TOWN OF SHARON
HAZARD MITIGATION PLAN
2024 UPDATE

Draft Plan for Review [June 25, 2024]

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ACKNOWLEDGEMENTS & CREDITS

This plan was prepared for the Town of Sharon by the Metropolitan Area Planning Council (MAPC) under the direction of the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR). The plan was funded by the Federal Emergency Management (FEMA) Hazard Mitigation Grant Program (HMGP).

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Public Meeting Participants and Community Stakeholders
Special thanks to the public meeting participants, residents, and community stakeholders who provided feedback.

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SECTION 1: EXECUTIVE SUMMARY

Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities. Other common concerns are the impacts of extreme heat, drought, and nor'easters. This plan also considers how our changing climate will affect natural hazards. Warming temperatures will fuel changing precipitation patterns and an increasing frequency and intensity of severe storms. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, to adopt a local multi-hazard mitigation plan and update this plan in five-year intervals.

PLANNING PROCESS

This is an update to the most recent Sharon Hazard Mitigation Plan, which was approved by FEMA on June 5, 2018. Planning for the Hazard Mitigation Plan update was led by the Sharon Local Hazard Mitigation Planning Team (or "Local Team"), composed of staff from a number of different Town Departments. The Local Team met on the following dates:

- August 2, 2023
- November 9, 2023
- March 28, 2024
- May 16, 2024

The Local Team discussed updates to local hazard areas, critical facilities, hazard mitigation goals, the Town's existing mitigation measures, and new or revised hazard mitigation measures that would benefit the Town.

Public participation in the planning process is important for improving awareness of the impacts of natural hazards and to build support for the actions the Town takes to mitigate them. The Local Team hosted two public meetings hosted by the Select Board. Town staff, residents, the Town Manager, and all Select Board members were present. The public meetings were held on:

- December 19, 2023
- June 25, 2024

Key stakeholders and neighboring communities were notified and invited to participate. The first public meeting was also used to launch a public survey that helped gather additional information related to hazard mitigation concerns, impacts, and preferred strategies. The second public meeting was used to launch a public comment period for the draft plan update. Please refer to appendix for more information about the public comments received, and VI: Planning Process & Public Participation for more information about the outreach and engagement efforts that informed this plan update.

RISK ASSESSMENT

The Sharon Hazard Mitigation Plan assesses the potential impacts to the Town from flooding, high winds, winter storms, brush fire, geologic hazards, extreme temperatures, and drought. Flooding, driven by hurricanes and other storms, presents the greatest hazard to the town, though there are also brush fire risks associated with the large tracts of forest in Sharon. These are shown in the map series in Appendix B.

The Sharon Local Hazard Mitigation Planning Team identified 101 Critical Facilities. These are also shown on the map series and listed in Table 39, identifying which facilities are located within the mapped hazard zones.

A Hazus analysis, which can be found in full in the 'Vulnerability Assessment' Section, provided estimates of damages from Hurricanes of 1% and 0.2% Annual Chance at $38 million and $135 million, respectively. Earthquakes of magnitude 5 analysis provided $4.3 billion in property damage and magnitude 7 analysis is pending. Flood damage for the 1% and the 0.2% Annual Chance of Flood at $16 million and $15 million, respectively.

HAZARD MITIGATION GOALS

The Sharon Local Multiple Hazard Community Planning Team endorsed the following eight hazard mitigation goals at the November 9 team meeting:

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

2. Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.

3. Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.

4. Prevent and reduce the damage to public infrastructure resulting from all hazards.

5. Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.

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

7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

8. Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

9. Consider the potential impacts of future climate change and incorporate climate sustainability and resiliency in hazard mitigation planning.

10. Partnering and working with traditionally underrepresented communities and climate vulnerable populations to reduce disproportionately experienced hazards.

HAZARD MITIGATION STRATEGY

The Sharon Local Hazard Mitigation Planning Team identified a number of mitigation measures that would serve to reduce the Town's vulnerability to natural hazard events. Overall, the hazard mitigation strategy recognizes that mitigating hazards for Sharon will be an ongoing process as our understanding of natural hazards and the steps that can be taken to mitigate their damages changes over time. Global climate change and a variety of other factors impact the Town's vulnerability and in the future, and local officials will need to work together across municipal lines and with state and federal agencies in order to understand and address these changes. The Hazard Mitigation Strategy will be incorporated into the Town's other related plans and policies.

PLAN REVIEW & UPDATE PROCESS

The process for developing Sharon's Hazard Mitigation Plan 2024 Update is summarized in Table 1 below.

Table 1: Plan Review and Update Process

Section	Reviews and Updates
Section 3: Public Participation	The Local Hazard Mitigation Planning Team placed an emphasis on public participation for the update of the Hazard Mitigation Plan, discussing strategies to enhance participation opportunities at the first local committee meeting. During plan development, the plan was discussed at two public meetings hosted by the Sharon Board of Selectmen. The plan was also available on the Town's website for public comment.
Section 4: Risk Assessment	MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. Town staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date list. MAPC also used the most recently available version of HAZUS to assess the impacts of flooding, hurricanes, and earthquakes.
Section 5: Goals	The Hazard Mitigation Goals were reviewed, updated, and endorsed by the Local Team.
Section 6: Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the Town.
Sections 7 and 8: Hazard Mitigation Strategy	Mitigation measures from the 2018 plan were reviewed and assessed as to whether they were completed, partially completed, or deferred. The Local Hazard Mitigation Planning Team determined whether to carry forward measures into the 2024 Plan Update, revise them, or delete them. The Plan Update's hazard mitigation strategy reflects both new measures and measures carried forward from the 2018 plan. The Local Hazard Mitigation Team prioritized all of these measures based on current conditions.

Section 9: Plan Adoption & Maintenance	This section of the plan was updated with an on-going plan implementation review and five-year update process that will assist the Town in incorporating hazard mitigation measures into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive HMP update.

As indicated *Section 7: Mitigation Measures from the 2018 Plan*, the Town has made progress implementing mitigation measures identified in the 2018 HMP. Below is a summary of the progress:

- **3** projects were completed, including Dam stabilization at Massapoag Brook, drainage improvements, and regulatory revisions for stormwater management to ensure compliance with NPDES.
- **10** of the mitigation measures from the 2018 plan were carried over to this 2024 plan update, most of which are partially complete. These partially completed measures are being improved or progressed by the town.
- **6** mitigation measures from the 2018 plan were not completed.
- **4** mitigation measures were not carried over to the current plan as they are no longer relevant to the town.

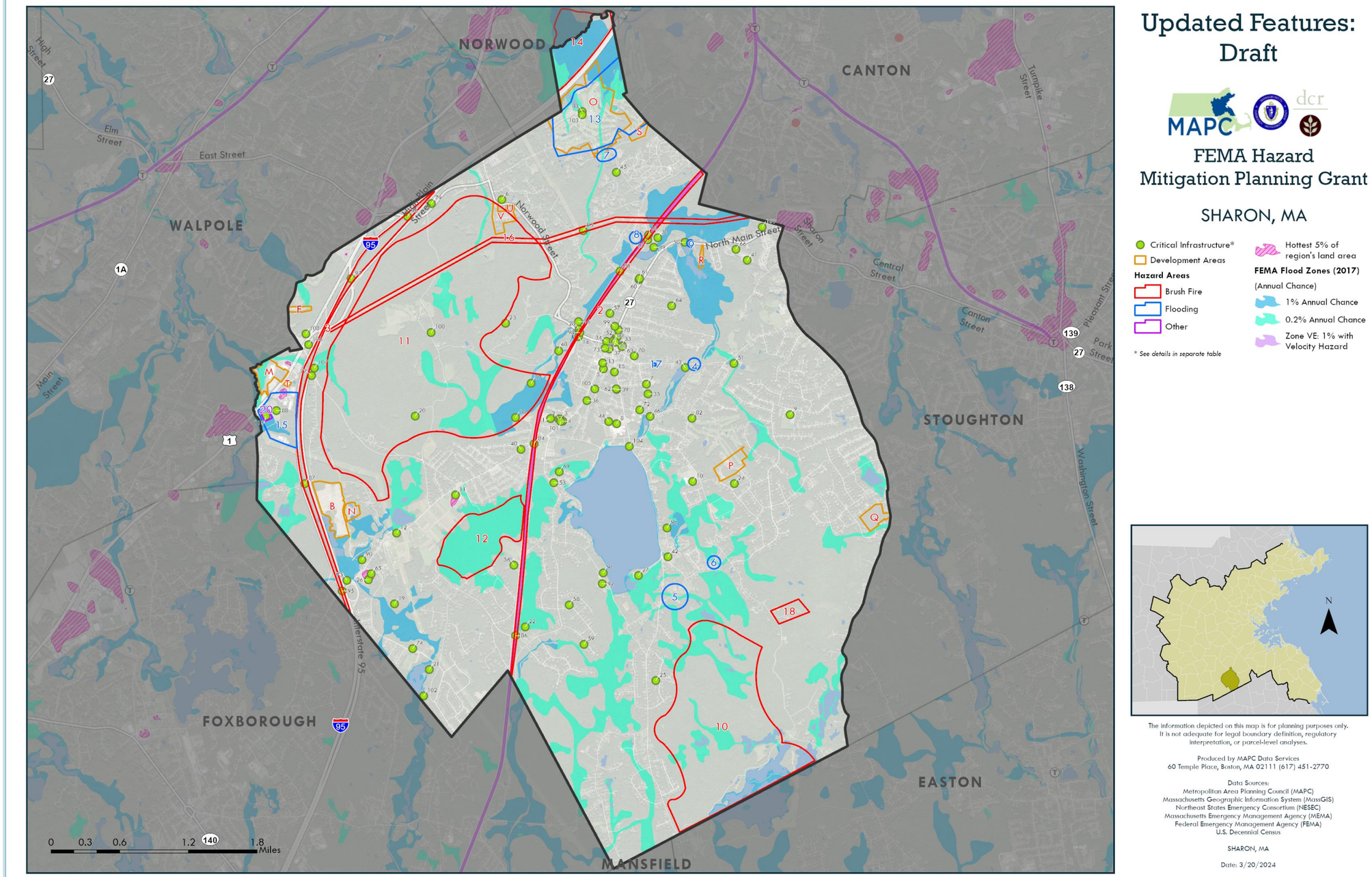
. As indicated in *Section 8: Hazard Mitigation Strategy,* the town has identified new mitigation measures to pursue.

- **5** new mitigation measures that were not in the previous plan were identified and added to this plan update.

Of the **16** total recommendations included in Section 8 of this 2024 plan update, **3 are high priority, 8 are medium priority, and 5 are low priority.**

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

Figure 1: Existing Features: Critical Facilities, Development Sites, Open Space, & Local Hazard Areas



Updated Features: Draft

MAPC dcr

FEMA Hazard Mitigation Planning Grant

SHARON, MA

- Critical Infrastructure*
- Development Areas

Hazard Areas

- Brush Fire
- Flooding
- Other

* *See details in separate table*

- Hottest 5% of region's land area

FEMA Flood Zones (2017)

(Annual Chance)

- 1% Annual Chance
- 0.2% Annual Chance
- Zone VE: 1% with Velocity Hazard

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.

Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census

SHARON, MA

Date: 3/20/2024

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SECTION 2: INTRODUCTION

PLANNING REQUIREMENTS UNDER THE FEDERAL DISASTER MITIGATION ACT

The Federal Disaster Mitigation Act, passed in 2000, requires that after November 1, 2004, all municipalities that wish to continue to be eligible to receive FEMA funding for hazard mitigation grants, must adopt a local multi-hazard mitigation plan and update this plan in five year intervals. This planning requirement does not affect disaster assistance funding.

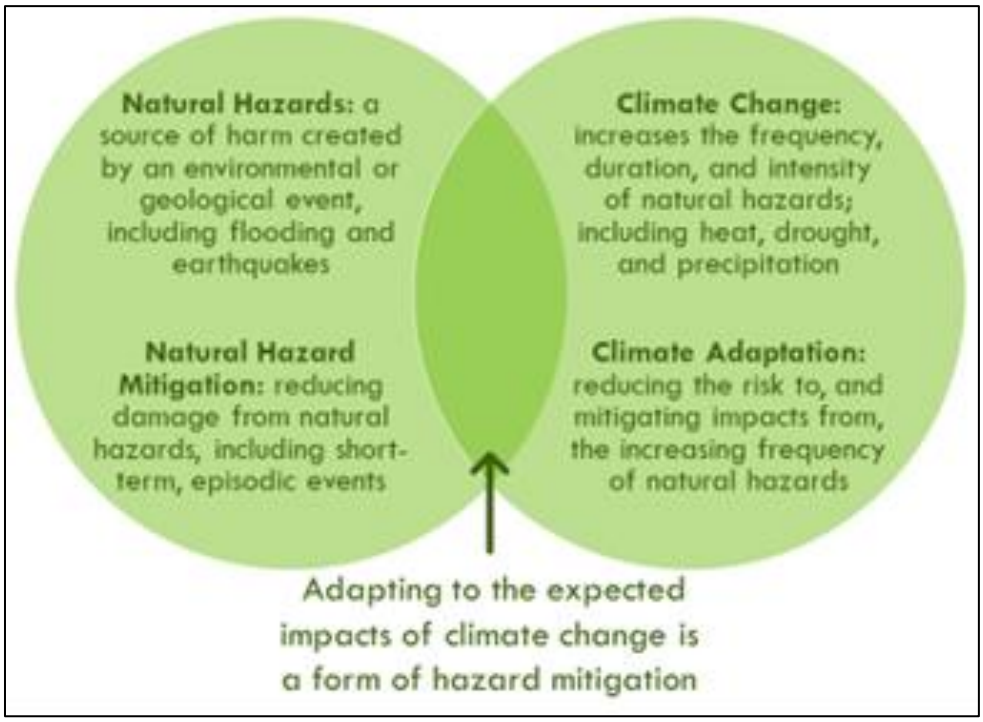
Federal hazard mitigation planning and grant programs are administered by the Federal Emergency Management Agency (FEMA) in collaboration with the states. These programs are administered in Massachusetts by the Massachusetts Emergency Management Agency (MEMA) in partnership with the Department of Conservation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

The Town of Sharon contracted with the Metropolitan Area Planning Council (MAPC), to assist the Town in updating its local Hazard Mitigation Plan, which was adopted in 2018. MAPC is the Regional Planning Agency (RPA) serving the 101 communities in the greater Boston area, and provided facilitation and technical support for this project.

WHAT IS A HAZARD MITIGATION PLAN?

Natural hazard mitigation planning is the process of determining how to systematically reduce or eliminate the loss of life and property damage resulting from natural hazards such as floods, earthquakes, and hurricanes. Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries, and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects, and other activities. FEMA's 2022 Local Mitigation Planning Policy Guide recognized that adapting to the expected impacts of climate change is a form of hazard mitigation. Therefore, this plan incorporates consideration of future risks due to projections for the increased frequency and severity of extreme weather fueled by global climate change effects.

Figure 2. Natural Hazards and Climate Change



PREVIOUS FEDERAL/STATE DISASTERS

Since 1991, there have been 36 natural hazard events that triggered disaster declarations that included Norfolk County. These are listed in Table 2 below. The majority of these events involved flooding and winter weather, while others were due to hurricanes or the COVID-19 pandemic.

Table 2: Federal/State Declared Disasters 1991-2023

Disaster Name	Date of Event	Declared Areas
Hurricane Bob	August 1991	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Severe Coastal Storm No Name Storm	October 1991	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Blizzard	March 1993	Statewide
Blizzard	January 1996	Statewide
Windstorm	May 1996	Counties of Plymouth, Norfolk, Bristol
Severe Storms, Flood	October 1996	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
Heavy Rain, Flood	June 1998	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester

Severe Storms, Flood	March 2001	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Snowstorm	March 2001	Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, Worcester
Snowstorm	February 2003	Statewide
Snowstorm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Flooding	April 2004	Essex, Middlesex, Norfolk, Suffolk, Worcester
Snowstorm	January 2005	Statewide
Hurricane Katrina	August 2005	Statewide
Severe Storms, Flooding	October 2005	Statewide
Severe Storms, Flooding	May 2006	Statewide
Severe Storm, Inland, Coastal Flooding	April 2007	Statewide
Severe Winter Storm	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, Worcester
Severe Storms, Flooding	December 2008	Statewide
Severe Storms, Flooding	March/April 2010	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
Hurricane (Hurricane Earl)	September 2010	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe Winter Storm, Snowstorm	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Hurricane (Hurricane/Tropical Storm Irene)	August 2011	Barnstable, Berkshire, Bristol, Dukes, Franklin, Hampden, Hampshire, Norfolk, Plymouth
Severe Storm, Snowstorm	October 2011	Berkshire, Franklin, Hampden, Hampshire, Middlesex, Worcester
Severe Winter Storm, Snowstorm, Flooding	February 2013	Statewide
Severe winter storm, snowstorm, flooding	January 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe winter storm and Snowstorm	March 2018	Essex, Middlesex, Norfolk, Suffolk, Worcester
Severe winter storm and flooding	March 2018	Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth

COVID-19 Pandemic	January 2020	Statewide
COVID-19	January 2020	Statewide
Severe winter storm and snowstorm	January 2022	Bristol, Norfolk, Plymouth, Suffolk

Sources: Massachusetts State Hazard Mitigation and Climate Adaptation Plan, Appendix B, 2018; OpenFEMA Dataset: Disaster Declarations; and FEMA Declared Disasters. See "Section 10: Reference List" for more information.

Since 2018, there have been 6 Massachusetts State Declared Disasters that affected Sharon. Below is a list of them, mostly containing winter storms and pandemics.

Table 3. State Disaster Declarations since 2018

Disaster Name	*Date of Event*	*Declared Areas*
Massachusetts Severe Winter Storm and Flooding	March 2-3, 2018	Statewide
Massachusetts Severe Winter Storm and Snowstorm	March 13-14, 2018	Statewide
Massachusetts Covid-19	January 20, 2020 – May 11, 2023	Statewide
Massachusetts Covid-19 Pandemic	January 20, 2020 – May 11, 2023	Statewide
Massachusetts Sever Winter Storm and Snowstorm	January 28-29, 2022	Statewide
Massachusetts Hurricane Lee	September 15-17, 2023	Statewide

FEMA FUNDED MITIGATION PROJECTS

The Town of Sharon has received funding from FEMA to complete this Hazard Mitigation Plan 5-year update under the Hazard Mitigation Grant Program (HMGP). This project totaled $15,725, with $11,794 covered by FEMA grants and $3,931 by local funding. The project is summarized in Table 4 below.

Table 4: FEMA-Funded Mitigation Projects

Grant	Project Title	Scope of Work	Total Cost		Federal Funding	Local Funding
HMGP 4214-22	Local Hazard Mitigation Plan	5-Year update of hazard mitigation plan	$15,725		$11,794	$3,931

Source: MEMA 2024 Database

COMMUNITY PROFILE

Sharon is a growing town of almost 18,000 people midway between Boston, Massachusetts and Providence, Rhode Island. An active network of civic organizations, shared appreciation of the diversity of its population, and a cherished history make Sharon a vibrant community. While many Sharon residents have second- and third-generation family roots in town, it is a community notable for its diversity and openness to newcomers. The town has an Interfaith Clergy Council and an "Affirming Diversity" group which foster cooperative understanding among Christian and Jewish congregations, an Islamic mosque, a Unitarian church, and adherents of Eastern religions. The Affirming Diversity group sponsors an annual Martin Luther King Day Celebration.

Sharon is bordered by Sharon to the north, Canton to the northeast, Stoughton to the east, Easton to the southeast, Mansfield to the south, Foxborough to the west, and Walpole to the west and northwest. It is 9 miles west of Brockton, 22 miles southwest of Boston, and 24 miles northwest of downtown Providence. Sharon is regionally accessible via public transportation; there is access to Boston and Providence via MBTA commuter trains stopping at the Sharon station, and to New York City and Washington, D.C., via Amtrak trains at nearby Route 128 station.

A sign hung for years at the local train station that read, “Sharon: a nice place to live because it’s naturally beautiful.” The welcome sign is now located in Post Office Square, and Sharon lives up to this motto. The 350-acre Lake Massapoag is particularly a treasure for residents of Sharon; in addition to its natural beauty and habitat for wildlife, it is known for its concerts, fireworks, fishing, and good swimming on Memorial Beach. Sharon is also the home of the 2,250-acre Moose Hill Wildlife Sanctuary, the Massachusetts Audubon Society’s first wildlife sanctuary, as well as 60% of Borderland State Park. In total, Sharon contains over 5,000 acres of protected open space, almost a third of the town’s 24 square miles.

The town is governed by a three-member Board of Selectmen with a Town Administrator and Open Town Meeting form of government. Sharon was established as the 2nd Precinct of Stoughton in 1740, incorporated as the Town of Stoughtonham in 1765, and named Sharon in 1783. Present-day Sharon was home to Native Americans who hunted and fished in the area for hundreds of years before British settlers came in 1637.[1]

The town maintains a website at www.townofsharon.net.

Table 5: Sharon Characteristics

Population = 18,473 people
- 7% are under age 5
- 27% are under age 18
- 18% are over age 65
- 9% have a disability

[1] This narrative was written with information provided by the community, and is taken in part from the Community Profile on the website maintained by the Department of Housing and Community Development, as well as from the Town of Sharon website.

- 1.26% of households are limited English-speaking

Number of Housing Units = 6,599

- 10% are renter-occupied housing units
- 29% of households are cost burdened

Sources: 2017-2022 American Community Survey 5-Year Estimates

The Town of Sharon has several unique characteristics to keep in mind while planning for natural hazards:

- Flooding in the town is not a significant threat to lives or property. However, the town does have some problems with water inundation during high rain and storm events and during the spring snowmelt season.
- Another defining characteristic of the town are its tree-lined streets. Although these trees are vulnerable to high winds and ice storms, they are a tradeoff the town is willing to have.
- The town has proactive municipal officials that frequently share information and coordinate on a regular basis. An example of this was the data collection sessions for this Hazard Mitigation Plan, at which representatives of several town departments were present.
- Sharon is home to historic structures and sites that are irreplaceable and bring economic value to the town.
- Sharon contains several major roadways that provide emergency routes for evacuation and for routes to medical facilities.
- Sharon has some bridge crossings and roadways that could be at risk in the event of flooding.
- Sharon would be a good candidate for flood-related grants due to the potential impact to property, transportation emergency routes, economic/historic resources, and the ability to solve the flooding problems through structural measures such as culvert upgrades, dam and bridge upgrades, or flood proofing. The cost-benefit analysis would likely be in the town's favor.
- Much of the critical infrastructure in the town is located in clusters, often near areas of floodplain. These facilities are therefore at higher risk during natural hazards.

SECTION 3: PLANNING PROCESS & PUBLIC PARTICIPATION

MAPC employs a six-step planning process based on FEMA's hazard mitigation planning guidance focusing on local needs and priorities but maintaining a regional perspective matched to the scale and nature of natural hazard events. Public participation is a central component of this process, providing critical information about the local occurrence of hazards while also serving as a means to build a base of support for hazard mitigation activities. MAPC supports participation by the general public and other plan stakeholders through:

- Meetings and work with the Local Teams
- Two public meetings, shared on Local Access TV and advertised through e-blasts, webpage content, a flyer, and social media posts
- A project website, available at https://www.townofsharon.net/home/news/sharon-hazard-mitigation-plan-update-available-online.
- Launching a public comment period at the second public meeting, and posting the draft plan to the project website to facilitate public comment

PLANNING PROCESS SUMMARY

The six-step planning process outlined below is based on the guidance provided by FEMA's Local Multi-Hazard Mitigation Planning Guidance. Public participation is a central element of this process, which attempts to focus on local problem areas and identify needed mitigation measures based on where gaps occur in the existing mitigation efforts of the municipality. By working on municipal hazard mitigation plans in groups of neighboring cities and towns, MAPC is able to identify regional opportunities for collaboration and facilitate communication between communities. In plan updates, the process described below allows staff to bring the most recent hazard information into the plan, including new hazard occurrence data, changes to a municipality's existing mitigation measures, and progress made on actions identified in previous plans.

Figure 3. Six-Step Planning Process

1. **Map the Hazards** – MAPC relies on data from a number of different federal, state, and local sources in order to map the areas with the potential to experience natural hazards. This mapping represents a multi-hazard assessment of the municipality and is used as a set of base maps for the remainder of the planning process. A particularly important source of information is the knowledge drawn from local municipal staff on where natural hazard impacts have occurred. These maps can be found in Appendix B.

2. **Assess the Risks & Potential Damages** – Working with local staff, critical facilities, infrastructure, vulnerable populations, and other features are mapped and contrasted with the hazard data from the first step to identify those that might represent particular vulnerabilities to these hazards. Land use data and development trends are also incorporated into this analysis. In addition, MAPC develops estimates of the potential impacts of certain hazard events on the community. MAPC drew on the following resources to complete the plan:

    - Town of Sharon, General Bylaws
    - Town of Sharon, Zoning Bylaw
    - Town of Sharon Master Plan, 2019
    - Town of Sharon Open Space and Recreation Plan, 2009
    - Town of Sharon Housing Production Plan, 2018
    - Commonwealth of Massachusetts, Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), 2023
    - Commonwealth of Massachusetts, Massachusetts Climate Change Assessment, 2022
    - New England Seismic Network, Boston College Weston Observatory, http://aki.bc.edu/index.htm
    - NOAA National Centers for Environmental Information, http://www.ncdc.noaa.gov/
    - Northeast States Emergency Consortium, http://www.nesec.org/
    - USGS, National Water Information System, http://nwis.waterdata.usgs.gov/usa/nwis
    - US Census, 2010
    - American Community Survey, 2022
    - DCR, Community Information System, Community Overview, 2022
    - FEMA, Local Mitigation Planning Policy Guide, 2022
    - FEMA, Disaster Declarations for States and Counties, 2023
    - FEMA, Flood Insurance Rate Maps for Norfolk County, Massachusetts, 2012
    - FEMA, HAZUS, 2022
    - MA Dept of Public Health, Massachusetts Environmental Public Health Tracking: Community Profile for Sharon, 2022
    - Massachusetts Office of Dam Safety, Inventory of Massachusetts Dams 2018
    - MA Department of Early Education and Care, Licensed Child Care Programs, 2022
    - US Census Bureau, 2021
    - MA Climate Change Adaptation Report, 2011
    - Blue Hill Observatory
    - Mass. Emergency Management Agency, State Hazard Mitigation Plan, 2013
    - NOAA, National Centers for Environmental Information, Storm Events Database
    - Tornado History Project
    - USDA Forest Service, Wildfire Risk to Communities
    - U.S. Global Change Research Program, Fourth National Climate Assessment, 2018
    - USACE Ice Jam Database

3. **Review Existing Mitigation** – Municipalities in the Boston Metropolitan Region have an active history in hazard mitigation as most have adopted flood plain zoning districts, wetlands protection programs, and other measures as well as enforcing the State building code, which has strong provisions related to hazard resistant building requirements. All current municipal mitigation measures must be documented.

4. **Develop Mitigation Strategies** – MAPC works with the local municipal staff to identify new mitigation measures, utilizing information gathered from the hazard identification, vulnerability assessments, and the community's existing mitigation efforts to determine where additional work is necessary to reduce the potential damages from hazard events. Additional information on the development of hazard mitigation strategies can be found in Chapter VIII.

5. **Plan Approval & Adoption** – Once a final draft of the plan is complete it is sent to MEMA for the state level review and, following that, to FEMA for approval. Typically, once FEMA has approved the plan the agency issues a conditional approval (Approval Pending Adoption), with the condition being adoption of the plan by the municipality. More information on plan adoption can be found in Chapter IX and documentation of plan adoption can be found in Appendix E.

6. **Implement & Update the Plan** – Implementation is the final and most important part of any planning process. Hazard Mitigation Plans must also be updated on a five year basis making preparation for the next plan update an important on-going activity. Chapter IX includes more detailed information on plan implementation.

2018 PLAN IMPLEMENTATION & MAINTENANCE

The 2018 Town of Sharon Hazard Mitigation Plan contained a risk assessment of identified hazards for the Town and mitigation measures to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA and local adoption, progress has been made on implementation of the measures. The Town has advanced a number of projects for implementation, including dam stabilization, improving drainage, continuing to protect open space and acquire land, and revise stormwater management regulations.

THE LOCAL MULTIPLE HAZARD COMMUNITY PLANNING TEAM

MAPC worked with the local community representatives to organize a Local Hazard Mitigation Planning Team for Sharon. MAPC briefed the local representatives as to the desired composition of that team as well as the need for public participation in the local planning process.

The Local Hazard Mitigation Planning Team is central to the planning process as it is the primary body tasked with developing a mitigation strategy for the community. The local team was tasked with working with MAPC to set plan goals, provide information on the hazards that impact the town, existing mitigation measures, and helping to develop new mitigation measures for this plan update. The Local Hazard Mitigation Planning Team membership can be found listed below.

Table 6. Membership of the Sharon Hazard Mitigation Planning Team

Name	Role

Micheal A. Madden, Chair	Fire Department
Leandra McLean	Health Department
Lauren Barnes	Town Administrator
Shepard Seigel	Town Administrator
Linda Berger	Recreation Department
Peter O'Cain	Department of Public Works
Scott Leanard	Police Department
Brad Fitzhenry	Police Department
Stephen Coffey	Police Department
Jeff Penders	Police Department
Josh Philibert	Conservation Commission
Sonal Pai	Department of Public Works
Jeff Ricken	Fire Department
Mike Polimer	Civil Defense Department

The Local Hazard Mitigation Planning Team met four times on the dates listed below. The agendas for these meetings are included in Appendix A.

- **August 2, 2023**: to discuss the project overview and update local hazard areas and critical facilities inventory
- **November 9, 2023**: to update hazard mitigation goals and existing mitigation measures
- **March 28, 2024**: to update the recommended mitigation strategies from the 2018 HMP and prepare for Public Meeting #1
- **May 16, 2024**: to develop new recommended mitigation measures and prepare for Public Meeting #2

PUBLIC MEETINGS & PUBLIC COMMENT

Public participation in the hazard mitigation planning process is important, both for plan development and for later implementation of the plan. Residents, business owners, and other community members are an excellent source for information on the historic and potential impacts of natural hazard events and particular vulnerabilities the community may face from these hazards. Their participation in this planning process also builds understanding of the concept of hazard mitigation, potentially creating support for mitigation actions taken in the future to implement the plan. To gather this information and educate residents on hazard mitigation, the Town hosted two public meetings, one during the planning process on December 19, 2023 and one once the draft plan was complete and ready for review on June 25, 2024.

Natural hazard mitigation plans typically do not attract much public involvement in the Boston region, unless there has been a recent hazard event. One of the best strategies for overcoming this challenge is to include discussion of the hazard mitigation plan on the agenda of an existing board or commission. With this strategy, the meeting receives widespread advertising and a guaranteed audience of the board or commission members plus those members of the public who attend the meeting.

LOCAL STAKEHOLDER INVOLVEMENT

The local Hazard Mitigation Planning Team was encouraged to reach out to local stakeholders that might have an interest in the Hazard Mitigation Plan including neighboring communities, agencies, businesses,

nonprofits, and other interested parties. Notice was sent to the following organizations and neighboring municipalities inviting them to review the Hazard Mitigation Plan and submit comments to the Town:

- Sharon Board of Health
- Metro South Chamber of Commerce
- Sharon Rotary Club
- Sharon Public Library
- HESSCO
- American Legion Post
- Sharon Historical Society
- Sharon Veterans of Foreign Wars (VFWs)
- Sharon Planning Board
- Sharon Borad of Appeals
- Sharon Pluralism Network
- Sharon Substance Prevention and Resource Committee
- Sharon Lions Club
- Town of Mansfield
- Town of Easton
- Town of Stoughton
- Town of Canton
- Town of Sharon
- Town of Walpole
- Town of Foxborough

The draft Sharon Hazard Mitigation Plan 2018 Update was posted at the MAPC web site for the second public meeting. Members of the public could access the draft document and submit comments or questions to the Town and MAPC.

CONTINUING PUBLIC PARTICIPATION

Following the adoption of the plan update, the planning team will continue to provide residents, businesses, and other stakeholders the opportunity to learn about the hazard mitigation planning process and to contribute information that will update the town's understanding of local hazards As updates and a review of the plan are conducted by the Hazard Mitigation Implementation Team, these will be placed on the Town's website, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with town and state open meeting laws.

PLANNING TIMELINE

Major milestones in the planning process to prepare this plan included the following:

Table 7. Planning Timeline for the 2024 HMP Update

August 2, 2023	Meeting of the Sharon Local Hazard Mitigation Planning Team
November 9, 2023	Meeting of the Sharon Local Hazard Mitigation Planning Team
December 19, 2023	First Public Meeting with Sharon Board of Selectmen
March 28, 2024	Meeting of the Sharon Local Hazard Mitigation Planning Team
May 16, 2024	Meeting of the Sharon Local Hazard Mitigation Planning Team
June 25, 2024	Second Public Meeting with Sharon Board of Selectmen

TBD	Draft Plan Update submitted to MEMA
TBD	Draft Plan Update submitted to FEMA
TBD	Notice of Approvable Pending Adoption sent by FEMA
TBD	Plan Adopted by the Town of Sharon
TBD	FEMA Formal Approval of the plan for 5 years

After this plan update is approved by FEMA for a five-year period, the Town should take note of the following milestones for the ongoing implementation, review, and updating of this plan:

Table 8. Plan Implementation Milestones 2024-2029

2026	Conduct Mid-Term Plan Survey on Progress
2027	Seek FEMA grant to prepare next plan update
2028	Begin process to update the plan
2029	Submit Draft 2028 Plan Update to MEMA and FEMA
2029	FEMA approval of 2029 Plan Update

SECTION 4: RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the Town as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large-scale natural hazard events. In order to update Sharon's risk assessment, MAPC gathered the most recently available hazard and land use data and met with the Local Team to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS.

> *"Global climate is changing rapidly compared to the pace of natural variations in climate that have occurred throughout Earth's history. Global average temperature has increased by about 1.8°F from 1901 to 2016, and observational evidence does not support any credible natural explanations for this amount of warming; instead, the evidence consistently points to human activities, especially emissions of greenhouse or heat-trapping gases, as the dominant cause."*
> Fourth National Climate Assessment, 2018 (Chapter 2-1)

The projected impacts of our warming climate on natural hazards are integrated throughout this risk assessment. Key impacts include rising temperatures, which in turn affect precipitation patterns and extreme weather. Analysis of these impacts included in this plan aligned closely with the data and assessment presented in Massachusetts' 2023 State Hazard Mitigation and Climate Adaptation Plan (2023 SHMCAP) and Massachusetts' 2022 Climate Change Assessment.

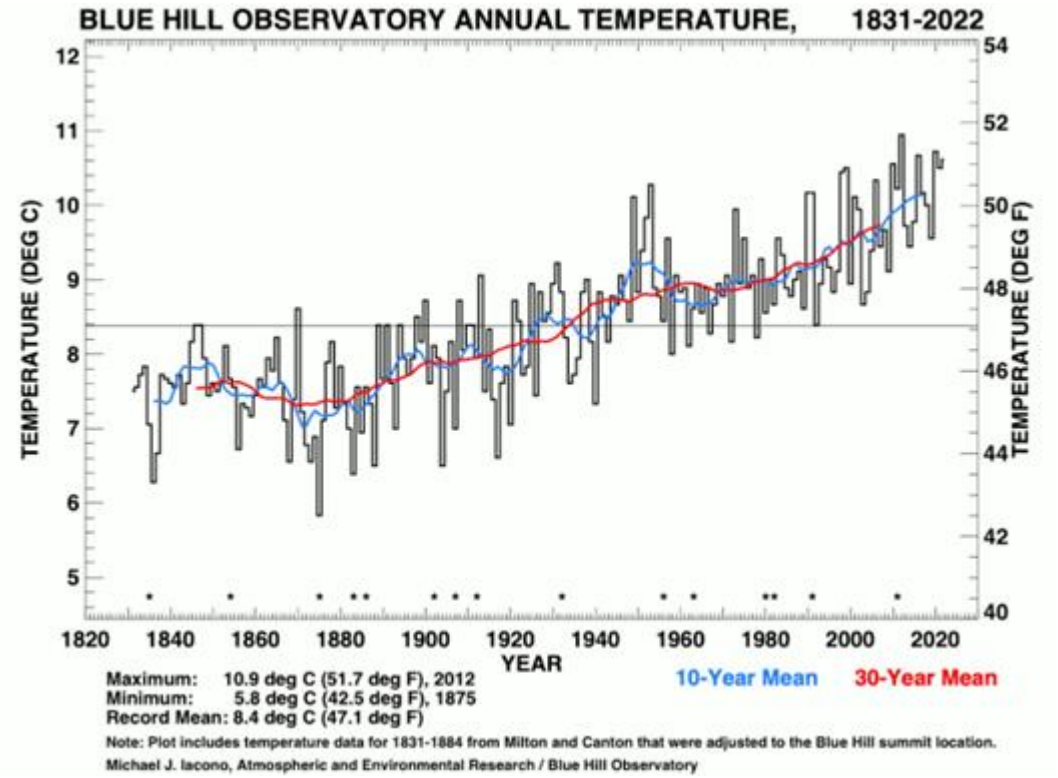
CLIMATE CHANGE OBSERVATIONS AND PROJECTIONS

Climate change observations come from a variety of data sources that have measured and recorded changes in recent decades and centuries. Climate change projections, however, predict future climate impacts and, by their nature, cannot be observed or measured. As a result of the inherent uncertainty in predicting future conditions, climate projections are generally expressed as a range of possible impacts.

TEMPERATURE

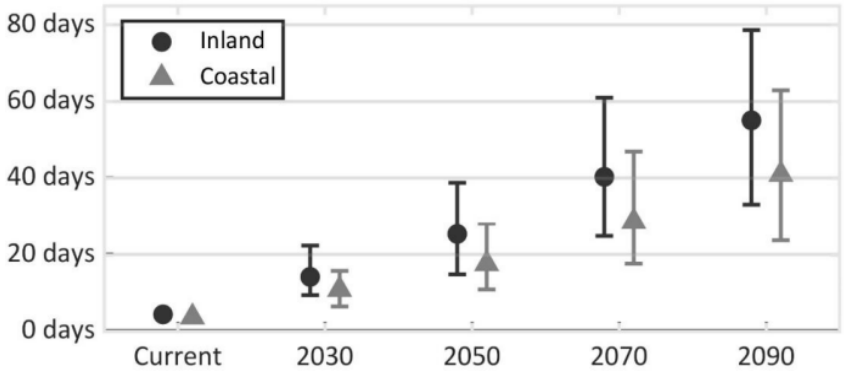
Our climate has always been regulated by gases, including carbon dioxide, methane, and nitrous oxide, which blanket the earth. These gases trap heat that would otherwise be reflected out to space; without them our planet would be too cold to support life. We refer to these gases as "greenhouse gases" (GHGs) for their heat trapping capacity. The combustion of fossil fuels, our primary energy source in the age of industrialization, releases GHGs into the atmosphere. In the past century, human activity associated with industrialization has contributed to a growing concentration of GHGs in our atmosphere. Records from the Blue Hill Observatory in Milton, MA show that average temperatures (30-year mean) have risen approximately 3 degrees (F) in the almost 200 years since record keeping began in 1831. See Figure4 below for more information.

Figure 4. Observed Increase in Temperature



Climate projections include an increase in average temperature and in the number of extreme heat days. Extreme cold days are projected to decrease in number. By 2030, the summer mean temperature could increase by 3.6°F from the historical period (1950-2013). By 2070, there could be 58 fewer days below freezing, which could lead to an increase in ticks. By mid-century, the State anticipates about 25 more days per year where the temperature exceeds 90°F for inland areas, and about 19 more days above 90°F for coastal areas (Commonwealth of Massachusetts, 2022).

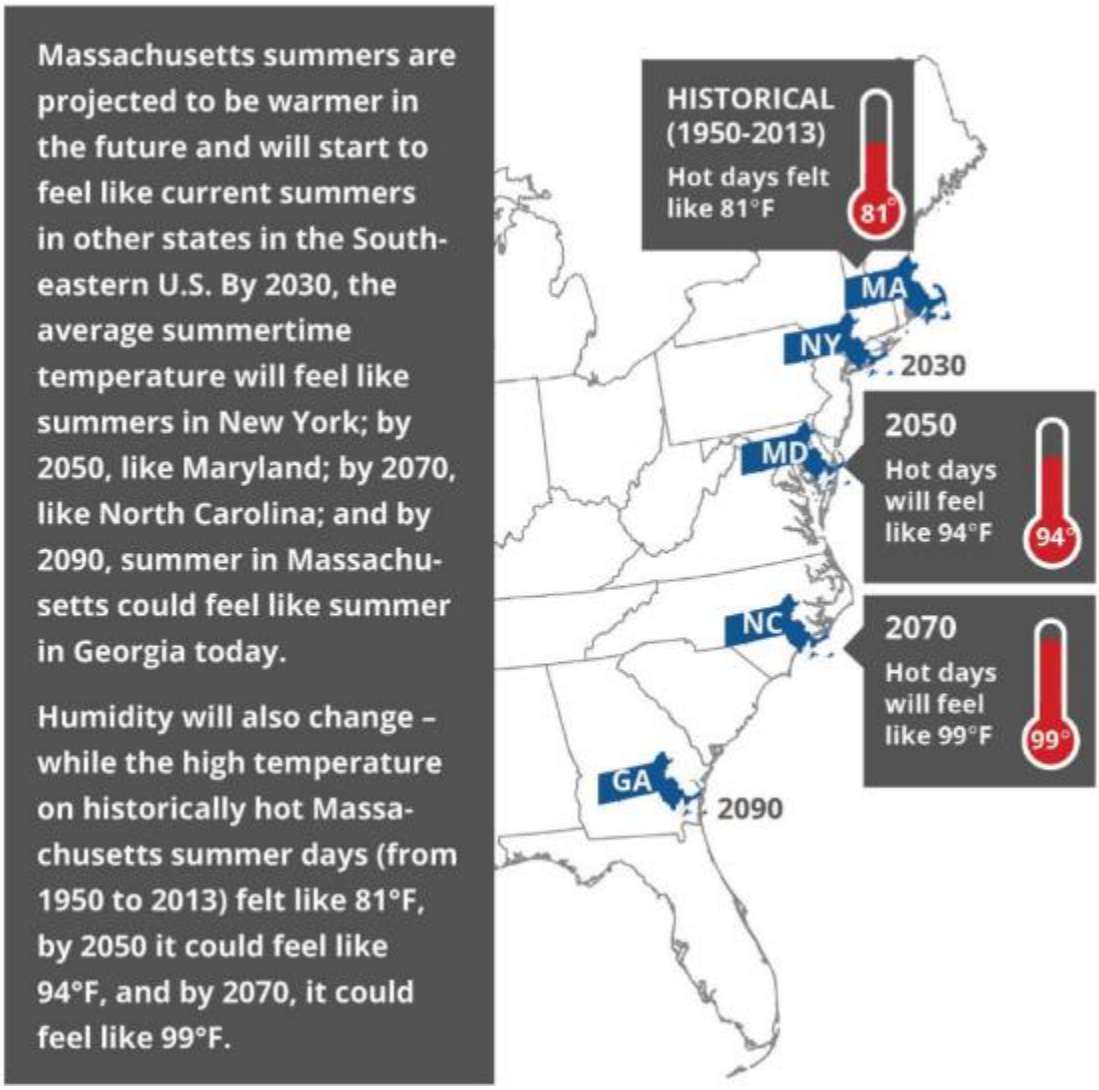
Figure 5. Change in the Annual Number of Days Over 90°F Compared to Today



Sources: 2022 MA Climate Change Assessment and Stochastic Weather Generator

These changes could result in Massachusetts summers feeling like a more southern state, as described in the infographic in Figure 11 from the State's 2022 Climate Change Assessment.

Figure 6. Change in Average Summertime Temperatures for Massachusetts

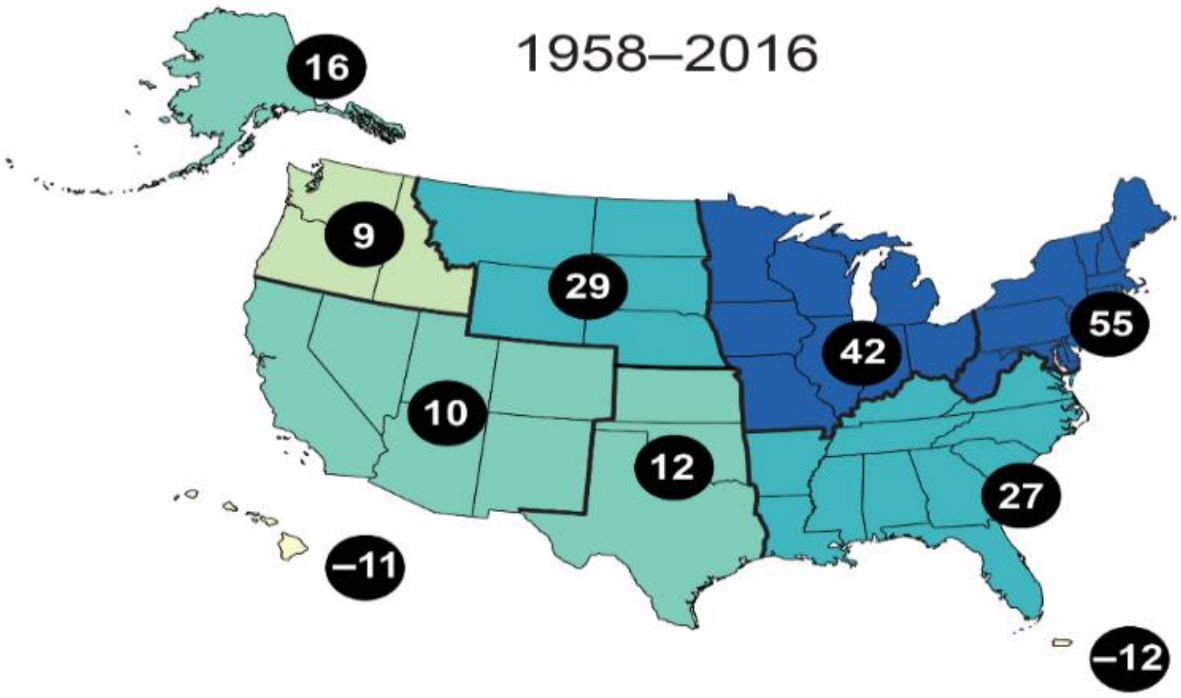


Source: 2022 MA Climate Change Assessment

PRECIPITATION PATTERNS

Annual precipitation in Massachusetts has increased by approximately 10% in the fifty-year period from 1960 to 2010 (MA EEA, 2011). Moreover, there has been a significant increase in the frequency and intensity of large rain events. For the Northeast US, according to the Fourth National Climate Assessment 2018, in the past sixty years there has been a 55% increase in the amount of annual precipitation that falls in the top 1% of storm events, as shown in Figure 12 below (US Global Change Research Program, 2018). Changes in precipitation are fueled by warming temperatures which increase evaporation and, therefore, the amount of water vapor in the air.

