstorms contain lightning. Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the Sun. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction causes a shock wave that we hear as thunder.

Lightning is a major hazard to citizens involved in outdoor activities. A lightning strike at a densely attended special event has the potential to create a major mass casualty incident. Lightning also can create wildfires and structure fires and may cause power and/or communications outages.

The Lightning Activity Level (LAL) grid can be used to measure the extent of a lightning event.

LAL	Cloud & Storm Development	Lightning Strikes/15 min
1	No thunderstorms	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two or three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	>25
6	Similar to LAL 3 except thunderstorms are dry.	9-15

Hail

Hailstones are balls of ice that grow as they are held up by winds, known as updrafts, that blow towards thunderstorms. The updrafts carry droplets of supercooled water, water at a below-freezing temperature that is not yet ice. The water droplets freeze into ice balls and grow to become hailstones. Most hailstones are smaller than a dime, but stones may grow to be as large as softballs.

Although not common in Brookline, hailstorm events resulting from significant thunderstorms can occur anytime. Summer storms especially may produce hail large enough to damage roofs, siding, and automobiles, or injure people who are outdoors. It was felt that a hailstorm event would be unlikely and would cause minimal damage. Since the previous hazard mitigation plan, no significant occurrences of lightning or hail events have occurred in Brookline.

Previous Occurrences of Lightning & Hail

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
There has been no significant damage from lightning & hail in Brookline to date.			

Lightning & Hail Hazard Loss Estimate

Losses from lightning & hail would be on a small scale, because of the localized nature of lightning and the minimal damage expected from hail. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from lightning & hail.

Step 1. Determine percent building damage ratio to single family residence from lightning & hail

- Wood Frame Construction = 5% building damage
- *Source: Brookline Hazard Mitigation Team*

Step 2. Determine percent of structures in Brookline that would be damaged by lightning & hail

- 0.25% of structures estimated to be damaged by lightning & hail
- *Source: Brookline Hazard Mitigation Team (no historical data on lightning & hail damage in Brookline)*

Step 3. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000
- *Source: Brookline Assessing Department*

Step 4. Determine total loss from lightning & hail

- Total Loss from Lightning = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Severe Thunderstorm = \$599,250,000 * .0025 * .05 = **\$74,906.25**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Lightning & Hail Hazard Area	Percentage of this type of Critical Facilities in Lightning & Hail Hazard Area
General Occupancy	30	30	100%
Essential Facilities	7	7	100%
Transportation	17	1	6%
Utility System	5	5	100%
High Potential Hazard	9	0	0%
Hazardous Materials	1	1	100%

Severe Winter Weather

A heavy snowstorm is generally considered to be one that deposits two or more inches of snow per hour in a twelve-hour period. Heavy snow can immobilize a region, stranding commuters, closing businesses, and disrupting emergency services. Accumulating snow can collapse buildings and knock down trees and power lines. Snow removal from roadways, utility damage, and disruption to businesses can have a significant economic impact on municipalities and residents.

A blizzard is a violent snowstorm with winds blowing at a minimum speed of 35 miles per hour and visibility of less than one-quarter mile for three hours. A Nor'easter is a large weather system traveling from south to north, passing along the coast. As the storm's intensity increases, the resulting counterclockwise winds impact the coast and inland areas in a Northeasterly direction. Winds from a Nor'easter can meet or exceed hurricane force, knocking down trees, utility poles, and power lines.

Ice storms occur when a mass of warm, moist air collides with a mass of cold, arctic air. The less dense warm air rises and the moisture precipitates out in the form of rain. When this rain falls through the colder, more-dense air and comes in contact with cold surfaces, ice forms and can become several inches thick. Heavy accumulations of ice can knock down trees, power lines, and communications for extended periods of time. Ice Storm extent can be defined by the Sperry-Piltz Ice Accumulation Index:

- 0—minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages
- 1—some isolated or localized utility interruptions are possible, typically lasting on a few hours. Roads and bridges may become slick and hazardous.
- 2—scattered utility interruptions expected, typically lasting 12-24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
- 3—numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1-5 days.
- 4—prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5-10 days.
- 5—catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed

In recent years, FEMA issued disaster declarations in Hillsborough County for severe winter weather in 1998, 2008, 2010, 2011, 2013, and 2015. Among these storms was a rare Nor'easter in late October of 2011 that caused major destruction in Hillsborough and Rockingham Counties. Heavy wet snow fell on trees that had much of their foliage remaining. Many trees could not withstand the extra weight of the snow and collapsed under the stress. Damage was very focused in the southern part of New Hampshire and caused nearly three times the amount of debris that the 2008 ice storm produced.

Previous Occurrences of Severe Winter Weather

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
March 11-14, 1888	Entire jurisdiction	30-50 inches of snow	No historic data on impact
1922	Entire jurisdiction	No historic data on extent	Extreme snow drifts paralyzed road network.
February 14-15, 1940	Entire jurisdiction	Over 30 inches of snow	Snow and high winds paralyzed road network.

February 14-17, 1958	Entire jurisdiction	20-33 inches of snow	Primary impact to road network.
March 18-21, 1958	Entire jurisdiction	22-24 inches of snow	Primary impact to road network.
March 2-5, 1960	Entire jurisdiction	Up to 25 inches of snow	Primary impact to road network.
January 18-20, 1961	Entire jurisdiction	Up to 25 inches of snow	Blizzard conditions paralyze road network.
February 22-28, 1969	Entire jurisdiction	24-98 inches of snow in Central NH	Primary impact to road network. Slow moving storm.
December 25-28, 1969	Entire jurisdiction	12-18 inches of snow	Primary impact to road network.
January 19-21, 1978	Entire jurisdiction	Up to 16 inches of snow	Primary impact to road network.
February 5-7, 1978 (Blizzard of '78)	Entire jurisdiction	25-33 inches of snow	Snow paralyzed road network, trapped commuters in cars, and forced closure of businesses.
April 5-7, 1982	Entire jurisdiction	18-22 inches of snow	Primary impact to road network.
March, 1983	Entire jurisdiction	Over 18 inches of snow, 30-40 mph winds	Snow paralyzed road network and forced closure of businesses.
December 1996	Entire jurisdiction	14 inches of snow	Damage to power lines forces closure of businesses. Heavy wet snow caused many trees to come down. Power outage for 5 days.
January 7, 1998	Entire jurisdiction	Ice storm, no data on extent available	\$12,446,202 in total damages, 1 death and 6 injuries in NH. \$17,000,000 in damages to PSNH equipment. FEMA Disaster Declaration #1199. 20 major road closures; 67,586 without power; 2,310 without phone service; 1 communication tower failure.
January 24, 1998	Entire jurisdiction	No data on extent available	17 power lines down in Brookline

December 11, 2008	Entire jurisdiction	Ice storm, no data on extent available	\$10,383,602 in FEMA public assistance in NH; \$6.35 per capita in Hillsborough County. FEMA Disaster Declaration #1812 Damage to power and phone lines and trees.
February 23, 2010	Entire jurisdiction	Snow followed by rainfall between 2-6 inches. Winds over 70 mph.	\$6,268,179 in FEMA public assistance in NH; \$3.68 per capita in Hillsborough County. FEMA Disaster Declaration #1892 Damage to power and phone lines, trees, and road network. Over 330,000 customers without power state-wide.
October 29-30, 2011	Entire jurisdiction	15-20 inches of snow.	\$3,052,769 in FEMA public assistance in NH; \$5.11 per capita in Hillsborough County. FEMA Disaster Declaration #4049 Damage to power and phone lines, trees, and road network.
February 8-10, 2013	Entire jurisdiction	Snowfall totals of 12-18 inches across region, up to 30 inches in parts of NH. Winds 10-20 mph with gusts up to 40 mph. Visibility less than ¼ mile.	FEMA Disaster Declaration #4105
January 26-28, 2015	Entire jurisdiction.	Snowfall totals of 18-24 inches across region. Winds 35 mph. Visibility 0.	\$3,293,059 in FEMA public assistance in NH; \$3.88 per capita in Hillsborough County. FEMA Disaster Declaration DR-4209.

Severe Winter Weather Hazard Loss Estimate

Severe Winter Weather events have primarily damaged road networks and infrastructure in NH. It is beyond the scope of this project to estimate the costs of repairing or replacing transportation and utility infrastructure damaged by severe winter weather. The Hazard Mitigation Team used the following calculations to estimate loss to single family residential structures from severe winter weather.

Step 1. Determine percent building damage ratio to single family residence from severe winter weather

- Wood Frame Construction, no additional provisions for roof snow loads = 5% building damage
- *Source: Brookline Hazard Mitigation Team*

Step 2. Determine percent of structures in Brookline that would be damaged by severe winter weather

- 1% of structures estimated to be damaged by severe winter weather
- *Source: Brookline Hazard Mitigation Team*

Step 3. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000
- *Source: Brookline Assessing Department*

Step 4. Determine total loss from Severe Winter Weather

- Total Loss from Severe Winter Weather = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Severe Winter Weather = \$599,250,000 * .01 * .05 = **\$299,625**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Severe Winter Weather Hazard Area	Percentage of this type of Critical Facilities in Severe Winter Weather Hazard Area
General Occupancy	30	26	87%
Essential Facilities	7	7	100%
Transportation	17	17	100%
Utility System	5	4	80%
High Potential Hazard	9	9	100%
Hazardous Materials	1	1	100%

Tornado/Downburst

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more.

