TOWN OF MEDFIELD
HAZARD MITIGATION PLAN

DRAFT PLAN
MAY 2019

PREPARED FOR:
TOWN OF MEDFIELD
459 MAIN STREET
MEDFIELD, MA 02052

PREPARED BY:
METROPOLITAN AREA PLANNING COUNCIL
60 TEMPLE PLACE
BOSTON, MASSACHUSETTS 02111
TEL 617.933.0700
WWW.MAPC.ORG

ACKNOWLEGEMENT AND CREDITS

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MAPC Officers

President	Keith Bergman, Town of Littleton
Vice President	Erin Wortman, Town of Stoneham
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Executive Director	Marc Draisen, MAPC

Thanks for the assistance of the following individuals:

MAPC Staff Credits

Senior Environmental Planner	Darci Schofield
Mapping/GIS Services	Darci Schofield

Massachusetts Emergency Management Agency

Director	Kurt Schwartz

Department of Conservation and Recreation

Commissioner	Carol I. Sanchez

Medfield Local Hazard Mitigation Planning Core Team

Kristine Trierweiler	Town Administrator
Sarah Raposa	Town Planner
Maurice Goulet	Director, Public Works
John Wilhelmi	Deputy Police Chief
William Carrico	Fire Chief
Amy Colleran	Facilities Director
Gary Pelletier	Building Commissioner
Leslie Willitts	Conservation Agent
Jeffrey Marsden	Superintendent, Medfield Public Schools
Michael LaFrancesca	Director of Finance and Operations, Medfield Public Schools
Roberta Lynch	Director, Council on Aging
Jon Cogan	Veterans Agent
Ann Thompson	Resident

Public Meeting Participants and Community Stakeholders

Special thanks to the public meeting participants and community stakeholders who provided feedback.

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EXECUTIVE SUMMARY

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

PLANNING PROCESS

This is the Town of Medfield's Natural Hazard Mitigation Plan update from its 2011 plan performed in conjunction with the Town's Municipal Vulnerability Preparedness (MVP) planning effort. MVP is a Commonwealth of Massachusetts program administered by the Executive Office of Energy and Environmental Affairs to help communities understand their vulnerabilities to the impacts of climate change and take action to minimize damage from climate change events. Planning for the Hazard Mitigation Plan was led by the Medfield Local Hazard Mitigation Core Team, composed of staff from a number of different Town Departments. This team also served as the Core Team to the MVP Planning process and met on October 16, 2019, December 22, 2019 and May 6, 2019. The team discussed where the impacts of natural hazards most affect the Town and its critical facilities, goals for addressing these impacts, updates to the Town's existing mitigation measures and new hazard mitigation measures that would benefit the Town for today and with our projected changing climate.

Public participation in this planning process is important for improving awareness of the potential impacts of natural hazards and climate change and to build support for the actions the Town takes to mitigate them. The Town hosted two public meetings at a meeting of the Board of Selectmen. The first was on February 19. 2019 and the second on May 28, 2019. The draft plan update was posted on the Town's website for public review for two weeks. Key town stakeholders and neighboring communities were notified and invited to review the draft plan and submit comments. [Public Comments]

RISK ASSESSMENT

The Medfield Hazard Mitigation Plan Update assesses the potential impacts to the Town from inland and riverine flooding, high winds, winter storms, brush fire, geologic hazards, extreme temperatures, drought, and climate change. Flooding, driven by extreme precipitation events and excessive precipitation, Nor'easters, Blizzards, and other storms, clearly present the greatest hazard to the Town. These are shown on the map series (Appendix B).

The Medfield Local Hazard Mitigation Core Team identified 53 Critical Facilities. These are also shown on the map series and listed in Table 22, identifying which facilities are located within the mapped hazard zones.

A HAZUS-MH analysis provided estimates of damages from Hurricanes of 1% and 0.2% Annual Chance at $16 million and $56 million respectively. Earthquakes of magnitudes 5 and 7 analysis provided $290 million and $2.16 billion respectively in property damages. Flood damage from riverine flooding for the 1% and the 0.2% Annual Chance Flood is $6.73 million and $14.7 million respectively.

HAZARD MITIGATION GOALS

The Medfield Local Hazard Mitigation Planning Team identified the following hazard mitigation goals for the Town:

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, MEMA, and EEA to educate town staff and the public about hazard mitigation.