Figure 7. Observed Change in Total Annual Precipitation in the Heaviest 1% Events

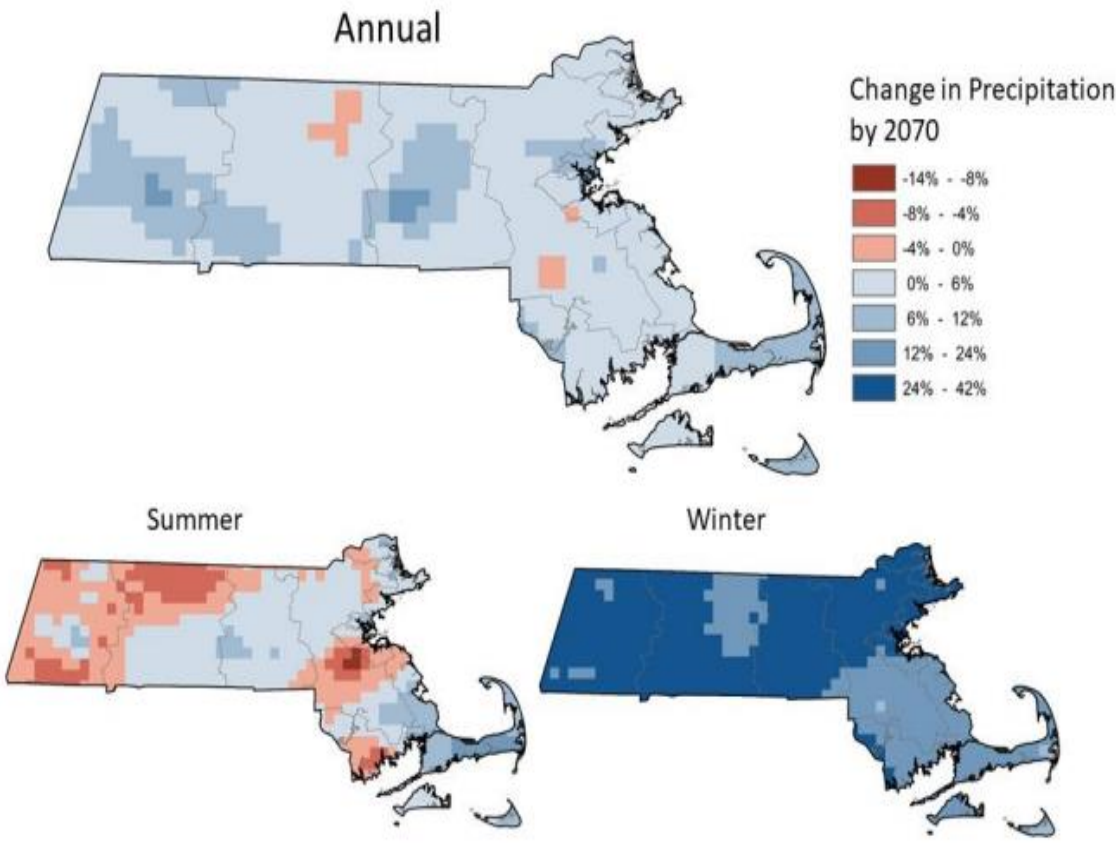


Source: Fourth National Climate Assessment, 2018
Numbers circled in black indicate % change.

Massachusetts' 2022 Climate Change Assessment anticipates that most parts of the State will see a future increase in annual total precipitation of less than 8% per year. Most of these increases are anticipated during the winter months (see Figure 13 below).

Additionally, the historic 10% annual chance daily rainfall event (2.8-4.0" of rain) could occur four times more frequently by 2090 (Commonwealth of Massachusetts, 2022).

Figure 8. Change in Annual and Seasonal Precipitation in 2070 Compared to Today



Source: 2022 MA Climate Change Assessment. Current climate is the 1986-2005 era, the projection for 2070 is for a 20-year era centered on 2070. Maps show LOCA downscaled GCM projections at the 50th percentile across 20 LOCA GCMs that overlap with the GCMs used in the Stochastic Weather Generator.

Despite overall increasing precipitation, more frequent and significant summer droughts are also a projected consequence of climate change. This is due to projections that precipitation will increase in winter and spring and decrease slightly in the summer and, a result of earlier snow melt, and higher temperatures that will reduce soil moisture. Massachusetts' 2022 Climate Change Assessment anticipates that these changes will vary by region. The Eastern Inland region where Sharon is located may experience slightly more consecutive dry days, and significantly more days without rain per year, by 2090 (Commonwealth of Massachusetts, 2022). See Figure 9 below for more information.

Figure 9. Consecutive dry day events (number of multiple-dry-day events per year)

Panel A: Consecutive dry day events (number of multiple-dry-day events per year)

Region	Baseline	2030	2050	2070	2090
Berkshires & Hilltowns	29	29	30	30	31
Greater Connecticut River Valley	31	31	32	32	33
Central	32	32	32	33	33
Eastern Inland	32	32	32	33	33
Boston Harbor	31	31	32	32	33
North & South Shores	31	31	32	32	33
Cape, Islands, & South Coast	31	31	32	32	33
Statewide	**31**	**31**	**31**	**32**	**33**
Statewide Percent Change	**0%**	**1%**	**2%**	**4%**	**6%**

Source: Stochastic Weather Generator

Panel B: Annual number of days without rain (days per year)

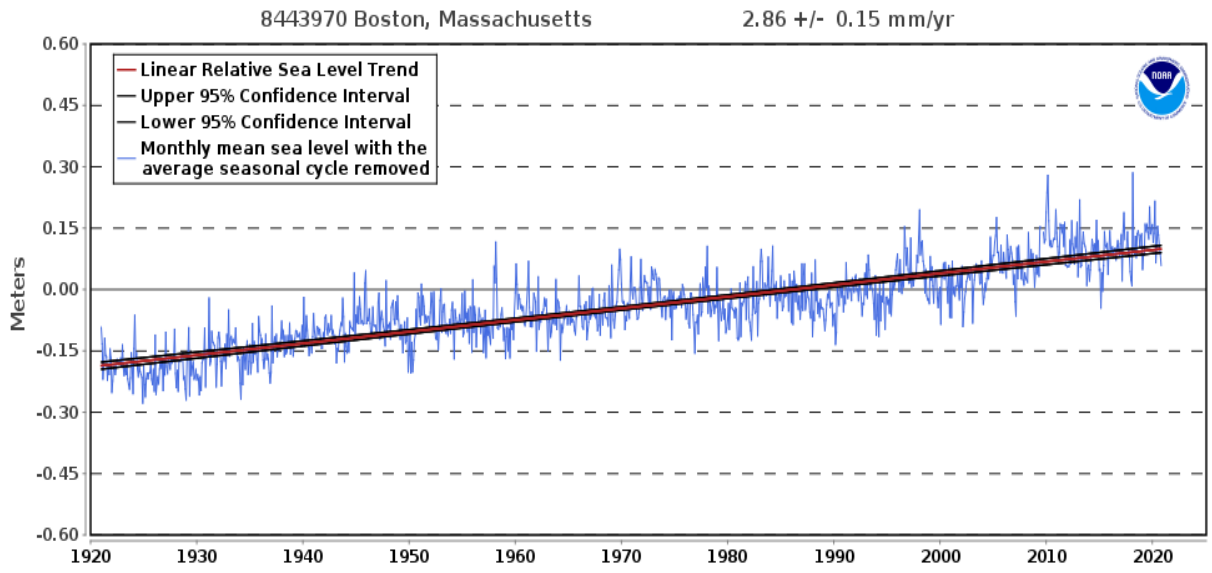
Region	Baseline	2030	2050	2070	2090
Berkshires & Hilltowns	159	161	165	167	170
Greater Connecticut River Valley	171	172	175	178	181
Central	180	182	185	188	192
Eastern Inland	186	181	185	188	193
Boston Harbor	192	185	192	194	198
North & South Shores	184	182	187	190	195
Cape, Islands, & South Coast	186	182	187	191	194
Statewide	**176**	**175**	**179**	**182**	**187**
Statewide Percent Change	**0%**	**-1%**	**2%**	**3%**	**6%**

Source: 2022 MA Climate Change Assessment. The Town of Sharon is located in the Eastern Region, outlined by the blue box above.

SEA LEVEL RISE

While Sharon is not a coastal community, high-level information on sea level rise is discussed here as the regional economy of the Boston Metro area may be impacted by sea level rise in the future. Warming temperatures contribute to sea level rise in three ways. First, warm water expands to take up more space. Second, rising temperatures are melting land-based ice which enters the oceans as melt water. A third, quite minor, contributor to sea level rise in New England is not related to climate change. New England is still experiencing a small amount of land subsidence (drop in elevation) in response to the last glacial period. NOAA's records from the Boston Tide Station show nearly one foot of sea level rise over the past century. See Figure 10 below for more information.

Figure 10. Observed Increase in Sea Level Rise



Source: NOAA

The sea level rise information in Massachusetts' 2022 Climate Change Assessment considers sea-level changes, land-level changes, and other regional facts that can impact the rate of change. The report includes the following approximate sea level rise projections for the State:

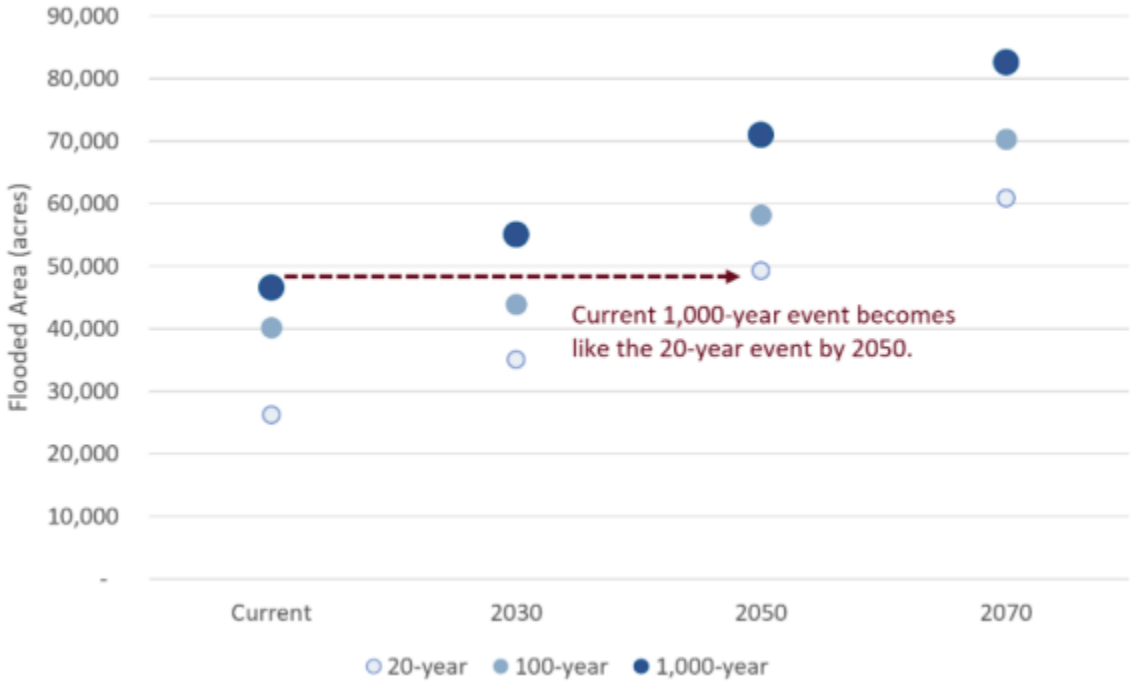
- **Northern Massachusetts:** 21 inches by 2050, and 43 inches by 2070
- **Southern Massachusetts:** 23 inches by 2050 and 45 inches by 2070

The 2022 Climate Change Assessment also quantified the developed land area flooded for events including:

- 20-year (5% annual probability)
- 100-year (1% probability)
- 1000-year (0.1% probability) events

This approach found that the area flooded by the current 1000-year event is comparable to the area of a 20-year event by 2050. Even more area could be impacted by the annual probability event by 2070. See Figure 11 below for more information.

Figure 11. Total Flooded Area of the Commonwealth for Selected Events



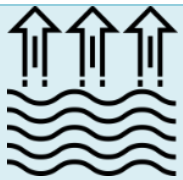
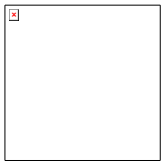
Source: 2022 MA Climate Change Assessment

OVERVIEW OF HAZARDS AND IMPACTS

Following the outline of the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), this local hazard mitigation plan organizes consideration of natural hazards based on their relationship to projected climate changes. Table 9 below, which is originally from the SHMCAP, summarizes the natural hazards reviewed in this plan, climate interactions, and expected impacts.

Table 9. Climate Change & Natural Hazards

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
Changes In Precipitation	Inland Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, increased potential for loss of life, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Landslide	Rising Temperatures, Extreme Weather	
	Coastal Flooding	Extreme Weather	

 Sea Level Rise	Coastal Erosion	Extreme Precipitation	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss of wetlands
	Tsunami	Rising Temperatures	
 Rising Temperatures	Average/Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, increase in vector-borne illnesses (West Nile, Zika, EEE), ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, increased potential for loss of life, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 Extreme Weather	Hurricanes/Tropical Storms	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter		
	Tornadoes		
	Other Severe Weather (Strong Wind & Thunderstorms)		

In order to update Sharon's risk assessment, MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS (described in the Vulnerability Assessment).

Additionally, the ResilientMass Plan and the 2018 SHMCAP are two key planning documents that examine natural hazards that have the potential to impact the Commonwealth. The 2018 SHMCAP uses definitions for hazard considerations that expanded on previous research in the 2013 Massachusetts State Hazard Mitigation Plan by including additional climate projections. The ResilientMass Plan (also known as the 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan) calls for a comprehensive, integrated, and collaborative approach to climate change planning.

Definitions used in the Commonwealth of Massachusetts State Hazard Mitigation Plan

Frequency - *The frequency designations used for Sharon were based on the 2018 State Hazard Mitigation and Climate Action plan supplemented with NOAA's county-level storm event data, local information from the Hazard Mitigation Team, and HAZUS results, as well as the 2013 State HMP definitions, which define frequency categories as:*

- **Very low frequency:** events that occur less frequently than once in 100 years (less than 1% per year)
- **Low frequency:** events that occur from once in 50 years to once in 100 years (1% to 2% per year);
- **Medium frequency:** events that occur from once in 5 years to once in 50 years (2% to 20% per year);
- **High frequency**: events that occur more frequently than once in 5 years (Greater than 20% per year).

Severity - *The 2018 SHMCAP defines severity as, "the extent or magnitude of a hazard, as measured against an established indicator (e.g., Richter Scale, Saffir-Simpson Hurricane Scale, or Regional Snowfall Index)." The severity designations used for Sharon were based on NOAA's county-level storm event data, local information from the Hazard Mitigation Team, HAZUS result, and the 2013 State HMP definitions, which define severity categories as:*

- **Minor**: Limited and scattered property damage; limited damage to public infrastructure and essential services not interrupted; limited injuries or fatalities.
- **Serious:** Scattered major property damage; some minor infrastructure damage; essential services are briefly interrupted; some injuries and/or fatalities.
- **Extensive:** Widespread major property damage; major public infrastructure damage (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and/or fatalities.
- **Catastrophic:** Property and public infrastructure destroyed; essential services stopped; numerous injuries and fatalities.

Table 10 below summarizes the frequency and severity of hazard risks for Massachusetts and Sharon, based on available data, including:

- **State-level data** including the 2022 Climate Change Assessment, ResilientMass Plan, and 2018 SHMCAP)
- **County-level data** from NOAA's National Climatic Data Center and Storm Events Database for Norfolk County (where Sharon is located)
- **Local-level information** including input from the Local Team, the hazard mapping included in Appendix B.

Table 10: Hazard Risks Summary

Natural Hazard	Frequency		Severity	
	MA	Sharon	MA	Sharon
Inland Flooding	High	High	Serious to Catastrophic	Serious to extensive
Dam Failures	Low	Low	Extensive	Extensive
Drought	Medium	Low	Minor to Serious	Minor

Landslide	High	Low	Minor to Extensive	Minor
Coastal Flooding	High	N/A	Serious to Extensive	N/A
Coastal Erosion	Variable	N/A	Serious to Extensive	N/A
Tsunami	Very Low	N/A	Extensive to Catastrophic	N/A
Extreme Temperatures	High	Medium	Minor to Serious	Minor
Wildfires/Brushfire	High	Medium	Minor to Extensive	Minor
Invasive Species	High	N/A	Minor	N/A
Hurricanes/Tropical Storms	Medium	Medium	Serious to Catastrophic	Extensive to Catastrophic
Severe Winter Storm / Nor'easter	High	High	Minor to Extensive	Minor
Tornadoes	High	Medium	Serious to Extensive	Minor
Other Severe Weather (Strong Wind & Thunderstorms)	High	High	Minor to Extensive	Minor
Earthquakes	Very Low	Very Low	Serious to Catastrophic	Serious

Sources: Frequency information for MA comes from the 2018 SHMCAP. Severity information for MA comes from the 2013 State HMP. Frequency and severity information for Norfolk come from NOAA's county-level data, local information from the Local Team, hazard mapping and HAZUS results.

Note: Not all hazards included in the 2022 Climate Change Assessment or the 2018 SHMCAP are relevant to the Town. Given Sharon's inland location, coastal hazards and tsunamis are unlikely to affect the Town and are therefore listed as Not Applicable ("N/A") in Table 10 above. Ice jams are also not a hazard in Sharon. The US Army Corps Ice Jam Database shows no record of ice jams in Sharon, and the Town did not identify ice jams as an issue of concern. Invasive species, although present, were also not identified as a major issue to the Town. Given the Town's location in an area of low landslide incidence (Map 6 in Appendix B), and designated in the table above as the lowest category of frequency (very low) and the lowest category of severity (minor), as well as the lack of previous documented landslide events, the Town did not identify landslides as a hazard of concern that warrants mitigation measures.

CHANGES IN PRECIPITATION

FLOODING

Flooding was the most prevalent serious natural hazard identified by local officials in Sharon. Flooding is generally caused by severe rainstorms, thunderstorms, hurricanes, and nor'easters. Large rainstorms can occur year-round. Hurricanes are most common in the summer and early fall. Nor'easters are most common in winter. Spring snowmelt may exacerbate flooding during storm events. Large rainstorms can occur year-round. Climate change has the potential to exacerbate these issues over time due to increasing extreme rainfall events. Increase in average annual rainfall may also lead to more incidents of basement flooding caused by high seasonal groundwater levels.

Sharon is located in the Neponset River Watershed and flooding is one of the most prevalent natural hazards in Sharon. Flooding can be associated with overflowing rivers and streams, as well as stormwater associated with impervious surfaces which overwhelms the capacity of natural or structured drainage systems and stormwater infrastructure.

REGIONALLY SIGNIFICANT FLOODS

There have been a number of major floods that have affected the Metro Boston region over the last fifty years. Significant historic flood events have included those listed below (Commonwealth of Massachusetts, 2018) and (NOAA, 2022).

- February 1978
- January 1979
- April 1987
- October 1991
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007
- March 2010
- February 2013
- January 2018
- March 2018
- June 2020

The best available local data is for Norfolk County through the National Centers for Environmental Information (see Table11). Norfolk County, which includes the Town of Sharon, experienced 33 flood events from June 2013 to June 2023. No deaths or injuries were reported and the total reported property damage in the county was $68,200. See the table below for more information.

Table 11: Norfolk County Flood Events, 2012-2023

DATE	DEATHS	INJURIES	PROPERTY DAMAGE ($)
6/7/2013	0	0	0
7/29/2013	0	0	0
8/9/2013	0	0	15,000
10/22/2014	0	0	0
10/23/2014	0	0	0
8/15/2015	0	0	0
8/18/2015	0	0	0
6/7/2016	0	0	5,000
8/14/2016	0	0	5,000
4/1/2017	0	0	5,000
7/12/2017	0	0	0

7/18/2017	0	0	1,000
8/2/2017	0	0	0
9/30/2017	0	0	10,000
10/25/2017	0	0	0
10/29/2017	0	0	0
1/12/2018	0	0	0
1/13/2018	0	0	0
4/16/2018	0	0	0
7/6/2018	0	0	10,000
10/29/2018	0	0	0
11/3/2018	0	0	500
4/15/2019	0	0	0
7/6/2019	0	0	0
7/17/2019	0	0	0
6/21/2020	0	0	0
6/28/2020	0	0	14,700
8/23/2020	0	0	2,000
12/25/2020	0	0	0
7/7/2021	0	0	0
7/18/2021	0	0	0
9/5/2022	0	0	0
10/14/2022	0	0	0
TOTAL	**0**	**0**	**68,200**

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Additionally, Norfolk County experienced 3 flash flood events from December 2012 to December 2022. No deaths or injuries were reported and the total reported property damage in the county exceeded $30 million. Most of the reported property damage occurred during the flash flood event on June 28, 2020. See the table below for more information.

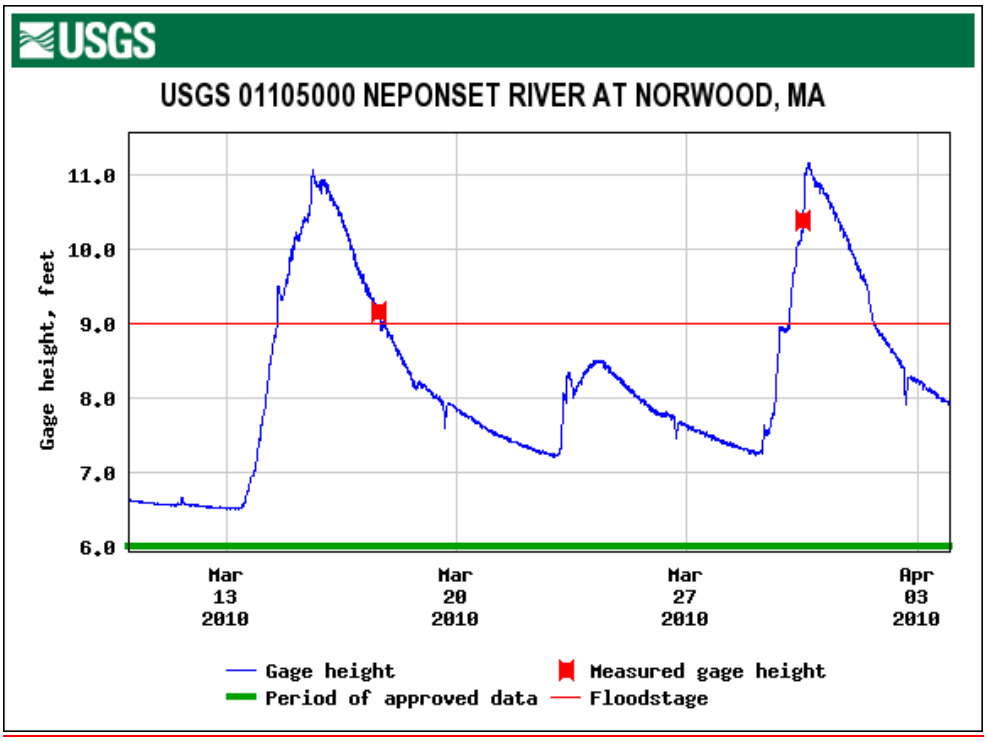
Table 12. Norfolk County Flash Flood Events, 2012-2022

DATE	DEATHS	INJURIES	PROPERTY DAMAGE ($)
9/1/2013	0	0	85,000
9/18/2018	0	0	0
6/28/2020	0	0	30,000,000
TOTAL	**0**	**0**	**30,085,000**

Although not included in the tables above showing flood events over the last ten years, the most severe recent flooding occurred during the major storms of March 2010, when a total of 17.7 inches of rainfall was recorded by the Blue Hills Observatory from three storms over 19 days from March 13 to 31. Accumulation was officially recorded by the National Weather Service (NWS). $24.96 million of property damage was reported in Norfolk County and these storms were a federally declared disaster. The weather pattern that caused these floods consisted of early springtime prevailing westerly winds that moved three successive storms, combined with tropical moisture from the Gulf of Mexico, across New England. Torrential rainfall

caused March 2010 to be the wettest month on record. The March 2010 rainstorms fit the profile of a type of severe precipitation event expected to increase in frequency as the climate warms. That is, significant precipitation, falling in late winter as rain rather than snow, on frozen ground, and while vegetation is still dormant.

Figure 12. Total Flooded Area of the Commonwealth for Selected Events



Source: United States Geological Survey 2023

One indication of the extent of flooding is the gage discharge at the nearest USGS streamflow gauging station on the Neponset River in Norwood, MA. Figure 12 illustrates that 2010 had the highest streamflow at nearly 2,000 cubic feet per second for the years of 1998-2022. Potential damages from flooding in the Town of Sharon were estimated using FEMA's HAZUS program. The results, shown in Table 44, indicate potential damages from a 1% Annual Chance Flood (100-year) at $16,130,000 and from a 0.2% Annual Chance Flood (500-year) at $15,880,000.

OVERVIEW OF TOWN-WIDE FLOODING

As with most of eastern Massachusetts the natural hazard threat that is most prevalent in the town of Sharon, and therefore the focus of most of the Town's hazard mitigation efforts, is flooding. However, the town is also at significant risk of brush and forest fires, especially at Borderland State Park and in the areas surrounding high-tension wires and railroad tracks in town.

The town is impacted by several bodies of water, including but not limited to, the Canoe River, Beaver Brook, Massapoag Brook, Massapoag Lake, and several smaller lakes, ponds, brooks, and streams. However, the Canoe River, Massapoag Brook, and Massapoag Lake tend to have the largest impact on flooding, as do inadequate flood storage and under-sized drainage systems.

Virtually all of the 100-year and 500-year flood zones in town are located near major bodies of water, including those named above. However, in many of those zones the flood frequency is greater than the 100-year flood event. Though the flood zones have not been properly studied as a system, Town officials believe that many of the town's more frequent flooding problems are related to insufficient or inoperable flood management structures, such as culverts, dams, and drain pipes that are not large enough to quickly transport flood waters away from town streets and neighborhoods and toward the nearby wetlands.

The western edge of the town of Sharon is bordered by the towns of Walpole and Foxborough, to the northwest is Walpole directly to the north Sharon and Canton and to the east is Stoughton. On the southeast are Mansfield and Easton. Combined with the watershed from its neighboring towns to the north and west, the Sharon area can accumulate a great deal of water in a short amount of time during heavy rains, severe storms, and in the spring season.

POTENTIAL FLOOD HAZARD AREAS

Information on potential flood hazard areas was taken from two sources. The first was the current National Flood Insurance Rate Maps, dated July 17, 2012. The FIRM flood zones are shown on Map 3b. in Appendix B and their definitions are listed below.

The current effective Flood Insurance Study (FIS) can be found here. Flooding sources included in Sharon are Beaver Brook, Billings Brook, Canoe River, Massapoag Brook, School Meadow Brook, and Sucker Brook. This report includes peak discharge rates for each flooding source, and the 3 flood zones that are designated in Sharon which are A, AE, and X. It should also be noted that the Town will be impacted by the Neponset Watershed RiskMAP mapping update for Norfolk and Suffolk Counties. This process is expected to result in a Letter of Final Determination (LFD) from FEMA by late December 2023 or January 2024. The Town will need to adopt an updated floodplain bylaw to reflect the new mapping before the updated Flood Insurance Rate Map (FIRM) and Flood Insurance Study will become effective in June or July 2024. The State model floodplain ordinance is available to assist municipalities with making these updates. Municipalities can also go above and beyond the State's minimum requirements by including additional language. This additional language can be related to strengthening floodplain overlay district requirements, stormwater regulations, site plan review, and more.

Flood Insurance Rate Map Zone Definitions

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

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

Zones X500 (.2% annual chance) **-** Zone X500 is the flood insurance rate zone that correspond to the 500-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone.

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

In addition, information on areas subject to flooding was provided by local officials. The Locally Identified Areas of Flooding described below were identified by Town staff as areas where flooding is known to occur. All of these areas do not necessarily coincide with the flood zones from the FIRM maps. Some may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8 in the Appendix B, "Local Hazard Areas."

LOCALLY IDENTIFIED AREAS OF FLOODING

The town identified the following local areas of potential flooding. These are summarized in Table 13 and displayed on Map 8 (Appendix B), with the corresponding map location numbers in the first column of Table 13.

The locally identified areas of flooding described below were identified by the Local Team as areas where flooding occurs. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, "Local Hazard Areas". The numbers do not reflect priority order.

Table 13: Locally Identified Areas of Flooding

Map ID	Name	Description
4	Billings Street, crossing Massapoag Brook	This is a high severity flood hazard with a low frequency. The issue here is the dam, if the dam were to fail, there would be a potential for extremely severe impacts. There is an existing culvert under the road, but local officials feel that the biggest problem at this spot is the town owned dam that is located here. For future mitigation,

		they recommend stabilizing the dam, as a way of alleviating the occasional flood concerns here.
5	Morse Street, south side of Massapoag Lake	This is a moderate to high severity flood threat that floods every couple of years. There are existing culverts that should be upgraded or rebuilt. Officials estimate a cost of about $100,000 for this work and list it as a low priority.
6	Morse Street, at Mountain Street	This is another moderate to high severity flood threat that floods every two or three years. Officials say there is no existing mitigation here, and suggested that to install culverts or other mitigation measures, would likely create problems on a busier roadway. They see no reason to do anything here and have said that mitigation here is a low priority.
7	Edgehill at Dedham Street	This is a low severity flood threat, which floods infrequently. There is an existing culvert in reportedly proper working order. Officials say a new, larger box culvert could be installed, but they do not feel this is a priority, given the cost and the minimal benefit it would achieve.
8	Saw Mill Pond Road	This is a moderate severity flood hazard that floods annually due to inflow/infiltration into the catch basins nearby. Town officials indicate that the subdivision was poorly designed and the catch basins are not properly drained away from the street. Maintenance and upgrades to the existing system are recommended, including proper drainage pipes, but there is no cost estimate, funding source or timeline currently in place for this project. The town considers this a medium or moderate priority.
9	Main Street, near Massapoag Brook	This is a low severity hazard that has flooded once, during the hurricane of 1956. There is currently a properly operating culvert and no further mitigation is recommended here.
13	Spring Valley Golf Course	A low severity flood hazard affects only the golf course and associated parking areas, all of which are on private property. No mitigation is in place and none is recommended. It is a low priority.
15	School Meadow Brook at Commercial Street	Flooding at this site has been more severe and frequent. However, the town undertook a dredging of the existing culvert under Route 1 and drainage channel and there has been little problem at this location since. It had previously been an annual problem. Town officials say it has become a high priority to maintain the condition of tat culvert, but no further mitigation is recommended here.

REPETITIVE LOSS STRUCTURES

FEMA defines a repetitive loss (RL) structure as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any 10-year rolling period since 1978". For more information on repetitive losses see here. There are no repetitive loss structures in Sharon.

FLOODING AND CLIMATE CHANGE

Data from the 2022 MA Climate Change Assessment related to changes in precipitation patterns is included in an earlier part of this Section. Those projections suggest that future rain events will be increasingly intense and lengthy, which could lead to increased inland and stormwater flooding.

Precipitation frequency estimates, which are used to derive stormwater design standards, were published in 1961 by the U.S. Commerce Department in a document known as TP-40 (Technical Paper 40). The 10-year,

24-hour storm for eastern Massachusetts was calculated as a 4.5-inch event. Recently the National Oceanic and Atmospheric Administration published updated estimates (NOAA Atlas 14), which increased this design storm by 0.6 inches to 5.14 inches for eastern Massachusetts. Communities should consider future rainfall rates when designing infrastructure. For example, Sharon could consider using NOAA Atlas 14 rainfall rates with an additional allowance to account for projected rainfall during the life of projects permitted today when sizing stormwater infrastructure. DEP takes a similar approach in its proposed regulations to describe current (not future) rainfall rates, called "NOAA14+". Mystic River Watershed Association (MyRWA) communities propose "NOAA14++", which they say reflects 2070 projections. The NOAA 14+ number is calculated by multiplying the NOAA 14 precipitation frequency estimate upper confidence interval by 0.9 (i.e., current but extreme precipitation events reflect 90% of upper confidence intervals). The NOAA 14++ number is the upper confidence interval. A comparison of these numbers for the Town of Sharon is summarized in the table below (NOAA, 2023).

Table 14. Rainfall rates for the 10-year 24-hour storm

NOAA 14	NOAA 14+	NOAA 14++
5.27 inches	5.90 inches	6.56 inches

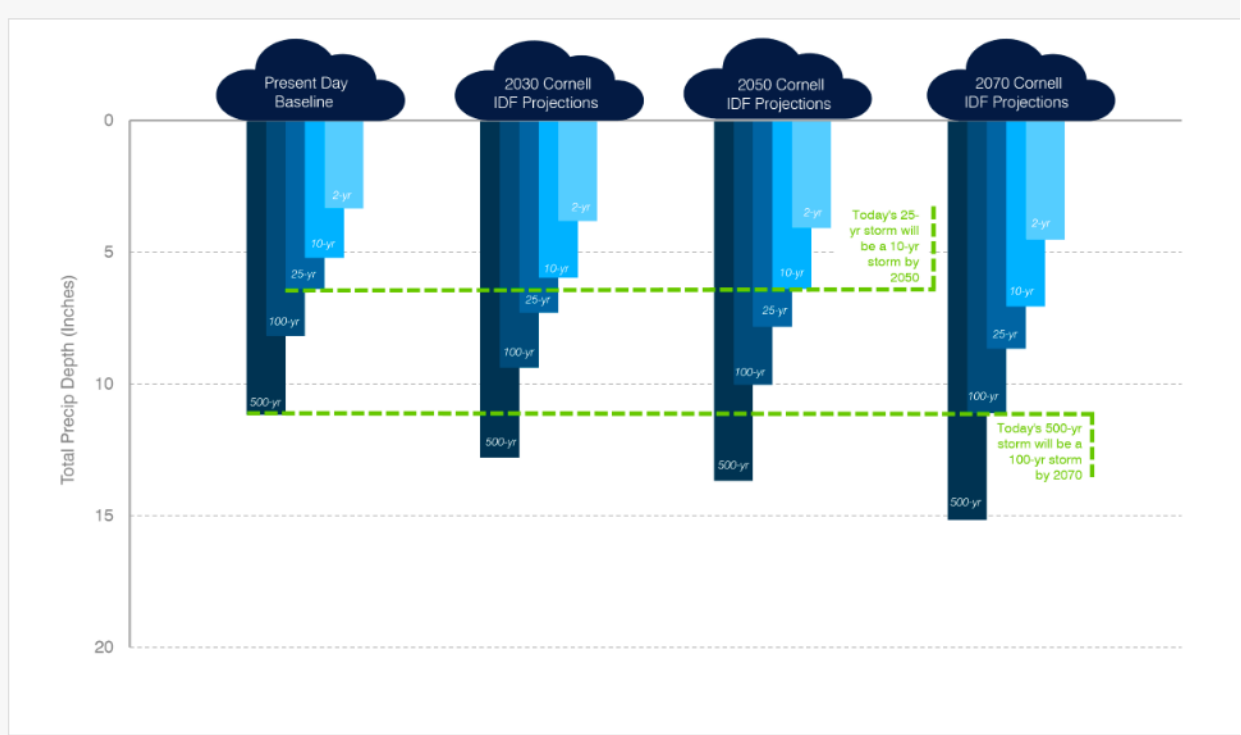
The 2022 MA Climate Change Assessment also highlights the following climate impacts for the Eastern Inland Region (where Sharon is located), related to flooding:

- By 2050, the 1 percent annual chance river flood could be two times more likely to occur
- By 2090, the historical 10 percent annual chance daily rainfall event (2.8 to 4 inches) could occur four times more frequently
- Damage could occur to inland buildings from heavy rainfall and overwhelmed drainage systems
- Damage could occur to transit service due to flooding
- There could be a reduction in the availability of affordably priced housing from direct damage including from flooding (Commonwealth of Massachusetts, 2022)

NEPRWA FLOOD MODEL

As the climate continues to warm, more intense precipitation has been observed since the mid-20th century (see Figure 18) and is expected to accelerate in future decades. How much this trend increases in the future will depend on the degree to which Greenhouse Gases (GHG) are controlled in this century.

Figure 13. Projected Future Increase in Precipitation Scenarios in the Neponset River Watershed Model

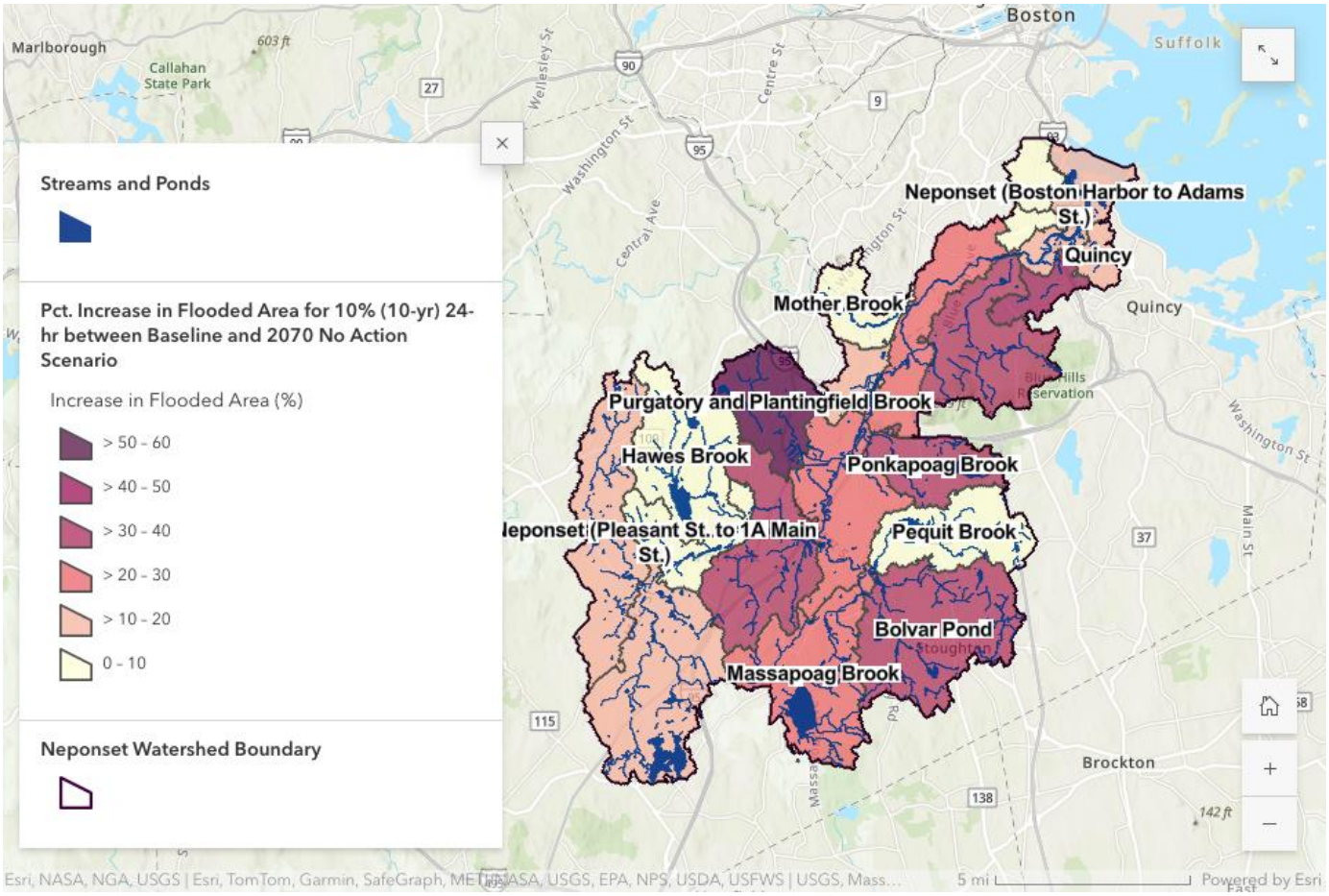


To assess how these global trends may affect the Neponset River Watershed, which includes the Town of Sharon, the Neponset River Watershed Association (NepRWA) and the 14 communities in the watershed worked together to develop the Neponset River Flood Model to identify areas vulnerable to flooding under future climate conditions. The following description of the project comes from the Neponset River Watershed Model Story Map prepared for the Neponset River Watershed Association under the Municipal Vulnerability Preparedness (MVP) Action Grant Program through the Massachusetts Executive Office of Energy & Environmental Affairs:

The project resulted in an interactive display of model results showing areas in the Neponset River watershed at risk from projected flooding events. The model was developed for the watershed area draining to Boston and comprises about 120 square miles. This represents the entire Neponset River watershed, which includes the Town of Sharon. This flood model-based approach provides multiple benefits, including a more accurate representation of surface flooding risks, a better understanding of flood extents, depth, volume, and duration across the watershed, and an easier approach to evaluate and visualize flood reduction strategies and their benefits.

A computer-based flood model that incorporates hydrologic analysis (examining rainfall and estimating surface runoff) and hydraulic analysis (studying the movement as it runs off, including through underground stormwater pipes) serves as a valuable tool for understanding current and future flooding within a watershed. The process of creating the model includes collecting and combining the drainage information from each town into one map. Then the details of existing culverts, dams, and underground pipes are added to the model. Finally, future climate projections are added, and the future risk of flooding is estimated in terms of total flooded area and other model outputs (see Figure 14).

Figure 14. Percent Increase in Total Flooded Area for Runoff Volume During the 2070 10-year Event Versus the Baseline 10-year Event, by Sub-Basin



The Neponset River Flood Model Results Viewer allows you to preview flooding impacts from various storm events within the watershed. The viewer also demonstrates the potential flood reduction benefits from the installations of green infrastructure systems and upland storage. On average, the watershed will experience a 22% increase in inundated areas and a 100% increase in total runoff for the 2070 10-year storm event. Individual communities can use the model as a starting point to inform more localized modeling for high-risk areas (either because of a high likelihood of flooding, or the presence of critical or vulnerable buildings or people). Additionally, NepRWA can identify regional projects that our communities can work together through the Neponset Region Climate Resilience Collaborative.

DAM HAZARDS

Dam failure can occur as a result of structural failure, independent of a hazard event, or as the result of the impacts of a hazard event such as flooding associated with storms or an earthquake. In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the area in the path of the dam's floodwaters.

Dam failure is a highly infrequent occurrence, but a severe incident could result in loss of lives and significant property damage. According to the Association of State Dam Safety Officials, three dams have failed in Massachusetts since 1984, one of which resulted in a death. There have been no recorded dam breaches in Sharon.

The increasing intensity of precipitation is the primary climate concern related to dams, as they were designed based on historic weather patterns. The ResilientMass Plan and the 2018 SHMCAP both indicate that changing precipitation patterns may increase pressure on dams and increase the likelihood of overflow events.

According to data provided by the Massachusetts Department of Conservation and Recreation and the Town, there are over a dozen dams in Sharon of various sizes (see Table 15).

Table 15: DCR Inventory of Dams in Sharon

Dam Name	River Impounded	Name Owner	Hazard Potential Classification
Trowel Shop Pond Dam	Massapoag Brook	Town of Sharon DPW	Low Hazard
Manns Pond Dam	Massapoag Brook	Town of Sharon DPW	Significant Hazard
Knifeshop Pond Dam	Massapoag Brook	Sharon Conservation Comm.	Small Unregulated
Massapoag Lake Dam	Massapoag Brook	Town of Sharon DPW	Significant Hazard
Hammershop Pond Dam	Massapoag Brook	Town of Sharon DPW	Significant Hazard
Leach Pond Dam	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Upper Leach Pond Dam	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Sharon Fish & Game Club Pond Dam		Sharon Fish & Game Club	Small Unregulated
Borderland S.P. Dam #2	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Borderland S.P. Dam #3	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Upper Leach Pond Dike #1	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Upper Leach Pond Dike #2	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Upper Leach Pond Dike #3	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard
Borderland S.P. Dam #1	Tributary of Poquanticut Bk.	Mass. DCR	Low Hazard

Source: MA Department of Conservation and Recreation Office of Dam Safety

The Department of Conservation and Recreation provides a classification of dam hazards, as summarized below. None of the dams in Sharon are classified as High Hazard. However, there are a few dams classified as Significant Hazard dams: Manns Pond Dam, Massapoag Lake Dam, and Hammershop Pond Dam. More than half the dams in Sharon are state-owned and managed by the Department of

Conservation and Recreation, several of which are located within Borderlands State Park. All of these are classified as Low Hazard dams.

DCR Dam Hazard Classification

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

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

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

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

Over time, the Town of Sharon has conducted multiple dam inspection reports and Emergency Action Plans (EAPs) for major dams. The list of those reports and their dates are summarized below.

Table 16. List of Dam Inspection Reports and Emergency Action Plans

Dam	Report	Date
Gavins Pond Dam	Dam Inspection Report	01/27/2023
Hammershop Pond Dam	Phase I Inspection	11/09/2017
	Emergency Action Plan Update	01/01/2023
Lake Massapoag Dam	Phase I Inspection	06/04/2014
	Emergency Action Plan	01/01/2023
Manns Pond Dam	Emergency Action Plan	08/31/2007
	Phase I Inspection	06/26/2018

Summaries of EAPs for each dam are included below. For Gavins Pond Dam, an EAP is not currently available; however, preparation of the EAP is currently under contract. So, in this plan, we have included the Inspection Report instead, which was done in 2023, for the Gavins Pond Dam.