Damage paths can be in excess of 1 mile wide and 50 miles long. Tornadoes are created when cold air overrides warm air, causing the warm air to rise rapidly.

A downburst is a severe localized wind blasting down from a thunderstorm. These 'straight line' winds are distinguishable from tornadic activity by their pattern of destruction and debris. Depending on the

size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories. Microbursts cover an area less than 2.5 miles in diameter and macrobursts cover an area at least 2.5 miles in diameter.

Hillsborough County has a higher risk of tornado activity compared to the rest of the State. Between 1961 and 1998 there were 15 known tornadoes in Hillsborough County. The most recent downburst activity occurred on July 6, 1999 in the form of a macroburst in Merrimack, Grafton and Hillsborough Counties. There were two fatalities as well as roof damage, widespread power outages, and downed trees, utility poles and wires.

Previous Occurrences of Tornado/Downburst

Hazard Type	Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
Tornado	July 2, 1961	Northern Hillsborough Co, originated near Weare, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	July 21, 1961	Central Hillsborough Co, originated near New Boston, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	May 9, 1963	Northeastern, Hillsborough Co, originated near Goffstown, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	May 20, 1963	Western Hillsborough Co, originated near Peterborough, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	June 9, 1963	Northeastern Hillsborough Co, originated near Manchester, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	August 28, 1965	Eastern Hillsborough Co, originated near Litchfield, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 19, 1966	Southern Hillsborough Co, originated near Amherst, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 17, 1968	Central Hillsborough Co, originated near Wilton, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	August 20, 1968	Northeastern Hillsborough Co, originated near Manchester, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 19, 1972	Southeastern Hillsborough Co, originated near Hudson, NH	Fujita Scale F1	0 fatalities, 0 injuries

Tornado	July 5, 1984	Western Hillsborough Co, originated near Harrisville, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 5, 1984	Southeastern Hillsborough Co, originated near Pelham, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	June 16, 1986	Western Hillsborough Co, originated near Swanzey, NH	Fujita Scale F1	0 fatalities, 0 injuries
Tornado	July 3, 1997	Central Hillsborough Co, originated near Greenfield, NH	Fujita Scale F2	0 fatalities, 0 injuries
Tornado	May 31, 1998	Western Hillsborough Co, originated near Antrim, NH	Fujita Scale F2	0 fatalities, 0 injuries
Downburst	July 6, 1999	Merrimack, Grafton, and Hillsborough Co.	Macrobust	2 fatalities, 2 lost roofs, damage to trees and utility infrastructure
Tornado	July 24 th , 2008	Southern Hillsborough County (Candia & Deerfield, NH more effected than others)	Fujita Scale F2	1 fatality, damage to over 100 structures, some destroyed, causing over \$2 million in damage and injuring 2 people directly.

Tornado Hazard Loss Estimate

There are no standard loss estimation models or tables for tornados (*Understanding Your Risks*, FEMA, pg. 4-27). As such, the Hazard Mitigation Team used data from previous tornado events to determine damage estimates. Historically, the strongest tornado seen in Hillsborough County was a F2, so loss estimates were calculated based on a tornado of that strength.

Step 1. Determine percent building damage ratio to single family residence from F2 tornado

- Wood Frame Construction, Low general tornado design level = 50% building damage
- *Source: Brookline Hazard Mitigation Team*

Step 2. Determine percent of structures in Brookline that would be damaged by F2 tornado

- 1% of structures estimated to be damaged by F2 tornado
- *Source: Brookline Hazard Mitigation Team (no historical data on tornado damage in Brookline)*

Step 3. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000

- *Source: Brookline Assessing Department*

Step 4. Determine total loss from F2 Tornado

- Total Loss from Tornado = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Tornado = \$599,250,000 * .01 * .5 = **\$2,996,250**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Tornado Hazard Area	Percentage of this type of Critical Facilities in Tornado Hazard Area
General Occupancy	30	26	87%
Essential Facilities	7	7	100%
Transportation	17	17	100%
Utility System	5	4	80%
High Potential Hazard	9	9	100%
Hazardous Materials	1	1	100%

Wildfire

Wildfires are fires ignited in grassy or wooded areas. They may be ignited intentionally by humans, naturally through lightning, or accidentally due to spark ignition from sources such as power lines or fireworks. The interface between forested lands and developed lands poses an ongoing threat to property from wildfires. Potential wildfire areas outside of the recommended response time radius from the fire station may pose a higher risk to structures and residents than those located closer to the fire station.

Previous Occurrences of Wildfire

Date	Hazard Location within Jurisdiction	Hazard Extent	Impact
There has been no significant damage from wildfires in Brookline to date.			

Wildfire Hazard Loss Estimate

Step 1. Determine percent building damage ratio to single family residence from wildfire

- Wood Frame Construction, combustible siding and decking = 20% building damage
- *Source: Brookline Hazard Mitigation Team*

Step 2. Determine percent of structures in Brookline that would be damaged by wildfire

- 0.5% of structures estimated to be damaged by wildfire
- *Source: Brookline Hazard Mitigation Team*

Step 3. Determine total assessed value of structures in Brookline

- Total Assessed Value of all Structures in Brookline = \$599,250,000
- *Source: Brookline Assessing Department*

Step 4. Determine total loss from Wildfire

- Total Loss from Wildfire = Total Assessed Value of all Structures * Percentage of Structures Estimated to be Damaged * Percent Building Damage Ratio
- Total Loss from Wildfire = \$599,250,000 * .005 * .2 = **\$599,250**

Critical Facility Type	Total Number of this type of Critical Facilities in Brookline	Number of this type of Critical Facilities in Wildfire Hazard Area	Percentage of this type of Critical Facilities in Wildfire Hazard Area
General Occupancy	30	26	87%
Essential Facilities	7	7	100%
Transportation	17	1	6%
Utility System	5	4	80%
High Potential Hazard	9	0	0%
Hazardous Materials	1	1	100%

Infectious Diseases

Infectious diseases are illnesses caused by organisms—such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some organisms may cause disease. Some infectious diseases can be passed from person to person, some are transmitted by bites from insects or animals, and others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment. Signs and symptoms vary depending on the organism causing the infection, but often include fever and fatigue. Mild infections get better on their own without treatment, while some life-threatening infections may require hospitalization.

The magnitude and severity of infectious diseases is described by its speed of onset (how quickly people become sick or cases are reported) and how widespread the infection is. Some infectious diseases are inherently more dangerous and deadly than others, but the best way to describe the extent of infectious diseases relates to the disease occurrence (<https://www.cdc.gov/opphss/csels/dsepd/ss1978/lesson1/section11.html>)

- Endemic – Constant presence and/or usual prevalence of a disease or infection agent in a population within a geographic area.
- Hyperendemic – The persistent, high levels of disease occurrence.
- Cluster – Aggregation of cases grouped in place and time that are suspected to be greater than the number expected even though the expected number may not be known.
- Epidemic – An increase, usually sudden, in the number of cases of a disease above what is normally expected.

- Outbreak – The same as epidemic, but over a much smaller geographical area.
- Pandemic – Epidemic that has spread over several countries or continents, usually affecting many people.

Public health incidents and infectious diseases may occur suddenly or with a slow onset. Incidents that occur suddenly may have extraordinary and/or overwhelming medical resource needs. Incidents may occur with a slow onset and/or with advance warning will allow for a more coordinated response. During sudden onset incidents, many victims may reach healthcare facilities on their own without the use of Emergency Medical Services (EMS), which means that victims may arrive to find unprepared or inadequate facilities.

Incidents may be insidious or obvious, and both have unique impacts. Insidious incidents (such as diseases that have a longer incubation/onset period where infection can be spread without knowing) can result in a much higher infection rate, eventually overwhelming existing medical resources and resulting in higher morbidity and mortality. Incidents that are more obvious are more recognizable and can result in a more accurate healthcare response, but this may also result in much higher social complications such as fear, anxiety, unnecessary social distancing. For example, the average person may be more afraid of Ebola than influenza; however, the latter is much more likely to occur in the US. Having proper surveillance systems to recognize public health and infectious disease incidents is critical to be able to limit impacts.

The duration of the incident can also cause unique impacts. In a short duration incident, there may be a medical surge at the beginning which tapers off as the incident goes on and may not result in significant disruption to everyday life. However, longer duration incidents may have significant impacts not only for the public health response, but also for business/industry and the economy (State of NH Multi-Hazard Mitigation Plan Update 2018 pg. 110-113).

Previous Occurrences of Infectious Disease

As does the rest of the state, Brookline experiences outbreaks annually. These include foodborne outbreaks, Influenza and other respiratory outbreaks, and Norovirus and other gastrointestinal virus outbreaks.