9. Prepare for the impacts of climate change. Align and implement the Natural Hazard Mitigation Plan and Municipal Vulnerability Preparedness mitigation and action items.

HAZARD MITIGATION STRATEGY

The Medfield Local Hazard Mitigation Core Team identified a number of mitigation measures and climate resilience actions that would serve to reduce the Town's vulnerability to natural hazard events and climate change. Overall, the hazard mitigation strategy recognizes that mitigating hazards for Medfield 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. Climate change and a variety of other factors impact the Town's vulnerability, 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 is incorporated into its Municipal Vulnerability Preparedness plan and other Town plans and policies.

PLAN REVIEW & UPDATE PROCESS

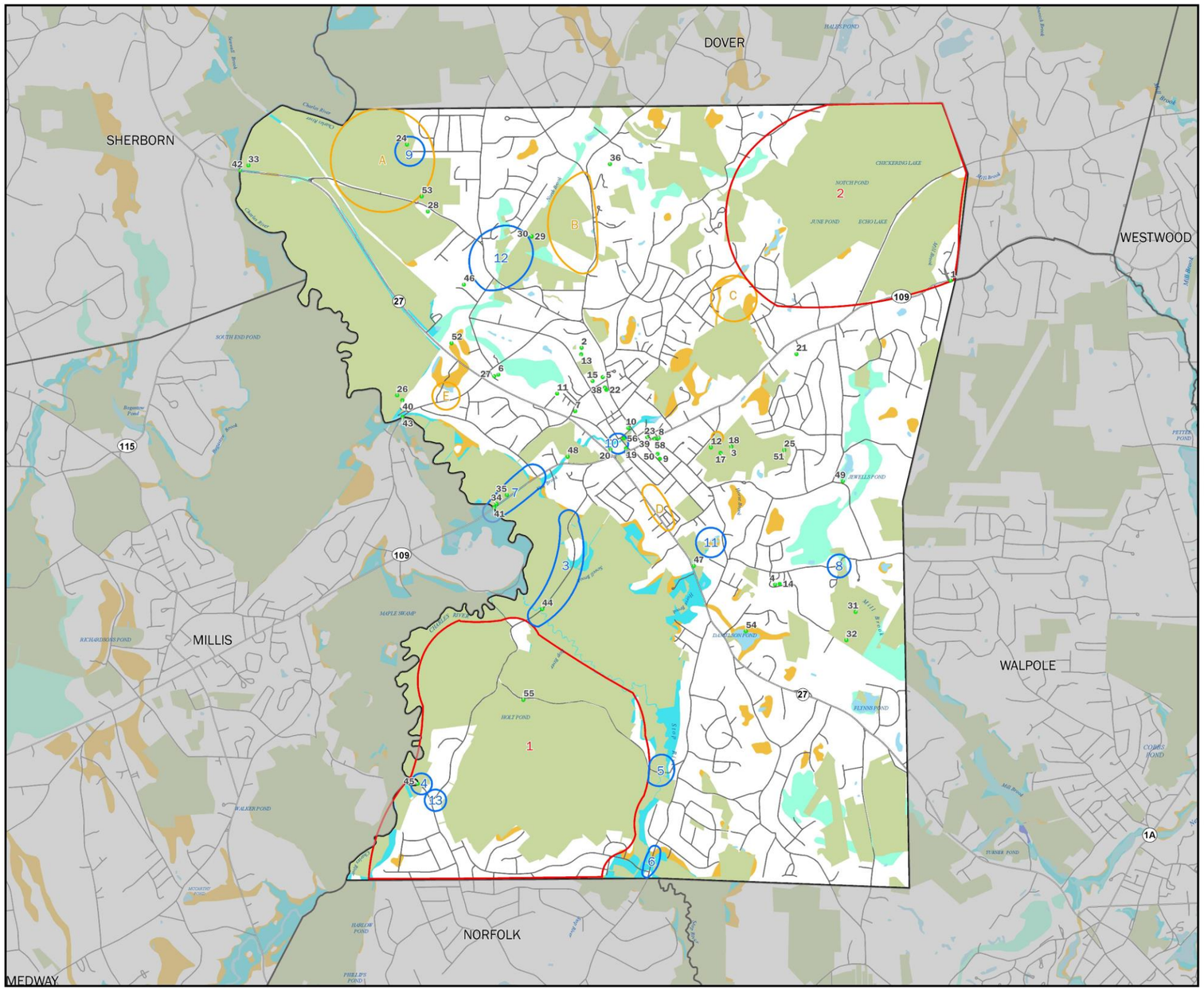
The process for developing Medfield's Hazard Mitigation Plan 2019 Update is summarized in **Table 1** below.