1. **Gavins Pond Dam Inspection Report**

Hydraulic/Hydrologic Data

Based on the size (Intermediate) and hazard potential (Significant (Class II)) of Gavins Pond Dam, the spillway design flood (SDF) for the dam is the 100-year storm event.

Hydrologic/Hydraulic data was provided for Gavins Pond Dam as part of the 2011 Phase1 Inspection Evaluation Report dated November 30, 2011. The analysis provided the following information.

- Spillway Design Flood Return Period: 100-year, 24-hour
- Precipitation (methodology): 6.8 inches (SCS Type III)
- SDF Inflow: 1,700 cfs
- SDF Outflow: 1,060 cfs
- Principal Spillway Capacity: 150 cfs
- Auxiliary Spillway Capacity: Not Assessed
- SDF safely routed without overtopping: 10%
- Max Depth of Overtopping for SDF: 1.2ft

According to the study, Gavins Pond Dam does not have sufficient capacity to contain the runoff generated from the 100-year flood. Using the peak outflow of 1,060 cfs, the dam will overtop by 1.2 feet. The study presented that the primary spillway currently has a capacity of 150 cfs. The auxiliary spillway was not included in the study, which reflects the current condition of the dam.

Summary of the Report

This Phase I Inspection/Evaluation Report details the inspection and evaluation of the Gavins Pond Dam located in Foxborough/Sharon, Massachusetts. The inspection was conducted on January 27, 2023 by Pare Corporation (Pare) of Foxboro, Massachusetts. Gavins Pond Dam is an approximately 270-foot long, 9.5-foot-high earthen embankment structure with a primary spillway and a gated auxiliary spillway with a gatehouse. The dam is currently classified as an Intermediate size, Significant (Class II) hazard potential dam.

No formal Operation and Maintenance (O&M) Manual is known to exist for this structure. An Emergency Action Plan is not currently available; however, preparation of the EAP is currently under contract. Per ODS requirements, an Emergency Action Plan is required for this Significant Hazard potential structure.

In general, Gavins Pond Dam was found to be in **Fair** condition with the following deficiencies noted:

1) Irregular stone masonry walls with sinkholes behind the wall and areas of bulging/failed wall sections.
2) Debris within the auxiliary spillway discharge basin and clogged outlet.
3) Concrete deterioration such as spalling, cracking, scour, exposed rebar, and section loss at the primary and auxiliary spillways.
4) Shifted upstream right training wall at the primary spillway.
5) Inoperable and non-functional auxiliary spillway obstructed by an earthen cofferdam.
6) Leakage through the cofferdam upstream of the auxiliary spillway and through the auxiliary spillway gatehouse structure.
7) Other areas of additional maintenance and dam safety concerns, as noted herein.

Figure 15. Overview of the downstream side of primary spillway

The Gavins Pond Dam Locus Plan is included Appendix C (Map1).

2. Hammershop Pond Dam Emergency Action Plan Update

Description

Hammershop Pond Dam is located on Massapoag Brook immediately southwest of the intersection of Ames and Cottage Streets in the Town of Sharon, Massachusetts.

- Drainage area: 4.1 +/-
- Hydraulic/Structural Height (ft): 9.5/12
- Normal Surface Area (ac): 2.7
- Embankment Length (ft): 210
- Dam Type: Earthen Embankment with Masonry Wall
- Normal Storage (ac-ft): 8.5

The downstream area is predominately forested and wetlands with developed/residential areas in the upland. The Town of Sharon boundary is approximately 2.7 miles downstream.

List of Downstream Dams:

- Knifeshop Pond Dam (MA02474) – Non-Jurisdictional, approximately 0.36-miles downstream.
- Manns Pond Dam (MA01277) – Significant Hazard (Class II), approximately 0.8-miles downstream.
- Trowel Shop Pond Dam (MA01161) – Low Hazard (Class III), approximately 2.36-miles downstream.

- Shepards Pond Dam (MA00162) – Significant Hazard (Class II), approximately 3.58-miles downstream.
- Shepards Street Dam (MA03104) – Significant Hazard (Class II), approximately 3.81-miles downstream.

The Hammershop Pond Dam Locus Plan is included in Appendix C (Map2).

Inundation Map Development

GZA simulated the dam breach with the impoundment level at the top of dam elevation and normal baseflows in the downstream area. GZA modeled a simplified the Inline Structure for Hammershop Pond Dam with no spillway and assigning the top of dam elevation of 247.0 feet (NAVD88). Based on a ground surface interpolated from the FEMA FIS profile for Norfolk County, the invert of the channel downstream of the dam is elevation 240 feet, resulting in a maximum breach height of 7.0 feet. GZA used an upstream baseflow of 10.3 cfs (i.e., 2.5 cfs per square mile of contributory watershed).

GZA performed one dam failure simulation with the breach parameters listed below for the Hammershop Pond Dam. Note that an actual breach may have different characteristics.

- Pool Elevation at Failure (at top of dam): 247.0 (ft, NAVD88), (Normal Pool is 242.7 ft, NAVD88)
- Bottom Breach Width: 10 ft
- Breach Side Slopes: 0 (H:V)
- Time to Failure: 0.1 (hrs)
- Breach Invert Elevation: 240.0 (ft, NAVD88)
- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

GZA performed intermediate simulations to determine if the failure of Hammershop Pond Dam would cause the domino failure of dams downstream. The breach parameters listed below are for Knifeshop Pond Dam. Manns Pond Dam, and the Trowel Shop Pond Dam were not overtopped in the simulations and thus not modeled as failing. Note that an actual breach may have different characteristics. Shepards Pond Dam, and Old Shepards Street Dam/Silk Mill Pond Dam were not included in the modeling extent in the simulations. Note that an actual breach may have different characteristics.

Knifeshop Pond Dam

- Pool Elevation at Failure (Peak WSE): 229.5 (ft, NAVD88)
- Bottom Breach Width: 20 ft
- Breach Side Slopes: 0.0 (H:V)
- Time to Failure: 0.1 (hrs)
- Breach Invert Elevation: 220.0 (ft, NAVD88)
- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

Note that the inundation zone from the dam failure may be affected by antecedent flooding (i.e. flooding from rainfall). GZA's simulation only includes the assumed baseflow of 3 cfs per square mile of drainage area. GZA's simulation does not include antecedent flooding due to rainfall in the downstream area.

The Hammershop Pond Dam Inundation Map is included in Appendix C (Map3, 3-1, 3-2, 3-3).

Impacted Area Summary

The estimated peak flow through the Hammershop Pond Dam breach is approximately 430 cfs. The potential impact area is shown on the Inundation Map. In the event of dam failure of the Hammershop Pond Dam, one residential structure on 132 Ames Street directly downstream of Hammershop Pond Dam as well as the area surrounding Knifeshop Pond Dam appear to be within the potential inundation area and is recommended to be evacuated. Ames Street directly downstream of Hammershop Pond Dam is also in the inundation area and is recommended to be closed. Evacuation and closure of the recreational Massapoag Trail is also recommended.

The breach at the Hammershop Pond Dam is expected to cause the failure of Knifeshop Pond Dam. Other downstream dams are not expected to overtop or fail as a result of the failure of Hammershop Pond Dam. The peak flow and peak flood wave time for each dam are shown on the Inundation Map.

The Inundation area downstream of Knifeshop Pond Dam to the boundary with the Town of Canton (0.16 miles to 2.7 miles downstream of Hammershop Pond Dam) is mostly contained in areas of forest and/or wetlands belonging to the Town of Sharon. Flooding is expected in several residential lots but does not appear to include any structures.

Mapping was terminated where Massapoag Brook enters Town of Canton limits as the estimated water surface elevation of 142.7 feet was less than the FEMA FIS estimated 10-year flood water surface elevation, 144.5 feet (NAVD88) (FEMA, 2021). Downstream of the mapping cutoff, refer to the FEMA FIS profiles.

Based on the simulation results, Ames Street directly downstream of Hammershop Pond Dam overtops. No other downstream bridge is expected to overtop due to the dam failure. Note that the dam breach flood wave may adversely affect bridges that are in the flood zone but not overtopped (e.g., by scour/erosion). Travel over bridges or along roadways above the flood wave is not recommended and should be closely monitored.

3. Lake Massapoag Dam Emergency Action Plan Update

Description

Massapoag Lake Dam is located on Massapoag Brook immediately southwest of the rotary at the intersection of Massapoag Ave, Quincy Street, and Pond Street, in the Town of Sharon, Massachusetts. The dam is located at latitude 42.110754° N and longitude 71.175543° W. A locus map and an aerial photograph of the site are provided in Figure 1 and Figure 2, respectively.

Access: The dam can be access from Massapoag Ave which runs adjacent to the impoundment. The dam can also be accessed via Beech Steet, which provides access to the parking lot adjacent to the gatehouse. There is no man-made built-up earth, concrete or similar embankment/barrier structure present at the site as the topography is such that the lake has long been a permanent fixture on the landscape. Massapoag Lake Dam therefore can best be described as a small spillway/gate control structure used solely for management of water levels in Massapoag Lake.

From Interstate- 95 take exit 11A for Neponset Street. Follow Neponset Street 2.2 miles to Washington Street. Turn right at Washington Street. After 1.0 mile Washington Street becomes Bay Road (at the junction of Route 27). Continue straight onto Bay Road and proceed for 0.8 miles then turn right onto East Street. After travelling approximately 2.0 miles on East Street the gate house will appear on the left side (adjacent to the round-about).

- Drainage area: 3.6 +/-
- Hydraulic/Structural Height (ft): 3/8
- Normal Surface Area (ac): 392
- Embankment Length (ft): 12
- Dam Type: Earthen Embankment with Masonry Wall
- Normal Storage (ac-ft): 5,230

Purpose/Operation of Dam

There were no records of the design or construction of the Massapoag Lake Dam available to GZA. However, a kiosk at the site containing historical information lake indicated that historically a gate structure has been located at the site for water level control in Lake Massapoag. The dam is vital to the Town as it controls the level of Lake Massapoag which is used for recreation.

Description of Downstream Area

The downstream area is predominately forested and wetlands with developed/residential areas in the upland. The Town of Sharon boundary is approximately 3.0 miles downstream.

Downstream Dams:

- Hammershop Pond Dam (MA02476) – Significant Hazard (Class II), approximately 0.2-miles downstream.
- Knifeshop Pond Dam (MA02474) – Non-Jurisdictional, approximately 0.36-miles downstream.
- Manns Pond Dam (MA01277) – Significant Hazard (Class II), approximately 0.8-miles downstream.
- Trowel Shop Pond Dam (MA01161) – Low Hazard (Class III), approximately 2.36-miles downstream.
- Shepards Pond Dam (MA00162) – Significant Hazard (Class II), approximately 3.58-miles downstream.
- Shepards Street Dam (MA03104) – Significant Hazard (Class II), approximately 3.81-miles downstream.
- Method of emergency drawdown: Primary spillway gate (5.3-ft long weir gate).

The Massapoag Lake Dam Locus Map is included in Appendix C (Map4).

Inundation map development

To evaluate the extent of flooding due to a partial dam failure at Massapoag Lake Dam, GZA performed a simulation of the hypothetical dam break utilizing HEC-RAS version 6.0.0 software. HEC-RAS was developed by the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center. The software is used to perform both 1-dimensional and 2-dimensional hydraulic modeling.

GZA developed a 4.25-mile long, 1-dimensional model including the Massapoag Lake Dam, the upstream impoundment, downstream Massapoag Brook, including downstream dams, and downstream bridges crossing the brook. The HEC-RAS model included 140 cross sections in addition to interpolated cross sections. The model extends approximately 2-miles upstream of the Massapoag Lake Dam and ends approximately 3 miles downstream of Massapoag Lake Dam, at the approximate boundary line of the Town of Sharon and Town of Canton. The downstream boundary condition was based on a normal depth slope from the FEMA FIS profile for Massapoag Brook.

GZA input to HEC-RAS a publicly available 1-meter resolution elevation raster1 in vertical datum NAVD88, units of feet. The streambed was adjusted based on Massapoag Brook Profile in Flood Insurance Study (FIS) for the Norfolk County2. GZA also input available bathymetric data3 for Lake Massapoag. GZA simulated the dam breach with the impoundment level at the top of dam elevation and normal baseflows in the downstream area. GZA modeled a simplified the Inline Structure for Massapoag Lake Dam with no spillway and assigning the top of dam elevation of 255.3 feet (NAVD88). Based on a ground surface interpolated from the FEMA FIS profile for Norfolk County, the invert of the channel downstream of the dam is elevation 248.2 feet, resulting in a maximum breach height of 7.0 feet. GZA used a stream baseflow of 10.3 cfs (i.e., 2.5 cfs per square mile of contributory watershed).

GZA performed one dam failure simulation with the breach parameters listed below for the Massapoag Lake Dam. Note that an actual breach may have different characteristics.

- Pool Elevation at Failure (at top of dam): 255.3 (ft, NAVD88), (Normal Pool is 252.0 ft, NAVD88)
- Bottom Breach Width: 10 ft
- Breach Side Slopes: 0.0 (H:V)
- Time to Failure: 0.3 (hrs)
- Breach Invert Elevation: 248.3 (ft, NAVD88)
- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

GZA performed intermediate simulations to determine if the failure of Massapoag Lake Dam would cause the domino failure of dams downstream. The breach parameters listed below are for Hammershop Pond Dam, Knifeshop Pond Dam, and Manns Pond Dam. Trowel Shop Pond Dam did not overtop in the simulations and was not modeled as failing. Shepards Pond Dam, and Old Shepards Street Dam/Silk Mill Pond Dam were not included in the modeling extent in the simulations. Note that an actual breach may have different characteristics.

Hammershop Pond Dam (MA02476)

- Pool Elevation at Failure (Peak WSE): 247.6 (ft, NAVD88)
- Bottom Breach Width: 20 ft
- Breach Side Slopes: 0.0 (H:V)
- Time to Failure: 0.1 (hrs)
- Breach Invert Elevation: 240 (ft, NAVD88)
- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

Knifeshop Pond Dam (MA02474)

- Pool Elevation at Failure (Peak WSE): 229.9 (ft, NAVD88)
- Bottom Breach Width: 20 ft
- Breach Side Slopes: 0.0 (H:V)
- Time to Failure: 0.1 (hrs)
- Breach Invert Elevation: 220.0 (ft, NAVD88)

- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

Manns Pond Dam (MA02477)

- Pool Elevation at Failure (Peak WSE): 210.3 (ft, NAVD88)
- Bottom Breach Width: 10 ft
- Breach Side Slopes: 0.0 (H:V)
- Time to Failure: 0.1 (hrs)
- Breach Invert Elevation: 204.9 (ft, NAVD88)
- Antecedent Downstream Flooding: 10.3 cfs (baseflow)

The Massapoag Lake Dam Inundation Map is included in Appendix C (Map5, 5-1, 5-2, 5-3).

Impacted Area Summary

The estimated peak flow through the Massapoag Lake Dam breach is 470 cfs. The potential impacted area is shown on the Inundation Map. The failure of Massapoag Lake Dam is expected to cause the failure of Hammershop Pond Dam, Knifeshop Pond Dam, and Manns Pond Dam. Trowel Shop Pond Dam is not expected to fail. The peak flow and peak flood wave time for each dam are shown on the Inundation Map.
The downstream inundation is mostly contained within areas of forested wetlands and within the Massapoag Brook channel. The inundation is expected to overtop the culvert crossing at Quincy Street, which is approximately 0.1 miles downstream of Massapoag Lake Dam. The inundation also overtops the culvert crossing at Ames Street, which is approximately 0.2 miles downstream of Massapoag Lake Dam (immediately downstream of Hammershop Pond Dam). Based on the modeling results, the inundation does not flow over the entire road at Ames Street.

The inundation area does not impact any downstream, habitable structures (dwellings). However, the dwelling structures at 2 East Street and 132 Ames Street are in close proximity to the inundation area. The nearest inundation at 2 East Street had a max depth of 0.25-ft and max velocity of 4 ft/s. The nearest inundation at 132 Ames Street had a max depth of 0.1-ft and max velocity of 3.9 ft/s.

The inundation area impacts 2 non-habitable structures (they appear to be storage sheds). The shed at 2 East Street is impacted by inundation with a max depth of 1.5-ft and max velocity of 1.5 ft/s. The shed at 149 Brook Road is impacted by inundation with a max depth of 0.4-ft and max velocity of 1.5 ft/s.

The inundation area downstream of Knifeshop Pond Dam to the boundary with the Town of Canton (0.35 miles to 3.0 miles downstream of Massapoag Lake Dam) is mostly contained in areas of forested wetlands belonging to the Town of Sharon. Flooding is expected in several residential lots but not to a level that would impact any structures.
Based on the simulation results, Ames Street directly downstream of Hammershop Pond Dam overtops. No other downstream bridge is expected to overtop due to the dam failure. Note that the dam breach flood wave may adversely affect bridges that are in the flood zone but not overtopped (e.g., by scour/erosion). Travel over bridges or along roadways above the flood wave is not recommended and should be closely monitored

4. **Manns Pond Dam Emergency Action Plan**

Description

Mann's Pond Dam is a 390 ft long earth embankment with a primary spillway, a low level outlet (LLO), and a high level outlet (HLO). The structural height of the dam is approximately 14 feet. The upstream slope consists of a vertical dry stone masonry wall that extends across the majority of the crest. The wall is constructed of loosely stacked large fieldstones. The wall terminates 15 feet from the left abutment and 63 feet from the right abutment. The remaining portions of the upstream face to the abutments are earth slopes.

Manns Pond Dam has a maximum structural height of approximately 14 ft and a 54 acre-foot impoundment during normal operating conditions. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Manns Pond Dam is an **Intermediate** size structure.
According to the Phase I Inspection performed by Weston & Sampson in September 2006 Manns Pond Dam is currently classified as a **High** Hazard (Class I) Dam. The inspection report stated that the results of a dam breach analysis may indicate that flood levels are not sufficiently high to warrant the classification of Manns Pond Dam as a high hazard structure.

GZA performed a dam breach analysis as part of this EAP. Based on the extent of the inundation area due to the hypothetical dam failure of Manns Pond Dam for fair weather conditions provided in Appendix C, one home would experience flooding. According to Section 10.06 Paragraph 4 of the Massachusetts Dam Safety Rules and Regulations (302 CMR 10.06) potential damage to habitable structures will be considered minor when habitable structures will experience no more than 2.0 feet incremental rise of flood water above the lowest ground elevation adjacent to the outside foundation walls. The fair weather breach of Manns Pond Dam results in less than 2 feet of flooding to the residential structure at 186 Billings Road that is shown to be in the path of the dam break flood. Therefore, the damage to the home that results from the fair weather breach of Manns Pond Dam is considered minor. Loss of life is possible, but not probable due to shallow flood depth, in GZA's opinion. Other damage would include the overtopping of Billings Road. Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, GZA recommends that DCR reclassify Manns Pond Dam as a **Significant** (Class II) hazard potential dam.

Drainage Area: The contributory drainage area for Manns Pond Dam is approximately 0.71 square miles and extends through Sharon to the southeast and west of the impoundment. According to the Weston & Sampson Phase I report and based upon conversations with Eric Hooper (Town of Sharon DPW Supervisor) contributions from Massapoag Lake (with a watershed area of approximately 3.8 square miles) are assumed to flow out of the south side of Massapoag Lake and therefore the watershed contributing to Massapoag Lake was assumed not to contribute to flows into Manns Pond Dam.

The Manns Pond Dam Locus Map is included in Appendix C (Map6).

Summary of Impact Areas

The following section summarizes the anticipated impacts of fair and wet weather dam break flooding in the Towns of Sharon and Canton. The lists of roads impacted by darn break flooding are approximate, and are listed in the general order of impact from upstream community to downstream community.

The failure of the Manns Pond Dam under fair weather conditions and normal pool elevation is expected to impact the structure at 186 Billings Street in the Town of Sharon. It is not anticipated that there will be any impact to structures outside of Sharon as a result of the fair weather failure.
Failure of the Manns Pond Dam under wet weather conditions is anticipated to impact approximately 5 structures, 2 of which are located in the Town of Sharon, the remaining 3 in the Town of Canton. Note that the majority of these buildings would experience flooding under the 100 year design storm prior to the failure of the Manns Pond Dam. The residences and other buildings affected by dam break flooding under the wet weather condition are primarily private residences, but also include a commercial building.
Town of Sharon

Within the Town of Sharon, dam break flooding is anticipated along the Massapoag Brook. Under fair weather conditions, flooding is expected to cause flooding in one home and under wet weather conditions, flooding is expected to cause flooding in two homes.

Impacted Roads: Town of Sharon

FAIR WEATHER	WET WEATHER
BILLINGS STREET	BILLINGS STREET
NORTH MAIN STREET (ROUTE 27)	NORTH MAIN STREET (ROUTE 27)
ACCESS ROAD FOR HIGH VOLTAGE LINES	ACCESS ROAD FOR HIGH VOLTAGE LINES

Town of Canton

Within the Town of Canton, dam break flooding is anticipated along the Massapoag River. Under fair weather conditions, it is not anticipated that any structures will be impacted. Under wet weather conditions (100 year design storm), flooding is expected to impact two residential structures and one commercial structures within the Town of Canton.

Impacted Roads: Town of Canton

FAIR WEATHER	WET WEATHER
	POND STREET

The Manns Pond Dam Inundation Map is included in Appendix C (Map7).

DROUGHT

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

In Massachusetts, droughts are caused by the prevalence of dry northern continental air and a decrease in coastal- and tropical-cyclone activity. During the 1960's, a cool drought occurred because dry air from the north caused lower temperatures in the spring and summer of 1962-65. The northerly winds drove frontal

systems to sea along the Southeast Coast and prevented the Northeastern States from receiving moisture (U.S. Geological Survey). This is considered the drought of record in Massachusetts.

Average annual precipitation in Massachusetts is 44 inches per year, with approximately 3 to 4 inch average amounts for each month of the year. Regional monthly precipitation ranges from zero to 17 inches. Statewide annual precipitation ranges from 30 to 61 inches. Thus, in the driest calendar year (1965), the statewide precipitation total of 30 inches was 68 percent of average.

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

The Massachusetts Drought Management Plan was revised in 2019 to change the state's classification of droughts by establishing four levels to characterize drought severity beyond normal conditions:

- Level 0-Normal Conditions (no drought)
- Level 1-Mild Drought (formerly Advisory)
- Level 2-Significant Drought (formerly Watch)
- Level 3-Critical Drought (formerly Warning)
- Level 4-Emergency Drought (formerly Emergency)

The levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions. They begin with a normal situation where data are routinely collected and distributed, move to heightened vigilance with increased data collection during an advisory, to increased assessment and proactive education during a watch. Water restrictions might be appropriate at the watch or warning stage, depending on the capacity of each individual water supply system. A warning level indicates a severe situation and the possibility that a drought emergency may be necessary. A drought emergency is one in which mandatory water restrictions or use of emergency supplies is necessary. Drought levels are used to coordinate both state agency and local response to drought situations.

The Massachusetts drought levels are shown in comparison to the U.S. Drought Monitor levels in Table 15. The two sets of drought indices are similar, but Massachusetts combines the USDM's level D2 and D3 into one category, Critical Droughts.

Figure 16. US Drought Monitor Compared to MA Statewide Drought Levels

USDM Names	Recurrence	Percentile Ranges	MA DMP Levels	MA Percentile Ranges	MA DMP Names
D0: Abnormally Dry	once per 3 to 5 years	21 to 30	1	>20 and ≤30%	Mild Drought
D1: Moderate	once per 5 to 10 years	11 to 20	2	>10 and ≤20%	Significant Drought
D2: Severe Drought	once per 10 to 20 years	6 to 10	3	>2 and ≤10%	Critical Drought
D3: Extreme Drought	once per 20 to 50 years	3 to 5			
D4: Exceptional Drought	once per 50 to 100 years	0 to 2	4	≤2%	Emergency

Source: Massachusetts Drought Management Plan, 2019

These levels are based on conditions of natural resources and provide information on the current status of water resources. As dry conditions can have a range of different impacts, a number of drought indices are available to assess these impacts. Massachusetts uses a multi-index system that takes advantage of several of these indices to determine the severity of a given drought or extended period of dry conditions. Drought level is determined monthly based on the number of indices which have reached a given drought level. Drought levels are declared on a regional basis for each of seven regions in Massachusetts. County by county or watershed-specific determinations may also be made. A determination of drought level is based on seven indices:

1. Standardized Precipitation Index (SPI) reflects soil moisture and precipitation.
2. Crop Moisture Index: (CMI) reflects soil moisture conditions for agriculture.
3. Keetch Byram Drought Index (KBDI) is designed for fire potential assessment.
4. Precipitation Index is a comparison of measured precipitation amounts to historic normal precipitation.
5. The Groundwater Level Index is based on the number of consecutive month's groundwater levels are below normal (lowest 25% of period of record).
6. The Stream flow Index is based on the number of consecutive months that stream flow levels are below normal (lowest 25% of period of record).
7. The Reservoir Index is based on the water levels of small, medium and large index reservoirs across the state, relative to normal conditions for each month.

Figure 17 shows the range of values for each of the indices associated with the drought levels. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for previous drought occurrences.

Figure 17. Indices Values Corresponding to Drought Index Severity Levels

Index Severity Level	Standardized Precipitation Index	Streamflow	Lakes and Impoundments	Groundwater	Keetch-Byram Drought Index	Crop Moisture Index
0	>30th percentile				< 200	> -1.0
1	≤30 and >20				200-400	≤-1.0 and > -2.0
2	≤20 and >10				400-600	≤-2.0 and < -3.0
3	≤10 and >2				600-700	≤ -3.0 and > -4.0
4	≤2				700-800	≤-4.0

Source: Massachusetts Drought Management Plan, 2019

The drought levels provide a framework from which to take actions to assess, communicate, and respond to drought conditions. Drought levels are used to coordinate both state agency and local response to drought situations. Water restrictions might be appropriate at the significant drought stage, depending on the capacity of each individual water supply system. A critical drought level indicates a severe situation and the possibility that a drought emergency may be necessary. A drought emergency is one in which mandatory water restrictions or use of emergency supplies is necessary.

Determinations regarding the end of a drought or reduction of a drought level focus on precipitation and groundwater levels. These factors have the greatest long-term impact on stream flow, water supply, reservoir levels, soil moisture, and forest fire potential.

Previous Occurrences

A summary of Massachusetts long term historic drought events from 1879 to 2019 is shown in Figure 18. This table was prepared for the Massachusetts Drought Management Plan in 2019, so it does not include droughts in the last few years.

Figure 18. Chronology of Major Droughts in Massachusetts since 1879

Date	Area affected	Recurrence interval (years)	Remarks	Reference
1879-83	–	–	Kinnison 1931 referenced these periods as two of three worst droughts on record in 1931, the third being the then current drought of 1929-1932.	Kinnison 1931
1908-12	–	–		
1929-32	Statewide	10 to >50	Water-supply sources altered in 13 communities. Multistate.	USGS 1989
1939-44	Statewide	15 to >50	More severe in eastern and extreme western Massachusetts. Multistate.	USGS 1989
1957-59	Statewide	5 to 25	Record low water levels in observation wells, northeastern Massachusetts.	USGS 1989
1961-69	Statewide	35 to >50	Water-supply shortages common. Record drought. Multistate.	USGS 1989
1980-83	Statewide	10 to 30	Most severe in Ipswich and Taunton River basins; minimal effect in Nashua River basin. Multistate.	USGS 1989
1985-88	Housatonic River Basin	25	Duration and severity as yet unknown. Streamflow showed mixed trends elsewhere.	USGS 1989
1995	–	–	Based on statewide average precipitation	DMP 2013
1998-1999	–	–	Based on statewide average precipitation	DMP 2013
Dec 2001 - Jan 2003	Statewide	–	Level 2 drought (out of 4 levels) was reached statewide for several months	DCR 2017
Oct 2007 - Mar 2008	Statewide except West and Cape & Islands regions	-	Level 1 drought (out of 4 levels)	DCR 2017
Aug 2010 - Nov 2010	Connecticut River Valley, Central and Northeast regions	–	Level 1 drought (out of 4 levels)	DCR 2017
Oct 2014 - Nov 2014	Southeast and Cape & Islands regions	–	Level 1 drought (out of 4 levels)	DCR 2017
Jul 2016 - Apr 2017	Statewide	–	Level 3 drought (out of 4 levels)	DCR 2017

Source: Massachusetts Drought Management Plan, 2019

EEA's Drought Management Task Force provides information on historic drought status for the Northeast region in Massachusetts, where Sharon is located. That information is summarized in Table 17 and Figure 18 below.

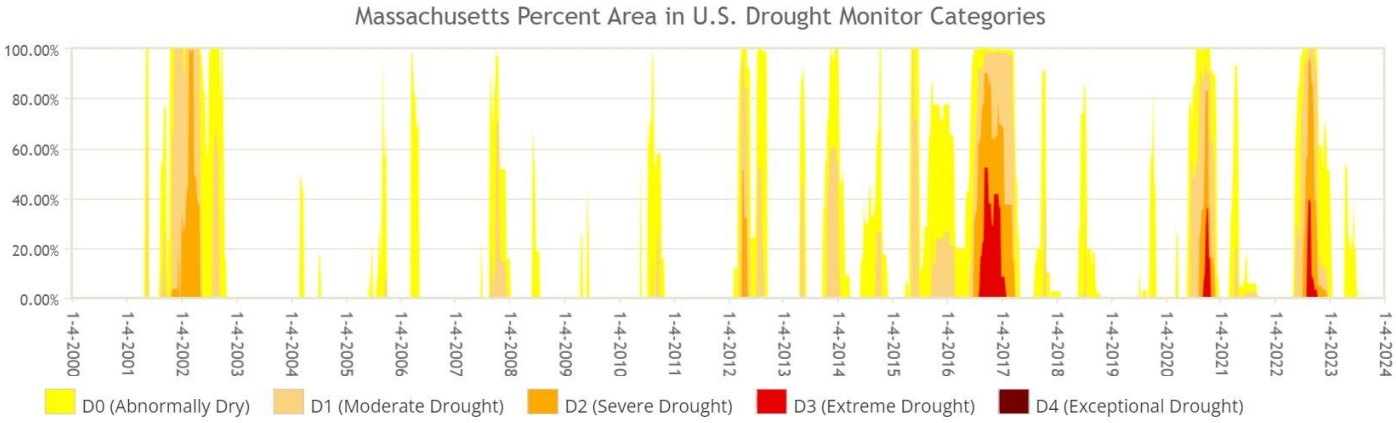
Table 17. Drought Status History for the Southeast Region, 2001-2023

Mild Drought/Advisory	2001, 2002, 2007, 2014, 2016, 2017, 2020, 2021, 2022
Significant Drought/Watch	2002, 2016, 2017, 2020, 2021, 2022
Critical Drought/Warning	2016, 2017, 2020, 2022
Emergency Drought/Emergency	None

Source: Drought Management Task Force, 2023

As shown in Figure 18, another measure of drought is the U.S. Drought Monitor, which characterizes droughts as abnormally dry, moderate, severe, extreme, and exceptional. Extreme drought is characterized by likely crop and pasture losses, water shortages, and water restrictions[3].

Figure 19. Percent Area in Massachusetts with Drought Conditions 2000-2023

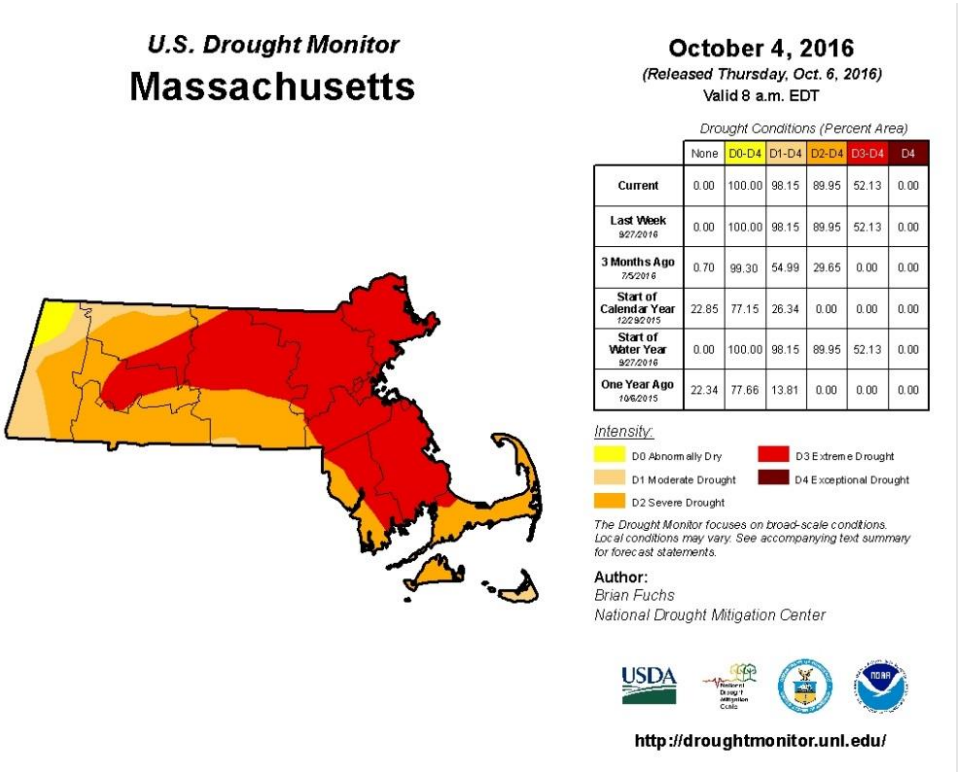


According to the US Drought Monitor, in 2016, nearly half of Massachusetts was in extreme drought conditions with 15 inches of deficit rainfall (Figure 18), the worst drought since 1965. The drought geographically affected 6.5 million people, forced communities to buy drinking water from the Massachusetts Water Resources Authority,[2] and prompting State aid to farmers for crop losses.

In recent past there have been several droughts in Massachusetts. The drought of 2016 was the worst one since 1985, with more than half of the state reaching the Extreme Drought stage for several months (Figure 19). This was followed by another drought four years later in 2020, which was most severe in Southeastern Massachusetts. Finally, in the early spring of 2021 a third, milder, drought was declared. By the summer of 2021 conditions in the northeast region improved but the region experienced another drought in the summer of 2022.

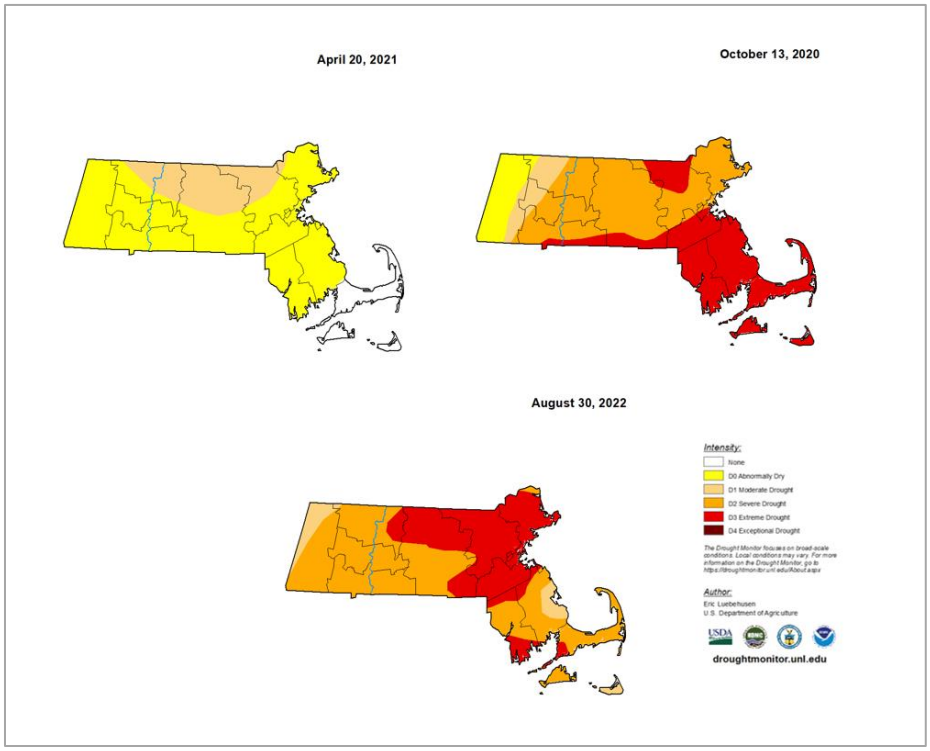
[2] https://www.boston.com/weather/local-news/2016/09/15/more-than-half-of-massachusetts-now-experiencing-an-extreme-drought

Figure 20. Extreme Drought Conditions in Massachusetts 2016



Source: US Drought Monitor, 2028-2023

Figure 21. Recent Massachusetts Drought Events (2018-2023)



Source: US Drought Monitor, 2028-2023

Potential Drought Vulnerability

The town's vulnerability to drought could include impacts on public and private water supplies, agriculture, aquatic ecology, wildlife, and fire hazard. Sharon shares major aquifers with Franklin, Norfolk, Millis and Wrentham. The Town's Water & Sewer Division serves Sharon residents using its two water storage tanks that have a combined capacity of 2.8 million gallons. Many residents rely on individual private wells. More information on municipal water infrastructure is included in the "Critical Infrastructure in Hazard Areas" section.

Prolonged drought could lower water tables and reduce the amount of water available from pumping wells. Lowering the water table could also result in reductions in water quality. A severe drought could also increase the risk of wildfire on forested lands and other vegetated areas, which are a dominant feature of Sharon.

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

Probability of Future Occurrence

The SHMCAP, using data collected since 1850, calculates that statewide there is a 1% chance of being in a drought emergency in any given month. For drought warning and watch levels, the chance is 2% and 8% respectively in any given month. See the table below for more information.

Table 18. Frequency of Massachusetts Drought Levels

Drought Level	*Frequency Since 1850*	*Probability of Occurrence in a Given Month*
Drought Emergency	5 occurrences	1% chance
Drought Warning	5 occurrences	2% chance
Drought Watch	46 occurrences	8% chance

Source: 2018 SHMCAP

Drought Emergency

Drought emergencies have been reached infrequently, with 5 events occurring in the period between 1850 and 2012: in 1883, 1911, 1941, 1957, and 1965-1966. The 1965-1966 drought period is viewed as the most severe drought to have occurred in modern times in Massachusetts because of its long duration. On a monthly basis over the 162-year period of record, there is a one percent chance of being in a drought Emergency.

Drought Warning

Drought Warning levels not associated with drought Emergencies have occurred five times, in 1894, 1915, 1930, and 1985, and 2016. On a monthly basis over the 162-year period of record, there is a two percent chance of being in a drought Warning level. As of July 2016, a Drought Warning has been declared for the Northeast region, which includes the Town of Sharon. December 2016 marked the ninth consecutive month of below average rainfall (see Figure 20).

Drought Watch

Drought Watches not associated with higher levels of drought generally have occurred in three to four years per decade between 1850 and 1950. In the 1980s, there was a lengthy drought Watch level of precipitation between 1980 and 1981, followed by a drought Warning in 1985. The frequency of drought Watches at a rate of three years per decade resumed in the 1990s (1995, 1998, 1999). In the 2000s, Drought Watches occurred in 2001 and 2002. The overall frequency of being in a drought Watch is 8% on a monthly basis over the 162-year period of record.

Droughts And Climate Change

Droughts are projected to increase in frequency and intensity in the summer and fall as weather patterns change. Factors contributing to this include increasing evaporation as a result of warmer weather, earlier snow melt, and more extreme weather patterns. Information from the 2022 Massachusetts Climate Change Assessment related to drought is included in the "Climate Change Observations and Projections" section of this report. Additionally, the 2022 Assessment highlights the following drought-related impacts to the Eastern Inland region where Sharon is located:

- Freshwater ecosystem degradation due to drought and other impacts
- Increased contaminant concentrations in freshwater during drought conditions
- Loss of tree cover due to drought and other impacts

EXTREME WEATHER

Extreme weather typically include wind-related hazards which are hurricanes, tropical storms, and tornadoes, as well as high winds during nor'easters and thunderstorms. As with many communities, falling trees that result in downed power lines and power outages are an issue in Sharon. Information on wind related hazards can be found on Map 5 in Appendix B.

Tree damage during high winds has the potential to be a significant hazard in Sharon. Trees can knock out power lines and block major roadways, which hinders emergency response. Since Sharon does experience downed trees that have caused isolated power outages and roadway blockages, maintaining trees in a proactive fashion is essential to minimize the potential impacts of tree damage on the community . Sharon is expanding its tree trimming and maintenance program as a mitigation measure.

WIND-RELATED HAZARDS

Wind-related hazards include hurricanes, tropical storms, and tornadoes, as well as high winds during nor'easters and thunderstorms. As with many communities, falling trees that result in downed power lines and power outages are an issue in Sharon.

Tree damage during high winds has the potential to be a significant hazard in Sharon. Trees can knock out power lines and block major roadways, which hinders emergency response. While Sharon does experience downed trees that have caused isolated power outages and roadway blockages, the town also takes pride in its tree-lined streets. Therefore, maintaining trees in a proactive fashion has been a trade-off for the tree amenities. The Department of Public Works has effective tree trimming and removal programs.

Sharon has numerous outdoor summer programs and microbursts have been a problem on at least two occasions. A microburst was recorded in town during the late 1990s, which caused some damage to trees and homes across a swath of the town. Another microburst was recorded in 2006, and caused a great deal of damage in the eastern part of the town. However, since microbursts are associated with the leading edge of rain storms, it is impossible to predict where they will strike in the future.

HURRICANES AND TROPICAL STORMS

A hurricane is a violent wind and rainstorm with wind speeds of 74 to 200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits land. Given its location not too distant from the coast, the Town of Sharon's entire area is vulnerable to hurricanes, which occur between June and November. A tropical storm has similar characteristics, but wind speeds are below 74 miles per hour. Since 1900, 39 tropical storms have impacted New England (NESEC). Massachusetts hurricanes since 1938 are shown in Table 19.

Table 19: Hurricane Records for Massachusetts, 1938 to 2023

Hurricane Event	Date
Great New England Hurricane	September 21, 1938
Great Atlantic Hurricane	September 14-15, 1944
Hurricane Doug	September 11-12, 1950
Hurricane Carol	August 31, 1954
Hurricane Edna	September 11, 1954
Hurricane Diane	August 17-19, 1955
Hurricane Donna	September 12, 1960
Hurricane Gloria	September 27, 1985
Hurricane Bob	August 19, 1991
Hurricane Earl	September 4, 2010
Tropical Storm Irene	August 28, 2011
Hurricane Sandy	October 29-30, 2012

Source: National Oceanic and Atmospheric Administration

Hurricane intensity is measured according to the Saffir/Simpson scale, which categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. These are combined to estimate potential damage. Table 20 gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Table 20: Saffir/Simpson Scale

Scale No. (Category)	Winds (mph)	Surge (ft)	Potential Damage
1	74 – 95	4 - 5	Minimal
2	96 – 110	6 - 8	Moderate
3	111 – 130	9 - 12	Extensive
4	131 – 155	13 - 18	Extreme
5	> 155	>18	Catastrophic

Source: National Oceanic and Atmospheric Administration

Hurricanes typically have regional impacts beyond their immediate tracks. Falling trees and branches are a significant problem because they can result in power outages when they fall on power lines or block traffic and emergency routes. Hurricanes are a town-wide hazard in Sharon. Potential hurricane damages to Sharon have been estimated using HAZUS-MH. Total damages are estimated at $18 million for a Category 2 hurricane and $66.6 million for a Category 4 hurricane. Other potential impacts such as households displaced, sheltering needs, and debris generation, are detailed in Table 29.

Based on records of previous occurrences, hurricanes in Sharon are a medium frequency event as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard occurs from once in 5 years to once in 50 years, or a 2% to 20% chance per year.

TORNADOS

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

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

Tornado damage severity is measured by the Fujita Tornado Scale, in which wind speed is not measured directly but rather estimated from the amount of damage. As of February 1, 2007, the National Weather Service began rating tornados using the Enhanced Fujita-scale (EF-scale), which allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized in Table 11 below:

Figure 22. Enhanced Fujita Scale

Scale	Wind speed		Relative frequency	Potential damage	
	mph	km/h			
EF0	65–85	105–137	53.5%	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.	
EF1	86–110	138–178	31.6%	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.	
EF2	111–135	179–218	10.7%	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
EF3	136–165	219–266	3.4%	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.	
EF4	166–200	267–322	0.7%	Extreme damage to near-total destruction. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.	
EF5	>200	>322	<0.1%	Massive Damage. Strong frame houses leveled off foundations and swept away; steel-reinforced concrete structures critically damaged; high-rise buildings have severe structural deformation. Incredible phenomena will occur.	

Source: SHMCAP 2018

The frequency of tornadoes in eastern Massachusetts is low; on average, there are six tornadoes that touchdown somewhere in the Northeast region every year. The strongest tornado in Massachusetts history was the Worcester Tornado in 1953, killing 94 people, injuring 1,288 and costing $52.1 million in damages (worth $465.3 million today). [3]

Recent tornado events in Massachusetts resulted in significant damage in Springfield in 2011 and in Revere in 2014. The Springfield tornado caused significant damage and resulted in four deaths in June of 2011. The Revere tornado touched down in Chelsea just south of Route 16, moved north into Revere's business district along Broadway, and ended near the intersection of Routes 1 and 60. The path was approximately two miles long and 3/8 mile wide, with wind speeds up to 120 miles per hour. Approximately 65 homes had substantial damage and 13 homes and businesses were rendered uninhabitable. And on August 22, 2016, an F1 tornado passed through part of nearby Concord. It impacted an area 0.85 miles long by 400 yards wide. According to the report from the National Centers for Environmental Information:

[3] Morrison, Sara. 2014. Tornados of Massachusetts Past.https://www.boston.com/weather/untagged/2014/07/28/tornadoes-of-massachusetts-past

"This tornado touched down near the Cambridge Turnpike and headed northeast. Most of the damage was concentrated in an area beginning near the intersection of Lexington Road and Alcott Road and continuing up to the neighborhood of Alcott and Independence Roads. Numerous trees were uprooted or had the tops sheared off. These subsequently blocked roads, damaged homes, and downed power lines, cutting off power to the neighborhood. In addition, utility poles were downed either from the wind or from the downed power lines. Thirty-nine houses in this area were damaged to some degree. Only one house suffered significant structural damage. The tornado continued for a short distance beyond this neighborhood before lifting. The historical home of Louisa May Alcott and her family was right next to the tornado path but was not damaged."