In 2020, the world experienced a major pandemic from the Coronavirus (Covid-19). New Hampshire Covid-19 Emergency Declaration EM-3445-NH spanned from January 20, 2020, through May 11, 2020. As of May 2023, Brookline had 1,380 Covid-19 cases total (NH DHHS).

The New Hampshire Department of Health and Human Services conducts infectious disease surveillance, and provides [statistics and reports on their website](#).

Infectious Disease Hazard Loss Estimate

Because the impacts of infectious disease are wide ranging, it is beyond the scope of this Plan to estimate the dollar value of losses to the municipality resulting from infectious diseases. Vulnerable populations are most at risk for this type of hazard.

Section 3.4 ~ Overall Summary of Vulnerability

Table 6—Overall Summary of Vulnerability by Hazard

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
Climate Change	- General Occupancy - Essential Facilities - Transportation - Utility Systems - High Potential Hazard - Hazardous Materials - Agricultural Land	See Impacts related to Drought, Extreme Temperatures, and Flooding below.	See Critical Facilities calculations for Drought, Extreme Temperature, and Flooding below.	See damage estimates for Drought, Extreme Temperature, and Flooding below.	Calculating \$ value of losses is beyond the scope of this Plan (see Section 3.5 Climate Change for explanation)
Drought	Agricultural land. Not likely to have a significant impact on structures themselves but can have significant impact on people's ability to utilize them.	Loss of crops. Inadequate quantity of drinking water—0% of Brookline population on public drinking water, 100% of Brookline population on private well water. Loss of water for fire protection. Increased risk of fire.	General Occupancy = 100% Essential Facilities = 100% Transportation = 0% Utility Systems = 20% High Potential Hazard = 0% Hazardous Materials = 100%	0 acres of agricultural land (0% of total land area)	Calculating \$ value of losses is beyond the scope of this Plan (see Section 3.5 Drought for explanation)
Earthquake	- General Occupancy - Essential Facilities - Transportation - Utility Systems - High Potential Hazard - Hazardous Materials	Structural damage or collapse of buildings. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications,	General Occupancy = 87% Essential Facilities = 100% Transportation = 100%	1-5%	\$77,903 - \$389,513

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
		radio system. Loss of water for fire protection. Risk to life, medical surge.	Utility Systems = 80% High Potential Hazard = 100% Hazardous Materials = 100%		
Extreme Temperatures	Not likely to have a significant impact on structures.	Overburdened power networks. Heating fuel shortages. Risk to life from prolonged exposure.	General Occupancy = 100% Essential Facilities = 100% Transportation = 0% Utility Systems = 0% High Potential Hazard = 0% Hazardous Materials = 0%	0%	\$0
Flooding	- General Occupancy - Transportation - High Potential Hazard - Hazardous Materials	Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage.	General Occupancy = 10% in 1% annual floodplain; 0% in 0.2% annual floodplain Essential Facilities = 14% in 1% annual floodplain; 0% in 0.2% annual floodplain Transportation	81 structures in 1% floodplain; 0% structures in 0.2% floodplain	Loss in 1% floodplain: 1-foot flood = \$3,068,592 2-foot flood = \$4,091,456 3-foot flood = \$4,705,180 4-foot flood = \$5,728,038 Loss in 0.2% floodplain: 1 foot flood

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
		Isolation of neighborhoods resulting from flooding.	= 76% in 1% annual floodplain; 0% in 0.2% annual floodplain Utility Systems = 20% in 1% annual floodplain; 0% in 0.2% annual floodplain High Potential Hazard = 44% in 1% annual floodplain; 0% in 0.2% annual floodplain Hazardous Materials = 0% in 1% annual floodplain; 0% in 0.2% annual floodplain		= \$0 2-foot flood = \$0 3-foot flood = \$0 4-foot flood = \$0
Severe Wind/Tropical Storm	- General Occupancy - Essential Facilities - Transportation - Utility Systems - High Potential Hazard - Hazardous Materials	Wind damage to structures and trees. Water damage to structures and their contents. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage.	General Occupancy = 87% Essential Facilities = 100% Transportation = 100% Utility Systems = 100% High Potential Hazard = 100% Hazardous Materials = 100%	5%	\$5,922,500

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
		Isolation of neighborhoods resulting from flooding.			
Lightning	- General Occupancy - Essential Facilities - Utility System - High Potential Hazard - Hazardous Materials	Smoke and fire damage to structures. Disruption to power lines and municipal communications. Damage to critical electronic equipment. Injury or death to people involved in outdoor activity.	General Occupancy = 100% Essential Facilities = 100% Transportation = 6% Utility Systems = 100% High Potential Hazard = 0% Hazardous Materials = 100%	0.5%	\$74,906
Severe Winter Weather	- General Occupancy - Essential Facilities - Transportation - Utility - High Potential Hazard - Hazardous Materials	Disruption to road network. Damage to trees and power lines, communications. Structural damage to roofs/collapse. Increase in CO, other hazards.	General Occupancy = 30% Essential Facilities = 100% Transportation = 100% Utility Systems = 80% High Potential Hazard = 100% Hazardous Materials = 100%	1%	\$299,625
Tornado/Downburst	General Occupancy	Wind damage to structures and	General Occupancy	1%	\$2,996,250

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
	- Essential Facilities - Transportation - Utility System - High Potential Hazard - Hazardous Materials	trees. Damage or loss of infrastructure, including roads, bridges, railroads, power and phone lines, municipal communications, radio system. Environmental hazards resulting from damage. Medical surge.	= 87% Essential Facilities = 100% Transportation = 100% Utility Systems = 80% High Potential Hazard = 100% Hazardous Materials = 100%		
Wildfire	- General Occupancy - Essential Facilities - Utility System - High Potential Hazard - Hazardous Materials	Smoke and fire damage to structures in wild land/urban interface. Damage to habitat. Impacts to air quality. Loss of natural resources.	General Occupancy = 87% Essential Facilities = 100% Transportation = 6% Utility Systems = 80% High Potential Hazard = 0% Hazardous Materials = 100%	0.5%	\$599,250
Infectious Disease	- General Occupancy - Essential Facilities	Risk to life, medical surge/overburdened healthcare systems.	General Occupancy = 87% Essential Facilities = 100%	0%	Calculating \$ value of losses is beyond the scope of this Plan (see Section 3.5 Infectious

Hazard	Types of Critical Facilities Impacted by Hazard	Impact of Hazard	% of Critical Facilities in Hazard Area	% of Structures Estimated to be Damaged	\$ Value of Loss
			Transportation = 0% Utility Systems = 0% High Potential Hazard = 0% Hazardous Materials = 100%		Diseases for explanation)

Table 7—Overall Summary of Vulnerability by Facility Type

Note that Climate Change is not included as a hazard in this analysis because its effects on critical facilities are included under the hazards of Drought, Extreme Temperatures, and Flooding.

Facility Type	Total # of facilities	# susceptible to Drought	# susceptible to Earthquake	# susceptible to Extreme Temperatures	# susceptible to Flooding	# susceptible to Severe Wind	# susceptible to Lightning	# susceptible to Severe Winter Weather	# susceptible to Tornado/Downburst	# susceptible to Wildfire	# susceptible to Infectious Disease
General Occupancy	30	30	26	30	3 in 1% annual, 0 in 0.2% annual	26	30	26	26	26	26
Essential Facilities	7	7	7	7	1 in 1% annual; 0 in 0.2% annual	7	7	7	7	7	7
Transportation	17	0	17	0	13 in 1% annual; 0 in 0.2% annual	17	1	17	17	1	0
Utility System	5	0	4	0	1 in 1% annual; 0 in 0.2% annual	5	5	4	4	4	0

Facility Type	Total # of facilities	# susceptible to Drought	# susceptible to Earthquake	# susceptible to Extreme Temperatures	# susceptible to Flooding	# susceptible to Severe Wind	# susceptible to Lightning	# susceptible to Severe Winter Weather	# susceptible to Tornado/Downburst	# susceptible to Wildfire	# susceptible to Infectious Disease
High Potential Hazard	9	1	9	0	4 in 1% annual; 0 in 0.2% annual	9	0	9	9	0	0
Hazardous Materials	1	0	1	0	0 in 1% annual; 0 in 0.2% annual	1	1	1	1	1	1

Section 3.5 ~ National Flood Insurance Program

The Town of Brookline participates in the National Flood Insurance Program (NFIP). This provides full insurance coverage based on risk as shown on detailed Flood Insurance Rate Maps (FIRMs). Brookline joined the NFIP on May 19, 1987. The Town's initial Flood Hazard Boundary Map was identified on April 4, 1975, and its initial Flood Insurance Rate Map was identified on May 19, 1987. The current effective map date is September 25, 2009.

Brookline has 11 NFIP policies in force and \$2,390,000 of insurance in force. There have been 6 paid losses totaling \$56,026. Brookline has 1 repetitive loss property with total repetitive loss payments of \$21,847. Brookline's repetitive loss property is classified as "other residential."