Table 1 Plan Review and Update Process

Chapter	Reviews and Updates
III – Public Participation	The Local Hazard Mitigation Core 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 Board of Selectmen. The plan was also available on the Town's website for public comment. [Public Comments]
IV – Risk Assessment	MAPC gathered the most recently available hazard and land use data and met with the Core Team 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 potential impacts of flooding, hurricanes and earthquakes using the latest available data.
V - Goals	The Hazard Mitigation Goals were reviewed and endorsed by the Medfield Local Hazard Mitigation Core Team.
VI – Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the Town.
VII & VIII – Hazard Mitigation Strategy	Exiting Mitigation were documented and assessed as to whether they were effective. The Plan's hazard mitigation strategy reflects new measures to prevent further loss. The Local Hazard Mitigation Team prioritized all of these measures based on current conditions.
IX – Plan Adoption & Maintenance	This section of the plan was updated with a new on-going plan implementation review and five year update process that will assist the Town in incorporating hazard mitigation issues into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive plan update.

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 Town will document any actions taken within this iteration of the Hazard Mitigation Plan on challenges met and actions successfully adopted as part of the ongoing plan maintenance to be conducted by the Medfield Hazard Mitigation Implementation Team, as described in Section VIII, Plan Adoption and Maintenance.

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



MAPC dcr

FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA

Sites
- Critical Infrastructure Sites*
- Repetitive Loss Sites
- * See details in separate table
- Water Bodies

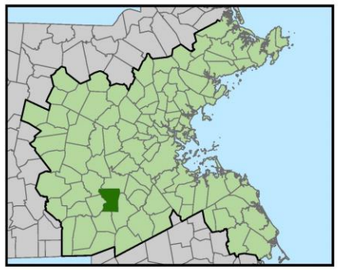
Flood Zones, 2014 (Annual Chance)
- Zone A : 1%
- Zone AE: 1%
- Zone AH: 1%
- Zone AO: 1%
- Zone VE: 1% with Velocity Hazard
- 0.2% Annual Chance

Areas of Concern
- Brush Fire
- Development
- Flooding
- Other

- Train Stations
- Commuter Rail Lines
- Trains

All Roads
- Interstate
- U.S. Highway
- State Route
- Street

0 0.25 0.5 Miles



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)

Flood Zones datalayer updated by MassGIS October 2013
from finalized data provided by
Federal Emergency Management Agency (FEMA)
MEDFIELD, MA

Path: K:\DataServices\Projects\Current_Projects\Environment\PDM\project_files\PDM_ExistingFeatures_Map_ArchD.mxd

Date: 12/17/2018

I. INTRODUCTION

PLANNING REQUIREMENTS UNDER THE FEDERAL DISASTER MITIGATION ACT

The Federal Disaster Mitigation Act, passed in 2000, requires all municipalities that wish to continue to be eligible to receive FEMA funding for hazard mitigation grants 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).

Massachusetts has taken a regional approach and has encouraged the regional planning agencies to apply for grants to prepare plans for groups of their member communities. The Town of Medfield received a grant from the Federal Emergency Management Agency (FEMA) under the Pre-Disaster Mitigation (PDM) Program and the Commonwealth of Massachusetts's Municipal Vulnerability Preparedness Planning Grant to assist the Town of Medfield in creating its Hazard Mitigation Plan update. Medfield released a call for proposals to complete a joint Hazard Mitigation Plan Update and Municipal Vulnerability Preparedness plans and hired the Metropolitan Area Planning Council to complete both efforts. The local Hazard Mitigation Plan produced under this contract is designed to individually meet the requirements of the Disaster Mitigation Act for each community while listing regional concerns and hazards that impact the Town creating the plan.