A tornado touched down in the Town of Sharon on September 6, 1973 in the wetlands behind Heights Elementary School. Since 1956, there have been ten total tornadoes in Norfolk County recorded by the Tornado History Project. One of these was an F2 tornado, and three were FI. These ten tornadoes resulted in a total of one fatality and six injuries and up to $3.6 million in damages, as summarized in **Error! Reference source not found.**12. The 1973 tornado was an F1 and resulted in fairly limited damage.

Table 21. Tornado Records for Norfolk County, 1950-2023

Date	Mag.	Fatalities	Injuries	Width (yd)	Length (mi)	Damage
6/9/1953	3	0	15	667	13.1	$2.5M
11/21/1956	2	0	0	17	0.1	$2.5K
8/9/1972	1	1	6	30	4.9	$25K
9/6/1973	1	0	0	10	1.1	$25K
7/10/1989	0	0	0	23	0.1	$2.5K
5/18/1990	0	0	0	10	0.2	$2.5K
5/18/1990	0	0	0	10	0.2	$2.5K
6/30/2001	0	0	0	80	0.1	$0.0K
8/21/2004	1	0	0	40	6	$1.5M
5/9/2013	EF0	0	0	50	0.38	$20K
6/23/2015	EF0	0	0	200	0.48	$20K
10/7/2020	EF0	0	0	50	.053	$6K
7/29/2023	EF0	0	0	25	0.16	$5K
Total		**1**	**21**			**4.111M**

Source: Tornado History Project; NOAA National Centers for Environmental Information

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

Although tornadoes are a potential town-wide hazard in Sharon, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Sharon would greatly depend on the track of the tornado. Generally Sharon Center is more densely developed and would likely be subject to more damage in the event of a tornado.

Based on the record of previous occurrences since 1956, Tornado events in Sharon are a low frequency event as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur from once in 50 years to once in 100 years (1% to 2% per year).

NOR'EASTERS

A northeast storm, known as a nor'easter, is typically a large counterclockwise wind circulation around a low-pressure center. Featuring strong northeasterly winds blowing in from the ocean over coastal areas, nor'easters are relatively common in the winter months in New England occurring one to two times a year. The storm radius of a nor'easter can be as much as 1,000 miles and these storms feature sustained winds of 20 to 40 mph with gusts of up to 60 mph. These storms are accompanied by heavy rain or snow, depending on temperatures (Commonwealth of Massachusetts, 2013).

Previous occurrences of nor'easters include the storm events included in the table below. Many of the historic flood events identified in the previous section were precipitated by nor'easters, including the "Perfect Storm" event in 1991. More recently, blizzards in February 2013, January 2015, and in March 2018 were large nor'easters that caused significant snowfall amounts.

Table 22: Nor'easter Events for Massachusetts, 1978-2021

Date	Nor'easter Event
February 1978	Blizzard of 1978
October 1991	Severe Coastal Storm ("Perfect Storm")
December 1992	Great Nor'easter of 1992
January 2005	Blizzard/Nor'easter
October 2005	Coastal Storm/Nor'easter
April 2007	Severe Storms, Inland & Coastal Flooding/Nor'easter
January 2011	Winter Storm/Nor'easter
October 2011	Severe Storm/Nor'easter
February 2013	Blizzard of 2013
January 2015	Blizzard of 2015
March 2015	March 2015 Nor'easters
January 2018	January 2018
March 2018	March 2018

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

The entire Town of Sharon could be at risk from the wind, rain, or snow impacts from a nor'easter, depending on the track and radius of the storm. Due to its inland location, the town would not be subject to coastal hazards.

Based on the record of previous occurrences, nor'easters in Sharon are high frequency events as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur more frequently than once in 5 years (greater than 20% per year).

SEVERE THUNDERSTORMS

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

The best available data on previous occurrences of thunderstorms in Sharon is for Norfolk County through the NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. From December 2012 to October 2023, records show 47 thunderstorm events in Norfolk County. These storms resulted in a total of $651,200 in property damage. There were no injuries or deaths reported. See the table below for more information.

Table 23: Norfolk County Thunderstorm Events, 2012-2023

Date	Magnitude	Deaths	Injuries	Property Damage ($)
6/17/2013	50	0	0	11,000
7/29/2013	50	0	0	20,500
7/3/2014	50	0	0	20,000
7/28/2014	60	0	0	50,000
6/23/2015	50	0	0	5,000
8/4/2015	50	0	0	30,000
8/15/2015	50	0	0	35,000
2/25/2016	50	0	0	94,000
6/7/2016	50	0	0	10,000
7/18/2016	50	0	0	90,000
7/22/2016	50	0	0	65,000
7/23/2016	40	0	0	35,000
8/14/2016	50	0	0	5,000
6/9/2017	45	0	0	1,000
6/13/2017	48	0	0	1,000
6/23/2017	50	0	0	1,000
8/2/2017	50	0	0	2,500
9/6/2017	50	0	0	1,000

7/17/2018	45	0	0	3,000
9/6/2018	50	0	0	6,000
11/3/2018	50	0	0	500
7/17/2019	50	0	0	5,000
7/31/2019	50	0	0	9,000
6/6/2020	50	0	0	10,000
6/28/2020	50	0	0	8,900
7/2/2020	50	0	0	31,000
7/5/2020	50	0	0	500
7/23/20	50	0	0	11,200
8/22/2020	50	0	0	2,000
8/23/2020	50	0	0	5,600
10/7/2020	55	0	0	35,800
11/15/20	50	0	0	500
6/8/2021	50	0	0	12,200
6/29/2021	50	0	0	1,100
6/30/21	55	0	0	1,500
7/7/2021	550	0	0	4,700
7/8/2021	50	0	0	1,000
7/16/2021	50	0	0	500
7/21/2021	50	0	0	600
7/27/2021	52	0	0	7,300
11/13/2021	50	0	0	1000
5/22/2022	50	0	0	8600
8/5/2022	50	0	0	800
8/26/2022	50	0	0	0
6/02/2023	43	0	0	2,100
7/27/2023	50	0	0	500
7/29/2023	50	0	0	500
TOTAL		**0**	**0**	**651,200**

Source: NOAA, National Climatic Data Center
*Magnitude refers to maximum wind speed

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

Based on the record of previous occurrences, severe thunderstorms in Sharon are high frequency events as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur more frequently than once in 5 years (greater than 20% per year).

WINTER HAZARDS

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

Winter storms are a potential town-wide hazard in Sharon. The average annual snowfall Sharon is 36-48 inches (see Map 6 in Appendix B). A number of public safety issues can arise during snow storms. Impassible streets are a challenge for emergency vehicles and affect residents and employers. Snow-covered sidewalks force people to walk in streets, which are already less safe due to snow, slush, puddles, and ice. Large piles of snow can also block sight lines for drivers, particularly at intersections. Not all residents are able to clear their properties, especially the elderly. Refreezing of melting snow can cause dangerous roadway conditions. In addition, transit operations may be impacted, as they were in the 2015 blizzard which caused the closure of the MBTA system for one day and limited services on several transit lines for several weeks.

The Town of Sharon provides standard snow plowing operations, and clearing snow has not posed any significant challenges. The Town does make plowing of roads a priority near emergency routes.

HEAVY SNOW AND BLIZZARDS

A blizzard is a winter snow storm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow which reduces visibility to or below ¼ mile. These conditions must be the predominant condition over a three hour period. Extremely cold temperatures are often associated with blizzard conditions, but are not a formal part of the definition. The hazard related to the combination of snow, wind, and low visibility significantly increases when temperatures drop below 20 degrees. Winter storms are a combination hazard because they often involve wind, ice, and heavy snow fall. The National Weather Service defines "heavy snow fall" as an event generating at least four inches of snowfall within a 12 hour period. Winter Storms are often associated with a Nor'easter event, a large counter-clockwise wind circulation around a low-pressure center often resulting in heavy snow, high winds, and rain.

The Regional Snowfall Index (RSI) characterizes and ranks the severity of northeast snowstorms. RSI has five categories: Extreme, Crippling, Major, Significant, and Notable. RSI scores are a function of the area affected by the storm, the amount of snow, and the number of people living in the path of the storm. The largest RSI values result from storms producing heavy snowfall over large areas that include major metropolitan centers. The RSI categories are shown in the table below.

Table 24: Regional Snowfall Index

Category	NESIS	Value Description
1	1 – 3	Notable

2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

Source: 2018 SHMCAP

The most significant recent winter event was Winter Storm Kenan (January 29, 2022), which resulted in 30.9" of snow in Massachusetts (Stucker, 2022). The table below shows presidentially-declared disasters in Norfolk County related to winter weather since 1978.

Table 25: Norfolk County Winter Federal Disaster Declarations, 1978-2023

Disaster Name	Date of Event	Declared Areas
Coastal Storms, Flood, Ice & Snow	February 1978	Barnstable, Bristol, Dukes, Essex, Nantucket, Norfolk, Plymouth, Suffolk
Winter Coastal Storm	December 1992	Barnstable, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Blizzard	March 1993	Statewide
Blizzard	January 1996	Statewide
Snow Storm	March 2001	Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, Worcester
Snow Storm	February 2003	Statewide
Snow Storm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Snowstorm	January 2005	Statewide
Severe Winter Storm, Snowstorm	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Severe Winter Storm, Snowstorm, Flooding	February 2013	Statewide
Severe winter storm, snowstorm, flooding	January 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe winter storm and Snowstorm	March 2018	Essex, Middlesex, Norfolk, Suffolk, Worcester
Severe winter storm and flooding	March 2018	Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth
Severe winter storm and snowstorm	January 2022	Bristol, Norfolk, Plymouth, Suffolk

Sources: OpenFEMA Dataset: Disaster Declarations and FEMA Declared Disasters

The best available data on past occurrences and impacts of winter storm events are reported for Norfolk County by NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. From

December 2012 through October 2023, Norfolk County experienced 8 days with recorded blizzards and 27 days with heavy snow, as shown in the tables below.

Table 26: Blizzards in Norfolk County, 2012-2023

Date	Deaths	Injuries	Property Damage ($)
2/8/2013	0	0	353000
1/2/2014	0	0	5000
1/26/2015	0	0	0
2/14/2015	0	0	10000
1/23/2016	0	0	50000
2/8/2016	0	0	10000
3/13/2018	0	0	60000
1/28/2022	0	0	2500
TOTAL	**0**	**0**	**490500**

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Table 27: Heavy Snow in Norfolk County, 2012-2023

Date	Deaths	Injuries	Damages ($)
2/8/2013	0	0	0
3/18/2013	0	0	0
12/14/2013	0	0	0
12/17/2013	0	0	0
1/2/2014	0	0	0
1/21/2014	0	0	0
2/5/2014	0	0	0
2/15/2014	0	0	5000
1/24/2015	0	0	0
1/26/2015	0	0	0
2/2/2015	0	0	0
2/8/2015	0	0	0
2/14/2015	0	0	0
3/5/2015	0	0	0
1/23/2016	0	0	0
2/5/2016	2	0	210000
2/8/2016	0	0	0
4/4/2016	0	0	0
3/14/2017	0	0	0
11/15/2018	0	0	0
10/30/2020	0	0	1800
12/16/2020	0	0	0
2/7/2021	0	0	0
1/7/2022	0	0	0
2/13/2022	0	0	0
2/25/2022	0	0	0
TOTAL	**2**	**0**	**216800**

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Map 6 in Appendix A demonstrates that the average annual snowfall in Sharon is between 36.1-48.0 inches. Winter storms are a potential town-wide hazard in Sharon.

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

A number of public safety issues can arise during snowstorms. Impassible streets are a challenge for emergency vehicles and affect residents and employers. Large piles of snow can also block sight lines for drivers, particularly at intersections. Refreezing of melting snow can cause dangerous roadway conditions. In addition, transit operations may be impacted, as they were in the 2015 blizzards which caused the closure of the MBTA system for one day and limited services on the commuter rail for several weeks.

HAIL

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow being converted to ice in the lower atmosphere leading to potentially hazardous conditions on the ground. Ice storm conditions are defined by liquid rain falling and freezing on contact with cold objects, creating ice buildups of one-fourth of an inch or more. An ice storm warning, which is now included in the criteria for a winter storm warning, is issued when a half inch or more of accretion of freezing rain is expected.

Sleet and hail are other forms of frozen precipitation. Sleet occurs when raindrops fall into subfreezing air thick enough that the raindrops refreeze into ice before hitting the ground. The difference between sleet and hail is that sleet is a wintertime phenomenon whereas hail falls from convective clouds (usually thunderstorms), often during the warm spring and summer months (a description of hail is included in a subsequent report section).

The best available data on previous ice storm events are recorded at the county level through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. However, there are no recorded ice storm events recorded for Norfolk County over the last 70 years. Given the regional nature of ice storms, most of the damages occur in the western portions of Middlesex County, farther inland and at a higher elevation than Sharon. The Town's location in the milder region closer to the coast and at lower elevations makes it less vulnerable to ice storms.

The greatest hazard is created by freezing rain conditions, which is rain that freezes on contact with hard surfaces leading to a layer of ice on roads, walkways, trees, and other surfaces. The conditions created by freezing rain can make driving particularly dangerous and emergency response more difficult. The weight of ice on tree branches can also lead to falling branches causing power outages and blocking roadways.

The impacts of winter storms may also include roof collapses and property damage and injuries related to the weight of snow and ice.

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow being converted to ice in the lower atmosphere leading to potentially hazardous conditions on the ground. Hail size typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters, shown in Table 18.

Table 28: Hail Size Comparisons

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

Source: NOAA

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

Town-specific data for previous ice storm occurrences are not collected by the Town of Sharon. The best available local data is for Norfolk County through the National Centers for Environmental Information. Norfolk County, which includes the Town of Sharon, experienced 10 events from 2013-2023 shown in Table 29.

Table 29: Norfolk County Hail Events, 2013-2023

Date	Hail Size	Deaths	Injuries	Property Damage ($)
5/21/2013	0.75	0	0	0
9/1/2013	0.75	0	0	0
8/7/2014	0.75	0	0	0
5/12/2015	0.75	0	0	0

6/23/2015	1	0	0	0
8/4/2015	1	0	0	0
6/30/2019	0.75	0	0	0
6/28/2020	1.5	0	0	0
7/7/2021	1	0	0	0
6/2/2023	0.75	0	0	0
TOTAL		**0**	**0**	**0**

Source: NOAA, National Centers for Environmental Information

*Magnitude refers to diameter of hail stones in inches

Ice storms are considered to be medium frequency events based on past occurrences, and as defined by the Massachusetts State Hazard Mitigation Plan. This hazard occurs once in five years to once in 50 years, with a 2% to 20% chance of occurring each year.

ICE JAMS

Ice jams occur in cold weather when normally flowing water begins to freeze effectively damming the waterway and causing localized flooding in the area. Flooding may also occur when ice jams break up and ice may pile up at culverts or around bridges. There is no known history of ice jams leading to flooding in Sharon and the local team did not identify this hazard as an issue for the Town.

Winter Weather and Climate Change

As with hurricanes, warmer ocean water and air will provide more fuel for winter storms. According to the 2018 SHMCAP it appears that Atlantic coast nor'easters are increasing in frequency and intensity. Further, the SHMCAP notes that research suggests that warmer weather in the Artic is producing changes to atmospheric circulation patterns that favor the development of winter storms in the Eastern United States. There is also some indication that as winters warm, temperatures may be more likely to produce icing conditions. Massachusetts' 2022 Climate Change Assessment predicts more mild winters, increased precipitation in the winter months, and multiple freeze-thaw cycles every winter due to warming temperatures (Commonwealth of Massachusetts, 2022).

GEOLOGIC HAZARDS

Geologic hazards include earthquakes, landslides, sinkholes, subsidence, and unstable soils such as fill, peat, and clay. Town officials did not identify any problems with areas of geologic instability, such as sinkholes or subsidence.

Although new construction under the most recent building codes generally will be built to seismic standards, there are still many structures in town which pre-date the most recent building code. Information on geologic hazards in Sharon can be found on Map 4 in Appendix B.

EARTHQUAKES

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

An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology.[4]

Seismologists use a Magnitude scale (Richter Scale) to express the seismic energy released by each earthquake. The typical effects of earthquakes in various ranges are summarized below.

Table 30: Richter Scale and Effects

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded
3.5- 5.4	Often felt, but rarely causes damage
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 km. across where people live.
7.0- 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred meters across.

Source: Nevada Seismological Library (NSL), 2005

According to the 2018 State Hazard Mitigation Plan, New England experiences an average of six earthquakes are felt each year. From 1668 to 2016, 408 earthquakes were recorded in Massachusetts.[5] Most have originated from the La Malbaie fault in Quebec or from the Cape Anne fault located off the coast of Rockport. The region has experienced larger earthquakes, including a magnitude 5.0 earthquake in 1727 and a 6.0 earthquake that struck in 1755 off the coast of Cape Anne. More recently, a pair of damaging earthquakes occurred near Ossipee, NH in 1940, and a 4.0 earthquake centered in Hollis, Maine in October 2012 was felt in the Boston area. Historical records of some of the more significant earthquakes in the region are shown in Table 38.

Table 31: Historical Earthquakes in Massachusetts or Surrounding Area

Location	Date	Magnitude
MA - Cape Ann	11/10/1727	5
MA - Cape Ann	12/29/1727	NA
MA – Cape Ann	2/10/1728	NA
MA – Cape Ann	3/30/1729	NA
MA – Cape Ann	12/9/1729	NA
MA – Cape Ann	2/20/1730	NA
MA – Cape Ann	3/9/1730	NA
MA – Boston	6/24/1741	NA
MA - Cape Ann	6/14/1744	4.7
MA – Salem	7/1/1744	NA
MA - Off Cape Ann	11/18/1755	6
MA – Off Cape Cod	11/23/1755	NA
MA – Boston	3/12/1761	4.6

[4]The Northeast States Emergency Consortium. http://nesec.org/earthquakes-hazards/
[5] The Northeast States Emergency Consortium. http://nesec.org/earthquakes-hazards/

MA - Off Cape Cod	2/2/1766	NA
MA – Offshore	1/2/1785	5.4
MA – Wareham/Taunton	12/25/1800	NA
MA – Woburn	10/5/1817	4.3
MA - Marblehead	8/25/1846	4.3
MA – Brewster	8/8/1847	4.2
MA – Boxford	5/12/1880	NA
MA - Newbury	11/7/1907	NA
MA - Wareham	4/25/1924	NA
MA – Cape Ann	1/7/1925	4
MA – Nantucket	10/25/1965	NA
MA – Boston	12/27/74	2.3
VA –Mineral	8/23/11	5.8
MA - Nantucket	4/12/12	4.5
ME – Hollis	10/17/12	4.0
CT-Wauregan	1/12/2015	3.3
CT-Wauregan	1/13/2015	2.6
NH-East Kingston	2/15/2018	2.7

Source: Boston HIRA

One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (%g). The range of peak ground acceleration in Massachusetts is from 10 % to 20 %, with a 2% probability of exceedance in 50 years, as shown in Figure 25. Sharon is in the middle part of the range for Massachusetts, at 12-14g, making it a moderate area of earthquake risk relative to the state, although Massachusetts as a whole is considered to have a low risk of earthquakes compared to the rest of the country. There have been no recorded earthquake epicenters within Sharon.

Figure 23: State of Massachusetts Earthquake Probability Map

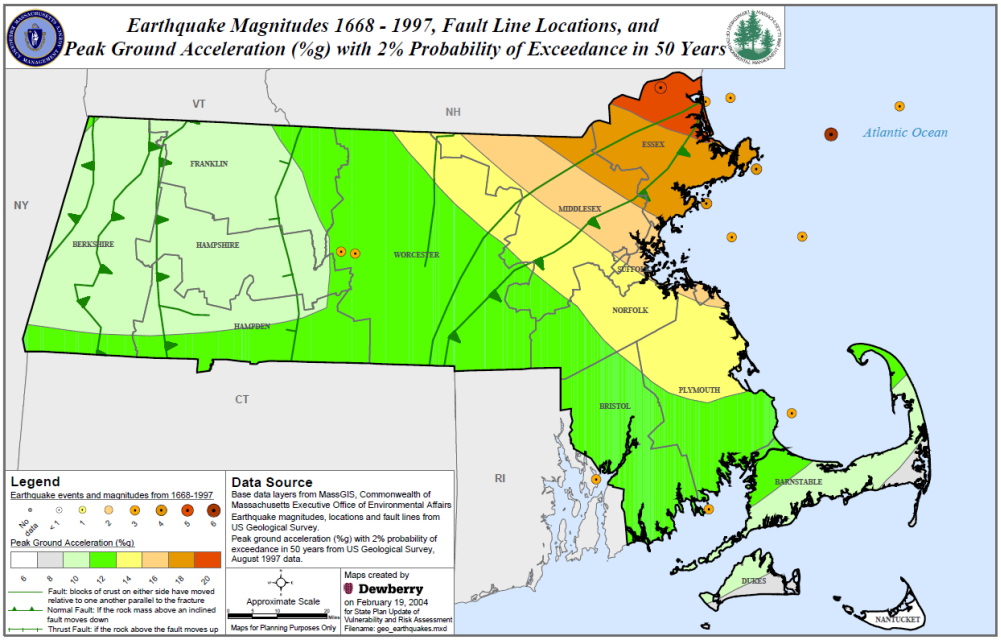
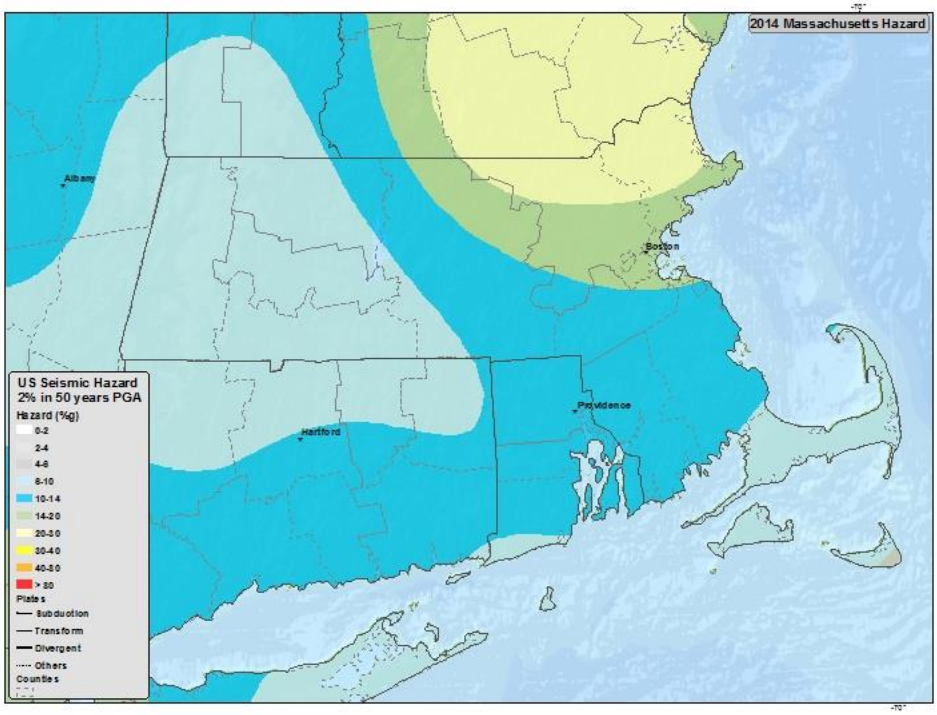


Figure 24. Massachusetts Seismic Hazard Map (2014)



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

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

Earthquakes are a potential town-wide hazard in Sharon. Earthquakes are a potential town-wide hazard in Sharon. The Town has many older buildings that pre-date the current building code which could be vulnerable in the event of a severe earthquake. Potential earthquake damage to Sharon has been estimated using HAZUS. Total building damages are estimated at $387,417,900 for a 5.0 magnitude earthquake (7.0 magnitude earthquake damage analysis is pending). Other potential impacts are detailed in Table 41, Estimated Damages from Earthquakes.

LANDSLIDES

According to the US Geological Survey (USGS), "The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors" (USGS 2023). Among the contributing factors are erosion by rivers or ocean waves over steepened slopes; rock and soil slopes weakened through saturation by snowmelt or heavy rains; earthquakes create stresses that make weak slopes fail; and excess weight from accumulation of rain or snow, and stockpiling of rock or ore, from waste piles, or from man-made structures.

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

In Massachusetts, according to the SHMCAP, the most common cause of landslides are geologic conditions combined with steep slopes and/or heavy rains. Landslides associated with heavy rains typically occur on steep slopes with permeable soils underlain by till or bedrock.

There is no universally accepted measure of landslide extent, but it has been represented as a measure of destructiveness. The table below summarizes the estimated intensity for a range of landslides. For a given landslide volume, fast moving rock falls have the highest intensity while slow moving landslides have the lowest intensity.

The SHMCAP, utilized data from the MA Department of Transportation from 1986 to 2006 to estimates that, on average, roughly one to three known landslides have occurred each year in the state. A slope stability map published by the MA Geological Survey and UMass-Amherst indicates that the most significant risk of landslide is in western Massachusetts.

Table 32: Landslide Volume and Velocity

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

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

Sharon has been classified as having a low risk for landslides (see Map 4, Appendix B). The town does not have records of any damages caused by landslides. There are not many steep slopes in the town and local officials state that landslides are not a major threat or occurrence in Sharon. Rather, there are localized issues of erosion during construction, as a result of development, or as a result of clearing vegetation.

Should a landslide occur in the future, the type and degree of impacts would be highly localized. The town's vulnerabilities could include damage to structures, damage to transportation and other infrastructure, and localized road closures. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Sharon.

Based on past occurrences and the Massachusetts Hazard Mitigation Plan, landslides are low frequency events that can occur once in 50 to100 years (a 1% to 2% chance of occurring each year).

WILDFIRE HAZARDS

Wildfire is a non-structure fire occurring in a forested, shrub or grassland areas. In the Boston Metro region these fires rarely grow to the size of a wildfire, as seen more typically in the western U.S or even more rural areas of Massachusetts. A more likely occurrence is brush fires that typically burn no more than the underbrush of a forested area. There are three different classes of wildfires:

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

A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers, and fire breaks. Wildfire season can begin in March and usually ends in late November. Most wildfires typically occur in April and May, when most vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced

somewhat. The National Wildfire Coordinating Group (NWCG) classifies the severity of wildfires based on their acreage as follows:

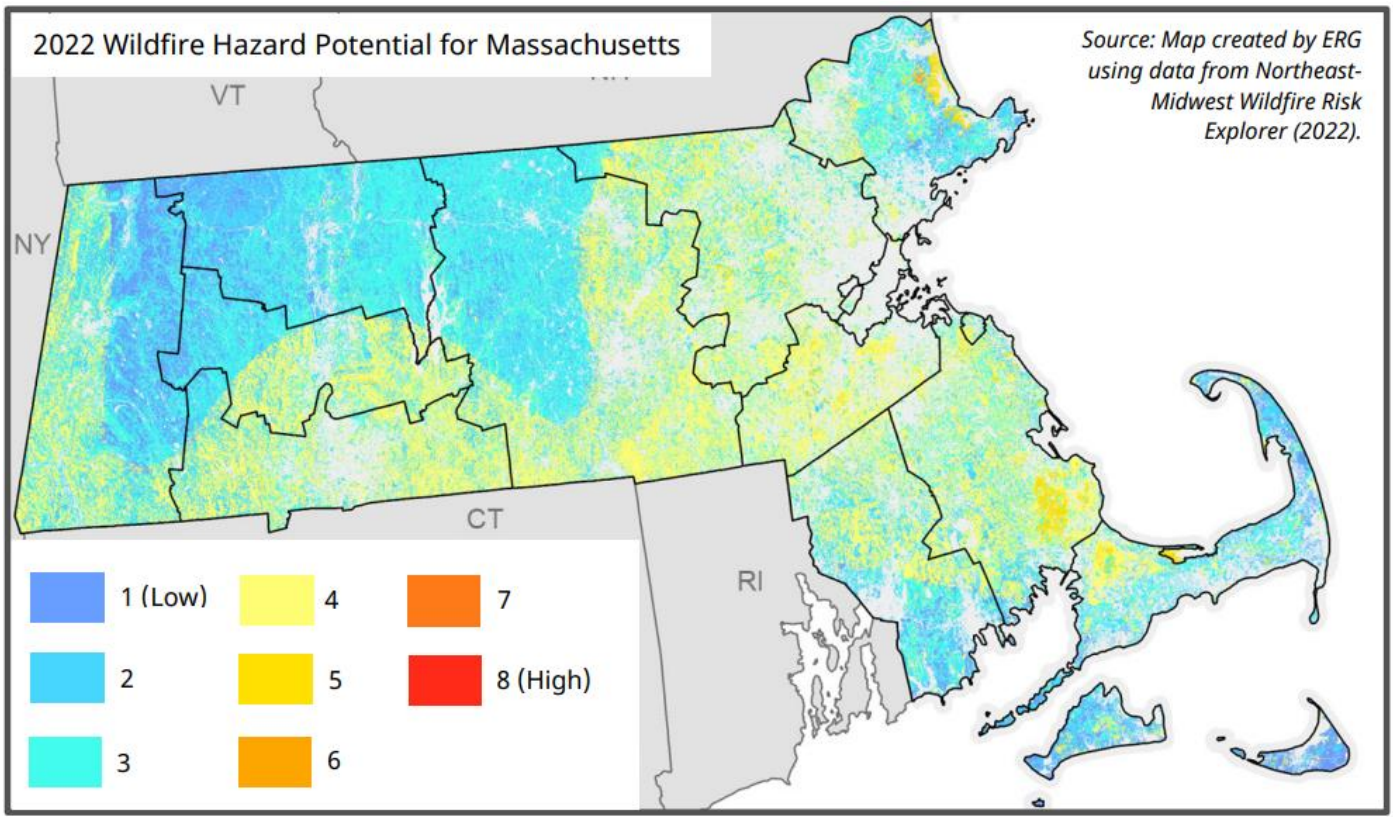
- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, but less than 5,000 acres;
- Class G - 5,000 acres or more (NWCG, 2023).

The most susceptible fuels are pitch pine, scrub oak and oak forests. Topography can affect the behavior of fires, as fire spreads more easily uphill. Fires can present a hazard where there is the potential to spread into developed or inhabited areas, particularly residential areas where sufficient fuel materials might exist to allow the fire the spread into homes. Protecting structures from fire poses special problems and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. If the wildfire destroys the ground cover, then erosion becomes one of several potential problems. The most common cause of wildfires is the careless disposal of smoking materials and untended campfires.

POTENTIAL WILDFIRE HAZARD AREAS

The 2023 ResilientMass Plan includes a map that depicts statewide fire risk into 7 categories, from Low to High. See Figure 24 below for more information. Norfolk County is designated as 1 of the 6 counties most at risk, according to ResilientMass.

Figure 25. 2022 Wildfire Hazard Potential for Massachusetts



Source: ResilientMass Plan, Map created by ERG using data from Northeast-Midwest Wildfire Risk Explorer (2022)

According to local officials, there are generally fewer than 20 brush fires town-wide annually, and much of that inactivity is attributed to successful public education campaigns about fire safety in the wooded areas of town. Less than 1% of the fires result in any significant property damage and there have been no deaths as a result of brush fires. Areas with high brush fire incidence are wooded areas adjacent to train tracks in the town and other undeveloped wooded areas adjacent to local residential areas. It is important to remember that fire can also be a result of other events, such as from the aftermath of an earthquake.

The greatest brush fire hazard in Sharon, and the Town's largest concern, relates to the high tension wires that traverse the town through the northern central area. Town officials noted that Duke Energy Corporation is also running natural gas transmission lines beneath a right-of-way under the high tension wires. There is concern that a fire in these areas could lead to a major explosion in the gas lines beneath them.

Borderland State Park is owned, maintained, and monitored by the state's Department of Conservation and Recreation. There are potential brush fire threats in the park's northwestern and southeastern edges, known as Moose Hill and Snake Hill respectfully. These areas are shown on Map8, "Hazard Areas."

- 2. Railroad tracks, all areas adjacent to tracks
- 3. I-95, grassy areas beside expressway
- 10. Borderland State Park
- 11. Moose Hill

- 12. South of Essex Road, within the floodplain
- 16. Gas Pipeline

Potential vulnerabilities to wildfires in Sharon include damage to structures and other improvements and impacts on natural resources such as the Moose Hill Reservation. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases.

Potential damages from wildfires in Sharon would depend on the extent and type of land affected. There could be the need for post-fire revegetation to restore burned properties, which could cost from a few thousand dollars to tens of thousands for an extensive area. However, there are no data on actual wildfire damages.

There are no recorded wildfire events for Norfolk County in NOAA's Storm Events Database (NOAA, 2022). Based on past occurrences and the Massachusetts Hazard Mitigation Plan 2013, brushfires are of Medium frequency, events that occur from once in 5 years to once in 50 years (2% to 20% probability per year).

Wildfire and Climate Change

As the climate warms, drought and warmer temperatures may increase the risk of wildfire as vegetation dries out and becomes more flammable. Increasing frequency of lightning and increasing damage to trees from pests, can also lead to greater fire risk. The 2022 Assessment cites anticipated forest health degradation from increasing wildfire frequency for the Eastern Inland Region, where Sharon is located.

EXTREME TEMPERATURES

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

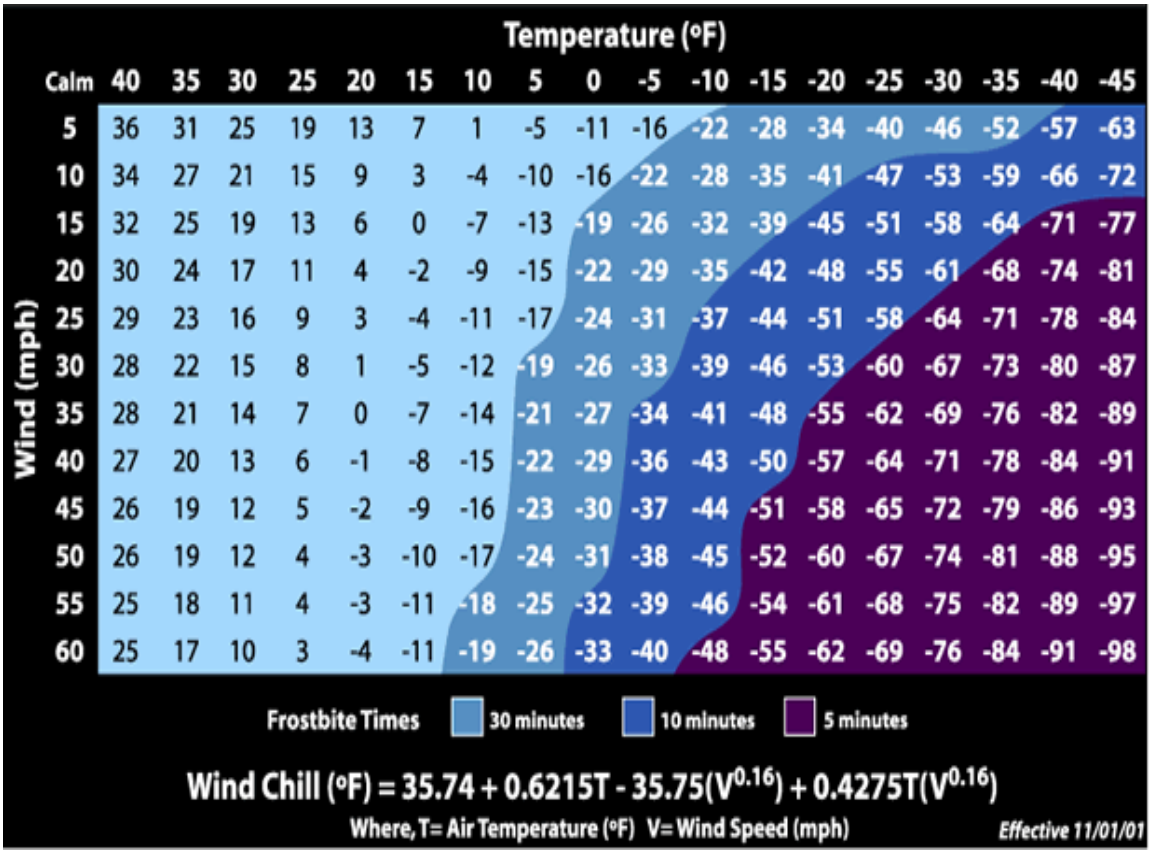
Sharon has four well-defined seasons. The seasons have several defining factors, with temperature one of the most significant. Extreme temperatures can be defined as those that are far outside of the normal seasonal ranges for Massachusetts. The average temperature for winter (December to February) in Massachusetts is 31.8°F. The average temperature for summer (June to August) is 71°F. Extreme temperatures are a town-wide hazard.

EXTREME COLD

For extreme cold, temperature is typically measured using the Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The latest version of the index was implemented in 2001 and is meant to show how cold conditions feel on unexposed skin and can lead to frostbite. The index is provided in Figure26 below.

Extreme cold is a dangerous situation that can result in health emergencies for susceptible people, such as those without shelter, those who are stranded, or those who live in homes that are poorly insulated or without heat. The elderly and people with disabilities are often most vulnerable. In Sharon, 18 percent of the population are over 65 and 9 percent of the population has a disability.

Figure 26: Wind Chill Temperature Index and Frostbit Risk



Source: National Weather Service

The Town of Sharon does not collect data for previous occurrences of extreme cold. The best available local data are for Norfolk County, through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. There are four extreme cold and wind chill events on record from December 2012 to October 2023, which caused zero deaths, injuries or property damage. See the table below for more information. Extreme cold is considered a town-wide hazard for Sharon.

Table 33: Norfolk County Extreme Cold and Wind Chill Occurrences, 2013-2023

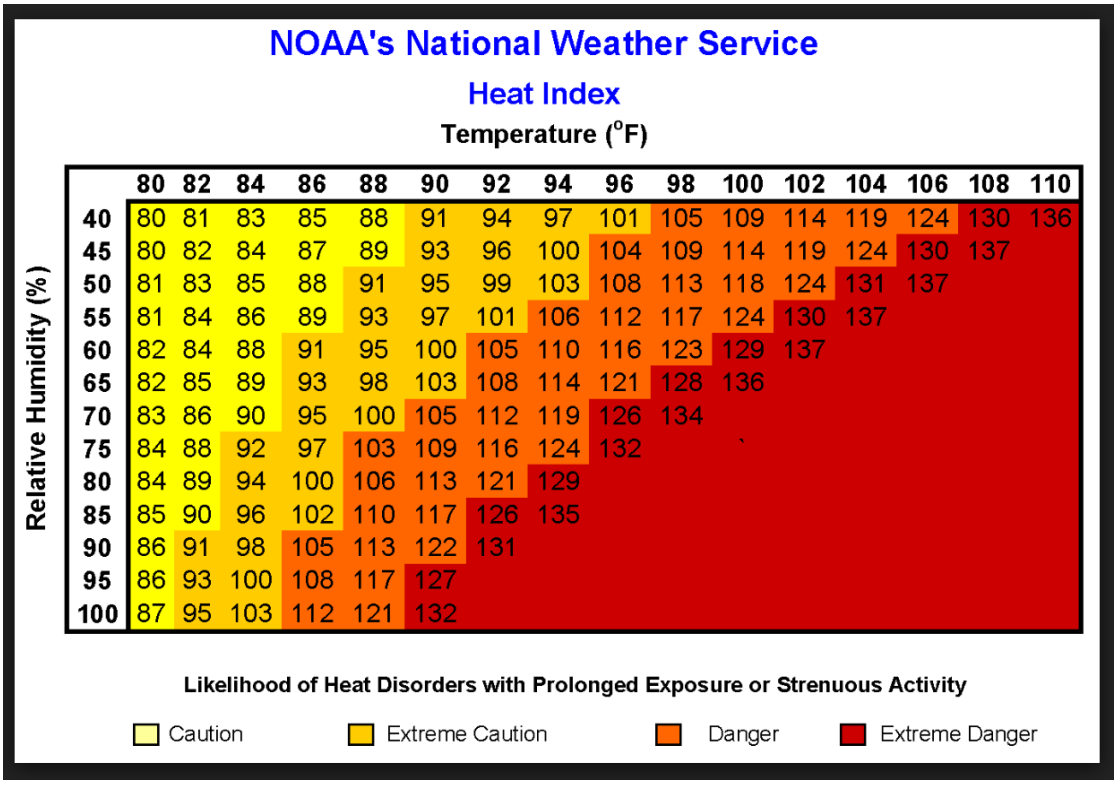
Date	Deaths	Injuries	Property Damage ($)
02/03/2007	1	0	0
2/16/2015	0	0	0
2/13/2016	0	0	0
2/14/2016	0	0	0

Source: NOAA, Center for Environmental Information, Storm Events Database

EXTREME HEAT

A heat wave in Massachusetts is defined as three or more consecutive days above 90°F. Another measure used for identifying extreme heat events is through a Heat Advisory from the NWS. These advisories are issued when the heat index (Figure 27) is forecasted to exceed 100°F for two or more hours; an excessive heat advisory is issued if the forecast predicts the temperature to rise above 105°F.

Figure 27: Heat Index Chart



Extreme heat poses many health risks. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and in severe cases, death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. Prolonged heat exposure can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

Senior adults are at particularly high risk to heat for several reasons. They may not adjust to sudden changes in temperature as quickly as younger people, they are more likely to have a chronic medical condition whose symptoms may be exacerbated by heat, and they are more likely to be taking prescription medications that affect their ability to control body temperature.[6,7]

[6] Gamble, J. L., Hurley, B. J., Schultz, P. A., Jaglom, W. S., Krishnan, N., & Harris, M. (2013). Climate Change and Older Americans: State of the Science. Environmental Health Perspectives, 121(1), 15–22. http://doi.org/10.1289/ehp.1205223

[7] Center for Disease Control and Prevention. Natural Disasters and Severe Weather. https://www.cdc.gov/disasters/extremeheat/older-adults-heat.html

Power failures can occur during heat waves because of increased electricity demand for air conditioning coupled with aging infrastructure. This occurred in June 2017 in the Town of Belmont, MA where intense heat cause a spike in electricity demand. With its aging infrastructure, the combination of these factors led to equipment failure.[8] Loss of electricity not only impair a resident's ability to cool, but can cause significant medical emergency for those who require electronic medical equipment or from food-borne illnesses from contaminated food, ingested after loss of refrigeration.

The Town of Sharon does not collect data on excessive heat occurrences. The best available local data are for Norfolk County, through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. There have been three days of excessive heat recorded from December 2013-October 2023, which caused zero deaths, injuries or property damage. See the table below for more information. Extreme heat is considered a town-wide hazard for Sharon.

Table 34: Norfolk County Extreme Heat Occurrences

Date	Deaths	Injuries	Damage ($)
7/1/2018	0	0	0
7/3/2018	0	0	0
8/28/2018	0	0	0

Source: NOAA, Centers for Environmental Information, Storm Events Database

Extreme temperatures are medium frequency events based on past occurrences, and as defined by the 2013 Massachusetts State Hazard Mitigation Plan. Both extreme cold and hot weather events occur between once in five years to once in 50 years, or a 2% to 20% chance of occurring each year.

According to ResilientMass, inland areas are very likely to experience extreme temperatures.

Extreme Temperatures and Climate Change

Data from the 2022 MA Climate Change Assessment related to changes in temperature is included in an earlier section of this chapter. Those projections predict an increase in average temperature and in the number of extreme heat days. The 2022 Assessment also highlights the following climate impacts for the Eastern Inland Region (where Sharon is located), related to temperatures:

- Warmer temperatures and more frequent heat waves are connected to impaired human health, increased droughts, reduced agriculture yields, species range shifts, and damaged infrastructure.
- By 2030, the summer mean temperature could increase by 3.6°F from the historical period (1950-2013), worsening stress on electric transmission and utility distribution infrastructure.
- By 2070, there could be 58 fewer days below freezing, increasing the chance of ticks overwintering and reducing winter recreation opportunities.
- Increase in vector borne diseases incidence and bacterial infections, including West Nile Virus and Lyme disease due to more favorable conditions for ticks and mosquitoes.
- Damage to electric transmission and utility distribution infrastructure associated with heat stress.

[8] Wicked Local Belmont "Power Outage in Belmont Affects 2,000 Customers" June 14, 2017. http://belmont.wickedlocal.com/news/20170612/power-outage-in-belmont-affects-2000-customers.

- Damage to rails and loss of rail/ transit service, including track buckling during high heat events.
- Reduced ability to work, particularly for outdoor workers during extreme heat, as well as commute delays due to damaged infrastructure.
- Freshwater ecosystem degradation due to warming waters.
- Forest health degradation from warming temperatures and increasing pest occurrence (Commonwealth of Massachusetts, 2022).

SUMMARY OF LOCALLY IDENTIFIED HAZARDS

Below is a table summarizing the hazard areas as identified by the Local Team. More information can be found on the maps in Appendix B.