As a participant in the NFIP, communities must agree to adopt a floodplain management ordinance and enforce the regulations found in the ordinance. Brookline has adopted the "Floodplain Ordinance," found in Section 1200 of the [Town of Brookline, NH Zoning and Land Use Ordinance](#). The Floodplain Ordinance is enacted to prevent the development of buildings and uses in areas that are unsatisfactory and hazardous due to the threat of flooding, protect natural flows and drainage, and comply with the requirements of the National Flood Insurance Act of 1968 (P.L. 90-488, as amended). The ordinance includes the following sections: Definition of Terms, Provisions, and Variance and Appeals Procedures.

The Building Official/Floodplain Administrator of the Town of Brookline is responsible for making determinations of substantial improvement and substantial damage. These determinations are made for all development in a special flood hazard area that proposes to improve an existing structure including alterations, movement, enlargement, replacement, repair, additions, rehabilitations, renovations,

repairs of damage from any origin (such as, but not limited to flood, fire, wind, or snow) and any other improvement of or work on such structure including within its existing footprint.

The Building Official/Floodplain Administrator, in coordination with any other applicable community official(s), shall be responsible for the following:

1. Determine if a substantial damage (SD) determination needs to be made and communicate SD and permit requirements to property owners.
2. Verify the cost of repairs to the structure.
3. Verify the market value of the structure.
4. Make the SD determination and issue it to the property owner.
5. Permit development/ensure compliance with community ordinance.
6. Inspect development and maintain as-built compliance documentation post construction.

To demonstrate Brookline's continued compliance with NFIP requirements, the Hazard Mitigation Team identified the follow mitigation actions as part of its comprehensive mitigation strategy. These actions also appear in Section 4.2, Table 9—Mitigation Actions.

Table 8—National Flood Insurance Program Mitigation Actions

National Flood Insurance Program Mitigation Actions			
Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	Public Information	Flooding	- General Occupancy - Essential Facilities
Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they	- Prevention - Natural Resources Protection	Flooding	- General Occupancy - Essential Facilities - Transportation Systems - Utility Systems - High Potential Hazard - Hazardous Materials

become available.			
Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE)	• Prevention	• Flooding	• General Occupancy • Essential Facilities
Require use of elevation certificates.	• Prevention	• Flooding	• General Occupancy • Essential Facilities

CHAPTER 4 MITIGATION STRATEGY

Section 4.1 ~ Goals and Objectives to Reduce Vulnerabilities to Hazards

The first step in developing a mitigation strategy is to establish goals that reflect what the municipality wishes to achieve through the implementation of its Hazard Mitigation Plan. The Brookline Hazard Mitigation Team established the following goals and objectives, based on its desire to protect the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property. These goals provided the basis for identifying and prioritizing mitigation actions.

Goal 1—Prevent the impacts of natural hazards on the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property whenever possible.

- Objective 1.1—Manage development in known hazard areas to avoid the risks associated with natural hazards.
- Objective 1.2—Plan to incorporate hazard mitigation into capital improvements and other future initiatives.
- Objective 1.3—Ensure building codes and other standards include requirements that make new construction more disaster resistant.
- Objective 1.4—Support the maintenance of this hazard mitigation plan.

Goal 2—Protect the Town's existing critical facilities, infrastructure, and private property from the impacts of natural hazards through cost effective mitigation activities.

- Objective 2.1—Modify existing structures to reduce damage from future natural hazard events.
- Objective 2.2—Perform cost effective flood hazard mitigation measures to protect private property.

Goal 3—Educate and inform the Town's residents to help them become more resilient to natural hazards impacting the community.

- Objective 3.1—Utilize educational methods to change the perception from "disaster losses are acceptable" to "many disaster losses are preventable if mitigation practices are followed."
- Objective 3.2—provide educational opportunities across all age ranges.
- Objective 3.3—Develop and distribute public awareness materials regarding the relative risk of natural hazards and practical mitigation measures to reduce damages and injuries.

Goal 4—become more resilient to the impacts that climate change has on the Town's population, critical facilities, infrastructure, emergency services, natural resources, and private property.

- Objective 4.1—Utilize existing documents, including the Nashua Regional Water Resiliency Action Plan (NRPC, 2016) and "Climate Change in Southern New Hampshire" (Sustainability Institute, University of New Hampshire, 2014) to better understand predicted changes in the region's climate.
- Objective 4.2—Conduct a town-specific vulnerability assessment to better understand the municipality's strengths and weaknesses with respect to climate change readiness.

- Objective 4.3—Prioritize which climate change impacts to address and when. Prioritization could be based on vulnerability assessment results, current needs, upcoming plans, feasibility, or budget considerations.
- Objective 4.4—Develop an adaptation strategy, including potential mitigation measures, timelines, responsible parties, and available funding sources.
- Objective 4.5—Implement the adaptation strategy and incorporate finding into hazard mitigation plan updates.
- Objective 4.6—Track progress and monitor results to determine where improvements can be made. Adjust the implementation strategy as necessary.

Goal 5—Address the challenges of natural resource degradation and the associated increased risk from hazards.

- Objective 5.1—Ensure development in hazard areas does not destroy natural barriers to damage, such as floodplains and vegetation.
- Objective 5.2—Protect or recreate environmental assets to help safeguard the built environment.

Goal 6—Protect emergency services, critical facilities, and other critical capabilities from hazard damage in order for them to remain operational.

- Objective 6.1—Identify critical facilities, infrastructure, and emergency services and their vulnerabilities to natural hazards.
- Objective 6.2— Develop and implement programs to promote hazard mitigation actions that protect the provision of emergency services in Town.
- Objective 6.3—Identify, maintain, and protect evacuation routes from hazard damage so they are usable when needed.

Section 4.2 ~ Mitigation Actions

After establishing goals and objectives to reduce vulnerabilities to each hazard type, the Hazard Mitigation Team identified mitigation actions to achieve these goals. The resulting mitigation actions appear in Table 9 below.

Table 9—Mitigation Actions

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
MITIGATION ACTIONS FROM 2017 PLAN			
The Planning Board will review and update the Floodplain Ordinance, Zoning Regulations, and the Master Plan to support hardened infrastructure and development as time and budget allows for the duration of this plan. The Building Inspector will proactively enforce the International Building Code	• Prevention • Property Protection	• Earthquake • Flooding • Severe Wind • Severe Winter Weather • Tornado	• General Occupancy • Essential Facilities • Hazardous Materials

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
(IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.			
Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.	Public Information	- Extreme Temperatures - Severe Winter Weather	Human lives
The Emergency Management Director will update and distribute Community Hazards Guides, as well as set up a schedule for regularly conducting various forms of outreach and education programs to increase awareness and assess vulnerability to drought, earthquake, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media. The public may not be familiar with some less-common hazards, and educating them on how to prepare for and respond to hazards will reduce their vulnerability to injury and property damage.	- Public Information - Prevention - Natural Resource Protection	- Drought - Earthquake - Extreme Temperatures - Flooding - Lightning - Severe Wind - Severe Winter Weather - Tornado - Wildfire	- General Occupancy - Human lives
Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are	- Prevention - Natural Resources Protection - Public Information	Drought	- General Occupancy - Essential Facilities

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least two public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red. Conserving water will reduce the impact of drought and ensure that water is available for essential needs such as hydration and fire suppression.			
Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators. Drought regions and updates on the drought status may be found here . When drought conditions occur, residential lawn watering will be restricted to conserve water supply and the Emergency Management Director will alert residents to fire danger.	Natural Resources Protection	- Wildfire - Drought	- General Occupancy - Essential Facilities - Transportation Systems - Utility Systems - High Potential Hazard - Hazardous Materials
Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station	- Prevention - Public Information	- Extreme Temperatures - Severe Winter Weather	Human Lives
Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.	- Prevention - Property Protection	Lightning	- General Occupancy - Essential Facilities
The Public Works Department will establish a regular system to monitor and maintain brush cutting, and proactively work with Eversource to harden electrical infrastructure and decrease overall vulnerability to damage during severe wind and winter weather events. This will include additional attention to tree trimming and removal in the vicinity of power lines and	Prevention	- Severe Winter Weather - Severe Wind	- Transportation Systems - Utility Systems

Mitigation Action	Mitigation Type	Hazard Addressed	Critical Facilities Addressed
structures.			
NATIONAL FLOOD INSURANCE PROGRAM MITIGATION ACTIONS			
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	Public Information	Flooding	General Occupancy
Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.	- Prevention - Natural Resources Protection	Flooding	- General Occupancy - Essential Facilities - Transportation Systems - Utility Systems - High Potential Hazard - Hazardous Materials
Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE)	Prevention	Flooding	- General Occupancy - Essential Facilities
Require use of elevation certificates for new structures in the floodplain.	Prevention	Flooding	- General Occupancy - Essential Facilities
ADDITIONAL MITIGATION ACTIONS			
Maintain current burn permit system and post fire danger categories. Tightly control burn permits and revoke when not properly and safely being utilized. Post fire danger categories and educate the public about what they mean and what they can do to prevent wildfires.	- Prevention - Property Protection - Public Information	Wildfire	- General Occupancy - Essential Facilities
Create municipal infectious disease standard operating guidelines.	- Prevention - Public Information	Infectious Diseases	- General Occupancy - Human Lives

Section 4.3 ~ Prioritizing Mitigation Actions

After identifying mitigation actions to address each hazard, the Team then began a two-step process to prioritize them. The first step was to conduct a benefit cost review. Benefit cost reviews provide a comprehensive overview of the monetary and non-monetary costs and benefits associated with each action. During this process, the Hazard Mitigation Team asked a variety of questions such as, “How beneficial is this action to the entire Town?” “How many people will benefit from this action?” “How large of an area is impacted by this project?” “How costly is this project?”