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 more. In combination with climate change impacts, municipalities can be prepared plan to mitigate for the increase in severity and frequency of extreme weather events that lead to natural hazards. This plan serves to review and mitigate the Town's historic vulnerability to natural disasters and future risks with climate change.

PREVIOUS FEDERAL/STATE DISASTERS

The Town of Medfield has experienced 22 natural hazards that triggered federal or state disaster declarations since 1991. These disasters are listed in Figure 2. The majority of these events involved flooding, while eight were due to hurricanes or nor'easters, and seven were due to severe winter weather.

Figure 2: Previous Federal/State Disaster Declarations[1]

Disaster Name (Date of Event)	Type of Assistance	Declared Areas
Hurricane Bob (August 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (16 projects)
No-Name Storm (October 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	FEMA Individual Household Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (10 projects)
December Blizzard (December 1992)	FEMA Public Assistance Project Grants	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk (7 projects)
March Blizzard (March 1993)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 1996)	FEMA Public Assistance Project Grants	All 14 Counties
May Windstorm (May 1996)	State Public Assistance Project Grants	Counties of Plymouth, Norfolk, Bristol (27 communities)
October Flood (October 1996)	FEMA Public Assistance Project Grants	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	FEMA Individual Household Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk (36 projects)
(1997)	HUD Community Development Block Grant	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
June Flood (June 1998)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester

[1] FEMA Disaster Designations by State/Tribal Area 2019. https://www.fema.gov/disasters/state-tribal-government/0/MA

Disaster Name (Date of Event)	Type of Assistance	Declared Areas
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (19 projects)
(1998)	HUD Community Development Block Grant	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
March Flood (March 2001)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (16 projects)
February Snowstorm (Feb 17-18, 2003)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 22-23, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
Hurricane Katrina (August 29, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
May Rainstorm/Flood (May 12-23, 2006)	Hazard Mitigation Grant Program	Statewide
April Nor'easter (April 15-27, 2007)	Hazard Mitigation Grant Program	Statewide
Flooding (March, 2010)	SBA Loan; FEMA Public Assistance & Individuals and Households Program	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Statewide
Hurricane Earl (September 2010)	FEMA Public Assistance Project Grants	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester
Tropical Storm Irene (August 27-28, 2011)	FEMA Public Assistance	Statewide
Hurricane Sandy (October 27-30, 2012)	FEMA Public Assistance	Statewide
Severe Snowstorm and Flooding (February 8-9, 2013)	FEMA Public Assistance; Hazard Mitigation Grant Program	Statewide
Blizzard of 2015 (January 26-28, 2015)	FEMA Public Assistance; Hazard Mitigation Grant Program	Statewide

Disaster Name (Date of Event)	Type of Assistance	Declared Areas
Winter Storm Riley and Flooding March 3-6, 2018	Hazard Mitigation Grant Program	Statewide
Severe Winter Storm and Snowstorm March 12-13, 2018	FEMA Public Assistance	Worcester, Norfolk, Middlesex, and Essex

FEMA FUNDED MITIGATION PROJECTS

Medfield has not received a FEMA Hazard Mitigation Grant.

COMMUNITY PROFILE

Medfield is a small historic suburban town 17 miles southwest of Boston with a population of approximately 12,610.[2] The Town is located on a rugged upland watershed area for two major rivers, the Neponset River and the Charles River. The Charles River creates one-fourth of the Town's boundary and an important crossing point of the Charles River valley leading to the western interior of the State. The town is bordered by Millis on the west, Sherborn on the northwest, Dover on the north and northeast, Walpole on the east and southeast and Norfolk on the south. It is 18 miles northwest of Brockton, 19 miles southwest of Boston, 29 miles north of Providence, RI and 208miles from New York City.

Located on a rugged upland watershed area and the adjacent river meadow, Medfield was the site of major native settlements and of early European settlements, although the latter were almost completely destroyed during the King Philip wars. The early economic base of the community was agriculture and cattle raising with some dairying and orchards, and the community gradually evolved from a front line frontier town to a moderately prosperous rural town with little development outside of farming and grazing. In the 19th century, straw hat making became a significant business in town, recording over $1 million worth of goods for one manufacturer alone in 1875.