Table 35. Sharon Locally Identified Hazards

Locally Identified Hazards Site ID	Name	Type	Comments
2	Railroad tracks, all areas adjacent to tracks	Brush Fire	Brush Fires
3	I-95, grassy areas beside expressway	Brush Fire	Brush Fires
4	Billings Street, crossing Massapoag Brook	Flooding	Flooding; Massapoag work done
5	Morse Street, southside of Massapoag Lake	Flooding	Flooding
6	Morse Street, at Mountain Street	Flooding	Flooding
7	Edgehill at Dedham Street	Flooding	Flooding
8	Saw Mill Road	Flooding	Flooding
9	Main Street, near Massapoag Brook	Flooding	Flooding
10	Borderland State Park	Brush Fire	Brush Fires
11	Moose Hill	Brush Fire	Brush Fires
12	South of Essex Road, within the flood plain	Brush Fire	Brush Fires
13	Cape Club of Sharon	Flooding	Flooding
14	North of I-95 - inaccessible by Sharon roads	Brush Fire	Brush Fires
15	School Meadow Brook at Commercial Street	Flooding	Flooding

16	Gas Pipeline	Brush Fire	Brush Fires
17	8 Robin Rd	Flooding	
18	Rattle Snake Hill	Brush Fire	Mountain St, on conservation land the town bought
20	Lineage	Other	High ammonia usage

LAND USE AND DEVELOPMENT TRENDS

EXISTING LAND USE

The most recent land use statistics available from the state are from aerial photography done in 2016. Table 36 shows the acreage and percentage of land in 22 categories. The majority of the Town is comprised of residential-single family at 25.72%. The next largest land use category is Open Land at 21.32%. These land use categories have changed over time, with the largest land use category in 2005 being Medium-density residential.

The most recent land use statistics available for Massachusetts communities are from aerial imagery completed in 2016. Some change has certainly occurred in Sharon since then, but this data provides the most detailed city-wide description of land use available. Land use is shown on Map 2 in Appendix B. Table 43 shows the acreage and percentage of land uses in 26 categories. The largest land use category is Open Land at 35.55%. The next largest land use category is residential-single family at 30.37%. Commercial land makes up 1.73 %, or 271 acres and 14.43% of the Town is land used for Tax Exempt purposes.

Table 36. Town of Sharon, MA 2016 Land Use

Land Use Type	Acres	Percent
Unknown (0)	11	0.07
Open Land (2)	5,547	35.55
Commercial (3)	271	1.73
Industrial (4)	140	0.9
Forest (6)	24	0.15
Agriculture (7)	145	0.93
Recreation (8)	469	3.00
Tax Exempt (9)	2,252	14.43
Mixed use, primarily residential (10)	47	0.3
Residential – single family (11)	4,739	30.37
Residential – multifamily (12)	300	1.92
Mixed use, primarily commercial (30)	1	0.00
Right-of-way (55)	1,254	8.03
Water (88)	408	2.61

NATURAL, CULTURAL, AND HISTORIC RESOURCE AREAS

Among its natural resources, Sharon possesses over 8,000 acres of forest land, which makes up over 53% of the entire town. The town has 23 certified vernal pools, and provides habitat for three of the State's threatened and endangered species (the Eastern Rattlesnake, Blanding's Turtle, and Marbled Salamander). Sharon has two National Historic Register sites: Cobb's Tavern and Ames State (currently Borderland State Park). The town also has many scenic streets which are regulated by a Scenic Roads bylaw and include: Bay Road, Bullard Street, Cedar Street, Deborah Sampson Street, East Foxboro Street, Everett Street, Gunhouse Street, Mann's Hill Road, Maskwonicut Street, Mohawk Street, Moose Hill Parkway, Mountain Street, Pine Grove Avenue, Richards Avenue, Upland Road, Wolomolopoag Street, Billings Street, Canton Street, East Street, Edge Hill Road, Furnace Street, Lakeview Street, Mansfield Street, Massapoag Avenue, Mont Fern Avenue, Moose Hill Street, Morse Street, Old Post Road, Pine Street, South Walpole Street, and Walpole Street.

DEVELOPMENT TRENDS

Under current zoning, the Town of Sharon has limited land available for potential development, and it is important to the Town that additional housing is of a higher-density and is clustered around preserved open space. Development trends throughout the metropolitan region are tracked by MassBuilds, MAPC's Development Database, which provides an inventory of new development over the last decade. The database tracks both completed developments and those currently under construction. Also the MAPC met with the local team to identify new development sites. The database includes 12 new developments in Sharon from 2018 to 2023. Most of these are residential developments (Table 37).

Table 37. Summary of Sharon Developments 2018-2023

ID	Development Name	Development Type	Status
B	Sharon Gallery	Mixed use	Completed
F	Landmark Pointe	Residential	Pending
M	Sharon Park South	Warehouse	Pending
N	Sharon Residences (40R)	Residential	Completed
P	Diamond Residences	Residential	Completed
Q	Birch Hill Realty Trust	Residential	Pending
O	Spring Valley Country Club	Residential	Pending
S	260-280 Edge Hill Road	Residential	Pending
U	ANR Lot	Residential	Pending
V	Audubon Preserve	Residential	Pending
T	1200 General Edward Highway	Marijuana Growing Facility	Pending
R	299 North Main Street	Residential	Pending

POTENTIAL FUTURE DEVELOPMENT IN HAZARD AREAS

MAPC consulted with the Local Hazard Mitigation Planning Team to determine areas that may be developed in the future, based on the Town's comprehensive planning efforts and current trends and projects. These areas are listed below with their hazard risks outlined in Table 38. This information is provided so that planners can ensure that development proposals comply with floodplain zoning and that careful attention is paid to drainage issues. All of the development sites are within an area of low incidence for landslides.

Table 38: Future Development Sites in Hazard Areas

ID	Development Name	Status	FEMA Flood Zone
B	Sharon Gallery	Completed	2.15% in A: 1% Annual Chance of Flooding, no BFE
F	Landmark Pointe	Pending	1.13% in X: 0.2% Annual Chance of Flooding
M	Sharon Park South	Pending	1.67% in AE: 1% Annual Chance of Flooding, with BFE , and 4.11% in AE: Regulatory Floodway , and 33.96% in X: 0.2% Annual Chance of Flooding
N	Sharon Residences (40R)	Completed	5.46% in AE: 1% Annual Chance of Flooding, with BFE
P	Diamond Residences	Completed	0.03% in X: 0.2% Annual Chance of Flooding
Q	Birch Hill Realty Trust	Pending	1.9% in X: 0.2% Annual Chance of Flooding
O	Spring Valley Country Club	Pending	5.21% in AE: 1% Annual Chance of Flooding, with BFE , and 14.98% in X: 0.2% Annual Chance of Flooding
S	260-280 Edge Hill Road	Pending	1.66% in Area with no DFIRM - Paper FIRMs in Effect
U	ANR Lots	Pending	
V	Audubon Preserve	Pending	
T	1200 General Edward Highway	Pending	
R	299 North Main Street	Pending	39.15% in A: 1% Annual Chance of Flooding, no BFE

CRITICAL FACILITIES & INFRASTRUCTURE IN HAZARD AREAS

Critical facilities and infrastructure include facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, etc.) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). The purpose of mapping the natural hazards and critical infrastructure is to present an overview of hazards in the community, how they relate to critical infrastructure, and to better understand which facilities may be vulnerable to particular natural hazards. There are 101 facilities identified in Sharon. These are listed in Table 39 and are shown on the maps in Appendix B.

Explanation of Columns in Table 39

- ***Column 1: ID #:*** The first column in Table 21 is an ID number which appears on the maps that are part of this plan. See Appendix B.
- ***Column 2: Name****:* The second column is the name of the site. If no name appears in this column, this information was not provided to MAPC by the community.
- ***Column 3: Type*:** The third column indicates what type of site it is.
- ***Column 4: Landslide Risk:*** The fourth column indicates the degree of landslide risk for that site. This information came from NESEC. The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to http://pubs.usgs.gov/pp/p1183/pp1183.html.
- ***Column 5: FEMA Flood Zone*:** The fifth column addresses the risk of flooding. A "No" entry in this column means that the site is not within any of the mapped risk zones on the Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone.
- ***Column 6: Locally-Identified Area of Flooding*:** The sixth column indicates the risk of flooding in local hazard areas. A "No" entry in this column means that the site is not within any of the mapped flood hazard zones. If there is an entry in this column, it indicates the local hazard area.
- ***Column 7: Brush Fire Area:*** The seventh column indicates the risk of brush fire in local hazard areas. A "No" entry in this column means that the site is not within any of the mapped brush fire hazard zones. If there is an entry in this column, it indicates the local hazard area.
- ***Column 8: Average Annual Snowfall*:** Areas designated "low" receive an annual average of 36.1 to 48.0 inches of snow. Areas designated "high" receive an annual average of 48.1 to 72 inches of snow, as shown on Map 6 in Appendix B.

Table 39: Critical Facilities and Relationship to Hazard Areas

ID #	Name	Type	Landslide Risk	FEMA Flood Zone	Locally-Identified Area of Flooding	Brush Fire Area	Average Annual Snow Fall
1	Department of Public Works	Municipal	Low incidence	No	No	No	G 36.1 - 48.0
2	Police Department	Police Station	Low incidence	No	No	No	G 36.1 - 48.0
3	Emergency Operations Center	Emergency Operations Center	Low incidence	No	No	No	G 36.1 - 48.0
4	Fire Department	Fire Station	Low incidence	No	No	No	G 36.1 - 48.0
5	Town Hall	Municipal	Low incidence	No	No	No	G 36.1 - 48.0
6	Foremost at Sharon	Nursing Home	Low incidence	No	No	No	G 36.1 - 48.0
7	Cottage Street School	School	Low incidence	No	No	No	G 36.1 - 48.0
8	Sharon High School	School	Low incidence	No	No	No	G 36.1 - 48.0
9	East Elementary School	School	Low incidence	No	No	No	G 36.1 - 48.0
10	Sharon Junior High School	School	Low incidence	No	No	No	G 36.1 - 48.0
11	Sharon Heights Elementary School	School	Low incidence	No	No	No	G 36.1 - 48.0
12	Sharon Vetenary Clinic	School	Low incidence	No	No	No	G 36.1 - 48.0
13	CVS Pharmacy	Pharmacy	Low incidence	No	No	No	G 36.1 - 48.0
14	Sharon Commuter Rail Station	Transportation Facility	Low incidence	No	No	No	G 36.1 - 48.0
15	Beth Israel Deaconess Health Care	Medical Facility	Low incidence	No	No	No	G 36.1 - 48.0
16	Well #4	Well	Low incidence	No	No	No	G 36.1 - 48.0
17	Well #2	Well	Low incidence	A: 1% Annual Chance of Flooding; no BFE	No	Moose Hill	G 36.1 - 48.0
18	Well #3	Well	Low incidence	A: 1% Annual Chance of Flooding; no BFE	No	Moose Hill	G 36.1 - 48.0
19	Well #5	Well	Low incidence	No	No	No	G 36.1 - 48.0
20	Moose Hill Water Storage Tank	Water Storage Tank	Low incidence	No	No	Moose Hill	G 36.1 - 48.0
21	Well #7	Well	Low incidence	No	No	No	G 36.1 - 48.0
22	Well #6	Well	Low incidence	X: 0.2% Annual Chance of Flooding	No	No	G 36.1 - 48.0
23	Upland Road Water Storage Tank	Water Storage Tank	Low incidence	No	No	No	G 36.1 - 48.0
24	Hampton Road Water Storage Tank	Water Storage Tank	Low incidence	No	No	No	G 36.1 - 48.0
25	Massapoag Avenue Tank	Water Storage Tank and Radio Repeater Site	Low incidence	No	No	No	G 36.1 - 48.0
26	Shaws Supermarket	Grocery Store	Low incidence	No	No	No	G 36.1 - 48.0
27	Sharon Community Center	Municipal	Low incidence	No	No	No	G 36.1 - 48.0
28	Water Department Building	Municipal	Low incidence	No	No	No	G 36.1 - 48.0
29	First Congressional Church	Church	Low incidence	No	No	No	G 36.1 - 48.0
30	Saint John's Episcopal Church	Church	Low incidence	No	No	No	G 36.1 - 48.0
31	Unitarian Church of Sharon	Church	Low incidence	No	No	No	G 36.1 - 48.0
32	Our Lady of Sorrows	Church	Low incidence	No	No	No	G 36.1 - 48.0
33	Hope Church	Church	Low incidence	No	No	No	G 36.1 - 48.0
34	First Baptist Church	Church	Low incidence	No	No	No	G 36.1 - 48.0
35	Temple Sinai of Sharon	Church	Low incidence	No	No	No	G 36.1 - 48.0
36	Temple Israel	Church	Low incidence	No	No	No	G 36.1 - 48.0
37	VFW Sharon Post	Place of Assembly	Low incidence	No	No	No	G 36.1 - 48.0
38	Stony Brook Court	Elder Housing	Low incidence	No	No	No	G 36.1 - 48.0
39	Salvation Army Hillcrest Lodge	Shelter	Low incidence	No	No	No	G 36.1 - 48.0
40	Mann's Pond Dam	Dam	Low incidence	AE: Regulatory Floodway	No	No	G 36.1 - 48.0
41	Sharon High School Sewer Pump Station	Dam	Low incidence	No	No	No	G 36.1 - 48.0

42	MacIntosh Farms Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	G 36.1 - 48.0
43	Hammershop Pond Dam	Dam	Low incidence	AE: Regulatory Floodway	No	No	G 36.1 - 48.0
44	Beaver Brook Dam	Dam	Low incidence	AE: Regulatory Floodway	No	No	G 36.1 - 48.0
45	Barney and Carey Lumber Company Dam	Dam	Low incidence	A: 1% Annual Chance of Flooding; no BFE	No	No	G 36.1 - 48.0
46	Carworks Pond Dam	Dam	Low incidence	No	No	No	G 36.1 - 48.0
47	Sharon Fish and Game Club Dam	Dam	Low incidence	X: 0.2% Annual Chance of Flooding	No	No	G 36.1 - 48.0
48	The Sharon Cooperative School, Inc.	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
49	Jake's Place	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
50	Islamic Academy of New England	School & Mosque	Low incidence	No	No	No	G 36.1 - 48.0
51	Jewish Special Education Colabborative	School	Low incidence	No	No	No	G 36.1 - 48.0
52	League School of Boston	School	Low incidence	No	No	No	G 36.1 - 48.0
53	Bird's Nest PreSchool	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
54	Chabad Center	School	Low incidence	No	No	No	G 36.1 - 48.0
55	Chabad Center	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
56	Hertz Nursery School	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
57	Creative Beginnings	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
58	Striar Hebrew Academy	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
59	Kindercare Learning Center	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
60	Sharon Housing Authority	Elder Housing	Low incidence	No	No	No	G 36.1 - 48.0
61	Pressure Reducer Station	Pressure Reducer Station	Low incidence	No	No	No	G 36.1 - 48.0
62	Canton Street Bridge (RR)	Bridge	Low incidence	No	No	Railroad tracks, all areas adjacent to tracks	G 36.1 - 48.0
63	Congregation Adath Sharon	Place of Worship	Low incidence	No	No	No	G 36.1 - 48.0
64	Etz Chaim	Place of Assembly	Low incidence	No	No	No	G 36.1 - 48.0
65	Young Israel Temple	Church	Low incidence	No	No	No	G 36.1 - 48.0
66	U.S. Post Office	Post Office	Low incidence	No	No	No	G 36.1 - 48.0
67	Gavin's Pond Road Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	G 36.1 - 48.0
68	American Legion Hall	Place of Assembly	Low incidence	No	No	No	G 36.1 - 48.0
69	Rockland Recovery Behavioral Health Clinic	Mental Health Rehab Facility	Low incidence	No	No	No	G 36.1 - 48.0
70	First Church of Christian Science	Church	Low incidence	No	No	No	G 36.1 - 48.0
71	Victory Church	Church	Low incidence	No	No	No	G 36.1 - 48.0
72	Sharon Library	Municipal	Low incidence	No	No	No	G 36.1 - 48.0
73	New England Telephone	Communication Tower	Low incidence	No	No	No	G 36.1 - 48.0
74	Sharon Country Club	Hazardous Material Site	Low incidence	No	No	No	G 36.1 - 48.0
75	Cape Club of Sharon	Hazardous Material Site	Low incidence	X: 0.2% Annual Chance of Flooding	Cape Club of Sharon	No	G 36.1 - 48.0
76	South Main Street Bridge Over RR	Bridge	Low incidence	No	No	Railroad tracks, all areas adjacent to tracks	G 36.1 - 48.0
77	Maskwonicut Street Bridge Over RR	Bridge	Low incidence	No	No	Railroad tracks, all areas adjacent to tracks	G 36.1 - 48.0
78	Wolomolopoag Street Bridge Over RR	Bridge	Low incidence	No	No	Railroad tracks, all areas adjacent to tracks	G 36.1 - 48.0
79	South Walpole Street Over and Under I-95	Bridge and Underpass	Low incidence	No	No	I-95, grassy areas beside expressway	G 36.1 - 48.0
80	BAPS Shri Swaminarayan Mandir	Place of Assembly	Low incidence	No	School Meadow Brook at Commercial Street	No	G 36.1 - 48.0

81	CareOne at Sharon	Assisted Living	Low incidence	AE: 1% Annual Chance of Flooding; with BFE	No	No	G 36.1 - 48.0
82	The Bilingual Montessori School of Sharon	Child Care	Low incidence	No	No	No	G 36.1 - 48.0
83	Everwood Day Camp	Day Camp	Low incidence	No	No	No	G 36.1 - 48.0
84	Gas Pipeline	Gas Pipeline	Low incidence	No	No	Gas Pipeline	G 36.1 - 48.0
85	The Saphire Estate	Place of Assembly	Low incidence	No	No	No	G 36.1 - 48.0
86	South Main Street Bridge Over I-95	Bridge	Low incidence	No	No	I-95, grassy areas beside expressway	G 36.1 - 48.0
87	High Plain Street Bridge Over I-95	Bridge	Low incidence	No	No	I-95, grassy areas beside expressway	G 36.1 - 48.0
88	Route 1 Bridges Over I-95	Bridge	Low incidence	No	No	I-95, grassy areas beside expressway	G 36.1 - 48.0
89	Depot Street Bridge Over RR	Bridge	Low incidence	No	No	Railroad tracks, all areas adjacent to tracks	G 36.1 - 48.0
90	New library	Library	Low incidence	No	No	No	G 36.1 - 48.0
91	Radio Repeater Site 1	Raio Repeater	Low incidence	No	No	Moose Hill	G 36.1 - 48.0
92	Gavins Pond Dam	Dam	Low incidence	No	No	No	G 36.1 - 48.0
93	Drinking water pumping station	water pump	Low incidence	No	Cape Club of Sharon	No	G 36.1 - 48.0
94	Gatehouse for Massapoag pond outlet		Low incidence	No	No	No	G 36.1 - 48.0
95	Temple Kol Tikvah	Place of Worship	Low incidence	No	No	No	G 36.1 - 48.0
96	Best Western Hotel		Low incidence	No	No	No	G 36.1 - 48.0
97	Chinese Church of MetroSouth Boston	Place of Worship	Low incidence	No	No	No	G 36.1 - 48.0
98	Econo Lodge		Low incidence	No	No	No	G 36.1 - 48.0
99	Ahamdiyya Muslim Community Center		Low incidence	No	No	No	G 36.1 - 48.0
100	Lineage	Freezer Storage, possibly hazardous amounts of ammonia	Low incidence	A: 1% Annual Chance of Flooding; no BFE	School Meadow Brook at Commercial Street	No	G 36.1 - 48.0
101	Radio Repeater Site 2	Radio Repeater + Massapoag Ave Watertank	Low incidence	No	No	No	G 36.1 - 48.0

VULNERABILITY ASSESSMENT

The purpose of the vulnerability assessment is to estimate the extent of potential damages from natural hazards of varying types and intensities. A vulnerability assessment and estimation of damages was performed for hurricanes, earthquakes, and flooding. The methodology used for hurricanes, flooding, and earthquakes was the HAZUS software. The methodology for flooding was developed specifically to address the issue in many of the communities where flooding was not solely related to location within a floodplain.

Introduction to HAZUS

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The following overview of HAZUS-MH is taken from the FEMA website. For more information on the HAZUS-MH software, go to http://www.fema.gov/plan/prevent/hazus/index.shtm

"FEMA's Hazus Program provides standardized tools and data for estimating risk from earthquakes, floods, tsunamis, and hurricanes. Hazus models combine expertise from many disciplines to create actionable risk information that increases community resilience. Hazus software is distributed as a GIS-based desktop application with a growing collection of simplified open-source tools. Risk assessment resources from the Hazus program are always freely available and transparently developed. The Hazus Program is managed by FEMA's Natural Hazards Risk Assessment Program (NHRAP), within the Risk Management Directorate."

There are three modules included with the HAZUS-MH software: hurricane, flooding, and earthquakes. There are also three levels at which HAZUS-MH can be run. Level 1 uses national baseline data and is the quickest way to begin the risk assessment process. The analysis that follows was completed using Level 1 data. Level 1 relies upon default data on building types, utilities, transportation, etc. from national databases as well as census data. While the databases include a wealth of information on the Town of Sharon, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is "subject to a great deal of uncertainty."

However, for the purposes of this plan, the analysis is useful. This plan is attempting to generally indicate the possible extent of damages due to certain types of natural disasters and to allow for a comparison between different types of disasters. Therefore, this analysis should be considered to be a starting point for understanding potential damages from the hazards.

ESTIMATED DAMAGES FROM HURRICANES

The HAZUS software was used to model potential damages to the community from a 100-year and 500-year hurricane event; storms that are 1% and 0.2% likely to happen in a given year, and roughly equivalent to a Category 2 and Category 4 hurricane. The damages caused by these hypothetical storms were modeled as if the storm track passed directly through the town, bringing the strongest winds and greatest damage potential.

Though there are no recorded instances of a hurricane equivalent to a 500-year storm passing through Massachusetts, this model was included in order to present a reasonable "worst case scenario" that would

help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as we enter into a period of more intense and frequent storms.

Table 40: Estimated Damages from Hurricanes

	Category 2	Category 4
Building Characteristics		
Estimated total number of buildings	6,581	
Estimated total building replacement value	$3,718,930,000	
Building Damages		
# of buildings sustaining minor damage	558	1,596
# of buildings sustaining moderate damage	36	311
# of buildings sustaining severe damage	0	23
# of buildings destroyed	0	38
Population Needs		
# of households displaced	0	4
# of people seeking public shelter	0	0
Debris		
Building debris generated (tons)	3,950	12,297
Tree debris generated (tons)	1,319	2,900
# of truckloads to clear building debris	63	285
Value of Damages		
Total property damage (buildings and content)	$38,356,530	$135,158,280
Total losses due to business interruption	$1,997,700	$10,402,590
Total value of damages	$40,354,230	$145,560,870

ESTIMATED DAMAGES FROM EARTHQUAKES

The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter had been at the geographic center of the study area. For the purposes of this plan, two earthquakes were selected: magnitude 5.0 and a magnitude 7.0. Historically, major earthquakes are rare in New England, though a magnitude 5 event occurred in 1963.

Table 41: Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics		
Estimated total number of buildings	6,581	
Estimated total building replacement value	$3,719,000,000	
Building Damages		
# of buildings sustaining slight damage	1,979	Pending
# of buildings sustaining moderate damage	986	
# of buildings sustaining extensive damage	219	

# of buildings completely damaged	47	

Population Needs		
# of households displaced	95	
# of people seeking public shelter	41	

Debris		
Building debris generated (tons)	48,000	
# of truckloads to clear debris (@ 25 tons/truck)	1,920	

Value of Damages		
Total property damage	$387,417,900	
Total losses due to business interruption	$49,894,200	
Total Damage	$437,312,100	

ESTIMATED DAMAGES FROM FLOODING

The HAZUS flooding module allows users model the potential damages caused by a 100-year flood event and a 500-year flood event.

Table 42: Estimated Damages from Flooding

	100 Year Flood	500 Year Flood
Building Characteristics		
Estimated total number of buildings	6,581	
Estimated total building replacement value	$3,719,000,000	
Building Damages		
# of buildings sustaining Damage Level 1-10	4	1
# of buildings sustaining Damage Level 11-20	1	2
# of buildings sustaining Damage Level 21-30	0	0
# of buildings sustaining Damage Level 31-40	0	0
# of buildings sustaining Damage Level 41-50	0	0
# of buildings sustaining Damage Level >50	0	0
Population Needs		
# of households displaced	91	118
# of people seeking public shelter	26	33
Debris		
Building debris generated (tons)	49	64
# of truckloads to clear building debris (25 ton trucks)	2	3
Value of Damages		
Total property damage (buildings and content)	$8,010,000	$8,480,000
Total losses due to business interruption	$8,120,000	$7,400,000
Total value of damages	$16,130,000	$15,880,000

SECTION 5:
HAZARD MITIGATION GOALS

The Sharon Local Hazard Mitigation Planning Team reviewed and discussed the goals from the 2010 Hazard Mitigation Plan for the Town of Sharon. All of the goals are considered critical for the Town and they are not listed in order of importance.

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

GOAL 2: Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.

GOAL 3: Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.

GOAL 4: Prevent and reduce the damage to public infrastructure resulting from all hazards.

GOAL 5: Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.

GOAL 6: Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

GOAL 7: Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

GOAL 8: Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

GOAL 9: Consider the potential impacts of future climate change and incorporate climate sustainability and resiliency in hazard mitigation planning.

SECTION 6: EXISTING MITIGATION MEASURES

The existing protections in the Town of Sharon are a combination of zoning, land use, and environmental regulations, infrastructure maintenance, and drainage infrastructure improvement projects. Infrastructure maintenance generally addresses localized drainage clogging problems, while large scale capacity problems may require pipe replacement or invert elevation modifications. These more expensive projects are subject to the capital budget process and lack of funding is one of the biggest obstacles to completion of some of these.

The Town's existing mitigation measures are listed by hazard type here and are summarized in Table 14.

EXISTING TOWN-WIDE MITIGATION FOR FLOOD-RELATED HAZARDS

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

1. Participation in the National Flood Insurance Program (NFIP) – Sharon participates in the NFIP with 38 policies in force as of May 1st, 2023. FEMA maintains a database on flood insurance policies and claims.

   The following information is provided for the Town of Sharon:

Flood insurance policies in force (May 1st, 2023)	38
Coverage amount of flood insurance policies	$12,650,900
Total losses (all losses submitted regardless of the status)	36
Substantial Damage Claims Since 1978	1
Total payments (total amount paid on losses)	$ 94,972.70

   The Town complies with the NFIP by enforcing floodplain regulations, maintaining up-to-date floodplain maps, and providing information to property owners and builders regarding floodplains and building requirements.

   Since 1978 there have been 1 claim paid for substantial damage in Sharon (see table above). The Town implements the Substantial Improvements/Substantial Damages provisions of the floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 through 65) and Massachusetts State Building Code (780CMR). The Town will also coordinate with State Flood Hazard Management Program staff to assure that proper practices are followed and that a post-disaster plan will be in place to implement all Substantial Improvements/Substantial Damages provisions.

2. Street sweeping – The Town of Sharon owns one street sweeper and each street in town is swept two to three times per year. Other downtown areas such as main business district can be swept more frequently as needed from May through September. Poor draining streets can also be swept as needed following rainstorms.

3. Catch basin cleaning – The Town of Sharon contracts to have catch basin cleaning done twice yearly, with roughly one-third of the 5,200 catch basins in town being cleaned each year. The Town's goal is to clean 1,600 catch basins per year.

4. Roadway treatments – The Town uses a mixture of one part sand to one part salt for de-icing purposes that minimizes the amount of sand that enters catch basins and streams. The Town also uses a special low sodium mix near town wells to minimize the impact of sodium in Town drinking water wells.

5. Zoning regulations – The Town's zoning regulations include a section on Subdivisions Rules and Regulations, which contain a number of requirements that address flood hazard mitigation. Some of these provisions also relate to other hazards. The zoning by-law also includes provisions for Flood Hazard Areas, Ground Water Protection Districts, Site Plan Approval, and Open Space Requirements. The town also has a Wetlands Protection regulation.

6. Public education – The Town provides public education on stormwater through the NPDES Phase II program.

EXISTING DAM FAILURE MITIGATION MEASURES

7. The Comprehensive Emergency Management Plan – The CEMP addresses dam safety. The Town is in the process of updating the CEMP.

8. Permits required for construction – State law requires a permit for the construction of any dam.

9. DCR Dam Safety Regulations – All dams are subject to the Department of Conservation and Recreation's dam safety regulations.

10. Town Dam at Massapoag Brook – Existing dam in place with associated culverts and drainage pipes.

EXISTING TOWN-WIDE MITIGATION FOR WIND-RELATED HAZARDS

11. Annual tree trimming – The Department of Public Works has an effective tree annual trimming program in public areas and along Rights-of-Ways.

12. Utility maintenance – Eversource, the energy provider for Sharon, does annual tree maintenance and trimming on trees that interfere with its utility lines.

EXISTING TOWN-WIDE MITIGATION FOR WINTER-RELATED HAZARDS

13. Standard plowing operations – The Department of Public Works provides standard snow plowing operations, including salting and sanding, but with a restricted salt policy.

14. Overnight parking ban – In effect from November 1 to April 1 during snowstorms.

15. Snow and Ice Disposal Bylaw – The Town's bylaw states that no person shall put any snow or ice in any public place or upon any part of a public street or sidewalk.

16. Sufficient snow storage – The Town is utilizing decentralized snow storage for environmental reasons.

EXISTING TOWN-WIDE MITIGATION FOR FIRE-RELATED HAZARDS

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

18. Subdivision and site plan review – The Fire Department reviews all subdivision and site plans for compliance with site access, water supply needs, and all other applicable regulations.

19. Fire Tower on Moose Hill – The State operates an active fire tower on Moose Hill.

20. Public education – The Town provides public education and notices during "drought watches."

21. Fire trails – The Town maintains some fire trails in wooded areas for firetrucks.

EXISTING TOWN-WIDE MITIGATION FOR EARTHQUAKE HAZARDS

22. Massachusetts State Building Code – The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0). Section 1612.1 states that the purpose of these provisions is "to minimize the hazard to life to occupants of all buildings and non-building structures, to increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake." This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be "prudent and economically justified" for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

23. Seismic Hazard Exposure Groups – Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to Table 1612.2.5. Group II includes buildings which have a substantial public hazard due to occupancy or use and Group III are those buildings having essential facilities which are required for post-earthquake recovery, including fire, rescue and police stations, emergency rooms, power-generating facilities, and communications facilities. The town does have an evacuation plan as specified in its Comprehensive Emergency Management Plan (CEMP).

24. Maximum slope requirements – The subdivision regulations have maximum slope requirements for new roads.

25. Earth Removal Bylaw – The Town of Sharon has an Earth Removal Bylaw that requires residents to obtain a permit before removing any earth.

EXISTING MULTI-HAZARD MITIGATION MEASURES

26. There are several mitigation measures that impact more than one hazard. These include the Comprehensive Emergency Management Plan, the Massachusetts State Building Code, and participation in a Local Emergency Planning Committee.

27. Comprehensive Emergency Management Plan (CEMP) – Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies. These plans contain important information regarding flooding, dam failures and winter storms. Therefore, the CEMP is a

mitigation measure that is relevant to many of the hazards discussed in this plan.

28. Local Emergency Management Planning Committee (LEPC) – The LEPC consists of representatives from Public Works, Water and Sewer, Fire, Police, Health, School Transportation, Board of Selectmen, Emergency Management, and local businesses.

29. Citizen Emergency Response Team (CERT) – The town has a CERT that provides training, supplies, and public education to neighborhoods.

30. Multi-department review of developments – Multiple departments, such as Planning, Zoning, Health, Public Works, Fire, and Police, review all subdivision and site plans prior to approval.

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

32. Public education – Emergency preparedness public education is available on the Town's website.

33. Revere 911 – The town has a reverse 911 system and names can be added to the database via the Town's website.

34. Backup generators – The Police and Fire Stations have backup generators, as do some of the water pumping stations in the community.

COMPILATION OF EXISTING MITIGATION

The following table summarizes the many existing natural hazard mitigation measures already in place in Sharon. Because of the number of entities, public and private, involved in natural hazard mitigation, it is likely that this list is a starting point for a more comprehensive inventory of all measures. Please note that the numbers shown in parentheses correspond to the Hazard Areas of Concern included on the maps in Appendix B.

Table 43: Existing Natural Hazard Mitigation Measures in Sharon

Hazard	Mitigation Measure	Changes since 2018 Plan
Flood-Related	1. Participation in the National Flood Insurance Program	
	2. Annual catch basin cleaning and annual street sweeping	
	3. Drainage system maintenance is performed as needed, and under a general maintenance permit issued by the Natural Resources Commission	
	4. Flood Plain Conservancy District	
	5. Wetlands Protection By-Law	Updated in 2021 that no structures are allowed within 100ft of previously undeveloped lots
	6. Massachusetts Stormwater Policy	Administrative review up to 5,000 sqft which doesn't require public hearing, Since 2023 update, 1 inch of infiltration is required, and Low-Impact Development (LID) is added

Hazard	Mitigation Measure	Changes since 2018 Plan
	7. Stormwater Requirements in subdivision regulations and site plan review	Revised the whole section in 2014. It got LID requirements and modern stormwater requirements in Section 340-4.5 of the Bylaw. Based on the stormwater bylaw update in 2023, all development review goes through the conservation commission.
	8. Open Space Residential Developments allowed	Added in 2022. They had the first development case that went through this zoning recently.
	9. Protected open space and proactive land preservation programs	Rattlesnake Hill (350 Acres, 2019) State DCR involved priority habitat linked to Audobon
	10. Public education on stormwater through the NPDES Phase II program	By Neponset River Water Association. Education at the high schools and public education through water bills.
Dams	11. DCR Dam Safety Regulations	Completed Dam Emergency Action Plans (EAP) and Inspection Reports. Details are included under the Dam hazard section. - Gavins Pond Dam (2023) - Hammershop Pond Dam Phase I Inspection (2017) - Hammershop Pond Dam EAP (2023) - Lake Massapoag Dam Phase I Inspection (2014) - Lake Massapoag Dam EAP (2023) - Manns Pond Phase I Inspection (2018) - Mass Pond Dam EAP (2020)
	12. Construction permits required Comprehensive Emergency	
	13. Dam at Massapoag Brook near Billings Street – the Town spent about $300,000 in 2010 to repair problems to the dam and it is currently considered to be in good condition	
Wind-Related	14. Annual tree trimming program by Department of Public Works	
	15.Tree maintenance by Eversource	
Winter-Related	16. Snow removal operations, restricted salt	Magnesium Chloride has been used in some sensitive areas because sodium could pollute the water. Near well #4 and train stations.
	17. Overnight parking ban November to April	
	18. Snow and Ice Disposal Bylaw	
Fire-Related	19. Open burning permits required	
	20. Fire Department reviews all development plans	
	1. Fire Department provides public education on its website	Town is planning to get a communication person, and the fire department is waiting to retrieve social media.
	1. Fire Tower on Moose Hill	
	1. Public education during drought watches	Water bans during drought season (May-Sept), They do education through water bills
	2. Fire trails in wooded areas	Currently minimally maintained and some of them are the State DCR land

Hazard	Mitigation Measure	Changes since 2018 Plan
Earthquake-Related	A) Maximum slopes for subdivision roads	
	B) Earth Removal Bylaw	
	C) Shelters and backup facilities available	The new high school is added as a shelter place
	D) Evacuation plan in CEMP	
Multi-Hazard	A) Multi-department review of developments	
	B) Comprehensive Emergency Management Plan (CEMP)	Meeting with MEMA next month to update the CEMP
	C) Enforcement of State Building Code	
	D) Emergency Preparedness public education on the town website	Using Sharon Radio for civil defense, Messaging through MEMA programs: the fire chief can call MEMA to send out messages to the phone numbers in the area
	E) Reverse 911	Very expensive to use – the school's database with parents during large storms
	F) Backup generators	New library will have it
	G) Citizen Emergency Response Team (CERT)	They have a civil defense, The Town contracted Mansfield Emergency Management Agency – they will typically come out for structure fires but they will also come out for sheltering and other tasks as well.
	H) Local Emergency Management Planning Committee (LEPC)	Regional emergency planning committee in Norfolk county including 13 towns.

LOCAL CAPACITY FOR IMPLEMENTATION

Under the Massachusetts system of "Home Rule," the Town of Sharon is authorized to adopt and from time to time amend a number of local bylaws and regulations that support the town's capabilities to mitigate natural hazards. These include Zoning Bylaws, Subdivision and Site Plan Review Regulations, Wetlands Bylaws, Health Regulations, Public Works regulations, and local enforcement of the State Building Code. Local Bylaws may be amended each year at the annual Town Meeting to improve the town's capabilities, and changes to most regulations simply require a public hearing and a vote of the authorized board or commission, such as the Community Planning and Development Board or Conservation Commission.

The Town of Sharon has recognized several existing mitigation measures that require implementation or improvements, and has the capacity within its local boards and departments to address these. The Sharon Department of Public Works will address the needs for catch basin cleaning and repairs and upgrades to drainage infrastructure. The Town's Planning Board will address the updates to the Master Plan and implementation of the Zoning Ordinance, Floodplain District, and Subdivision Rules and Regulations. The Conservation Commission will oversee implementation of the Wetlands Bylaw and the Open Space Plan. The Department of Public Works together with the Planning Board and Conservation Commission will coordinate implementation and enforcement of the Stormwater Bylaw.

SECTION 7: MITIGATION MEASURES FROM PREVIOUS PLAN

IMPLEMENTATION PROGRESS ON THE PREVIOUS PLAN

At a meeting of the Sharon Hazard Mitigation Planning Committee, Town staff reviewed the mitigation measures identified in the 2018 Sharon Hazard Mitigation Plan and determined whether each measure had been implemented or deferred. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into this Hazard Mitigation Plan 2024 Update. The decision on whether to delete or retain a particular measure was based on the committee's assessment of the continued relevance or effectiveness of the measure and whether the deferral of action on the measure was due to the inability of the Town to take action on the measure. Table 33 summarizes the status of mitigation measures from the 2018 plan that are being continued in the 2024 update.

Sharon has made considerable progress on implementing mitigation measures identified in the 2018 Hazard Mitigation Plan. Moving forward into the next five-year plan implementation period, there will be many more opportunities to incorporate hazard mitigation into the Town's decision making processes.

The challenges the Town faces in implementing these measures are primarily due to limited funding and available staff time. This plan should help the Town prioritize the best use of its limited resources for enhanced mitigation of natural hazards.

Table 44: Mitigation Measures from the 2018 Plan

Mitigation Action	Priority in 2018	Current Status	Include in 2024 HMP Update?
DAM-RELATED			
1) Dam stabilization at Massapoag Brook	High	Completed	No
FLOOD-RELATED			
2) Improved drainage for Saw Mill Road	High	Completed	No
3) Continuation of open space protection and land acquisition	High	Partially Completed	Yes
4) Regulatory revisions for stormwater management to ensure compliance with NPDES	High	Completed	No
5) Improve maintenance for culverts, trenches on School Meadow Brook	Medium	Partially Completed	Yes
6) Reconstruct culvert on Morse Street	Medium	Not Completed	Yes
7) Expand culvert at Morse and Mountain streets	Medium	Not Completed	Yes
FIRE-RELATED			
8) Improve access to wooded areas for fire trucks	High	Partially Completed	Yes
WINTER-RELATED			
9) Assessment of municipal structures for susceptibly to snow loads	Medium	Not Completed	Yes
WIND-RELATED			
10) Assessment of municipal structures for susceptibly to wind loads	Medium	Not Completed	Yes
DROUGHT-RELATED			
11) Promote drought tolerant landscaping and site design measures	Medium	Partially Completed	Yes
EXTREME TEMPERATURE-RELATED			

12) Promote green building and cool roof design	Low	Partially Completed	Yes
EARTHQUAKE-RELATED			
13) Assessment of public buildings for earthquake resistance	Low	Not Completed	Yes
OTHER			
14) Update hazardous materials response plan annually	Medium	Partially Completed	Yes
15) Assessment of historic structure natural hazard vulnerability	Low	Not Completed	Yes

Transitioning to the 2024 Updated Plan

As indicated *Section 7: Mitigation Measures from the 2018 Plan*, the Town has made progress implementing mitigation measures identified in the 2018 HMP. Below is a summary of the progress:

- **11** of the mitigation measures from the 2018 plan were carried over to this 2024 plan update, most of which are partially complete. These partially completed measures are being improved or progressed by the town.
- **6** mitigation measures from the 2018 plan were not completed and carried over to the current plan.

As indicated in *Section 8: Hazard Mitigation Strategy,* the town has identified new mitigation measures to pursue.

- **5** new mitigation measures that were not in the previous plan were identified and added to this plan update.
- Of the **16** total recommendations included in Section 8 of this 2024 plan update**, 3 are high priority, 8 are medium priority, and 5 are low priority.**

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

SECTION 8:
HAZARD MITIGATION STRATEGY

WHAT IS HAZARD MITIGATION?

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

http://www.fema.gov/government/grant/hmgp/index.shtm
http://www.fema.gov/government/grant/pdm/index.shtm
http://www.fema.gov/government/grant/fma/index.shtm

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

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

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

REGIONAL AND INTER-COMMUNITY CONSIDERATIONS

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

REGIONAL PARTNERS

In densely developed urban communities such as the metropolitan Boston area, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are complex systems of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including the Town, the Department of Conservation and Recreation (DCR), the Massachusetts Water Resources Authority (MWRA), Massachusetts Department of Transportation (MassDOT) and the Massachusetts Bay Transportation Authority (MBTA). The planning, construction, operation and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies must be considered the communities' regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do including budgetary and staffing constraints and they must make decisions about numerous competing priorities.

OVERVIEW OF REGIONAL FACILITIES WITHIN SHARON

Following, is a brief overview of regional facilities found in Sharon and a discussion of inter-municipal issues.

Major facilities owned, operated and maintained by state or regional entities include:

- Interstate I-95 (MassDOT)
- State roads Routes 1,1A, and Route27 (MassDOT)
- High tension lines
- MBTA Commuter Rail Lines (Sharon Station)
- Sharon Airport/ Golf Course
- MWRA Water System

INTER-COMMUNITY CONSIDERATIONS

Mitigation measures for the following regional issues should be taken into account as Sharon develops its own local plan:

A) Coordinate and Review Developments on a Regional Basis

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

B) Neponset River Watershed

Flooding and management of the watershed are key regional issues. As noted in this plan, dams located outside of the Town of Sharon or on the town border are critical concerns.

NEW DEVELOPMENT AND INFRASTRUCTURE

As part of the process of developing recommendations for new mitigation measures for this plan update, the Town considered the issues related to new development, redevelopment, and infrastructure needs in order limit future risks. Taking into consideration the Zoning and By-law changes adopted in recent years, the Wetlands Act enforced by the Conservation Commission, and the recent adoption of the Community Preservation Act, the town determined that existing regulatory measures are taking good advantage of local Home Rule land use regulatory authority to minimize natural hazard impacts of development. Priorities for the future include updating stormwater management bylaws.

PROCESS FOR SETTING PRIORITIES FOR MITIGATION MEASURES

The last step in developing the Town's mitigation strategy is to assign a level of priority to each mitigation measure so as to guide the focus of the Town's limited resources towards those actions with the greatest potential benefit. At this stage in the process, the Local Hazard Mitigation Planning Team had limited access to detailed analyses of the cost and benefits of any given mitigation measure, so prioritization is based on the local team members' understanding of existing and potential hazard impacts and an approximate sense of the costs associated with pursuing any given mitigation measure.

Priority setting was based on local knowledge of the hazard areas, including impacts of hazard events, the extent of the area impacted, and the relation of a given mitigation measure to the Town's goals. In addition, the local Hazard Mitigation Planning Team also took into consideration factors such as the number of homes and businesses affected, whether road closures occurred and what impact closures had on delivery of emergency services and the local economy, anticipated project costs, whether any environmental constraints existed, and whether the Town would be able to justify the costs relative to the anticipated benefits.

The table below summarizes the factors considered for prioritizing the recommended hazard mitigation measures. For each mitigation measure, the geographic extent of the potential benefiting area is identified as well as an estimate of the overall benefit and estimated cost of the mitigation measures. The overall priority of each measure was evaluated in terms of these factors.

Table 45. Factors for Prioritizing Mitigation Measures

Estimated Benefits	
High	Action will result in a significant reduction of hazard risk to people and/or property from a hazard event
Medium	Action will likely result in a moderate reduction of hazard risk to people and/or property from a hazard event
Low	Action will result in a low reduction of hazard risk to people and/or property from a hazard event
Estimated Costs	
High	Estimated costs greater than $100,000
Medium	Estimated costs between $10,000 to $100,000
Low	Estimated costs less than $10,000 and/or staff time

Priority	
High	Action very likely to have political and public support and necessary maintenance can occur following the project, and the costs seem reasonable considering likely benefits from the measure
Medium	Action may have political and public support and necessary maintenance has potential to occur following the project
Low	Not clear if action has political and public support and not certain that necessary maintenance can occur following the project

IDENTIFICATION OF POTENTIAL MITIGATION MEASURES

During the local hazard team meetings, officials in Sharon determined possible mitigation measures for the various natural hazards that have impacted or could impact the town. In addition, MAPC solicited suggestions for mitigation measures when it collected hazard information from town officials and from other town plans and studies. MAPC compiled all suggested potential mitigation measures in matrix below. The summary table is then followed by series of considerations that were factored into determining mitigation measures. These include: regional and inter-community issues, regional partners and facilities, and new development and infrastructure. Following those considerations, the Hazard Mitigation Strategy chapter of the plan then provides an explanation of the prioritization process of the potential mitigation measures to be included in the updated mitigation plan, as well as a prioritized matrix of the measures.

INTRODUCTION TO POTENTIAL MITIGATION MEASURES TABLE (TABLE 35)

Description of the Mitigation Measure – The description of each mitigation measure is brief and cost information is given only if cost data were already available from the community. The cost data represent a point in time and would need to be adjusted for inflation and for any changes or refinements in the design of a particular mitigation measure.

Priority – As described above and summarized in Table 34, the designation of high, medium, or low priority was done considering potential benefits and estimated project costs, as well as other factors in the STAPLEE analysis.

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

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

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

Estimated Cost – The Local Hazard Mitigation Team assigned a cost category as follows:

Low:	<$10,000 and/or staff time
Medium:	$10,000 to $100,000
High:	>$100,000

Additional information on funding sources – The best way to determine eligibility for a particular funding source is to review the project with a staff person at the funding agency. The following websites provide an overview of programs and funding sources.

Army Corps of Engineers (ACOE) – The website for the North Atlantic district office is http://www.nae.usace.army.mil/. The ACOE provides assistance in a number of types of projects including shoreline/streambank protection, flood damage reduction, flood plain management services and planning services.

Massachusetts Emergency Management Agency (MEMA) – The grants page http://www.mass.gov/dem/programs/mitigate/grants.htm has a useful table that compares eligible projects for the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program.