Table 10—Benefit Cost Review

Mitigation Action	Likely Benefits	Likely Costs
Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.	- This action would be effective at avoiding and reducing future losses. - This action is beneficial to all applicable buildings across the entire Town.	- This action may not benefit older structures not subject to newer building codes. \$0 additional costs, percentage of Building Inspection budget appropriation (source: Brookline Operating Budget)
Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.	- Helps vulnerable populations. - Voluntary participation	- May be difficult to get personal contact information. - Voluntary participation means not everyone would be covered. \$750 annually (source: Brookline Operating Budget, Emergency Management appropriation)
Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquake, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media.	- The Town currently has the capacity to implement this action. - This action is beneficial to all residents in Town.	- This action may have limited impact because it can be difficult to get people to pay attention to outreach campaigns. \$0 additional costs, percentage of Emergency Management budget (source: Brookline Operating Budget)
Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water	This action has environmental benefits if residents comply with reduced water	This action may have limited impact if there is not an accompanying enforcement mechanism.

Mitigation Action	Likely Benefits	Likely Costs
systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least two public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.	consumption measures. The state may have educational materials that the Town could utilize.	- There are social concerns about local government regulating what residents can do with private wells. \$0 additional costs, percentage of Executive appropriation for implementation and Police Department budget appropriation for enforcement (source: Brookline Operating Budget)
Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators.	- This action has environmental benefits if residents comply with reduced water consumption measures. - This action may help ensure adequate water supply for firefighting and emergency management purposes.	- This action may have limited impact if there is not an accompanying enforcement mechanism. \$0 additional costs, percentage of Fire Department budget appropriation (Brookline Operating Budget)
Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station	- This action would benefit the entire Town and particularly the most at risk and needy populations. - This action has broad social benefits for the community.	\$0 additional costs, percentage of Emergency Management budget appropriation (source: Brookline Operating Budget)
Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.	Reduced inconvenience and loss associated with a shutdown of critical facilities due to lightning damage	\$1,000-\$5,000 per critical facility for lightning protection devices (source: Brookline Operating Budget, General Government Buildings appropriation)
Continue to work with Eversource to harden electrical	Trimming trees near power lines would reduce	Removal of trees along designated scenic roads

Mitigation Action	Likely Benefits	Likely Costs
infrastructure, including trimming trees near power lines.	the risk of outages. Fewer trees directly along road would also reduce root systems in roadways, allow more sunlight for better snowmelt, and improve overall improve road conditions.	requires Planning Board approval. - Tree removal may be incompatible with local aesthetics . \$2,000-\$3,000 per large tree for removal (source: Brookline Operating Budget, Highways, Streets, & Bridges: Tree Warden appropriation)
Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	- Educate residents, builders, and other professionals about NFIP. - Reduce property loss costs associated with flooding	- Minimal, part of normal town operations. - Percentage of existing Code Enforcement budget appropriation (source: Brookline Operating Budget)
Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack River Watershed into municipal planning activities when they become available.	- This action would be most beneficial to residents of flood-prone areas of Town. - This action has the potential to reduce flood related economic losses.	- There are potential economic costs associated with limiting where development can go. - Percentage of existing Planning & Zoning budget appropriation (source: Brookline Operating Budget)
Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE)	- This action would be most beneficial to residents in flood-prone areas of Town. - This action has the potential to reduce flood related economic losses.	- Minimal, part of normal town operations \$0 additional costs, percentage of existing Code Enforcement budget appropriation (source: Brookline Operating Budget)

Mitigation Action	Likely Benefits	Likely Costs
Require use of elevation certificates for new structures in the floodplain.	- This action would be most beneficial to residents in flood-prone areas of Town. - This action has the potential to reduce flood related economic losses.	- Minimal, part of normal town operations \$0 additional costs, percentage of existing Code Enforcement budget appropriation (source: Brookline Operating Budget)
Maintain current burn permit system and post fire danger categories. Tightly control burn permits and revoke when not properly and safely being utilized. Post fire danger categories.	- This action would result in reduced fire-fighting costs. - This action would be most beneficial to portions of Town near wooded areas. - Sound forestry practices can help reduce the risk of wildfire. - This action would also be beneficial to mitigate manmade fire related hazards	- Opinions vary about wildfire management, so this action could cause social and political tension. - Enforcement of burn permits can be costly. \$0 additional costs, percentage of existing Fire Department budget appropriation (Brookline Operating Budget)
Create municipal infectious disease standard operating guidelines.	- This action would benefit the entire Town and particularly the most at risk and needy populations. - This action has broad social benefits for the community.	\$0 additional costs, percentage of Emergency Management budget appropriation (source: Brookline Operating Budget)

After completing a Benefit Cost review for each action, the Hazard Mitigation Team then prioritized the actions by conducting a STAPLEE Analysis, which stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental factors. For each mitigation action, the Team asked the following questions:

- Social— Will the action unfairly affect any one segment of the population? Will it disrupt established neighborhoods? Is it compatible with present and future community values? Will it adversely affect cultural resources?
- Technical—How effective is the action in avoiding or reducing future losses? Will it create more problems than it solves? What are some secondary impacts? Does it solve a problem or only a symptom?

- Administrative— Does the community have the capability to implement the action? Can the community provide the necessary maintenance? Can it be accomplished in a timely manner?
- Political— Is there public support both to implement and maintain the action? Is the political leadership willing to support it? Does it present a financial burden to stakeholders?
- Legal— Does the community have the authority to implement the action? Is enabling legislation necessary? What are the legal side effects? Will the community be liable for the actions, support of actions, or lack of actions?
- Economic— What are the costs of this action? How will the costs be borne? Are state/federal grant programs applicable? Does the action fit into existing capital improvements or economic development budgets?
- Environmental— How will this action affect the environment? Does it comply with local, state, and federal environmental regulations? Is it consistent with community environmental goals? Are endangered or threatened species likely to be affected?

The cost and benefit of each mitigation action were then evaluated and assigned a quantitative score based on the STAPLEE criteria.

Benefit Score Range: 0 = Not Beneficial, 1 = Somewhat Beneficial, 2 = Beneficial, 3 = Very Beneficial

Cost Score Range: 0 = Not Costly, -1 = Somewhat Costly, -2 = Costly, -3 = Very Costly

Next, the scores for each action were added to determine priority. Finally, the Hazard Mitigation Team reviewed the scores and resulting prioritization to make sure it was consistent with the Town's goals and Master Plan. The STAPLEE analysis and prioritized mitigation actions appear in Table 11 below.

Table 11—STAPLEE Analysis

Mitigation Action: Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.			
Criteria	Evaluation	Cost	Benefit
Social	This action would not unfairly affect any segment of the population or disrupt established neighborhoods. It is compatible with community values that understand trees need to be trimmed for road maintenance and public safety.	0	3
Technical	This action would be effective in avoiding or reducing future losses. It is very likely that a severe winter storm or severe wind event will occur and impact power lines. It would not create more problems than it solves and it solves the problem rather than only a symptom. Fewer trees directly along the road would also improve drainage, reduce road systems in the roadway, and allow more sunlight to melt the snow, all resulting in better road conditions.	0	3
Administrative (including responsible party)	Brookline has the capacity to implement this action. The Brookline Highway Department and Eversource would be the responsible parties.	0	3
Political	In general there is political support for this action, although there may be some opposition to tree trimming along designated scenic roads.	-1	3
Legal	The Town does not have the authority to trim trees along scenic roads without first receiving approval from the Planning Board. The Planning Board has the legal authority to declare dead trees along a scenic road a public hazard and therefore allow them to be removed.	-1	3
Economic (including direct cost)	Some costs associated with this action would be borne by Eversource. The remaining costs would be borne by the Town. The removal of large trees would cost an estimated \$2,000-3\$,000 per tree and would be performed by a hired contractor. The removal of small trees would be performed by the Highway Department. The benefits of a more resilient electrical infrastructure far outweigh the costs of this action.	-1	3
Environmental	This action would positively impact the environment by improving road drainage and decreasing the need to use ice melting agents.	0	3
Subtotal		-3	21
Total			18
Priority			1