Medfield is also known for its 18th and 19th century historic assets such as the Peak House and Dwight-Derby house, its vast areas of conservation land like Rocky Woods, and the historic state mental hospital, Medfield State Hospital. Built in 1890, the hospital was once a major employment center, however, it closed in 2003 where after it set several movies such as Shutter Island. Medfield State Hospital is currently an award-winning redevelopment site for conservation, mixed-use, artist, residential and commercial development. Medfield also boasts its Medfield Day, a 40-year tradition, where the community gathers with local and area businesses for a family festival. These are the kinds of assets at risk to climate change in the vibrant community of Medfield.

The Town is governed by a Town Administrator, Board of Selectmen, and Open Town Meeting governmental structure. Medfield was incorporated in 1651.

[2] American Community Survey 2017.

Some of Medfield's unique characteristics to keep in mind include:

- As a riverine community, the town is directly threatened by potential flooding from extreme precipitation events or storms potentially damaging roads, dams, bridges, residences and other infrastructure. .
- Flooding from an elevated water table is also an important concern to residences and property, during high rain and storm events, particularly during the spring snow which exacerbates flooding due to an elevated water table.
- A 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 a number of dams that are currently reported to be in good shape. However, should a dam fail at one these locations, it could cause increased risks of flooding downstream.
- 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 PDM plan, at which representatives of several Town departments were present.
- Medfield is home to historic structures and sites that are irreplaceable and bring economic value to the town.
- Medfield contains several major roadways and bridge crossings that provide emergency routes for evacuation and for routes to medical facilities. Some of these transportation resources or infrastructures are frequently at risk of flooding, particularly from ocean storm-related flooding.
- Medfield would be a good candidate for flood-related grants due to the potential impact to property, transportation emergency routes, and 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, and in some cases near areas of floodplain. These facilities are therefore at higher risk of damage.

The Town maintains a website at https://www.town.medfield.net/.

Figure 3: Medfield Demographic Characteristics[3,4]

Population = 12,024 people

a) 5.0% are under age 5
b) 28.3% are under age 18
c) 11.3% are over age 65
d) 5.3% (±1.5%) have a disability
e) 5.4% are single-parent households
f) 5.7% (±1.8%) are foreign-born

Number of Housing Units = 4,237

- 12.1% are renter-occupied housing units
- 17.5% of housing units were built before 1940
- 89.9% of housing units are single family homes

[3] 2010 Census
[4] 2017 American Community Survey 5-year Estimates

II. PLANNING PROCESS AND 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 and regional climate change. 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 Local Hazard Mitigation Core Teams, two public meetings hosted by the Town of Medfield, posting of the plan to the Town's website, and invitations sent to neighboring communities, Town boards and commissions, the local chamber of commerce, and other local or regional entities to review the plan and provide comment.

PLANNING PROCESS SUMMARY

The six-step planning process outlined below is based on the guidance provided by FEMA in the 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. The planning process is described below.

Figure 4: 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 Medfield Zoning By-Laws.
    - MAPC. *Town of Medfield Municipal Vulnerability Preparedness Community Resilience Building Summary of Findings,* 2019.
    - Town of Medfield Open Space and Recreation Plan DRAFT 2017.
    - Environment America Research and Policy Center, *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation,* July 2012.
    - FEMA, Local Mitigation Plan Review Guide; October 1, 2011.
    - FEMA Flood Insurance Rate Maps for Norfolk County, MA, 2012.
    - FEMA LOMR, Effective 12/13/17.
    - MA Office of Dam Safety, Inventory of Massachusetts Dams.
    - Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan. 2018.
    - Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data.
    - 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/.
    - US Census, 2010.
    - American Community Survey, 2017 5-year estimates.
    - The Northeast Climate Science Center. www.Resilientma.org.
    - National Oceanic and Atmospheric Administration.
    - Cambridge Climate Change Vulnerability Assessment.
    - The Boston Research Advisory Group, 2016.
    - Massachusetts Office of Coastal Zone Management.
    - Blue Hill Observatory and Science Center.
    - Fourth National Climate Assessment 2018.

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 VII.

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 D.

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.

THE LOCAL HAZARD MITIGATION CORE TEAM

MAPC worked with the local community representatives to organize a Local Hazard Mitigation Core Team for Medfield. 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 Core 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 below.