Abbreviations Used in Table 35

- DCR: MA Department of Conservation and Recreation
- BRIC: Building Resilient Infrastructure and Communities
- EEA: Massachusetts Executive Office of Energy and Environmental Affairs
- MassDOT: Massachusetts Department of Transportation
- TOM: Town of Sharon
- DEP: Department of Environmental Protection
- MAPC: Metropolitan Area Planning Council
- TAP: Technical Assistance Program (an MAPC Grant)
- ACR: Accelerating Climate Resilience (An MAPC Grant)
- PPA: Power Purchase Agreement
- EMPG: MEMA Emergency Management Performance Grant
- CCP: MEMA Citizen Corps Program
- MET: Massachusetts Environmental Trust
- "General fund" refers to funding from the Town

Table 46: Mitigation Measures for the Hazard Mitigation Strategy

Mitigation Measure	Priority in Update	Lead Implementation	Time Frame	Estimated Cost Range	Potential Funding Sources
FLOOD-RELATED					
1. Continuation of open space protection and land acquisition	Low	Conservation	2024-2029	Unknown at this time, needs study and design; $50k to $100k	Town of Sharon General Fund, BRIC
2. Improve maintenance for culverts, trenches on School Meadow Brook	Medium	Public Works	2024-2029	Unknown at this time, needs study and design; $50k to $100k	Town of Sharon General Fund, BRIC
3. Reconstruct culvert on Morse Street	Medium	Public Works	2027-2029	Unknown at this time, needs study and design $50k to $100k	Town of Sharon General Fund, BRIC, Chapter 90
4. Expand culvert at Morse and Mountain streets	Medium	Public Works	2027-2029	$75k to $125k	Town of Sharon General Fund, BRIC, Chapter 90
5. Measures to manage stormwater runoff to Lake Massapoag and Massapoag Brook reduce water quality impacts (see letter from Lake Massapoag Advisory Commission)	High	Public Works	2027-2029	800K	DEP Water Quality Grants, MVP Grants, CPC funds
6. Robin road drainage improvement	High	Public Works	2024-2029	500k	Bipartisan Infrastructure Law, Chapter 90
FIRE-RELATED					
7. Improve access to wooded areas for fire trucks	High	Fire Department, Public Works	2024-2029	Town staff time	DCR, MassFire Control Grant
WINTER-RELATED					
8. Assessment of municipal structures for susceptibly to snow loads	Medium	Public Works, Building	2024-2029	$50,000 to $75,000	Town of Sharon General Fund, BRIC
WIND-RELATED					
9. Improve tree trimming(also related to winter hazard)	Low	Public Works	2024-2029	Town staff time, Mostly utility company leads it and Town supports it	Town of Sharon General Fund
DROUGHT-RELATED					
10. Promote drought tolerant landscaping and site design measures	Medium	Planning, Conservation	2024-2029	Town staff time	Town of Shaon General Fund
EXTREME TEMPERATURE-RELATED					
11. Promote green building and cool roof design	Low	Building, Planning	2024-2029	Town staff time	Town of Sharon General Fund, MVP action grant

12. Enforcing public notification system for extreme weather events	Medium	Fire Department	2024-2029	Town staff time	Town of Sharon General Fund
EARTHQUAKE-RELATED					
13. Assessment of public buildings for earthquake resistance	Low	Building, Public Works	2024-2029	$50,000 to $75,000	Town of Sharon General Fund, BRIC
CLIMATE CHANGE RELATED					
14. Adopting Extreme Stretch Code for new building construction	Medium	Building, Public Works	2024-2029	Town staff time	Town of Sharon General Fund
OTHERS					
15. Update hazardous materials response plan annually	Medium	Fire Department, Public Works	2024-2029	Town staff time	Town of Sharon General Fund
16. Assessment of historic structure natural hazard vulnerability	Low	Fire Department, Public Works, Building	2024-2029	$50,000 to $75,000	Town of Sharon General Fund

SECTION 9:
PLAN ADOPTION & MAINTENANCE

PLAN ADOPTION

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

PLAN MAINTENANCE

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

MAPC worked with the Sharon Hazard Mitigation Planning Team to prepare this plan. After approval of the plan by FEMA, this group will meet to function as the Hazard Mitigation Implementation Team, with the [Fire Chief] designated as the coordinator. Additional members could be added to the local implementation team from businesses, non-profits and institutions. The Town will encourage public participation during the next 5-year planning cycle. As updates and a review of the plan are conducted by the Hazard Mitigation Implementation Team, these will be placed on the Town's web site, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with town and state open meeting laws.

IMPLEMENTATION AND EVALUATION SCHEDULE

Mid-Term Survey on Progress – The coordinator of the Hazard Mitigation Implementation Team will prepare and distribute a survey in year three of the plan. The survey will be distributed to all of the local implementation group members and other interested local stakeholders. The survey will poll the members on any changes or revisions to the plan that may be needed, progress and accomplishments for implementation, and any new hazards or problem areas that have been identified.

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

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

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

sources of funding may include FEMA Pre-Disaster Mitigation grants and the Hazard Mitigation Grant Program. Both grant programs can pay for 75% of a planning project, with a 25% local cost share required. The team should also review and consider the comments and suggestions for improving the plan in FEMA's Plan Review Tool, found in Appendix E.

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

INTEGRATION OF THE PLANS WITH OTHER PLANNING INITIATIVES

Upon approval of the Sharon Hazard Mitigation Plan 2018 Update by FEMA, the Local Hazard Mitigation Team will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. At a minimum, the plan will be reviewed and discussed with the following departments:

- Fire/Emergency Management
- Police
- Public Works/Highway
- Engineering
- Planning and Community Development
- Conservation
- Parks and Recreation
- Health
- Building

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

The Hazard Mitigation Plan will be integrated into other town plans and policies as they are updated and renewed, including the Open Space and Recreation Plan, Comprehensive Emergency Management Plan, and Capital Investment Program.

SECTION 10: LIST OF REFERENCES

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APPENDIX A: LOCAL TEAM MEETINGS

Sharon Hazard Mitigation Plan Update
Team Meeting #1

Wednesday, August 2, 2023
10:00 – 11:30 AM
Sharon Fire Department
211 South Main Street, Sharon MA

And Zoom for GIS Mapping
https://us06web.zoom.us/j/85990498022
Meeting ID: 859 9049 8022

AGENDA

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1. **Welcome and Introductions**
2. **Review of HMP Project and Schedule** (see attached timeline)
3. **Getting Started: Local Data Updates from the 2018 Plan**
   - *The Team will update the following local sites from the 2018 plan (see attached worksheets):*
     1. **Local Hazard Areas** (Flooding, Brushfire)
     2. **Critical Facilities**
     3. **New Development sites** (may be reviewed separately with planner)
   - *MAPC's GIS Planner Alexa DeRosa will join via Zoom to map new or revised sites using the online platform Google MyMaps*
4. **Next steps: Preparing for Public Meetings and Outreach**
   - We will hold 2 Public Meetings:
     1st public meeting during the planning process (October 2023)
     2nd public meeting at the end to present the draft plan (February 2024)
   - The HMP Team to identify local stakeholders to invite
   - Next HMP Team meeting in September

Sharon Hazard Mitigation Plan Update
Local Team Meeting #2

Thursday, November 9, 2023
10:00 – 11:30 AM

Sharon Fire Department
211 South Main Street, Sharon MA

AGENDA

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1. Welcome and Project Update
Review of updated Worksheets from the last meeting, further revisions if needed

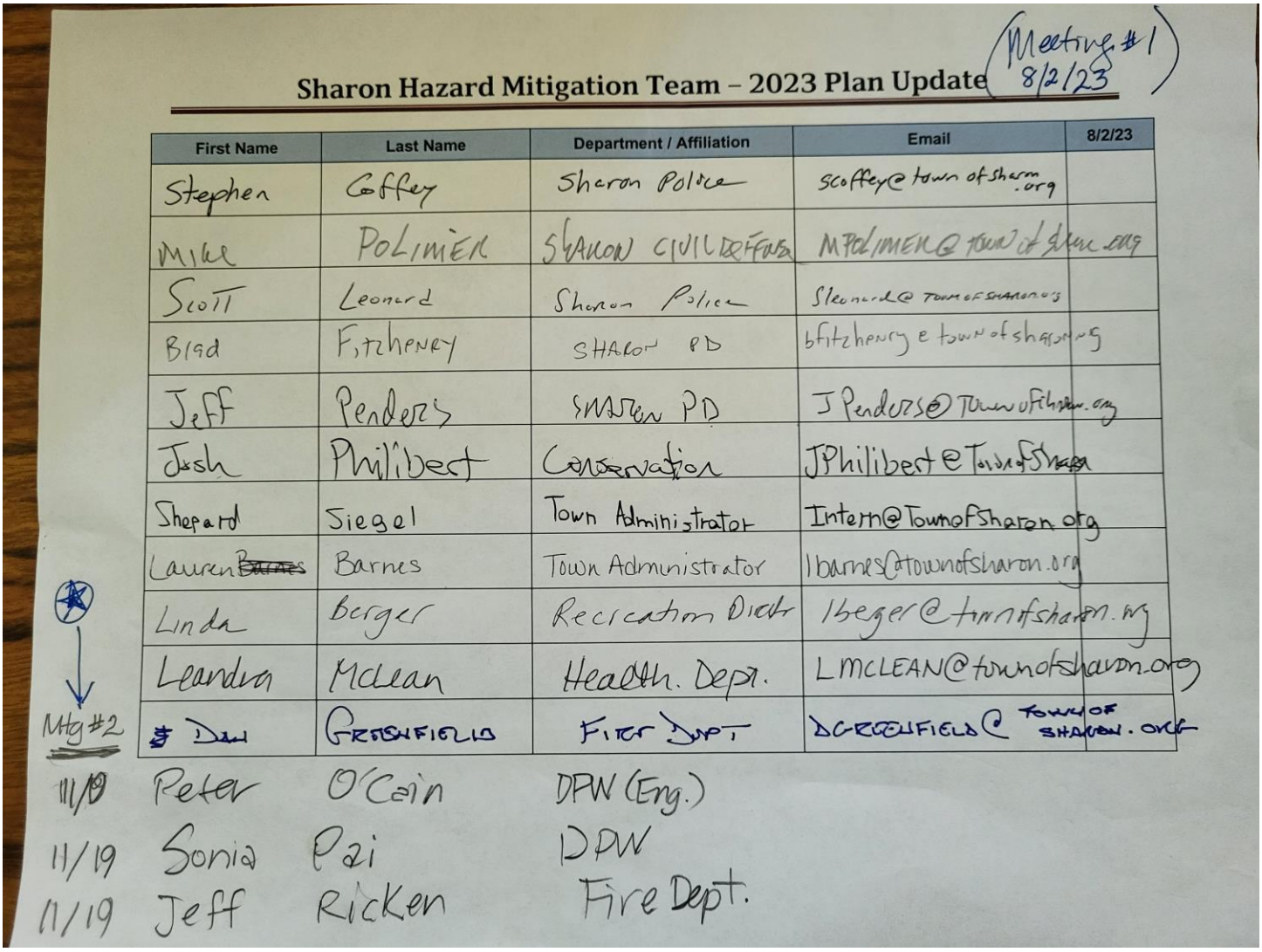
2. Review and Update of Mitigation Goals for the Plan
See Mitigation Goals from the 2018 plan attached

3. Review Status of Existing Mitigation Measures
See Worksheet#4 of Existing Mitigation from the 2018 Plan attached

- Note any **Changes for 2023**
- Update with any **Improvements Needed**
- Add any **New Measures** adopted since 2018

4. Prepare for First Public Meeting and Community Survey

- Location (host board/commission?)
- Date (target early Dec.)
- Distribution of a community hazard mitigation survey (target November-January)
- *Meeting Invitation/Survey outreach to the community:*
  - *Identify local stakeholders to invite* (refer to MVP invitees)
  - *Community groups, businesses, NGO's, etc.*
  - Public outreach on Town website, social media



Sharon Hazard Mitigation Team – 2023 Plan Update

Meeting #1 8/2/23

First Name	Last Name	Department / Affiliation	Email	8/2/23
Stephen	Coffey	Sharon Police	scoffey@townofsharon.org	
Mike	POLIMIEN	SHARON CIVIL DEFENSE	MPOLIMIEN@townofsharon.org	
Scott	Leonard	Sharon Police	Sleonard@townofsharon.org	
Brad	Fitzhenry	SHARON PD	bfitzhenry@townofsharon.org	
Jeff	Penders	SHARON PD	JPenders@Townofsharon.org	
Josh	Philibert	Conservation	JPhilibert@TownofSharon	
Shepard	Siegel	Town Administrator	Intern@TownofSharon.org	
Lauren ~~Barnes~~	Barnes	Town Administrator	lbarnes@townofsharon.org	
Linda	Berger	Recreation Dirctr	lberger@townofsharon.org	
Leandra	Mclean	Health. Dept.	LMCLEAN@townofsharon.org	
~~Dan~~	GREENFIELD	FIRE DEPT	DGREENFIELD@TOWN OF SHARON.ORG	
Mtg #2				
11/9	Peter	O'Cain	DPW (Eng.)	
11/19	Sonia	Pai	DPW	
11/19	Jeff	Ricken	Fire Dept.	

Sharon Hazard Mitigation Plan Update
Local Team Meeting #3

Thursday, March 28, 2024
10:00 – 11:30 AM

In-Person Meeting
Sharon Public Safety Building
211 S Main St

AGENDA

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1. Welcome and Project Update

2. Review Status of Mitigation Strategies from the 2018 Plan

The Team will review the recommended mitigation measures from the 2018 plan and note those that have been implemented, are in progress, or have not been implemented.
See the attached worksheet to note the status of mitigation recommendations.

3. Next Steps

- Final Team Meeting – May
  - To be Scheduled and Confirmed in March 2024
  - Finalize mitigation recommendations for the 2024 plan
- Second Public Meeting– June
  - Presentation of the draft plan and public questions/comments
  - Draft plan to be posted on the Town's website for public review
- Draft Plan to be submitted for MEMA & FEMA review – June
  - Revisions to the draft plan if required by MEMA or FEMA
  - FEMA will issue "Approval Pending Adoption" notice
- Adoption of the Final Plan by the Town
  - FEMA will issue "Approval Pending Adoption" notice
- FEMA will issue a formal Letter of Plan Approval
  - The new plan will be in effect for 5 years, until 2029
  - The Town will be eligible to apply for BRIC grants for mitigation projects

Sharon HMP TEAM 3/28/24

Name	
Martin Pillsbury	MAPC
Jiwon Park	MAPC
Josh Philibert	Conservation
PETER O'CHIN	DPW
Linda Berger	Recreation
Kevin Weber	DPW
Leandra McLean	Health.
MICHAEL MADDEN	FIRE DEPARTMENT
Fred Turkington	Town Administrator

Sharon Hazard Mitigation Plan Update
Team Meeting #4 (Final Meeting)

Thursday, May 16, 2024
10:00 to 11:30 AM

Sharon Public Safety Building
211 S Main St

AGENDA

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1. Welcome and Project Update

2. Finalize the Mitigation Strategies for 2024 Plan

- Corrections or updates to ***Worksheet #4*** (attached) from the last Team Meeting, if any
- Review the draft mitigation strategies for the 2024 plan, ***Worksheet #5***
- We will confirm the recommendations, priorities, lead agencies, timeframes, and costs

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3. Next Steps for Sharon

- Final Public Meeting (June 25th)/ Public Review of Draft Plan
  - Confirm the date with the Select Board
  - Presentation of the draft plan
  - Outreach to local stakeholders and organizations; social media; press
  - Draft plan to be posted online for public review after the meeting
  - Team to review public comments received and decide if any edits to plan

4. FEMA Review and Approval

- Draft Plan will be submitted for MEMA & FEMA review – June
  - Revise plan if required by MEMA or FEMA comments
- Adoption of the Final Plan by the Town
  - FEMA will issue notice of "Approvable Pending Adoption"
  - Vote of plan adoption by the Select Board
- FEMA formal Letter of Plan Approval
  - The new plan will be in effect for 5 years, until 2029
  - The Town will be eligible to apply for BRIC grants for mitigation projects

Sharon HMP Team 5/16/24

Name	
Jiwon Park	MAPC
Josh Philibert	Sharon Conservation
Fred Turkington	Town Admin.
MICHAEL MASSON	SHARON FIRE
Leandra Mclean	Health Dept
Linda Berg	Rec Director
Eric Hooper	

APPENDIX B: HAZARD MAPPING

The MAPC Data Services Department produced a series of maps. Some of the data came from the Northeast States Emergency Consortium (NESEC). More information on NESEC can be found at http://www.serve.com/NESEC/. Due to the various sources for the data and varying levels of accuracy, the identification of an area as being in one of the hazard categories must be considered as a general classification that should always be supplemented with more local knowledge.

The map series consists of thirteen maps as described below. The maps in this appendix are necessarily reduced scale versions for general reference. Full sized higher resolution PDF's of the maps can be requested.

Map 1.	Population Density
Map 1a.	Environmental Justice
Map 2.	Land Use
Map 3.	Flood Zones
Map 3b.	Flood Zones and 2010 Flood Claims
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Local Hazard Areas
Map 9.	Land Surface Temperature
Map 10.	Wildfire Risk

Map 1: Population Density – This map uses the US Census block data for 2020 and shows population density as the number of people per acre in seven categories with 60 or more people per acre representing the highest density areas.

Map 1b: Environmental Justice – This map shows Environmental Justice (EJ) populations using 2020 data. EJ designations from the State include English isolation, income, and minority residents.

Map 2: Land Use – This map shows land cover and land use from MassGIS' 2016 Land Cover/Land Use dataset.

Map 3: Flood Zones – The map of flood zones used the FEMA NFIP Flood Zones for Norfolk County as its source. For more information, refer to the FEMA Map Service Center website http://www.msc.fema.gov. The definitions of the flood zones are described in detail on this site as well. The flood zone map for each community also shows critical infrastructure and municipally owned and protected open space.

Map3b: Flood Claims – This map shows flood insurance and disaster claim records from March 2010. The March 29, 2010 federal disaster declaration associated with severe rainfall and flooding triggered the launch of the Federal Emergency Management Agency's (FEMA's) Individual Assistance Program through which residential property owners, businesses, and institutions without flood insurance were eligible to apply for relief to pay for storm-related expenditures and repairs. Across the seven counties, over 27,000 individual claims were approved for nearly $59 million in disaster assistance, while reimbursements to state and local governments totaled $25 million. In the MAPC region, 18,400 claims were approved for $30 million dollars in disaster assistance.

Map 4: Earthquakes and Landslides (Regional) – This map depicts landslide risk and recorded earthquake epicenters in the community and surrounding region. This information came from NESEC. For most communities, there was no data for earthquakes because only the epicenters of an earthquake are mapped.

The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to http://pubs.usgs.gov/pp/p1183/pp1183.html.

Map 5: Hurricanes and Tornadoes (Regional) – This map shows the spatial characteristics of several different meteorological properties and past events in the community and surrounding region. The map includes the storm tracks for both hurricanes and tropical storms. This information must be viewed in context. A storm track only shows where the eye of the storm passed through. In most cases, the effects of the wind and rain from these storms were felt in other communities even if the track was not within that community. This map also shows the location of tornadoes with a classification as to the level of damages. What appears on the map varies by community since not all communities experience the same wind-related events. These maps also show the 100-year wind speed and areas that could be inundated by storm surge during a hurricane, if any.

Map 6: Average Snowfall (Regional) - This map shows the average snowfall in the community and the surrounding region.

Map 7: Composite Natural Hazards (Regional) - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100-year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and hurricane surge inundation areas. Areas with only one hazard were considered to be low hazard areas. Moderate areas have two of the hazards present. High hazard areas have three hazards present and severe hazard areas have four hazards present.

Map 8: Local Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph/ The critical infrastructure sites and planned development areas are also shown. The source of the aerial photograph is Mass GIS

Map 9: Land Surface Temperatures – MAPC's Statewide Land Surface Temperature (LST) Index was created by combining estimates of surface temperature from days in 2018, 2019, and 2020 where the daily air temperature maximum exceeded 70 degrees Fahrenheit. The Statewide LST Index "Hot Spots" data depicts the 5% highest LST index areas in each Regional Planning Agency (RPA) region. The data was generated by identifying pixels whose LST index values are equal to or greater than 95% of LST index values in the region, and then delineating cohesive regions where pixels meet this criterion as polygons. Map 9 represents the "Hot Spots" relative to the MAPC region, mapped on top of the National Land Cover Database's 2016 30-m tree canopy data.

Map 10: Wildfires – This map shows wildfire risk to the community using USDA data. Wildfire risk is classified as very low, low, moderate, high, and very high.

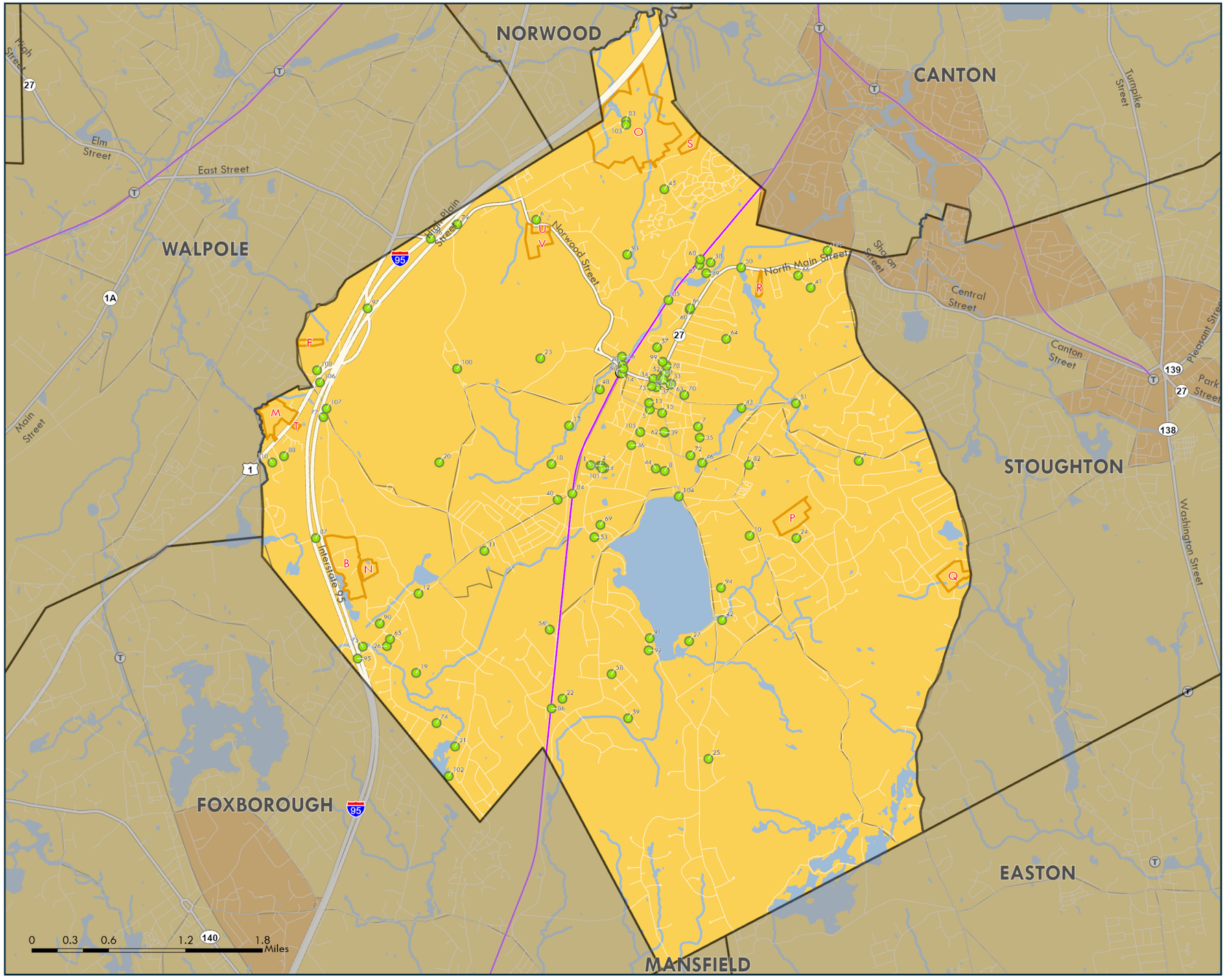
The map set described above is included on the subsequent pages.

Map 1: Population Density

MAPC dcr

FEMA Hazard Mitigation Planning Grant

SHARON, MA



- Critical Infrastructure*
- Development Areas

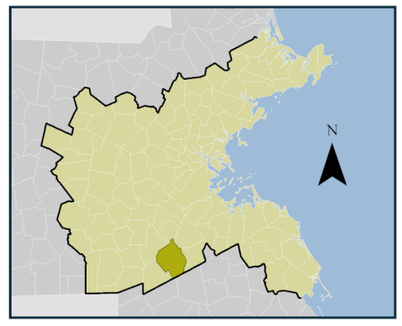
* See details in separate table

- Water Bodies
- Commuter Rail

Census 2020 Block Groups

Population Density: People per acre

- 0 or No Data
- 0.1 - 5.0
- 5.1 - 15.0
- 15.1 - 30.0
- More than 30



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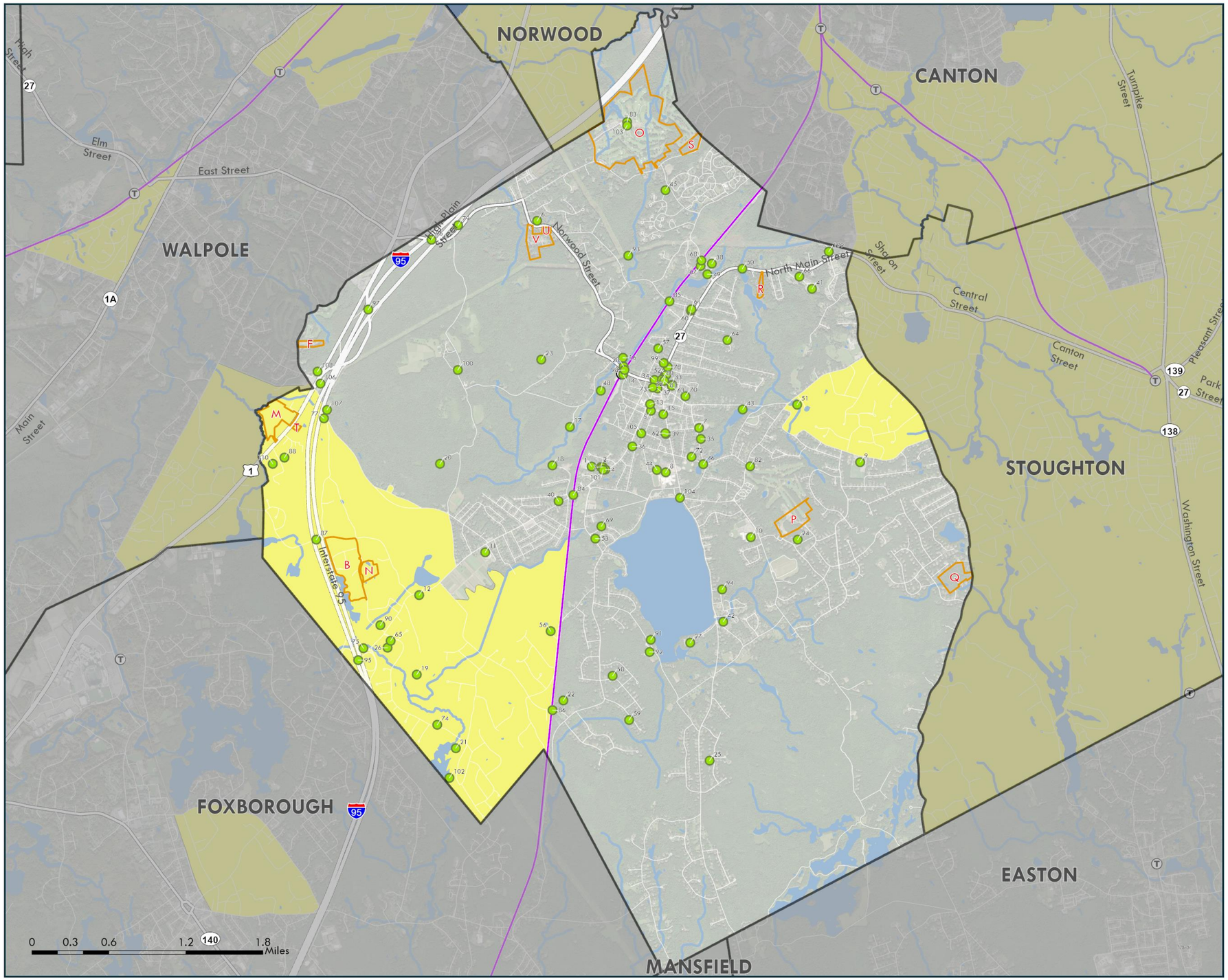
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census

SHARON, MA

Date: 6/5/2024



Map 1a: Environmental Justice

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SHARON, MA

- Critical Infrastructure*
- Development Areas

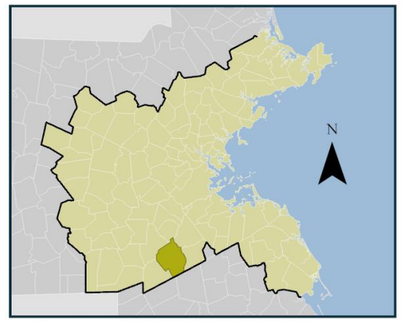
* See details in separate table

- Water Bodies
- Commuter Rail

Environmental Justice Populations 2020

EJ Criteria Description

- English isolation
- Income
- Income and English isolation
- Minority
- Minority and English isolation
- Minority and income
- Minority, income and English isolation



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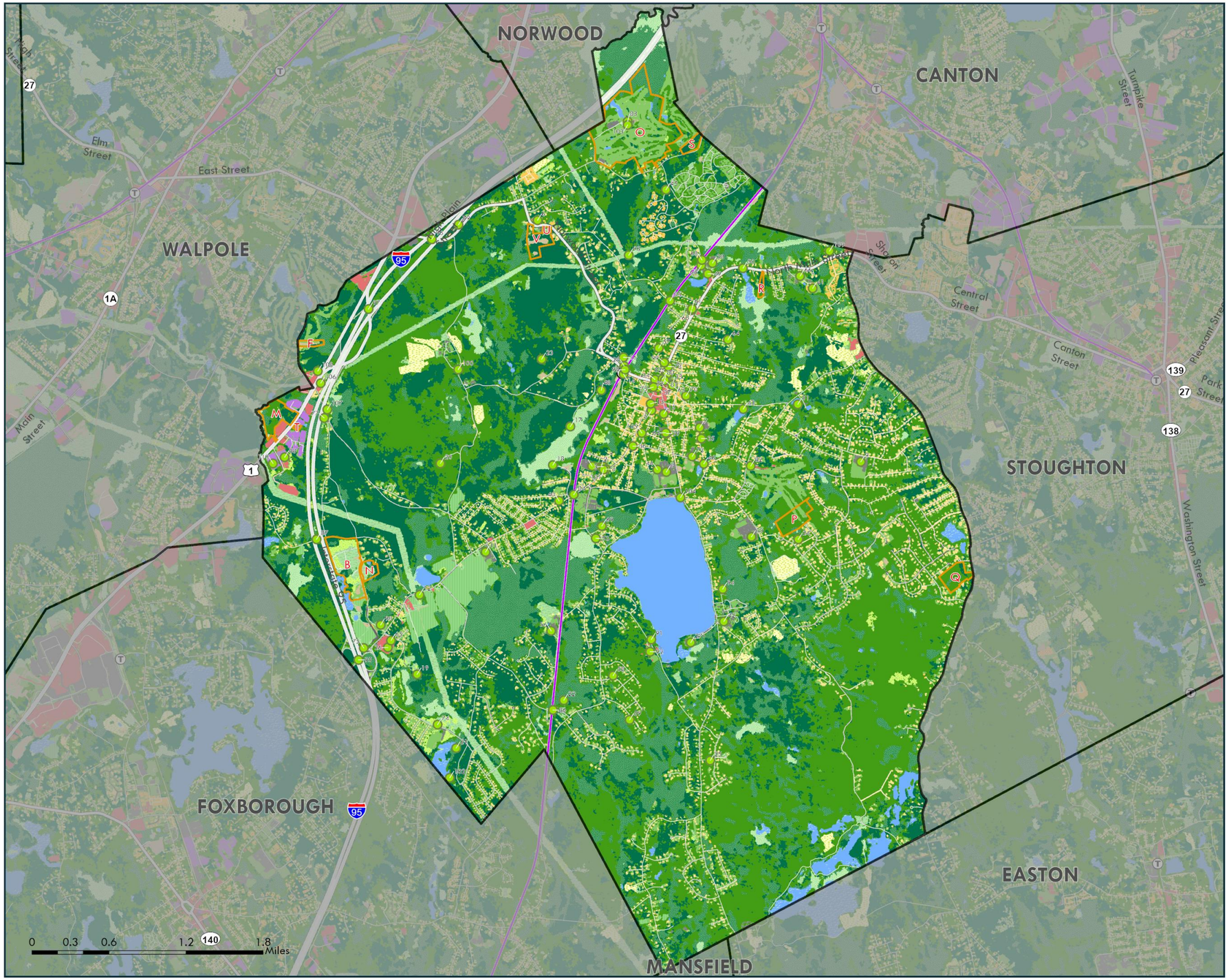

Map 2: Land Use

MAPC dcr

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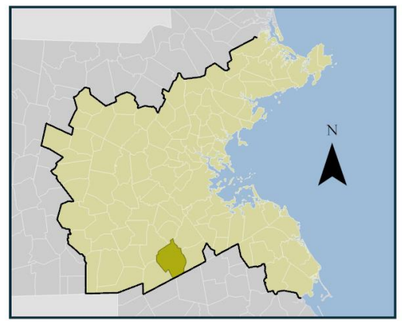
SHARON, MA

- Critical Infrastructure*
- Development Areas
- Commuter Rail

* See details in separate table

Land Cover-Land Use (2016)

- Residential - Single Family
- Residential - Multi-Family
- Residential - Other
- Commercial
- Industrial
- Mixed Use - Primarily Residential
- Mixed Use - Primarily Commercial
- Mixed Use - Other
- Other Impervious
- Right-of-way
- Cultivated
- Pasture/Hay
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Saltwater Wetland
- Water
- Unconsolidated Shore
- Aquatic Bed



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Map 3: Flood Zones

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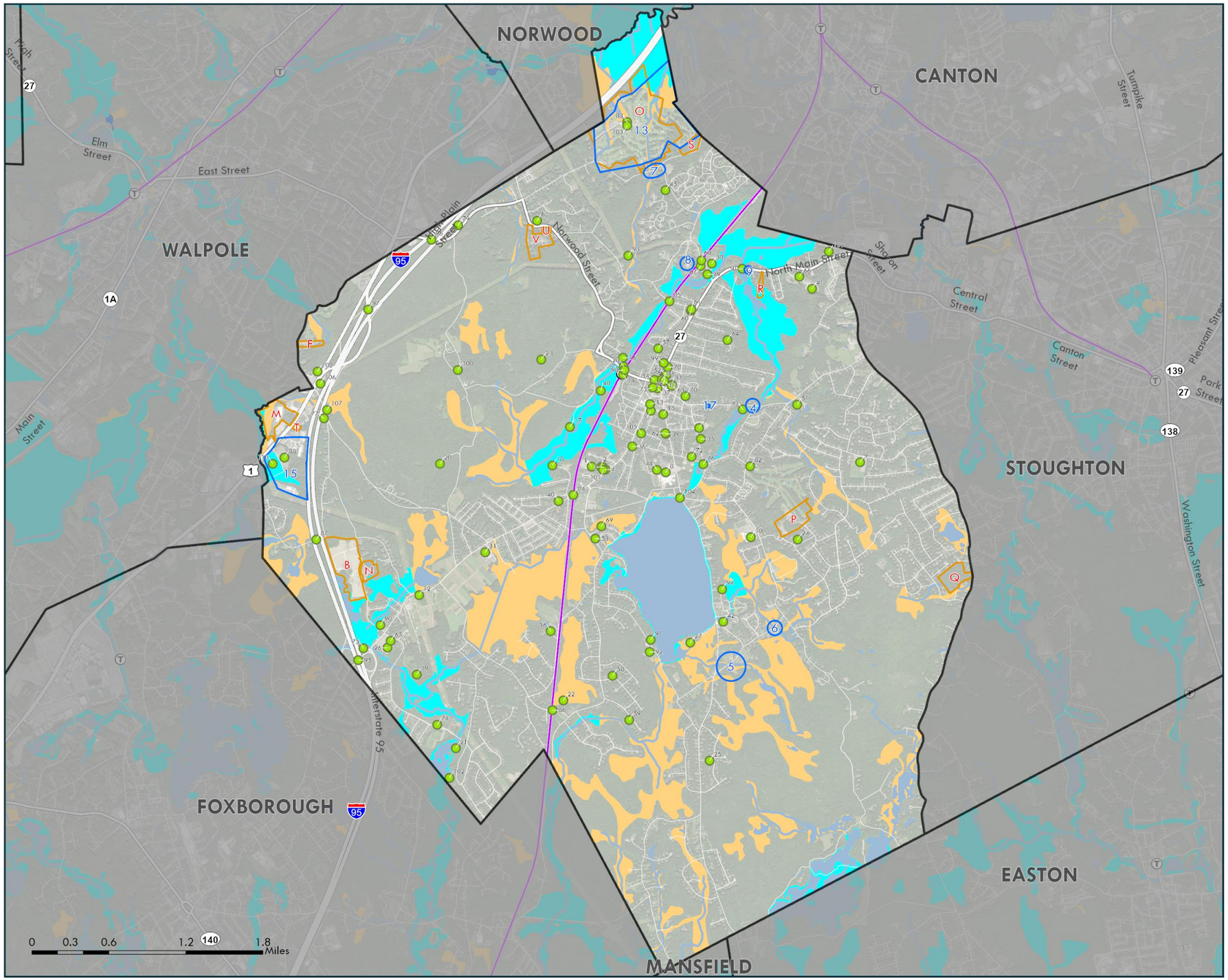
SHARON, MA



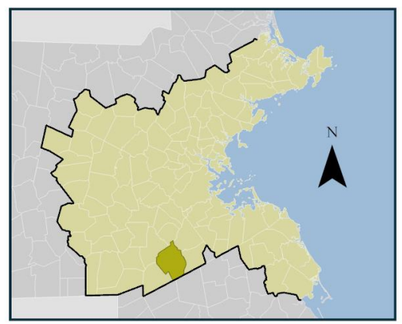
- Critical Infrastructure*
- Development Areas
- Flood Hazards

* See details in separate table

- Water Bodies
- Commuter Rail

FEMA Flood Zones, 2017
(Annual Chance)

- Zone A: 1%
- Zone AE: 1%
- Zone AH: 1%
- Zone AO: 1%
- Zone VE: 1% with Velocity Hazard
- 0.2% Annual Chance



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Map 3b: Flood Zones and 2010 Flood Claims

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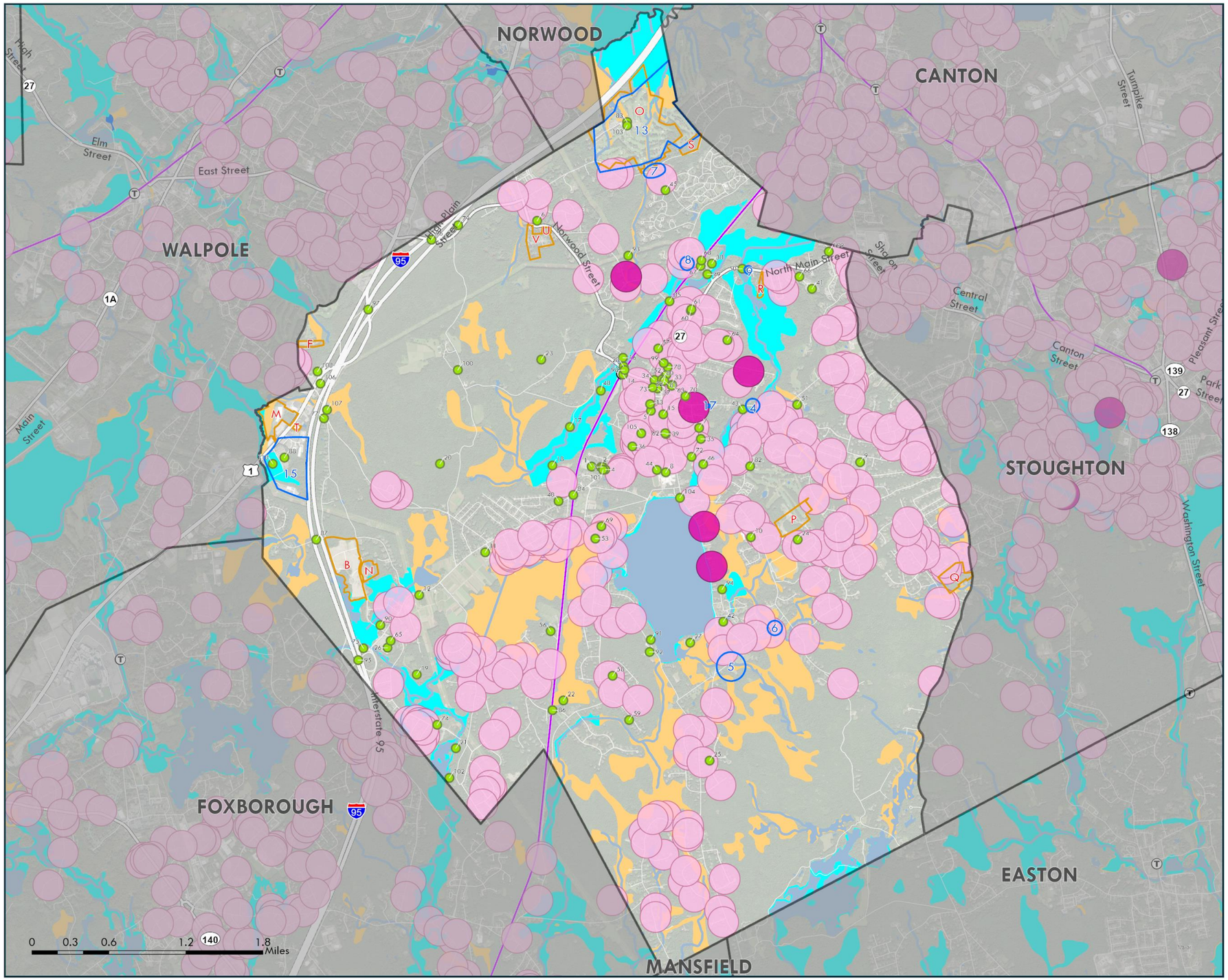


- Critical Infrastructure*
- Development Areas
- Flood Hazards

* See details in separate table

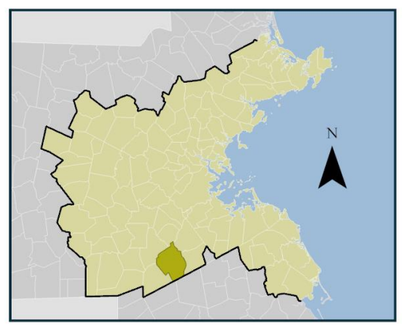
- Water Bodies
- Commuter Rail

FEMA Flood Zones, 2017
(Annual Chance)

- Zone A: 1%
- Zone AE: 1%
- Zone AH: 1%
- Zone AO: 1%
- Zone VE: 1% with Velocity Hazard
- 0.2% Annual Chance

2010 Flood Claims

- Disaster Assistance
- Flood Insurance



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Federal Emergency Management Agency (FEMA)
U.S. Decennial Census

SHARON, MA

Date: 6/5/2024

Map 4: Earthquakes and Landslides

MAPC

dcr

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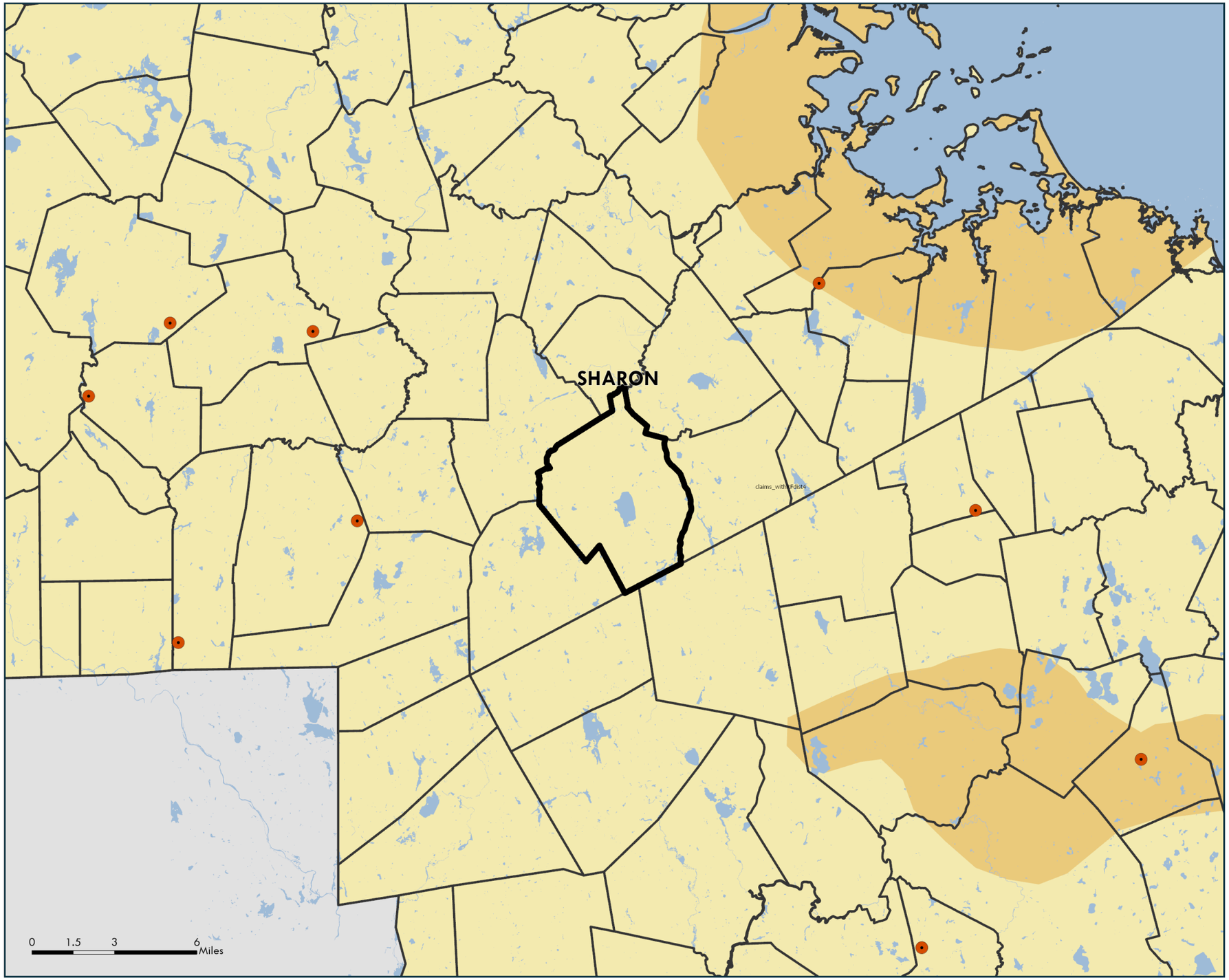
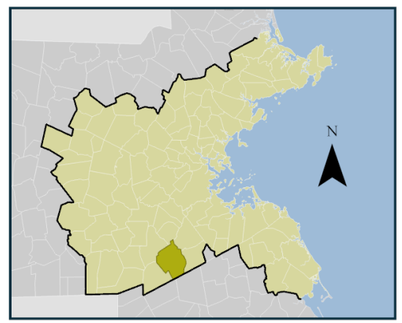