Mitigation Action: Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station.			
Criteria	Evaluation	Cost	Benefit
Social	This action primarily benefits Brookline's most vulnerable residents. It is compatible with present and future community values.	0	3
Technical	This action does not solve the problem of extreme temperatures, but it does solve the symptom of exposure. Extreme temperatures are very likely to occur in Brookline, so mitigation measures are important.	0	3
Administrative (including responsible party)	Brookline has the capability to implement this action. The Brookline Emergency Management Director is responsible for it and it falls under emergency management operations. This action can be implemented in a very timely manner.	0	3
Political	There is public support to implement and maintain this action.	0	3
Legal	Brookline has the legal authority to implement this action.	0	3
Economic (including direct cost)	This action falls under Brookline's existing Emergency Management budget and does not impose additional costs on the Town.	0	2
Environmental	There are no environmental impacts associated with this action.	0	0
Subtotal		0	17
Total			17
Priority			2

Mitigation Action: Maintain current burn permit system and post fire danger categories. Tightly control burn permits and revoke when not properly and safely being utilized. Post fire danger categories.			
Criteria	Evaluation	Cost	Benefit
Social	This action does not unfairly impact any segment of the population and it is compatible with present and future community values	0	3
Technical	This action helps to avoid or reduce future losses. Wildfire poses danger during dry periods, which Merrimack has been experiencing in recent years. It has the potential to solve the underlying problem of wildfires by removing the fuel source. It will not create additional problems or cause secondary impacts.	0	3
Administrative (including responsible party)	Brookline has the capability to implement this action, although it poses an additional burden on the Fire Dept., particularly for enforcement of burn permits. Eversource is responsible for removing underbrush and standing deadwood under power lines.	-2	3
Political	There is public and political support for this action	0	2
Legal	Brookline has the legal authority to implement this action.	0	3
Economic (including direct cost)	The benefits of reduced fire-fighting costs and potential decrease in property damage could exceed the costs of implementing this action. At the same time, large scale wildfires are relatively rare in Brookline and therefore the costs of implementing this action may outweigh the benefits. Eversource would be responsible for the direct costs of brush removal under power lines	-2	3
Environmental	Fire is a natural part of the ecosystem and suppressing it may have negative consequences. On the other hand, large-scale, man-made fires can have a detrimental impact on the environment.	0	3
Subtotal		-4	20
Total			16
Priority			3

Mitigation Action: Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquake, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media.

Criteria	Evaluation	Cost	Benefit
Social	This action does not unfairly affect any one segment of the population. It is available to all Brookline residents, provided that a variety of distribution methods are utilized.	0	2
Technical	There is a high likelihood that at least one of the hazards addressed through this action will occur. This action would help to decrease risk and avoid future loss, but only if residents take personal action as a result of this educational campaign.	-1	2
Administrative (including responsible party)	Brookline has the capability to implement this action. This action would be the responsibility of the Brookline Emergency Management Director.	0	3
Political	There is public support to implement and maintain this action.	0	3
Legal	Brookline has the legal authority to implement this action.	0	2
Economic (including direct cost)	There is \$0 in additional costs to implement this action. It is part of the existing Emergency Management budget.	0	3
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		-1	16
Total			15
Priority			4

Mitigation Action: Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.			
Criteria	Evaluation	Cost	Benefit
Social	This action would not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	2
Technical	This action would help to avoid or reduce future losses. It has more potential to solve symptoms related to flooding than the underlying problem itself. It would not create additional problems or cause secondary impacts.	0	3
Administrative (including responsible party)	Brookline has the capability to implement this action. The Brookline Building Inspector would be responsible for it. It can be accomplished in a timely manner.	0	3
Political	There is public support to implement and maintain this action. The political leadership is also willing to support it.	0	2
Legal	Brookline has the legal authority to implement this action. The Town's role is only to provide and distribute the materials, not to make actual insurance determinations.	0	2
Economic (including direct cost)	This action is consistent with normal town operations and does not impose additional economic costs. It would cost \$500 per year to implement and would come out of the Building Inspection budget.	-1	2
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts only if the recommendations in the literature are implemented.	0	1
Subtotal		-1	15
Total			14
Priority			5

Mitigation Action: Create municipal infectious disease standard operating guidelines.			
Criteria	Evaluation	Cost	Benefit
Social	This action would not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	2
Technical	This action would help to avoid or reduce future losses. It has more potential to solve symptoms related to infectious disease than the underlying problem itself. It would not create additional problems or cause secondary impacts.	0	2
Administrative (including responsible party)	Brookline has the capability to implement this action. The Brookline Emergency Management Director would be responsible for it.	0	2
Political	There is public support to implement and maintain this action, especially since the recent Covid-19 pandemic. The political leadership is also willing to support it.	0	3
Legal	Brookline has the legal authority to implement this action.	0	2
Economic (including direct cost)	This action is consistent with normal town operations and does not impose additional economic costs.	0	2
Environmental	This action will not impact the environment.	0	0
Subtotal		0	13
Total			13
Priority			6

Mitigation Action: Create a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.

Criteria	Evaluation	Cost	Benefit
Social	This is a voluntary program, so it would not affect any one segment of the population. Helping vulnerable populations is compatible with community values.	0	2
Technical	This action is only effective at avoiding or reducing future losses if residents voluntarily participate in it.	0	2
Administrative (including responsible party)	The Town has the capability to implement this action if information is voluntarily provided by residents. The Brookline Emergency Management Director is responsible for implementing this action.	0	2
Political	There is political support for this action.	0	2
Legal	The Town has the authority to implement this action and no enabling legislation is necessary. Participation in this program is entirely voluntary.	0	2
Economic (including direct cost)	This action would cost roughly \$750 annually. It is consistent with normal town operations and does not impose additional economic costs.	0	2
Environmental	This action would not impact the environment.	0	0
Subtotal		0	12
Total			12
Priority			7

Mitigation Action: Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the State Drought Management Plan to monitor drought indicators.

Criteria	Evaluation	Cost	Benefit
Social	This action does not unfairly impact any segment of the population and it is compatible with present and future community values.	0	2
Technical	This action helps to solve symptoms of drought by making emergency response personnel and residents aware of current conditions. Monitoring alone has limited ability to reduce future loss—additional action is needed.	-2	2
Administrative (including responsible party)	The Brookline Fire Dept. is responsible for monitoring water supply and drought conditions.	0	3
Political	There is public and political support for this action.	0	2
Legal	Brookline has the legal authority to implement this action.	0	2
Economic (including direct cost)	Monitoring costs are covered under the existing Fire Dept. budget.	-1	2
Environmental	This action has a positive impact on the environment by providing the data needed to promote water conservation.	0	1
Subtotal		-3	14
Total			11
Priority			8

Mitigation Action: Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.			
Criteria	Evaluation	Cost	Benefit
Social	There are not social impacts associated with this action. Enforcement would apply evenly across all applicable buildings, including new construction, major renovations, and changes of use.	-1	2
Technical	This action is effective at avoiding and reducing future losses and it mitigates the impacts of these hazards.	0	2
Administrative (including responsible party)	Brookline has the capability to implement this action. Responsibility would fall under the Brookline Building Inspector.	0	2
Political	There is public support for this action. Concerns may exist among some property owners who would be directly impacted.	-1	2
Legal	Brookline has adopted these codes and has the legal authority to enforce them.	0	2
Economic (including direct cost)	There would be no additional costs associated with enforcing building codes, as it falls under the existing \$40,201 Building Inspection budget. This action could have a positive economic impact by reducing the number of emergency response calls.	-1	2
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		-3	13
Total			10
Priority			9

Mitigation Action: Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.			
Criteria	Evaluation	Cost	Benefit
Social	This action would not unfairly affect any segment of the population, disrupt established neighborhoods, or adversely affect cultural resources.	0	2
Technical	This action is effective in avoiding or reducing future losses. It would not create more problems than it solves. It would reduce the inconvenience from a shutdown of critical facilities resulting from power outages. However, incidents related to lightning are very rare in Brookline.	-1	2
Administrative (including responsible party)	Brookline has the capacity to implement this action. Each critical facility department head is responsible for implementing the installation of lightning protection devices.	0	2
Political	There is political support to implement and maintain this action.	0	2
Legal	Brookline has the authority to implement this action.	0	1
Economic (including direct cost)	The cost of \$1,000-\$5,000 per critical facility for lightning protection devices would come out of the Brookline Operating Budget, General Government Buildings appropriation. The cost of taking this action is less than the potential costs of damage to critical electronics and facilities.	-1	2
Environmental	This action would not impact the environment.	0	0
Subtotal		-2	11
Total			9
Priority			10

Mitigation Action: Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline according to findings from 2017 regulatory audit. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.