Kristine Trierweiler	Town Administrator
Sarah Raposa	Town Planner
Maurice Goulet	Director, Public Works
John Wilhelmi	Deputy Police Chief
William Carrico	Fire Chief
Amy Colleran	Facilities Director
Gary Pelletier	Building Commissioner
Leslie Willitts	Conservation Agent
Jeffrey Marsden	Superintendent, Medfield Public Schools
Michael LaFrancesca	Director of Finance and Operations, Medfield Public Schools
Roberta Lynch	Director, Council on Aging
Jon Cogan	Veterans Agent
Ann Thompson	Resident

The Medfield Planning Board and the Medfield Conservation Commission are the primary entities responsible for regulating development in town. Feedback from the Planning Board and the Conservation Commission was assured through the participation of the Town Planner, Conservation Agent and the Town Administrator, as well as other local public safety officials including the DPW, Building and Health Departments, Facilities Manager, Fire, and Police. In addition, MAPC, the State-designated regional planning authority for Medfield, works with all agencies that that regulate development in the region, including the listed municipal entities and state agencies, such as the MassDOT and the Department of Conservation and Recreation.

The Local Hazard Mitigation Core Team met on: October 16, 2019, December 22, 2019 and May 6, 2019. The purpose of the first meeting included review and updates to the hazard mitigation goals, and gathering information on local hazard mitigation issues, and sites or areas related to these. The second meeting focused on verifying research, risks, and vulnerabilities gathered by MAPC staff and discussion of existing mitigation practices and potential new or revised mitigation measures. The third meeting was to finalize new recommended mitigation actions, timing, and prioritization of mitigation actions.

The agendas for these meetings are included in Appendix A.

PUBLIC MEETINGS

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 and climate change impacts, 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 and one after a complete draft plan was available for review.

Natural hazard mitigation plans unfortunately rarely 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. These board and commission members represent an engaged audience that is informed and up to date on many of the issues that relate to hazard mitigation planning and climate change resilience in the locality and will likely be involved in plan implementation, creating an important audience with which to build support for hazard mitigation and climate resilience measures. In addition, these meetings frequently receive press coverage, expanding the audience that has the opportunity to hear the presentation and provide comment.

The public had an opportunity to provide input to the Medfield hazard mitigation planning process during two meetings of the Planning Board on February 19, 2019 and May 28, 2019 where the draft plan was presented to the Board of Selectmen. Both meetings were broadcast live on local cable television. Both meetings were publicized in accordance with the Massachusetts Public Meeting Law. The agenda each meeting can be found in Appendix C. [Public Comments]

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:

Town of Millis
Town of Walpole
Town of Norfolk
Town of Dover
Town of Sherborn
Medfield Council on Aging
Medfield Housing Authority
Medfield Planning Board
Medfield Local Emergency Planning Commission
Neponset River Watershed Association
Charles River Watershed Association
Neponset Valley Chamber of Commerce
Medfield Library
The Trustees of Reservations
Medfield Employers and Merchant Organization

Medfield Local Hazard Mitigation Core Team: Town Administrator, DPW, Fire, Police, Facilities, Planning, Conservation, Health, Building Departments.

See Appendix C for public meeting notices. The draft Hazard Mitigation Plan 2019 was posted on the Town's website after the second public meeting on May 28, 2019. Members of the public could access the draft document and submit comments or questions to the Town. [Public Comments]

CONTINUING PUBLIC PARTICIPATION

Following the adoption of the plan update, the Core Team will continue to provide residents, businesses, and other stakeholders the opportunity to learn about the hazard mitigation planning and Municipal Vulnerability Preparedness process and to contribute information that will update the town's understanding of local hazards and climate change. As the annual update and 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.

PLANNING TIMELINE

Pre-disaster planning for this plan began in 2018 upon receipt of a FEMA Hazard Mitigation Planning Grant and Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness Planning Grant. The timeline for this planning effort is summarized below.

October 20, 2018	First meeting of the Medfield Hazard Mitigation/MVP Core Team
December 19, 2018	Second meeting of the Medfield Hazard Mitigation/MVP Core Team
February 19, 2019	First Public Meeting before the Board of Selectmen
May 6, 2019	Third meeting of the Medfield Hazard Mitigation/ MVP Core Team
May 28, 2019	Second Public Meeting before the Board of Selectmen
	Draft Plan submitted to MEMA
	Draft Plan submitted to FEMA

III. RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards and climate change impacts that could occur within the Town of Medfield as well as the relationship between natural hazards and climate change with 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 and climate change impacts.