Landslides

- High landslide incidence (greater than 15% of the area is involved in landsliding)
- High susceptibility to landsliding and moderate incidence
- High susceptibility to landsliding and low incidence
- Moderate susceptibility to landsliding and low incidence
- Low landslide incidence (less than 1.5 % of the area is involved in landsliding

Earthquakes

- Epicenters



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U.S. Decennial Census

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Map 5: Hurricanes and Tornadoes

MAPC dcr

FEMA Hazard Mitigation Planning Grant

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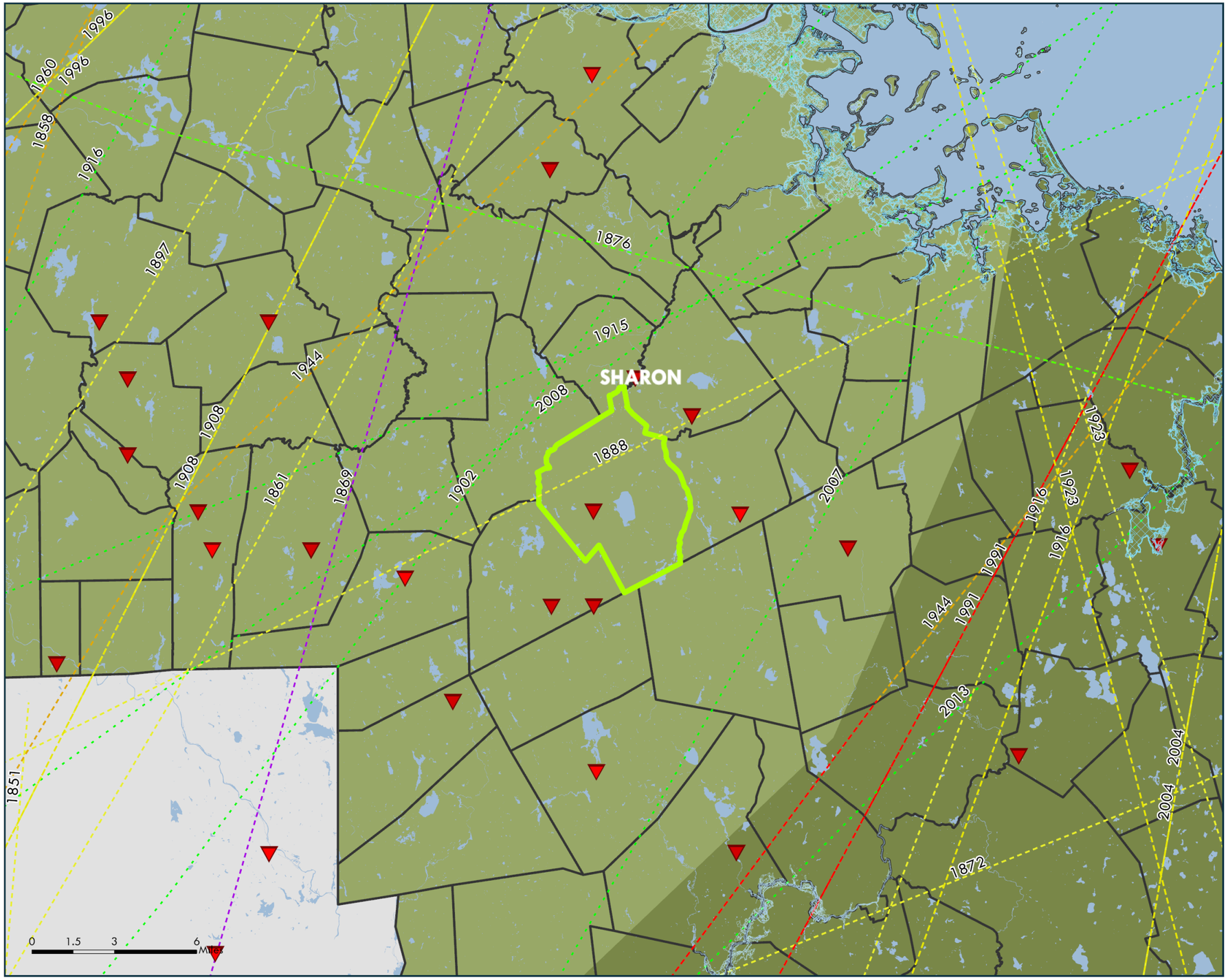


Hurricane Surge Inundation Area

Tornado

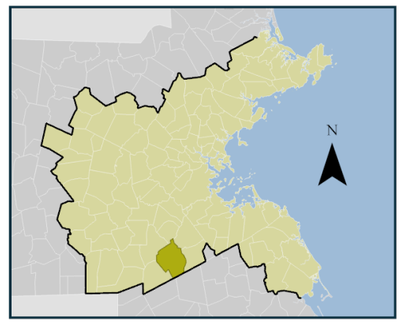
Storm Tracks

- Tropical Depression
- Tropical Storm
- Category 1 Hurricane
- Category 2 Hurricane
- Category 3 Hurricane

100 Year Wind Speeds

Miles Per Hour

- 90 MPH
- 100 MPH
- 110 MPH
- 120 MPH
- 130 MPH



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U.S. Decennial Census

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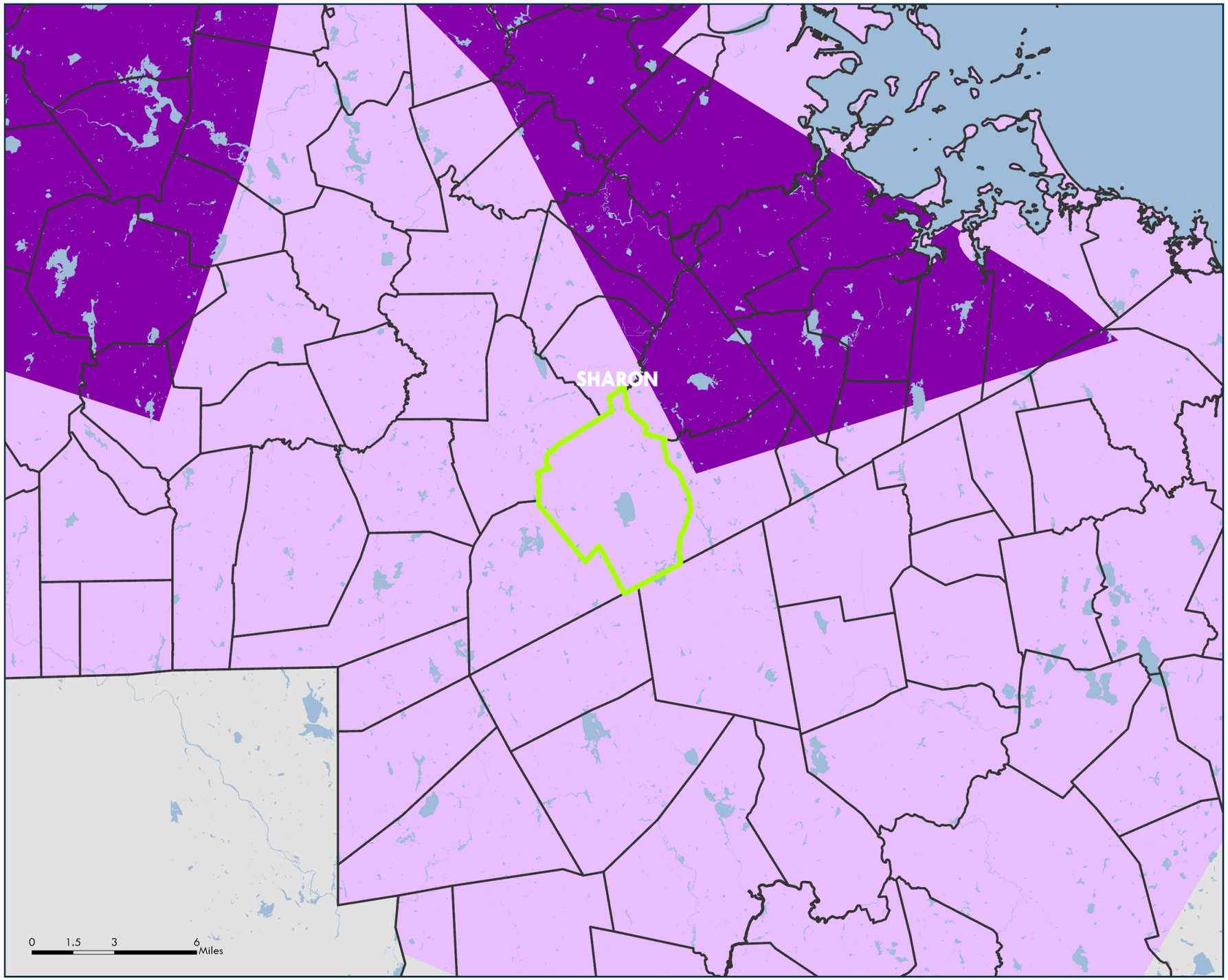

Map 6: Average Snowfall

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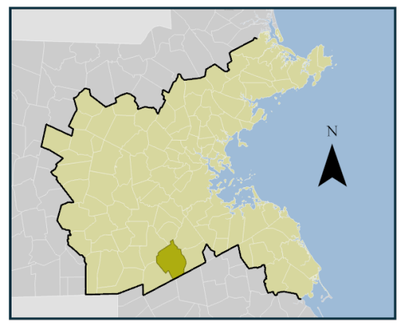
SHARON, MA

Average Annual Snowfall

Inches

G 36.1 - 48.0

H 48.1 - 72.0



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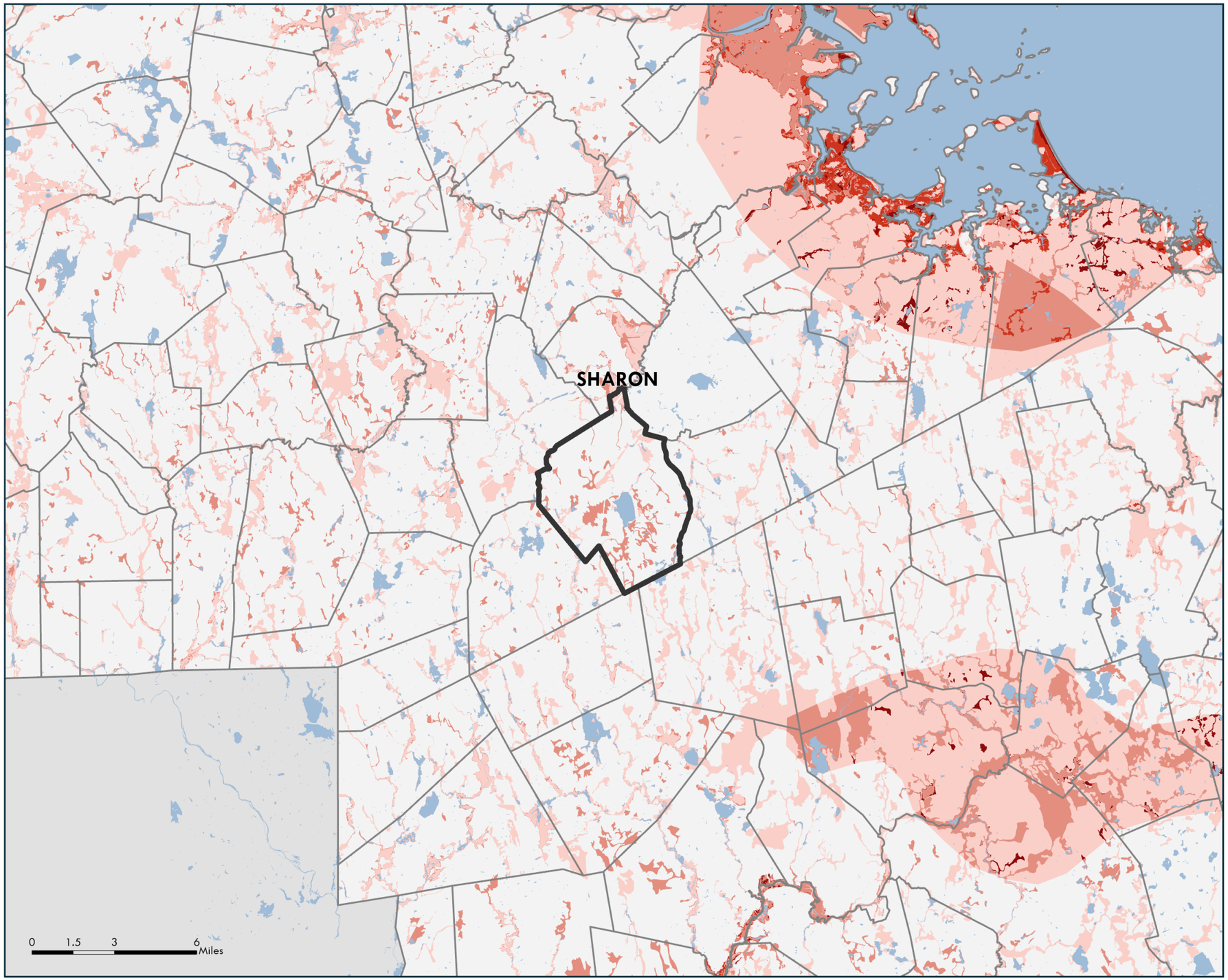

Map 7: Composite Natural Hazards

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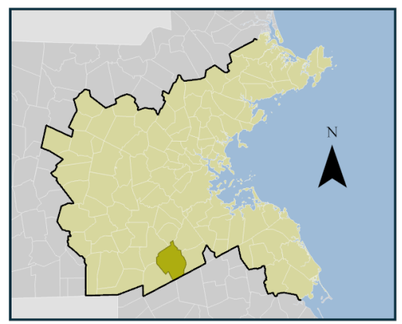
Composite Natural Hazards

- Low (2 Hazards)
- Moderate (3 Hazards)
- High (4 Hazards)
- Very High (5 Hazards)

Composite natural hazards shown for areas of existing development.
Hazards include:

- 100 year wind speed of 110 MPH or higher
- Moderate landslide risk
- FEMA flood zones (100 year and 500 year)
- Average snowfall of 36.1" or more
- Hurricane surge inundation areas



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Map 8:
Local Hazard Areas

MAPC

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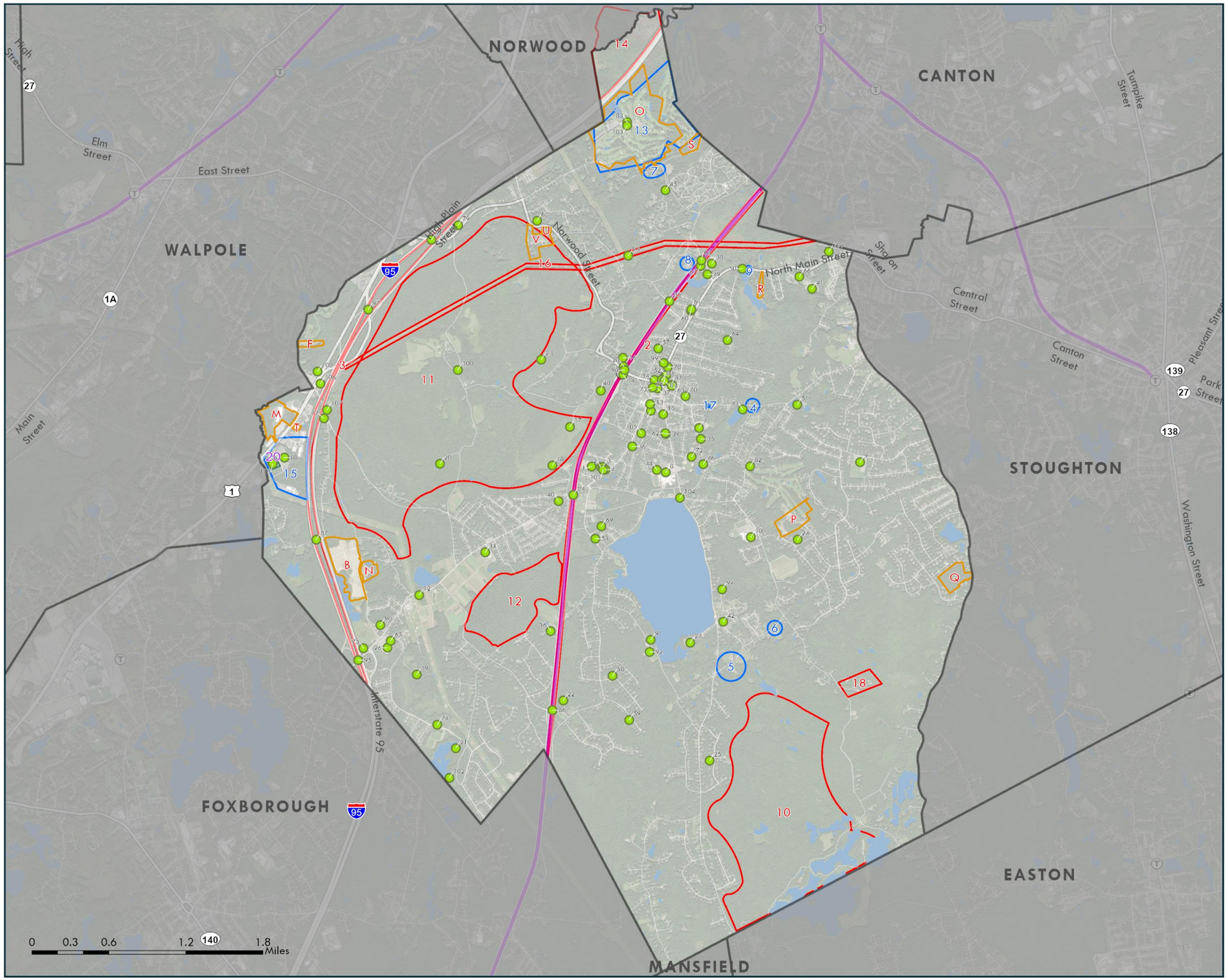
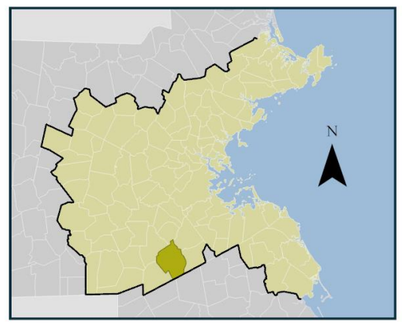


Critical Infrastructure*
Development Areas
* See details in separate table

Water Bodies
Commuter Rail

Hazard Areas

Type
- Brush Fire
- Flooding
- Other



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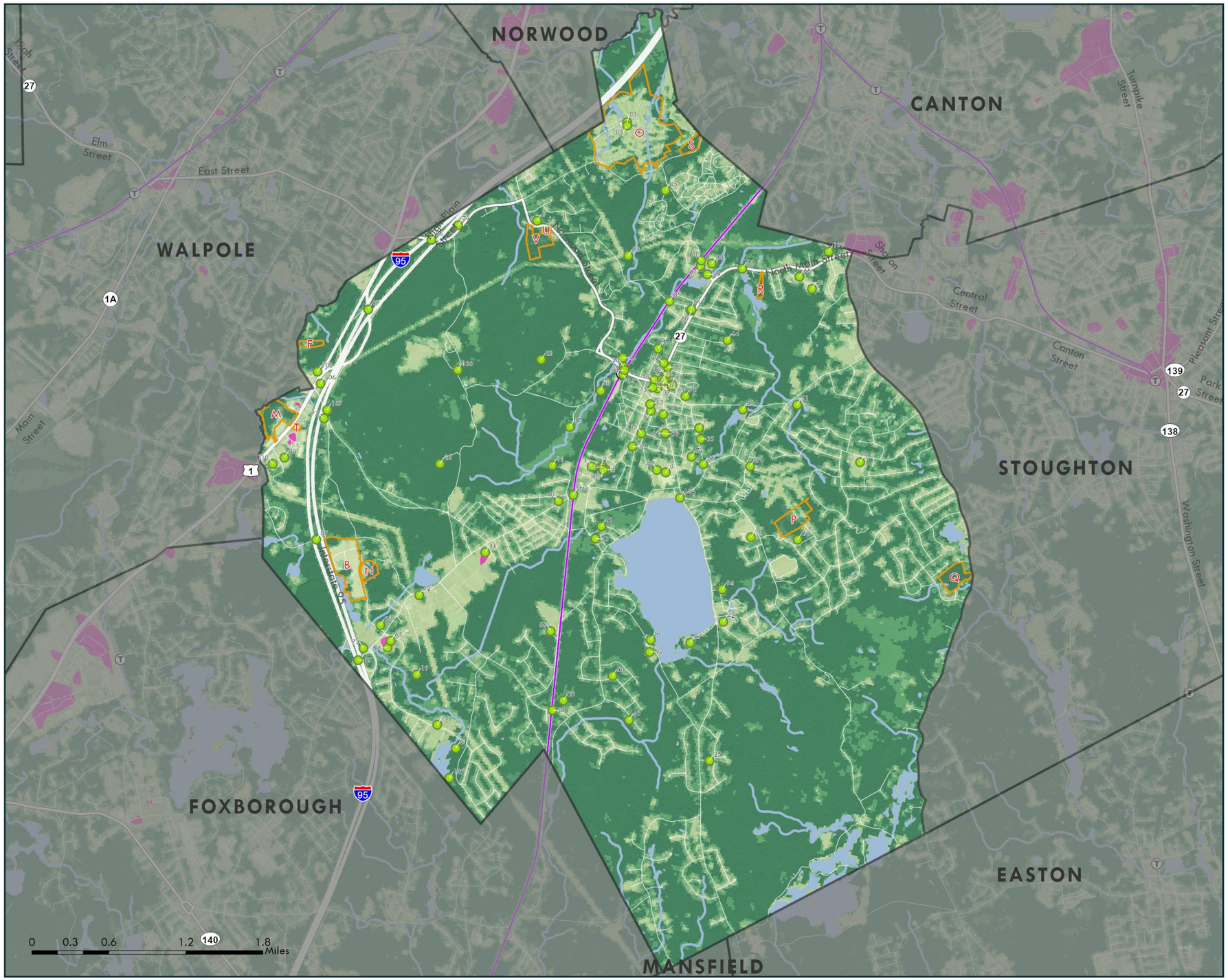

Map 9: Land Surface Temperature

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SHARON, MA

- Critical Infrastructure*
- Development Areas

* See details in separate table

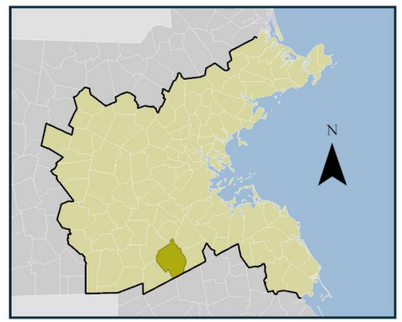
- Water Bodies
- Commuter Rail

Tree Canopy Coverage (2016 - 30m)

% Canopy Coverage

- 0 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%

- Hottest 5% of region's land area



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Map 10:
Wildfire Risk

MAPC

dcr

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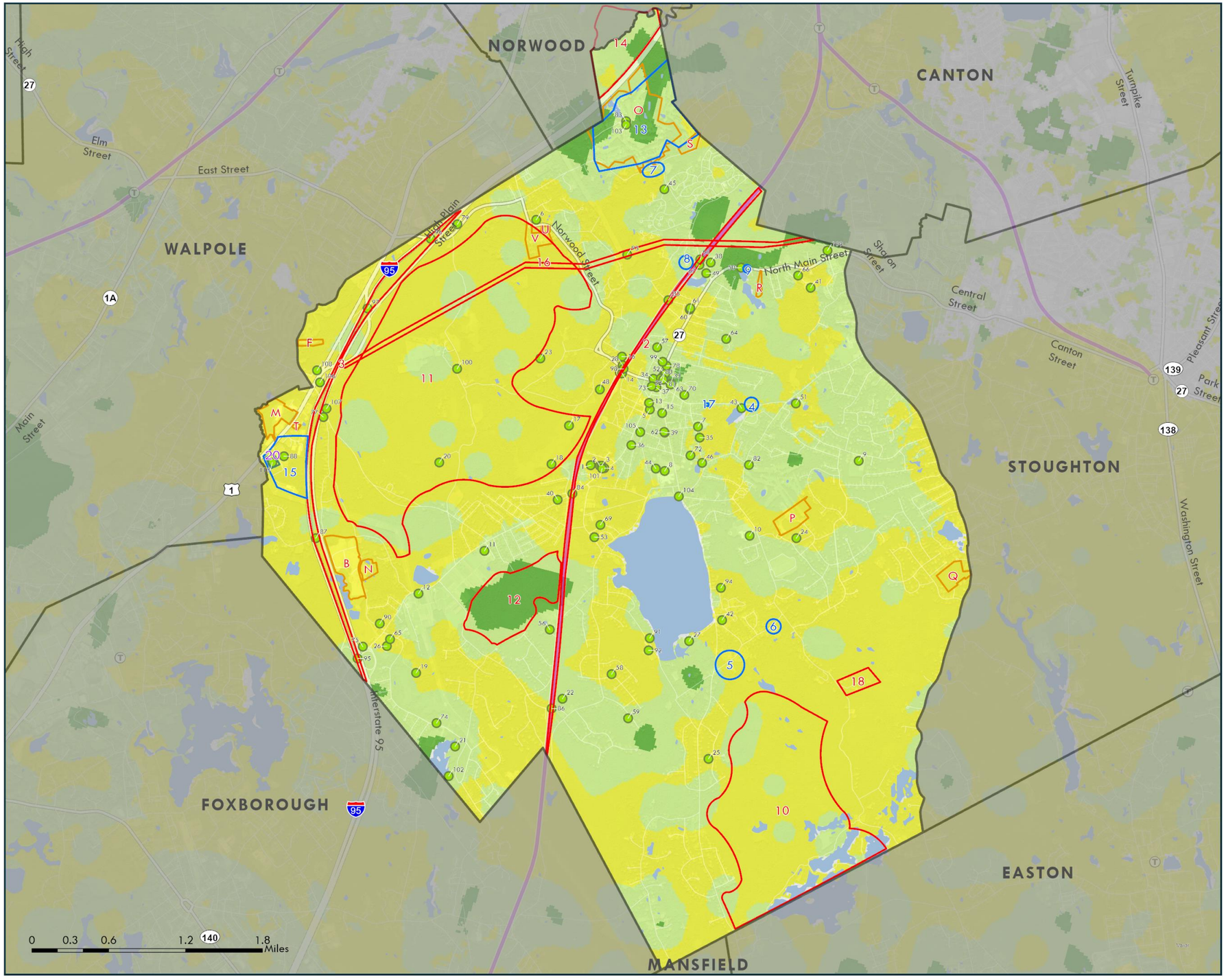


Critical Infrastructure*

Development Areas

* See details in separate table

Hazard Areas

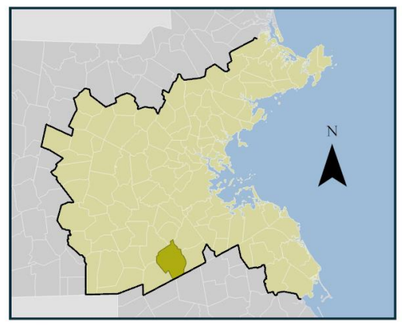
Type

- Brush Fire
- Flooding
- Other

USDA Wildfire Risk to Communities

Wildfire Hazard Potential

- N/A
- Very Low
- Low
- Moderate
- High
- Very High



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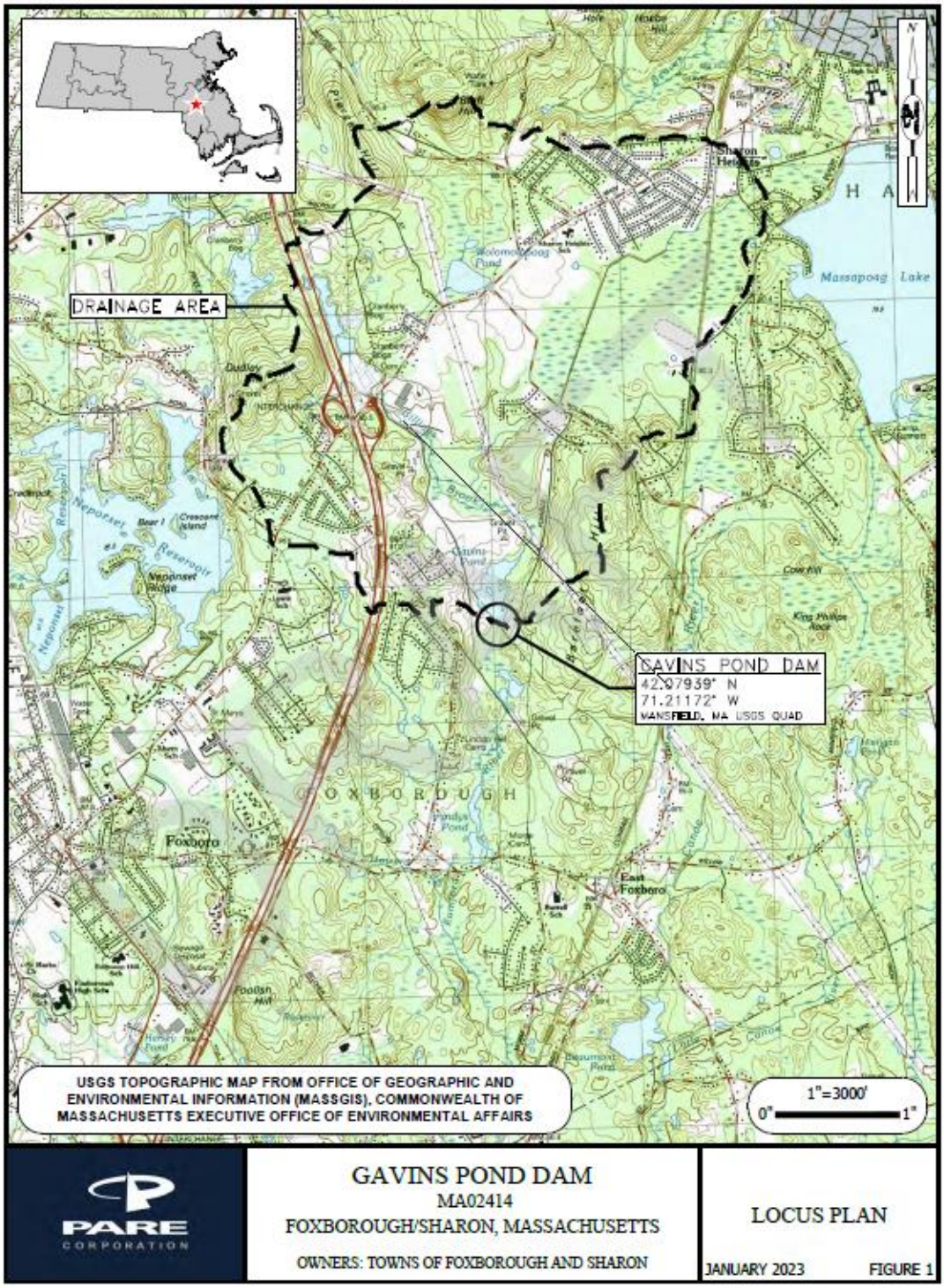
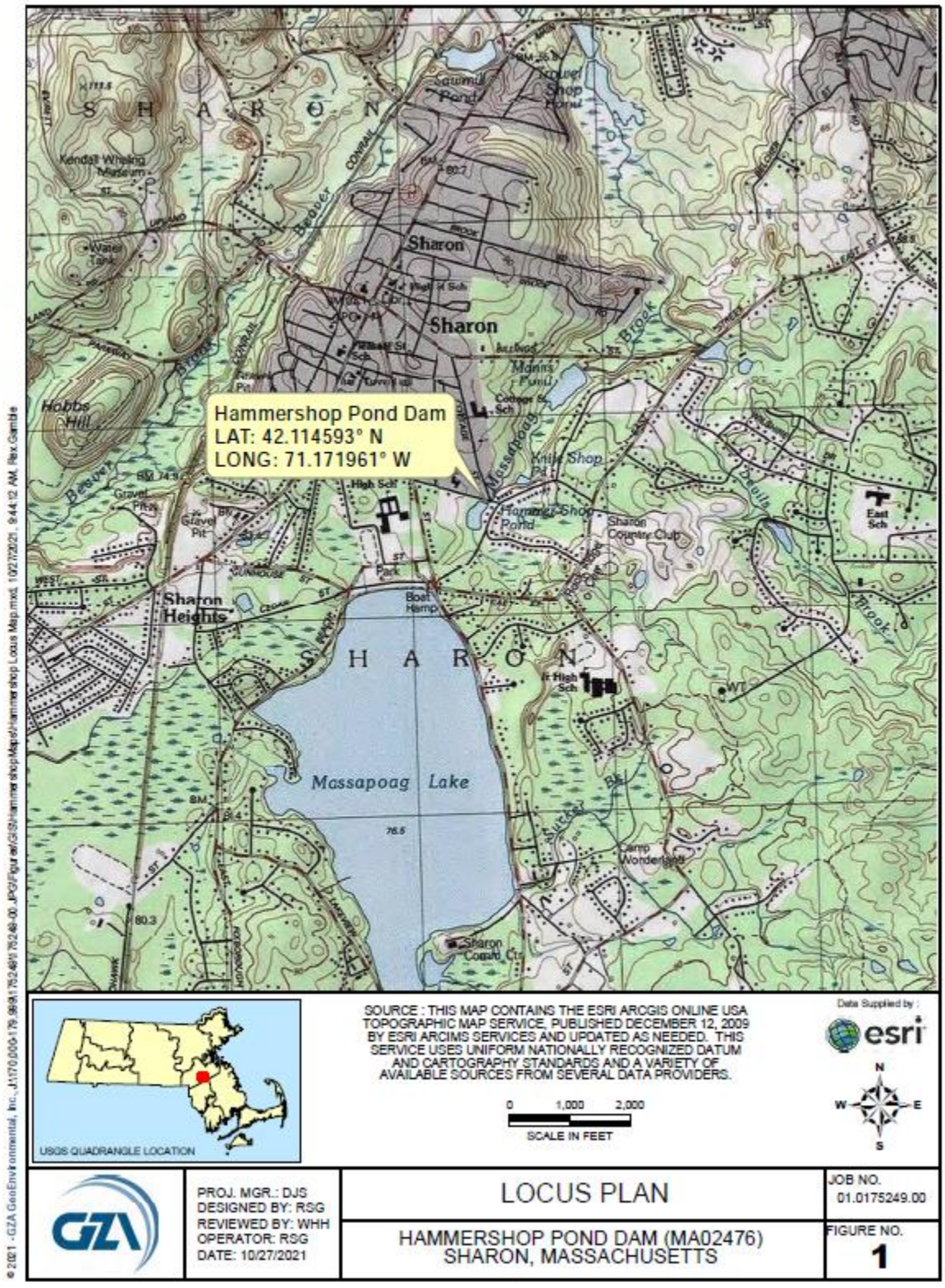
APPENDIX C:DAM REPORT MAPS

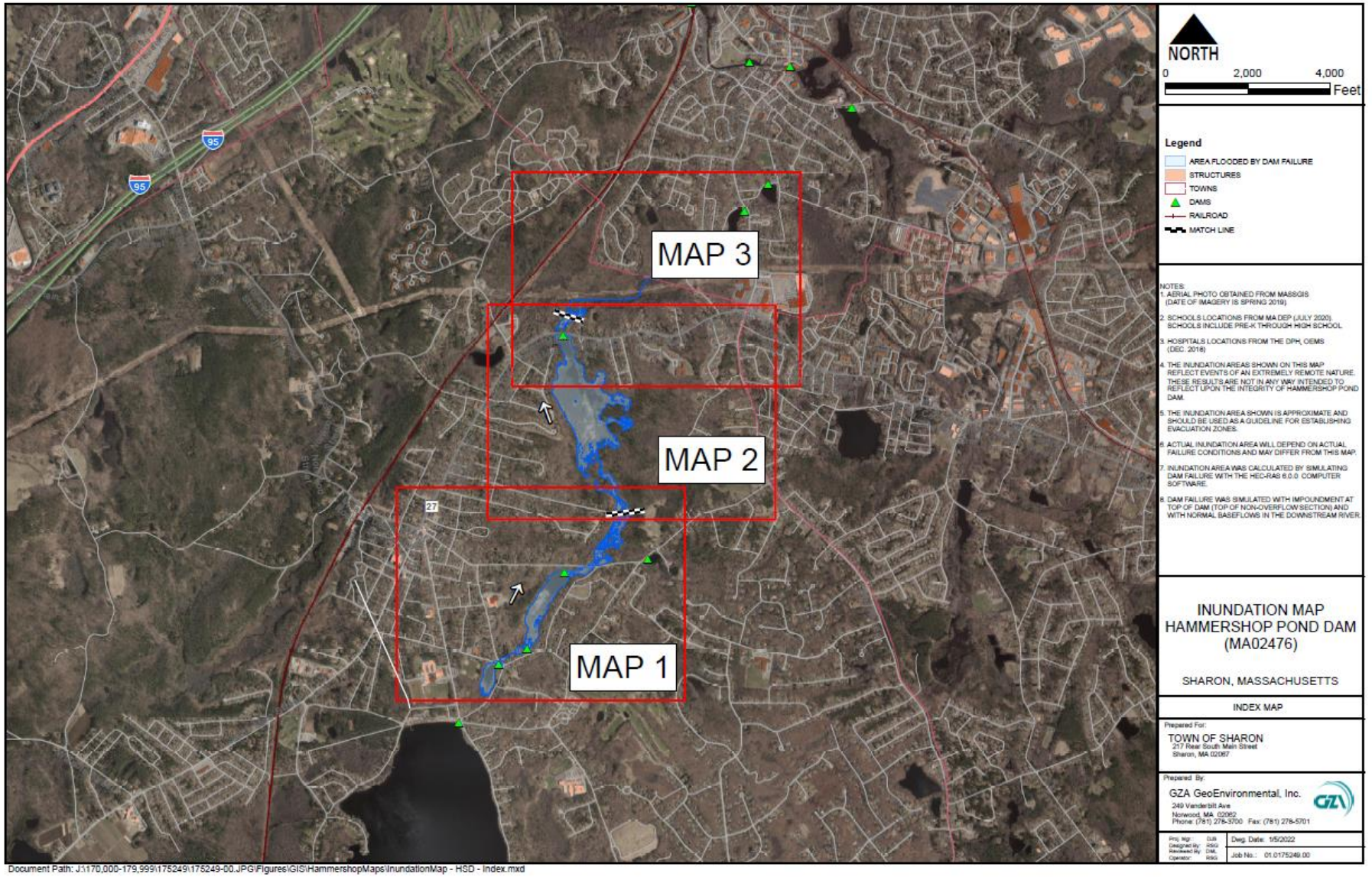
Map1. Gavins Pond Dam Locus Plan



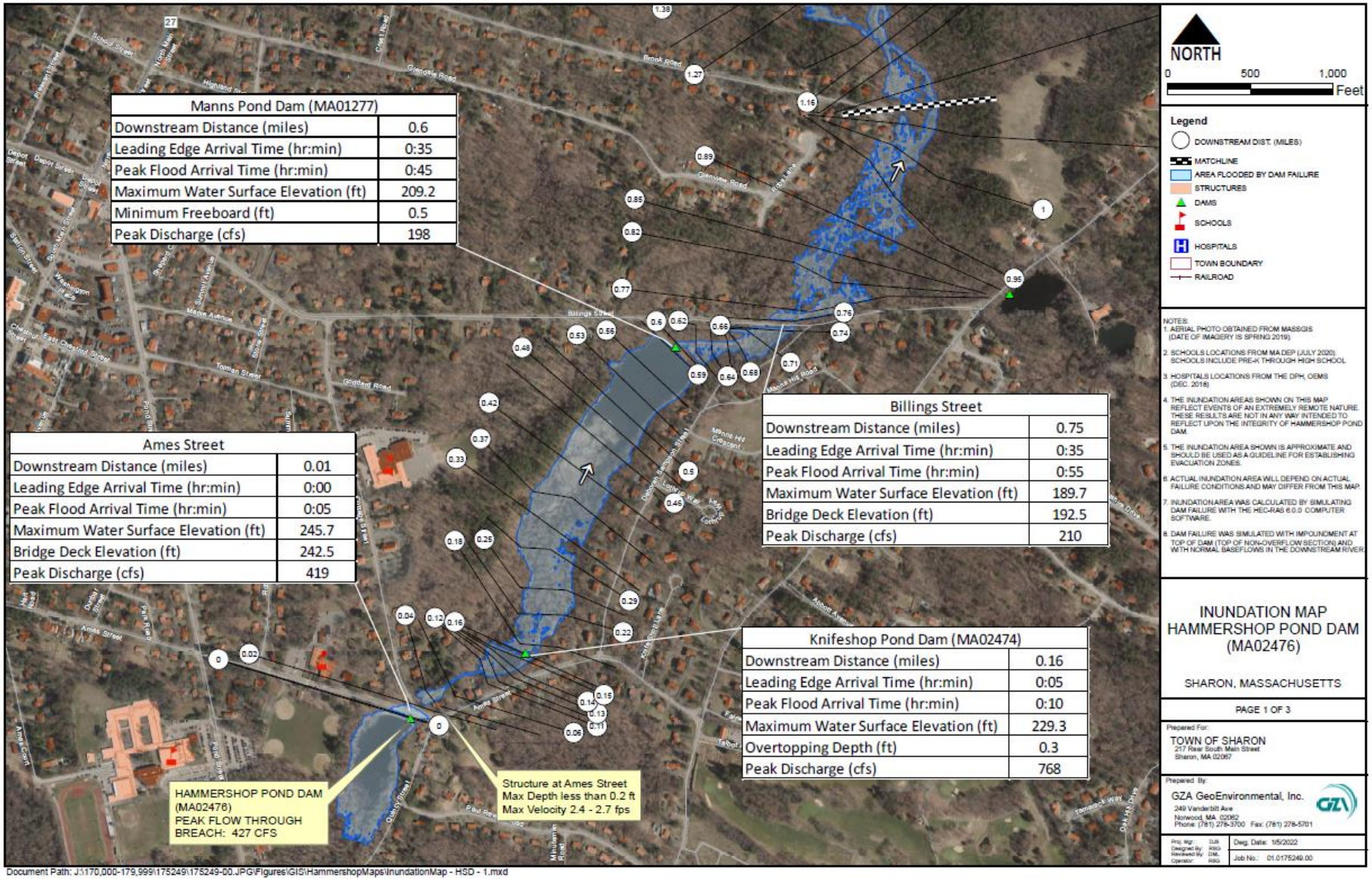
Map2. Hammershop Pond Dam Locus Plan



Map3. Hammershop Pond Dam Inundation Map



Map3-1. Hammershop Pond Dam Inundation Map 1



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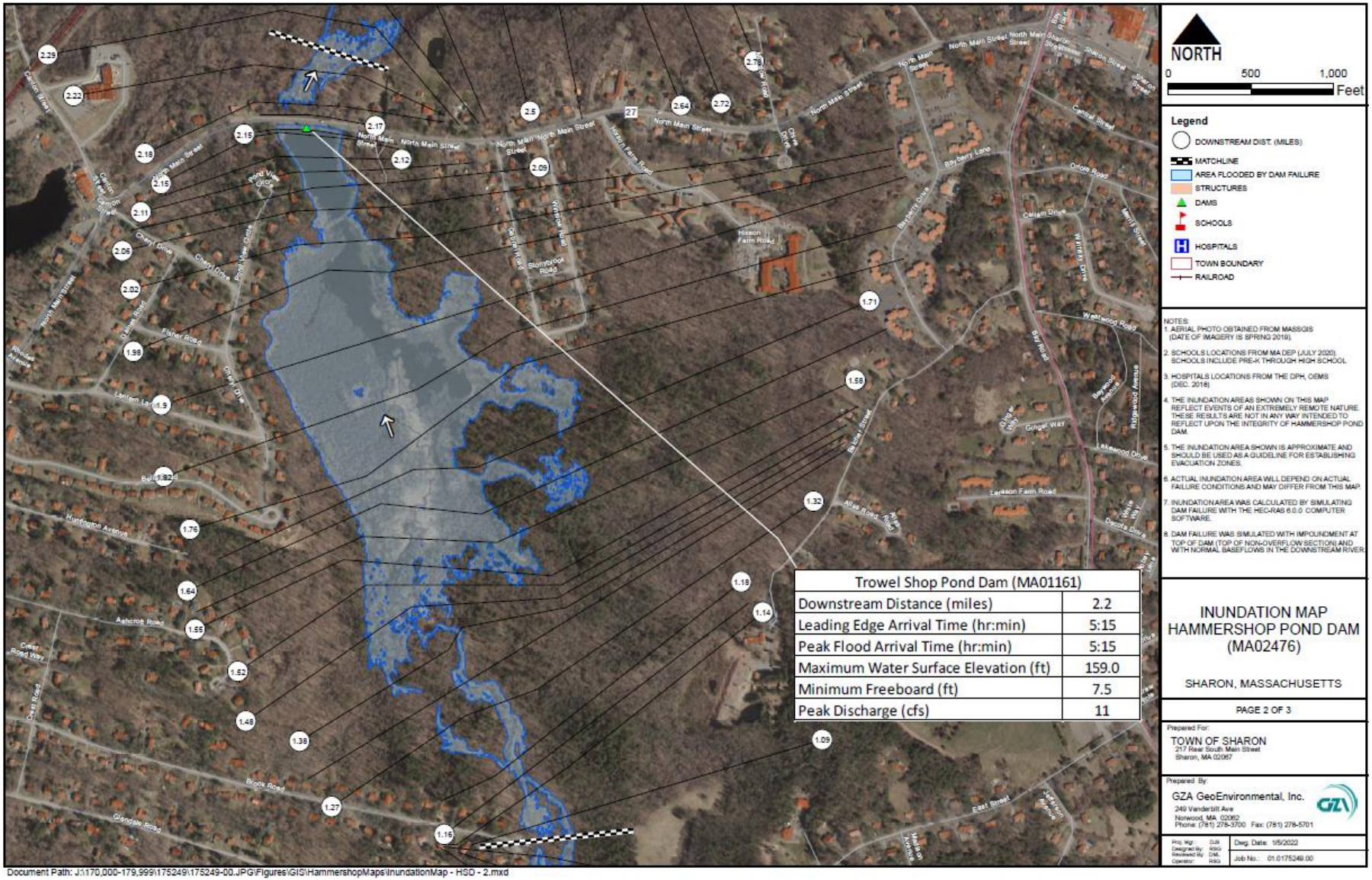
Map3-2. Hammershop Pond Dam Inundation Map 2