Criteria	Evaluation	Cost	Benefit
Social	This action would impact property owners subject to revised floodplain designations. It would have a positive social impact on the community by reducing flooding.	0	2
Technical	This action helps solved the problem of flood related damage. It is effective in reducing future losses.	0	2
Administrative (including responsible party)	Brookline has the capability to implement this action. Revisions to regulations require a town vote and public hearing. The Brookline Planning Board would be responsible for this action.	-2	2
Political	There is public support to implement this action.	0	1
Legal	Brookline has the legal authority to implement this action.	0	1
Economic (including direct cost)	This action could cost \$5,000-\$10,000 depending on the scope. However, this expenditure would simultaneously accomplish a number of similar mitigation actions. This action could have a positive economic impact by reducing the number of emergency response calls.	-1	2
Environmental	This action has positive environmental impacts and is consistent with community environmental goals.	0	1
Subtotal		-3	11
Total			8
Priority			11

Mitigation Action: Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE).			
Criteria	Evaluation	Cost	Benefit
Social	There are no social impacts associated with this action. Enforcement would apply evenly across all applicable buildings, including new construction, major renovations, and changes of use.	0	2
Technical	This action would help to avoid or reduce future losses. It would not create additional problems or cause secondary impacts.	0	2
Administrative (including responsible party)	The Town has the capacity to administer this action. The Building & Code Enforcement Division is the responsible party.	0	1
Political	There are no political issues associated with this action.	0	0
Legal	There are no legal issues associated with this action.	0	0
Economic (including direct cost)	This action is consistent with normal town operations and does not impose additional economic costs.	0	1
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		0	7
Total			7
Priority			12

Mitigation Action: Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least two public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.

Criteria	Evaluation	Cost	Benefit
Social	This action does not unfairly affect any one segment of the population because it is applied evenly to all residents and businesses. There are social concerns about local government regulating how residents can use their private wells.	-2	0
Technical	The effectiveness of this action depends on the ability of the Town to enforce it. If followed, it would help to reduce the impacts of drought.	-1	2
Administrative (including responsible party)	Brookline has the capability to implement this action. The Brookline Board of Selectmen would be responsible for implementation and the Brookline Police Dept. would be responsible for enforcement.	0	3
Political	The Brookline Board of Selectmen support this action. There is general public support for this action, although some residents are unsatisfied with it.	-2	2
Legal	The Brookline Board of Selectmen have the legal authority to implement this action under NH RSA 41:11-d.	0	3
Economic (including direct cost)	There are no additional costs associated with this action. A percentage of the Executive budget would be used for implementation and a percentage of Police Dept. budget would be used for enforcement.	-1	0
Environmental	This action would have a positive impact on the environment by reducing water use in a time of scarcity.	0	2
Subtotal		-6	12
Total			6
Priority			13

Mitigation Action: Require use of elevation certificates for new structures in the floodplain.			
Criteria	Evaluation	Cost	Benefit
Social	This action would directly impact individuals seeking to build in the floodplain.	-1	2
Technical	This action is effective in avoiding or reducing future losses. It has more potential to solve symptoms related to flooding rather than the underlying problem itself. It will not create additional problems or cause secondary impacts. Development in the floodplain is already limited, so this action may not have a significant impact.	-1	2
Administrative (including responsible party)	Brookline has the capacity to administer this action. The Brookline Building Inspector would be the responsible party. It can be accomplished in a timely manner.	0	1
Political	There is political support for this action.	0	1
Legal	Brookline has the authority to implement this action.	0	1
Economic (including direct cost)	Some landowners may believe they will face economic hardship if they are required to take extra measures in order to build in flood-prone areas. This action is consistent with normal town operations and would come out of the Planning Dept. budget.	-2	0
Environmental	This action has the potential to reduce property damage and subsequent environmental impacts.	0	1
Subtotal		-4	8
Total		4	
Priority		14	

Section 4.4 ~ Implementing and Administering Mitigation Actions

The Town of Brookline has integrated its 2017 Hazard Mitigation Plan into a variety of other planning mechanisms, including the Brookline Emergency Operations Plan and Capital Improvements Plan. In addition, the Town of Brookline has incorporated and will continue to integrate requirements of the Brookline Hazard Mitigation Plan Update 2024 into other planning mechanisms and actions.

Updates to Brookline’s Capital Improvement Plan will include any applicable mitigation projects identified in the Hazard Mitigation Plan, such as bridge improvements. The next update to the Town’s Master Plan will also incorporate elements of the Hazard Mitigation Plan where applicable.

The Brookline Hazard Mitigation Team will be responsible for helping Town boards and departments to integrate the Hazard Mitigation Plan into their own planning mechanisms. The Hazard Mitigation Team developed Table 12, which is an action plan that outlines who is responsible for implementing the prioritized mitigation actions, how they will be funded, and when they will be completed.

Timeframe	
Short Term	1 year or less
Medium Term	2 -3 years
Long Term	4-5 years

Table 12—Implementation and Administration

Priority	Mitigation Action	Responsible Party	Cost & Funding	Timeframe
1	Continue to work with Eversource to harden electrical infrastructure, including trimming trees near power lines.	Highway Department	Cost = \$2,000-\$3,000 per large tree for removal Funding Source: Brookline Operating Budget Highways, Streets, & Bridges: Tree Warden appropriation	Short Term
2	Protect vulnerable populations from the impacts of extreme temperatures and severe winter storms by establishing warming and cooling stations at the Safety Complex and Fire Station.	Emergency Management Director, Fire Department	Cost = \$0 additional costs Funding source: Brookline Operating Budget, Emergency Management appropriation	Short Term
3	Maintain current burn permit system and post fire danger categories.	Fire Department	Cost = \$0 additional costs	Short Term

Priority	Mitigation Action	Responsible Party	Cost & Funding	Timeframe
	Tightly control burn permits and revoke when not properly and safely being utilized. Post fire danger categories.		Funding Source: Brookline Operating Budget, Fire Department Budget	
4	Distribute Community Hazards Guides and conduct outreach and education programs to increase awareness of drought, earthquake, extreme temperatures, flooding, lightning, severe wind, severe winter weather, tornado, wildfire, and carbon monoxide risks. Utilize Code Red, community access TV, Brookline website, and social media.	Emergency Management Director	Cost = \$750 annually Funding Source: Brookline Operating Budget, Emergency Management appropriation	Short Term
5	Prepare, distribute, or make available NFIP, insurance, and building codes explanatory pamphlets or booklets.	Building Inspector	Cost = \$500 annually Funding Source: Brookline Operating Budget, Building Inspection appropriation	Short Term
6	Create municipal infectious disease standard operating guidelines.	Emergency Management Director	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Emergency Management appropriation	Medium Term
7	Create and maintain a database to track those individuals at high risk of death during hazard events, such as the elderly, sick, and homeless. Coordinate with the Emergency Management Director to conduct in-person outreach to these individuals to ensure they are adequately protected from the impacts of hazard events, including severe winter weather and extreme temperatures.	Emergency Management Director	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Emergency Management appropriation	Short Term
8	Monitor water supply and drought conditions. Utilize NH Division of Forest and Lands reports and consult the New Hampshire Drought Management Team (DMT) and the	Fire Department	Cost = \$0 additional costs Funding Source: Brookline Operating	Short Term

Priority	Mitigation Action	Responsible Party	Cost & Funding	Timeframe
	State Drought Management Plan to monitor drought indicators.		Budget, Fire Department appropriation	
9	Proactively enforce the International Building Code (IBC) and International Residential Code (IRC) to protect buildings and infrastructure from the impacts of earthquake, flooding, severe wind, severe winter weather, and tornado.	Building Inspector	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Building Inspection appropriation	Short Term
10	Protect critical facilities and equipment from lightning damage. Install and maintain surge protection on critical electronic equipment at Safety Complex and Fire Station.	All Department Heads	Cost = \$1,000-\$5,000 per critical facility for lightning protection Funding Source: Brookline Operating Budget (General Government Buildings appropriation	Medium Term
11	Incorporate flood mitigation into local planning. Revise/adopt regulations to improve floodplain management in Brookline according to findings from 2017 regulatory audit. Update or strengthen floodplain development ordinances to reflect increased flood risk under climate change, such as prohibiting or limiting floodplain development, limiting the percentage of impervious surface allowed, prohibiting fill, and creating a stream buffer ordinance. Incorporate updated floodplains for Merrimack Watershed into municipal planning activities when they become available.	Planning Board	Cost = \$5,000-\$10,000 depending on scope Funding Source: Brookline Operating Budget, Planning & Zoning appropriation	Medium Term
12	Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE).	Building Inspector	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Building Inspection	Short Term

Priority	Mitigation Action	Responsible Party	Cost & Funding	Timeframe
			appropriation	
13	Enforce RSA 41:11-d, which allows municipalities to restrict all residential lawn watering for properties on public water systems and those on private domestic wells within their political boundaries if the state or federal government declares a drought condition for that region of the state. The governing body can enforce the lawn watering restrictions by imposing fines in accordance with RSA 625:9. Notice shall be given at least 3 calendar days before the regulations are implemented and shall be published in a paper of general circulation in the municipality and shall be posted in at least two public places. Other outreach methods include Brookline town website, social media accounts, local cable, and Code Red.	Board of Selectmen, Police Department	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Executive Appropriation and Police Department appropriation	This action will start when a state or federal drought is declared and will be completed when drought conditions end.
14	Require use of elevation certificates for new structures in the floodplain.	Building Inspector	Cost = \$0 additional costs Funding Source: Brookline Operating Budget, Building Inspection appropriation	Short Term