In order to determine Medfield's risk assessment, MAPC gathered the most recently available natural hazard, land use, and climate change data and met with Town staff to identify local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS, which is described in more detail in this section.

OVERVIEW OF HAZARDS AND IMPACTS

Table 2: Hazard Risks Summary[5]

Hazard	Frequency		Severity	
	Massachusetts	Medfield	Massachusetts	Medfield
Inland Flooding	Every 3 years	Every 3 years	Substantial	Substantial
Drought	8% any given month	8% any given month	Watch	Watch
Landslides	Every other Year	Low	Minor	Minor
Coastal Flooding	6 events per year	N/A	3 feet or greater	N/A
Coastal Erosion	8.7 feet/year	N/A	Severe	N/A
Tsunami	1in every 39 years	N/A	Significant	N/A
Extreme Temperatures	1.5-2.0 extreme temp events/year	1.5-2.0 extreme temp events/year	Minor	Minor
Brush Fires	One each year	One each year	Minor	Minor
Hurricane/Tropical Storm	One every two years	One every two years	Minor	Minor
Severe Winter Storms/Nor'easters	One every year	One every year	Medium	Medium
Tornadoes	1.7 per year	1.7 per year	Serious	Serious
Other Severe Weather (Thunderstorms/High Winds)	30-30 thunderstorms annually; 43.5 high wind events annually	30-30 thunderstorms annually; 43.5 high wind events annually	Medium	Medium
Earthquake	10% chance of Mag 5 in 10 year period	10% chance of Mag 5 in 10 year period	Medium	Medium

[5] Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan. September 2018

The Massachusetts Hazard Mitigation Plan provides an in-depth overview of natural hazards in Massachusetts. Previous state and federal disaster declarations since 1991 are summarized in Figure 2. Table 2 summarizes the natural hazard risks for Medfield. This evaluation takes into account the frequency of the hazard, historical records, and variations in land use. This analysis is based on the vulnerability assessment in the Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan. The statewide assessment was modified to reflect local conditions in Medfield using the definitions for hazard frequency and severity listed below. Based on this, the Town developed locally-specific rankings for the frequency and severity of each category of natural hazard in Medfield.

It should be noted that a few of the hazards listed in the 2018 Massachusetts State Hazard Mitigation plan are not applicable to the Town of Medfield. Due to its size and the development patterns in Medfield, Major Urban Fires are not applicable. Ice Jams are an unlikely natural hazard; with only two occurrences in Norfolk County in 1970 and 1971. There was no damage reported as a result of these ice jams and Medfield has chosen not to profile it since it is a secondary hazard. Finally, since Medfield is an inland community, Medfield is not vulnerable to Tsunamis, Coastal Flooding, and Coastal Erosion and hazards related to coastal areas were not addressed.

Flood-Related Hazards

Flooding was the most prevalent natural hazard identified by local officials in Medfield. Flooding in town is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms. Global climate change will likely exacerbate these issues and lead to more coastal flooding over time due to the potential for changing rainfall patterns, heavier storms, and higher sea levels.

Regionally Significant Floods

There have been a number of major floods that have affected the Metro Boston region over the last fifty years. For the Boston area there has been a 10% increase in precipitation over the past 50 years[6] and a 71% increase in the amount of rain that falls in the top 1% events from 1958 – 2012.[7] Significant historic flood events in or around Medfield have included:

- Blizzard of 1978
- January 1979
- April 1987
- October 1991
  ("The Perfect Storm")
- December 1992
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007
- April 2004
- March 2010
- December 2010
- March 2013
- January 2018
- March 2018

Town-specific data for previous flooding occurrences are not collected by the Town of Medfield. The best available local data is from NOAA's National Centers for Environmental Information. Norfolk County, which includes the Town of Medfield, experienced 64 flood events, and 24 days with flood event and property damage from 1999-2019 (see Table 3). No deaths or injuries were reported and the total reported property damage in the county was $40.3 million dollars.[8]

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[6] Blue Hills Observatory

[7] USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

[8] National Centers for Environmental Information. National Oceanic and Atmospheric Administration