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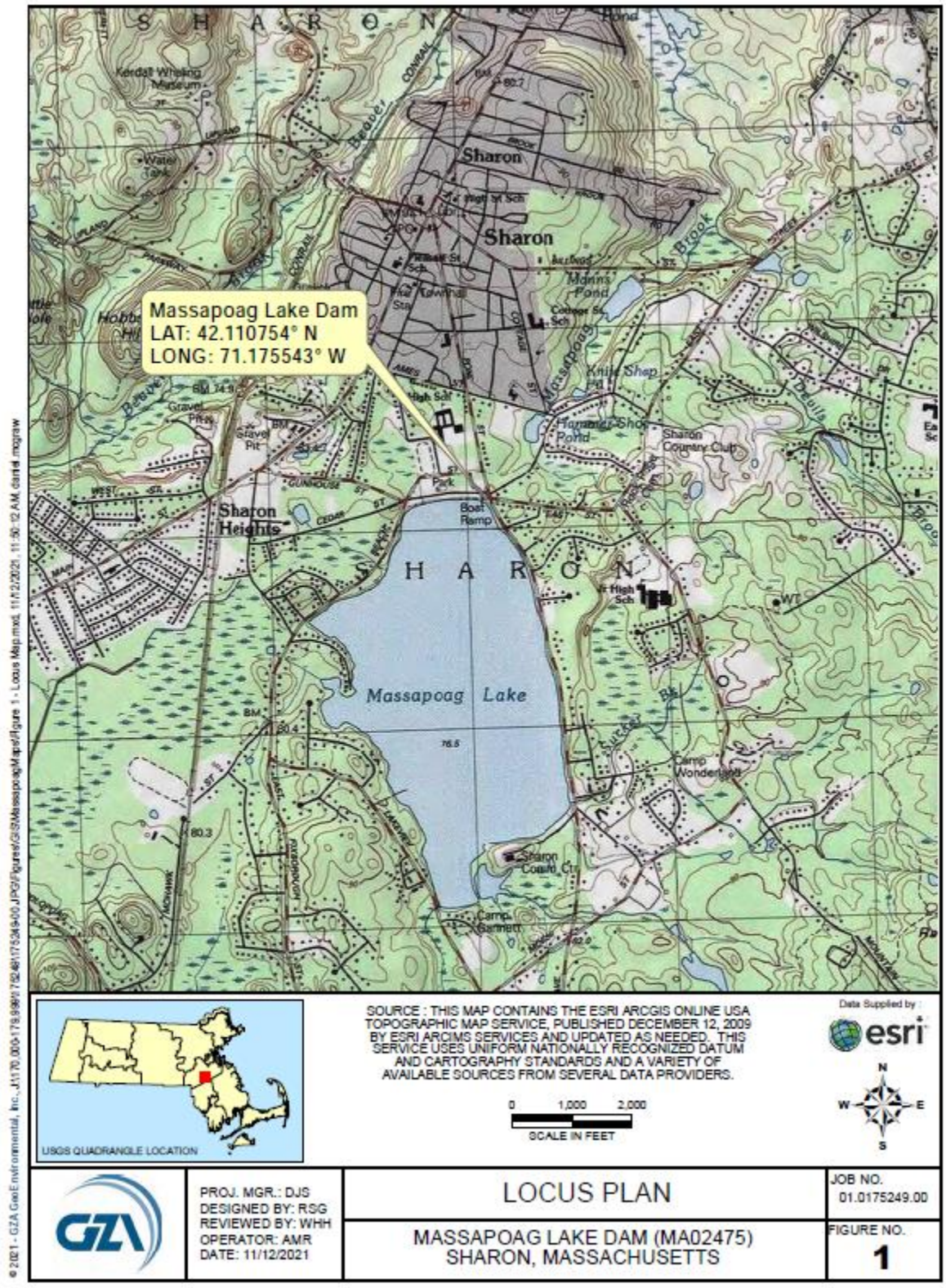
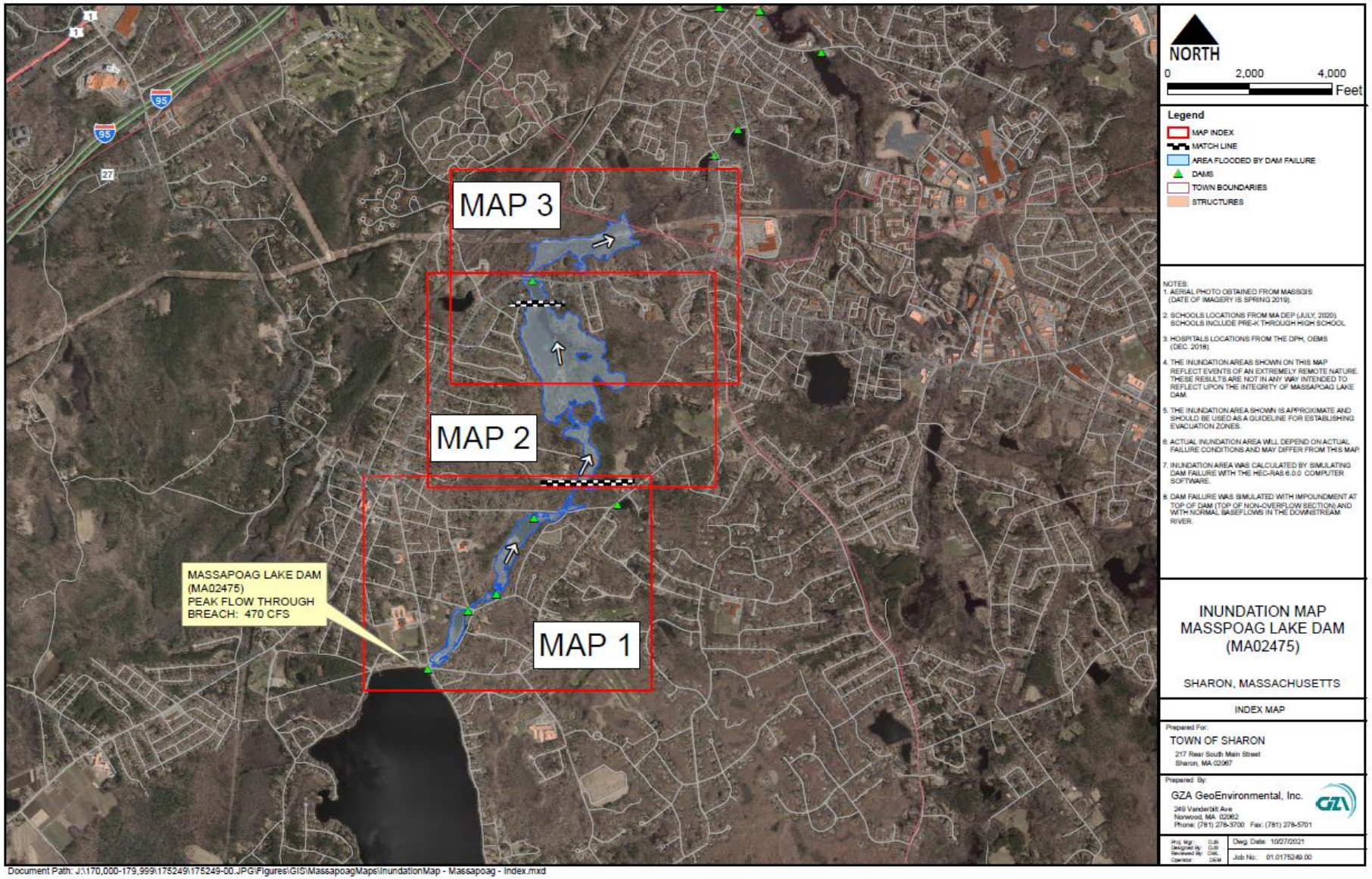
Map3-3. Hammershop Pond Dam Inundation Map 3

Document Path: J:\170,000-179,999\175249\175249-00.JPG\Figures\GIS\HammershopMaps\InundationMap - HSD - 3.mxd

Map4. Massapoag Lake Dam Locus Map



Map5. Massapoag Lake Dam Inundation Map



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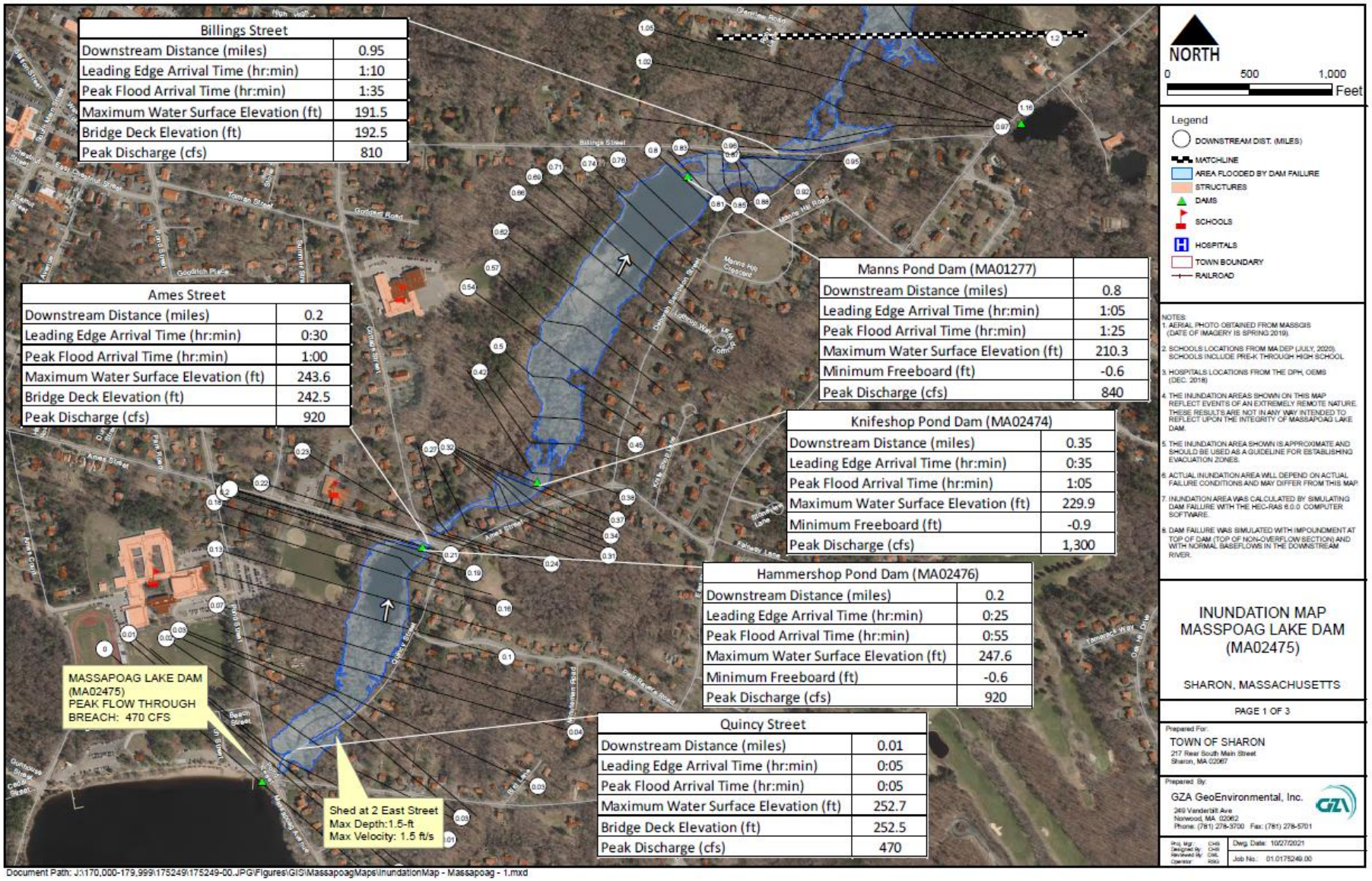
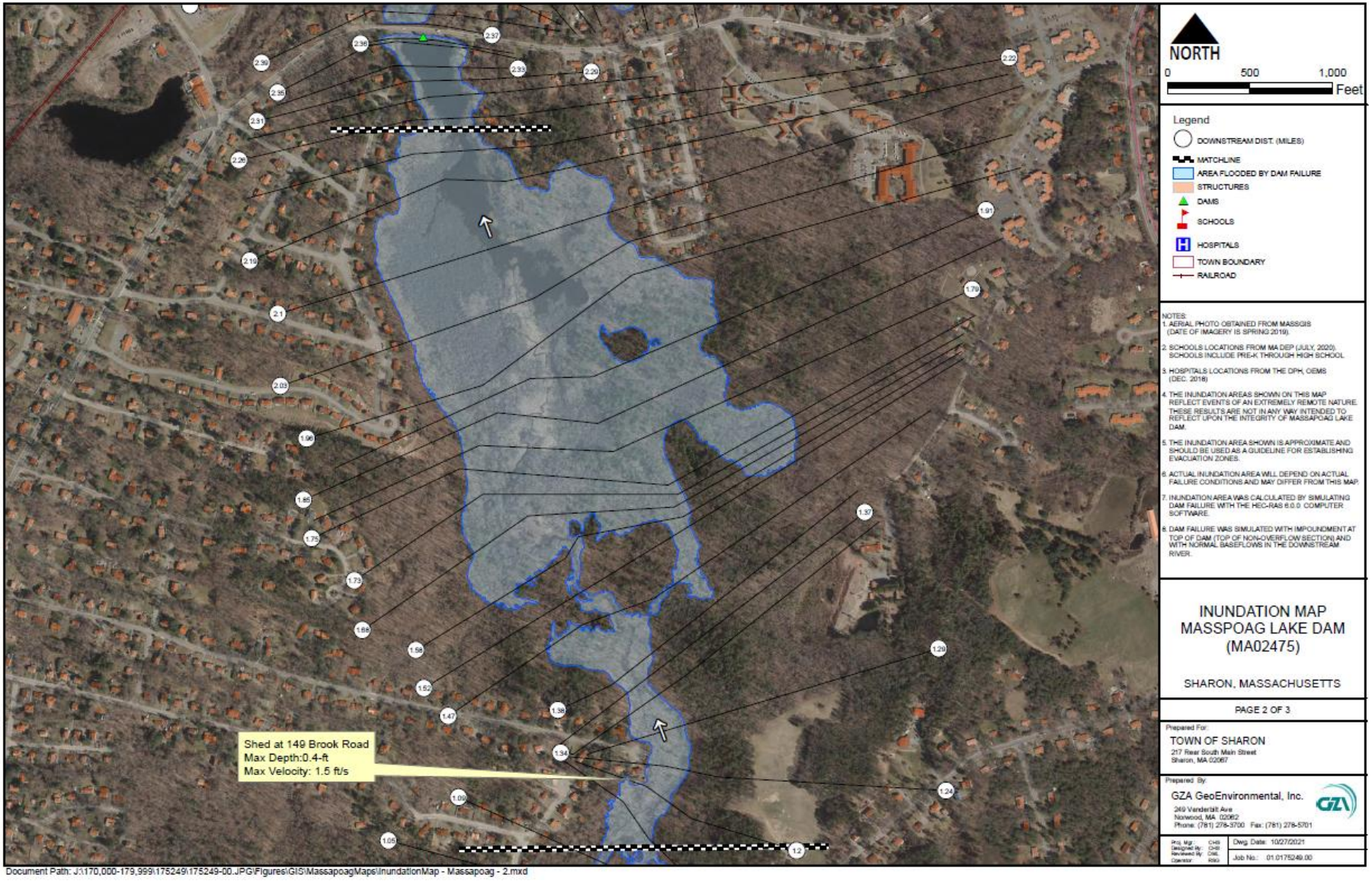
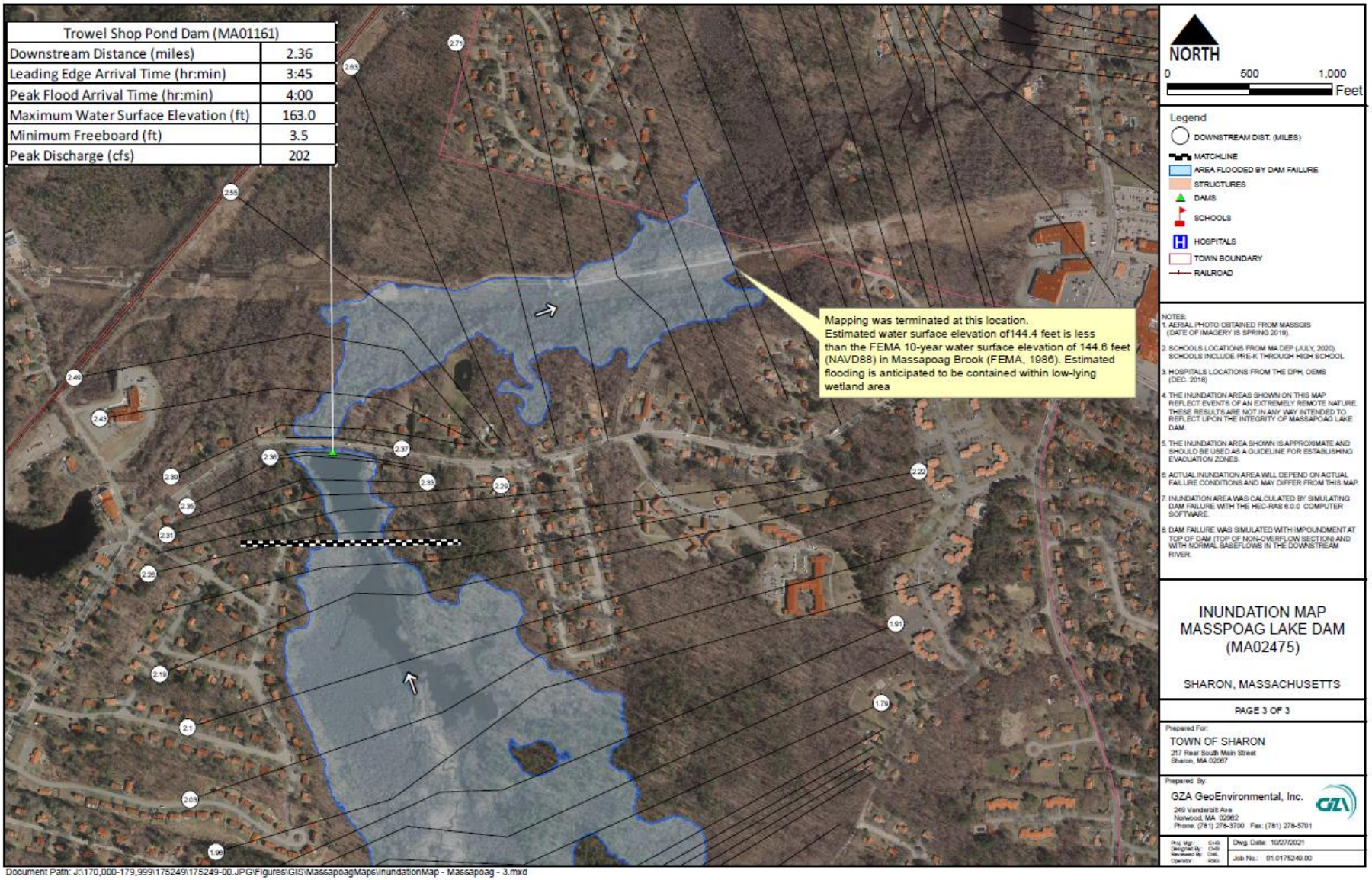
Map5-1. Massapoag Lake Dam Inundation Map 2



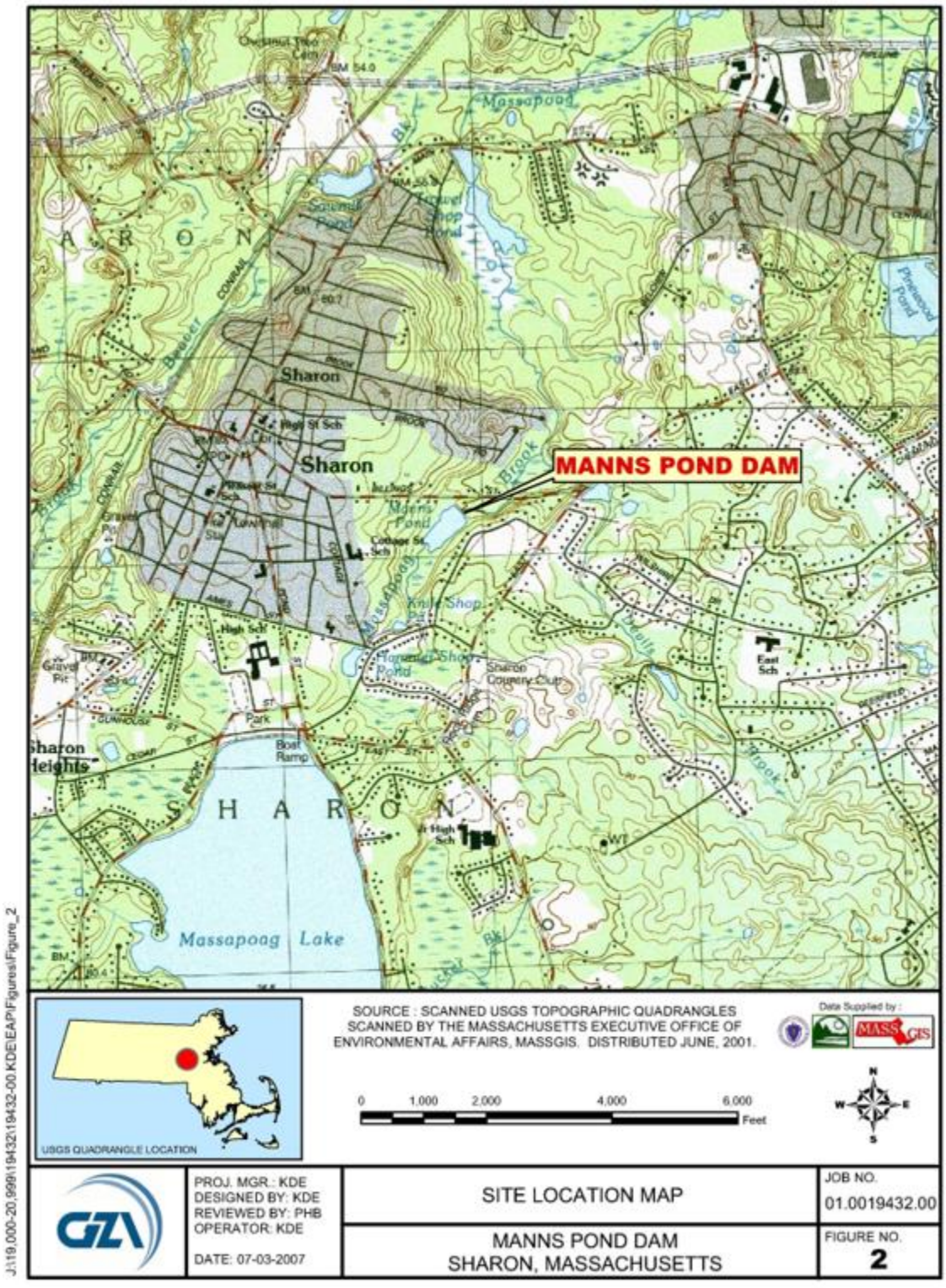
Map5-2. Massapoag Lake Dam Inundation Map 3



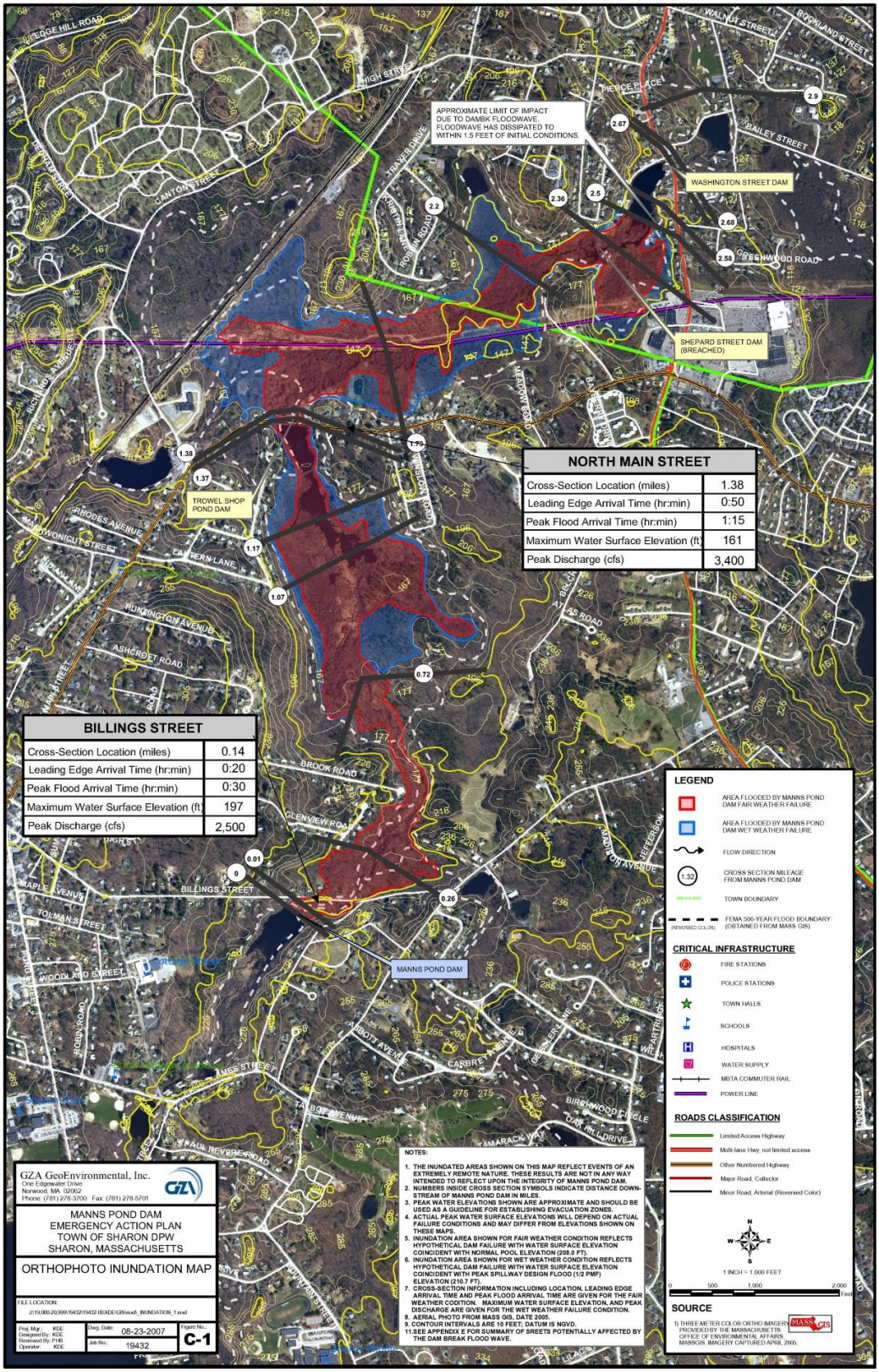
Map5-3. Massapoag Lake Dam Inundation Map 3



Map6. Manns Pond Dam Locus Map



Map7. Manns Pond Dam Inundation Map



APPENDIX D: PUBLIC PARTICIPATION

Sharon Hazard Mitigation Plan
Public Meeting

When: **Tuesday, December 19, 2023, 7:00 PM**

Online Zoom: https://zoom.us/j/5846487446?pwd=ZE45aUhrNXc3ayszKzVhcnBRR1BkZz09
Meeting ID: 584-648-7446 **Password: 02067**
By Phone: 1-312-626-6799 or 1-301-715-8592 or 1-929-205-6099
To mute or unmute yourself, Press *6

Sharon experiences natural hazards that can impact residents and businesses, including flooding, severe winter storms, and droughts.

The Town is updating its Hazard Mitigation Plan to assess vulnerability to natural hazards and strategies to increase the Town's resilience.

We want to hear from you! Join us at the meeting and tell us about your concerns for natural hazards and resilience actions the Town can take.

Please join us on December 19 !

If you have questions or comments, send an email to ResilientSharon@mapc.org

MAPC

Amanda Linehan, Communications Manager, Metropolitan Area Planning Council
617-933-0705, alinehan@mapc.org

CALENDAR LISTING / MEDIA ADVISORY

SHARON HAZARD MITIGATION PLAN TO BE DISCUSSED AT DECEMBER 19 PUBLIC MEETING

Who: Sharon residents, business owners, institutions, and non-profit organizations, and others interested in preventing and reducing damage from natural hazards.

What: At a public meeting on Tuesday, December 19 at 7:00 PM, a presentation on the Sharon Hazard Mitigation Plan Update will be given at a meeting of the Sharon Select Board. The meeting will be held online via Zoom, see details below. The presentation will be given by the Metropolitan Area Planning Council, which is assisting the Town's Hazard Mitigation Team prepare the plan.

The Town of Sharon is preparing an updated Hazard Mitigation Plan to document natural hazards that affect the Town, such as floods, hurricanes, nor'easters, and severe winter storms. The plan will recommend mitigation actions the Town can take to reduce its vulnerability to these natural hazards.

By preparing an updated Hazard Mitigation Plan, the Town of Sharon will be eligible for FEMA grants to fund mitigation projects such as drainage improvements.

When: **Tuesday, December 19, 2023, 7:00 PM**

Where: **Sharon Select Board Meeting**
Online meeting via Zoom:
https://zoom.us/j/5846487446?pwd=ZE45aUhrNXc3ayszKzVhcnBRR1BkZz09
Meeting ID: 584-648-7446
Password: 02067
By Phone: 1-312-626-6799 or 1-301-715-8592 or 1-929-205-6099 or
To mute or unmute yourself, Press *6

MAPC is the regional planning agency for 101 communities in the metropolitan Boston area, promoting smart growth and regional collaboration. More information about MAPC is available at www.mapc.org.

##

SHARON
MASSACHUSETTS

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Home

Sharon Hazard Mitigation Plan Update available online

POSTED ON: DECEMBER 21, 2023 - 6:00AM

The Town of Sharon is updating its Hazard Mitigation Plan to assess vulnerability to natural hazards such as flooding, severe storms and drought and create strategies to increase the town's resilience.

A presentation on the plan given on Dec. 19 is now available on the town website at this link.

If you have questions or comments send an email to SharonResilience@mapc.org.

TOWN OF SHARON
MEETING NOTICE

Posted in accordance M. G.L. c. 30A, §§ 18-25

RECEIVED
CLERK'S OFFICE
SHARON, MA 02067
2023 DEC 18 PM 3:05

SHARON SELECT BOARD
December 19, 2023 – 7:00 pm

****Important note** Sharon TV will record and broadcast virtual Board and Committee meetings on Sharon TV. If you elect to enable your webcam, your image and background may be broadcast with or without sound.**

Online	Meeting ID	Password
www.zoom.us	**584-648-7446**	02067

https://zoom.us/j/5846487446?pwd=ZE45aUhrNXc3ayszKzVhcnBRR1BkZz09

BY PHONE

1-312-626-6799	1-929-205-6099	1-253-215-8782
1-301-715-8592	1-346-248-7799	1-669-900-6833

To mute or unmute yourself, Press *6

Note: If you plan to also use your computer to see participants and shared documents, do not use computer audio since it will create an echo with your computer speakers.

REVISED AGENDA

Recitation of the Pledge of Allegiance

1. 7:00 pm — Public comment period
2. 7:10 pm — Board/Committee reappointment interviews
   a. Eliott Feldman, candidate for reappointment to Council on Aging Board
3. 7:20 pm — Hazard mitigation presentation by Metropolitan Area Planning Council
   a. Public notice
   b. Hazard mitigation plan adopted 2018
4. 7:40 pm — Update and report presentation by Governance Study Committee
   a. Report
5. 8:00 pm — Discuss changes to personnel bylaw with Personnel Board
   a. Bylaw draft
   b. Committee authority
6. 8:15 pm — Consider and vote to fill the vacancy on the Board of Registrars of Voters through March 30, 2024
   a. Ann Marie Sargent application
   b. Jana Katz application
7. 8:20 pm — Consider and vote on a renewal Class II Auto Dealer license for DC Auto Sales
   a. Renewal application
8. 8:30 pm — Review and approve consent calendar

Note: Items may not be discussed in the order listed or at the specific time estimated. Times are approximate. The meeting will be recorded for later broadcast by Sharon Community Television.

TO: Town of Sharon Select Board and MAPC
FROM: Lake Massapoag Advisory Committee
RE: Comments on Hazard Mitigation Plan
DATE: March 20, 2024 (updated from December 19, 2023)

During December and January, Sharon had four intense tropical rainstorms which registered about 3" each from Ambient weather stations in homes near the lake, along with strong winds, localized flooding, many downed trees, and power outages. These are obvious climate hazards.

Accompanying all this runoff there is an ***invisible hazard*** we need to face: the ***runoff of excess nutrients*** from the watershed into Lake Massapoag, especially ***phosphorus,*** which accumulates deep in ***lake sediment*** and feeds ***cyanobacteria blooms.***

Two lake area residents shared photos and videos of water overwhelming the storm drains and running into the lake on Beach St. at the bottom of Lake Ave, and of a large pool that sits on Beach Rd, which as a private way has no storm drains. After every major storm there was severe beach and sand erosion at Veterans Memorial Park Beach, along with deepening ruts in the parking lots.

As you may recall, a lakewide cyanobacteria bloom closed the lake for over two weeks in July 2021, following the first of three heavy tropical storms that also led to high E. coli counts at Community Center Beach (CCB). In every season since, there have been repeated localized blooms from late August-late October, requiring posting of caution signs to stay out and move to a clear area, and CCB was closed to swimming starting in 2023.

LMAC is doing extensive testing to document phosphorus and *E. coli* levels at its many inflows, where high levels are routinely recorded, and professional testing of water quality in the Deep Hole and lake coves. We are again on a path toward eutrophication of Lake Massapoag. In 1984, a comprehensive diagnostic study by IEP said that without action, Lake Massapoag would become eutrophic by the year 2000 - dead from lack of oxygen as algae and weeds became overgrown. ***The Town made significant investments to implement many of its recommendations, and we gained nearly 40 years of lake health***.

We are at a crossroads again, due to continued development and climate change. LMAC applied for and received two state grants to develop a ***Watershed-Based Plan for a Resilient Lake Massapoag 2025-2050,*** with funding from an EEA MVP Action Grant and a DEP 604b Watershed Planning Grant, and matching funds from the Town and Community Preservation Commission.

A Resilient Sharon needs a Resilient Lake

Here are LMAC's recommendations for Sharon's Hazard Mitigation plans:

- The Town's Hazard Mitigation Plan should prominently ***include hazard mitigation to the lake*** via mitigation of increased runoff of phosphorus, excess nutrients, septic seepage, etc. and its impact on cyanobacteria, bacteria, and invasive weeds.
- All of the Town's development, open space, recreation, zoning, etc. plans should ***include lake impacts*** and how to protect it and incorporate the recommendations of the Watershed-Based Plan 2025-2050 we are now developing.
- Core sediment testing funded by CPC this November found high levels of iron-bound phosphorus in deep lake sediment. Iron releases phosphorus in low oxygen conditions, which occur in parts of the lake below 20 feet deep as temperatures rise during the summer. A pending FY25 $525,000 CPC grant for a high-dose alum treatment in March 2025 will address ***internal loading of accumulated phosphorus***. Mitigation is expensive.
- The Watershed-Based Plan will include recommendations for priority projects to reduce ***external loading of phosphorus*** via best management practices (BMP) and green infrastructure projects; state funding is available and requires local match.
- LMAC is launching a ***Love our Lake campaign*** to reduce residential nutrients and runoff, with details in our newsletter sent with Town water bills, and information via Town announcements, the lake website, www.lakemassapoag.net, partner organizations, and social media.
- We have begun talking with legislators to ***increase the ability of towns to enact nutrient reduction measures*** that have been authorized on Cape Cod and the Islands for years, and to update and reform measures needed for timely permitting.

LMAC's Lake Dashboard below highlights high phosphorus and *E. coli* readings from this year's June-October 2023 season. For additional information, see the Lake website noted above and LMAC's page on the town website, https://www.townofsharon.net/lake-massapoag-advisory-committee.

Lake Massapoag Dashboard: June - Oct YTD 2023

Lake Level: Av 10.2, Range (9.6-10.8)

Flume Depth: Av 1.38, Range (.8-2.6)

High E coli (E): 17 samples

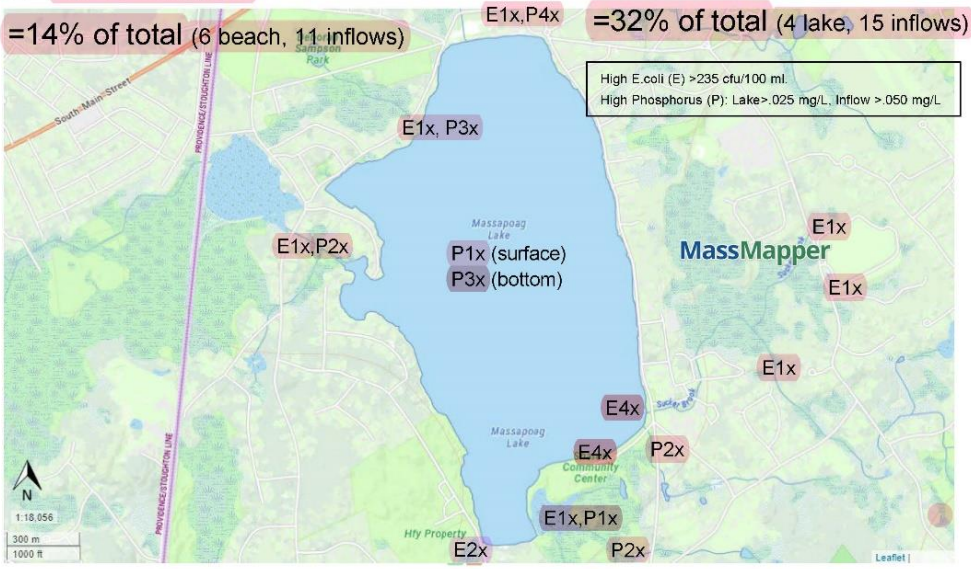
=14% of total (6 beach, 11 inflows)

Conditions: More Rain, More Heat

[vs.1891-2020 average]

High Phosphorus (P): 19 samples

=32% of total (4 lake, 15 inflows)



E = High E. coli at beaches: Community Center Beach 4x 6/26, 7/17, 8/7, 9/5; Everwood/Gannett 6/12, Everwood 7/17.

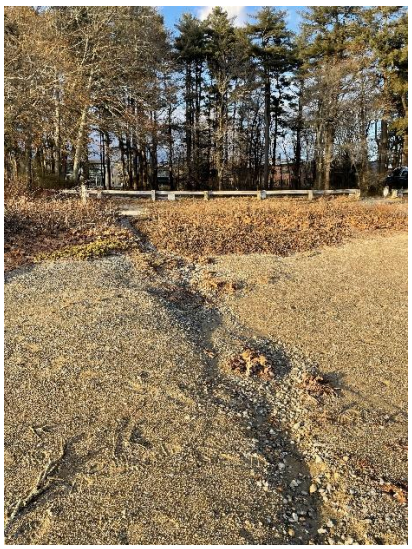
E = High E. coli at inflows: Sucker Brook 4x 6/27, 7/17, 8/31, 9/25; Opp 123 Beach, Longmeadow, Landfill S, Landfill N 6/27; Lagoon, 140 E. Foxboro, Wetland/SHS 7/17.

P = High phosphorus in lake: Deep Hole (surface) 5/17; Deep Hole (bottom) 5/17, 7/17, 9/18.

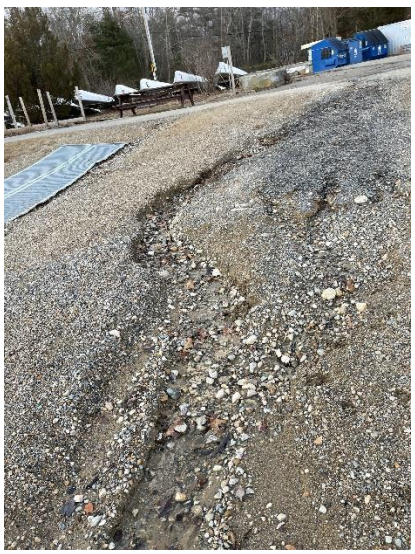
P = High phosphorus inflows: Wetland/SHS 4x 6/20, 6/27, 8/31, 9/26; Opp 123 Beach 3x 6/27, 8/31, 9/26; 240 Massapoag 3x 6/27, 9/26, 10/23; 140 E. Foxboro 2x 6/27, 9/26; opp 3 Capen Hill 2x 8/31, 9/26; Lagoon 1x 6/13.

Examples of Flooding and Beach Erosion December 2023 – January 2024

Lake Ave/Beach Street
12/12/23



Memorial Beach East
1/13/24



Memorial Beach West
1/13/24

Sharon Hazard Mitigation Plan
Public Meeting

When: **Tuesday, June 25, 2024, 7:00 PM**

Online Zoom: https://zoom.us/j/5846487446?pwd=ZE45aUhrNXc3ayszKzVhcnBRR1BkZz09
Meeting ID: 584-648-7446 **Password: 02067**
By Phone: 1-312-626-6799 or 1-301-715-8592 or 1-929-205-6099
To mute or unmute yourself, Press *6

Sharon experiences natural hazards that can impact residents and businesses, including flooding, severe winter storms, and droughts.

The Town has prepared an updated FEMA Hazard Mitigation Plan to assess vulnerability to natural hazards and identify strategies to increase the Town's resilience.

We want to hear from you! Join us at the online meeting on **June 25** for a presentation of the plan. The draft plan will be available online and comments are welcome at SharonResiliene@mapc.org

If you have questions or comments, send an email to SharonResilience@mapc.org

MAPC

Dear Town Clerks of Mansfield, Easton, Stoughton, Canton, Walpole, and Foxborough,

The Town of Sharon has prepared the 2024 update of the Sharon Hazard Mitigation Plan, which is intended to reduce the Town's vulnerability to natural hazards such as flooding, drought, hurricanes, and winter storms. The plan identifies recommend hazard mitigation measures, including infrastructure improvements, regulatory measures, and educational and outreach efforts related to natural hazards.

As part of the planning process, as required by FEMA, Sharon's neighboring municipalities are being notified of a public presentation on the draft plan to be held on zoom. The meeting will be held as follows:

- Date: **June 25, 2024, 7:00PM**
- Location: Zoom (https://zoom.us/j/5846487446?pwd=ZE45aUhrNXc3ayszKzVhcnBRR1BkZz09)

A flyer announcing the meeting with the above information is also attached.

After the public meeting, the draft plan will be available online on the MAPC's website for public review, and questions and comments are welcome.

Thank you,

Jiwon Park
Regional Land Use Planner II
jpark@mapc.org
Pronouns: she, her, hers

Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111
www.mapc.org

APPENDIX E: PLAN ADOPTION

<TOWN LETTERHEAD>

CERTIFICATE OF ADOPTION
Select Board
TOWN OF SHARON, Massachusetts

A RESOLUTION ADOPTING THE
TOWN OF SHARON HAZARD MITIGATION PLAN 2024 UPDATE

WHEREAS, the Town of Sharon established a Committee to prepare the *Town of Sharon Hazard Mitigation Plan 2024 Update*; and

WHEREAS, the *Town of Sharon Hazard Mitigation Plan 2024 Update* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Sharon, and

WHEREAS, duly-noticed public meetings were held by Select Board on December 19, 2023 and June 25, 2024.

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

NOW, THEREFORE BE IT RESOLVED that the Town of Sharon Select Board adopts the *Town of Sharon Hazard Mitigation Plan 2024 Update*, in accordance with M.G.L. 40 §4 or the charter and bylaws of the Town of Sharon.

ADOPTED AND SIGNED this Date. _____

Name(s)

Title(s)

Signature(s)

ATTEST