CHAPTER 5. PLAN ADOPTION

Section 5.1 ~ Formal Adoption by Governing Body

CERTIFICATE OF ADOPTION

TOWN OF BROOKLINE, NH BOARD OF SELECMEN

A RESOLUTION ADOPTING THE TOWN OF BROOKLINE, NH HAZARD MITIGATION PLAN UPDATE 2024

WHEREAS, the Town of Brookline has historically experienced damage from natural hazards and it continues to be vulnerable to the effects of climate change, drought, earthquake, extreme temperatures, flooding, severe wind, lightning, severe winter weather, tornado, and wildfire, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Brookline has developed and received approval pending adoption from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2024 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between October 4, 2022 and February 7, 2023 regarding the development and review of the Hazard Mitigation Plan Update 2024; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedures for the Town of Brookline; and

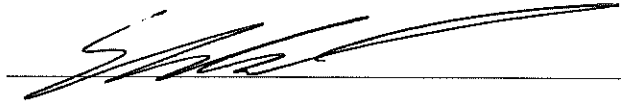
WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Brookline, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of Brookline eligible for funding to alleviate the impacts of future hazards; now therefore be it

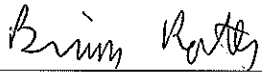
RESOLVED by the Brookline Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Brookline
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. An annual report on the progress of the implementation elements of the Plan shall be presented to the City Council/Board of Selectmen by the Brookline Hazard Mitigation Team.

Adopted this day, the 9th of December, 2024.



Eddie Arnold, Chair, Brookline Selectboard

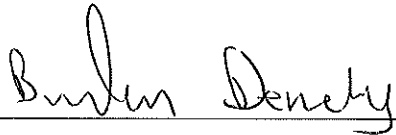


Brian Rater, Vice-Chair, Brookline Selectboard

Steve Russo, Brookline Selectboard

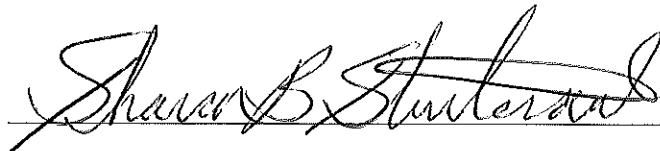


Ed Perry, Brookline Selectboard



Brendan Denehy, Brookline Selectboard

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Brookline the 9th of December, 2024.



Witness

Section 5.2 ~ FEMA Approval Letter



FEMA

December 19, 2024

Robert M. Buxton, Director
New Hampshire Homeland Security and Emergency Management
33 Hazen Dr.
Concord, NH 03305

Director Buxton:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region 1 Mitigation Division has approved the *Town of Brookline, New Hampshire Hazard Mitigation Plan Update 2024* effective **December 12, 2024** through **December 11, 2029** in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the Town of Brookline, NH is eligible to apply to New Hampshire Homeland Security and Emergency Management for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region 1 Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Jay Neiderbach at (202) 285-7769 or josiah.neiderbach@fema.dhs.gov.

Sincerely,

Christopher Markesich
Floodplain Management and Insurance Branch Chief
Mitigation Division | DHS, FEMA Region 1

cc: Austin Brown, Mitigation & Recovery Section Chief, NH HSEM
Lynne Doyle, State Planner, NH HSEM
Dean Savramis, Mitigation Division Director, DHS, FEMA Region 1
Josiah (Jay) Neiderbach, Hazard Mitigation Community Planner, DHS, FEMA Region 1

Town of Brookline, New Hampshire

Hazard Mitigation Plan Update 2024

Appendix

Hazard Mitigation Team Meeting Agendas & Sign-in Sheets

Notification Letter

Hazard Mitigation Plan Update Website Screen Shot

Hazard Mitigation Team Meeting Agendas & Sign-in Sheets

mtg 1

mitg 3

Brookline Hazard Mitigation Plan Update - 1/3/23 - 9 AM - Brookline Town Hall

Name	Title	Agency	Email
Charles E Corey Sr	Chief	BFD	ccorey@brooklinenh.us
Mike Wennich	Public Works Dir	BPH	mWennich@brooklinenh.us
Bill Quigley	Chief	Police Dept	wquigley@brooklinenh.us
Scott Butcher	Town Admin.	ADMIN	sbutcher@brooklinenh.us
Michele Decoteau	Town Planner	Planning Dept	Mike MDecoteau@gmail.com
David Coffey	Emergency Mng., Dir.	EM	dcoffey@brooklinenh.us
Jeffrey Stewart	Chief	Ambulance Dept	jstewart@brooklinenh.us

Brookline Hazard Mitigation Meeting - 2/7/23 - 9 am - Brookline Town Hall

Name	Title	Agency	Email
Marsha Haines	Planner	Red Cross	marsha.haines2@redcross.org
Jeffrey STEWART	Chief	Brookline Ambulance	jstewart@brookline.nh.us
Michelle Decoteau	Town Planner	Brookline Town Planner	MDecoteau@Brookline.nh.us
Scott BUTCHER	Town Admin.	Town of Brookline	sbutcher@brookline.nh.us
Bill QUIGLEY	Chief	Brookline Police	wquigley@brookline.nh.us
Mike WENRICH	P.W. Director	B P W	mwennich@brookline.nh.us
David Coffey	Emergency Director	Emergency Mgmt. Dept.	dcoffey@brookline.nh.us
Charles E Corey Sr	Chief	BFD	ccoreya@brookline.nh.us

Notification Letter



October 5th, 2022

Brookline, NH Hazard Mitigation Plan Update

The Town of Brookline, in conjunction with the Nashua Regional Planning Commission, is in the process of updating its Hazard Mitigation Plan. We strongly encourage all residents, members of the business community, and other interested individuals to participate in the update process.

The Brookline Hazard Mitigation Plan Update will examine changes in development and mitigation priorities that have occurred since the 2017 Plan. It will also address natural hazards in the Town, previous occurrences of these hazards, the probability of future hazard events, and the vulnerability of Brookline's critical facilities to these hazards. The Plan will conclude by identifying and prioritizing mitigation actions to reduce Brookline's vulnerability to natural hazards.

You can stay informed by visiting the Brookline Hazard Mitigation Plan Update website at <http://www.nashuarpc.org/BrooklineHazMit>. The webpage will be updated throughout the planning process and includes meeting times, locations, agendas, and updated documents. For additional information or to participate in the Plan update, please contact me at paytonh@nashuarpc.org or (603) 417-6570 x6567.

All the best,

NASHUA REGIONAL PLANNING COMMISSION

A handwritten signature in black ink, appearing to read "Payton Hoyt", is written over a horizontal line.

Payton Hoyt
Regional Planner
(603) 417-6570 x6567
paytonh@nashuarpc.org



Nashua Regional Planning Commission
Metropolitan Planning Organization
30 Temple Street, Suite 310, Nashua, NH 03060

Hazard Mitigation Plan Update Website Screen Shot



Brookline Hazard Mitigation Plan
Update 2017

Hazard Mitigation Plan Guide



The Town of Brookline, in conjunction with the Nashua Regional Planning Commission, is in the process of updating its Hazard Mitigation Plan. We strongly encourage all residents, members of the business community, and other interested individuals to participate in the update process.

The Brookline Hazard Mitigation Plan Update will examine changes in development and mitigation priorities that have occurred since the 2017 Plan. It will also address natural hazards in the Town, previous occurrences of these hazards, the probability of future hazard events, and the vulnerability of Brookline's critical facilities to these hazards. The Plan will conclude by identifying and prioritizing mitigation actions to reduce Brookline's vulnerability to natural hazards. This webpage will be updated throughout the planning process and includes meeting times, locations, agendas, and updated documents.

To learn more or be added to a contact list, please contact Camille Pattison at camillep@nashuarpc.org or (603) 417-6570 ext. 6577.

Steering Committee Members

Name	Title
Scott Butcher	Town Administrator
David Coffey	Director, Emergency Management
Charles (Charlie) Corey	Fire Chief
Michele Decoteau	Town Planner
William (Bill) Quigley	Police Chief
JP Royce	Fire Inspector
Jeffrey Stewart	Chief, Brookline Ambulance Service
Mike Wenrich	Director, Public Works

Hazard Mitigation Plan Update Meetings

- All meetings will take place at 9:00am.
- Meeting 1 location: Brookline Safety Complex
- Meeting 2, 3, 4 location: Brookline Town Hall

Meeting 1, October 4, 2022

[Agenda](#)

Task 1: planning process, identifying resources

Meeting 2, November 1, 2022

[Agenda](#)

Task 2: natural hazards, previous occurrences of hazards, probability of future hazards, critical facilities, vulnerabilities by hazard

Meeting 3, January 3, 2023

[Agenda](#)

Task 3: status of previous mitigation actions, new mitigation actions

Meeting 4, February 7, 2023

[Agenda](#)

Task 4: prioritize mitigation actions, implementation schedule