Table 3: Norfolk County Flood Events, 1999-2019

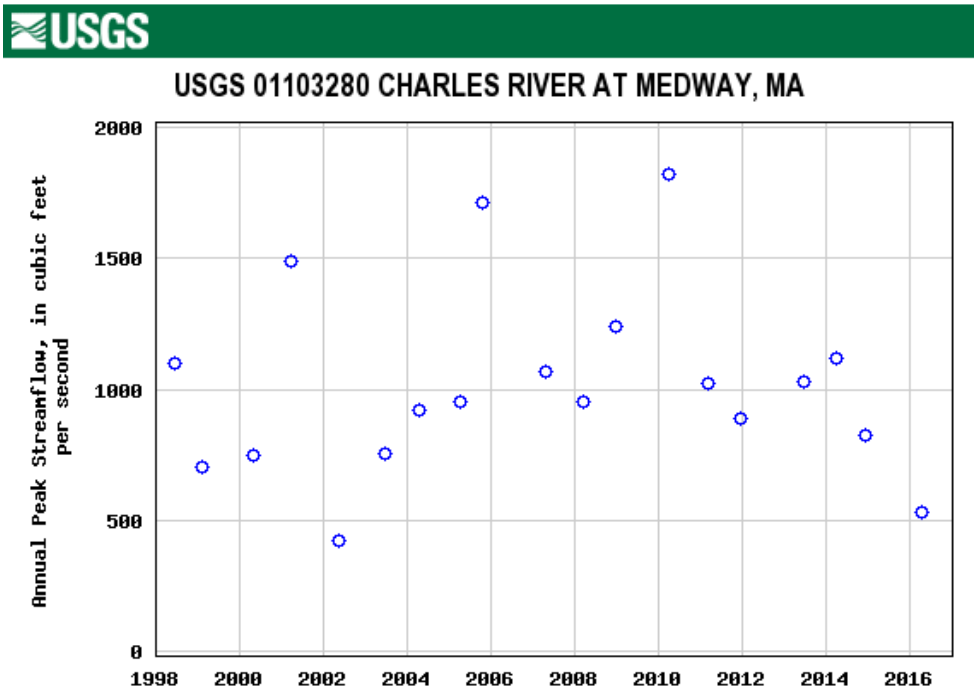
Location	Begin Date	Deaths	Injuries	Property Damage
EASTERN NORFOLK (ZONE)	3/5/2001	0	0	$0
SUFFOLK (ZONE)	3/5/2001	0	0	$15,000,000
WESTERN NORFOLK (ZONE)	3/22/2001	0	0	$0
WESTERN NORFOLK (ZONE)	3/22/2001	0	0	$0
WESTERN NORFOLK (ZONE)	4/1/2001	0	0	$0
EASTERN NORFOLK (ZONE)	10/15/2005	0	0	$40,000
WESTERN NORFOLK (ZONE)	10/15/2005	0	0	$30,000
WESTERN NORFOLK (ZONE)	10/15/2005	0	0	$40,000
WESTERN NORFOLK (ZONE)	10/15/2005	0	0	$60,000
NORFOLK CO.	5/13/2006	0	0	$5,000
NORFOLK CO.	6/7/2006	0	0	$20,000
NORFOLK CO.	6/7/2006	0	0	$0
NORFOLK CO.	6/7/2006	0	0	$0
NORFOLK CO.	10/28/2006	0	0	$8,000
NORFOLK CO.	11/24/2006	0	0	$0
NORFOLK CO.	3/2/2007	0	0	$5,000
NORFOLK CO.	4/18/2007	0	0	$5,000
NORFOLK CO.	2/13/2008	0	0	$10,000
NORFOLK CO.	7/2/2008	0	0	$5,000
NORFOLK CO.	8/15/2008	0	0	$3,000
NORFOLK CO.	5/24/2009	0	0	$0
NORFOLK CO.	6/27/2009	0	0	$15,000
NORFOLK CO.	3/14/2010	0	0	$16,640,000
NORFOLK CO.	3/29/2010	0	0	$8,320,000
NORFOLK CO.	4/1/2010	0	0	$0
NORFOLK CO.	7/24/2010	0	0	$20,000
NORFOLK CO.	8/5/2010	0	0	$0
NORFOLK CO.	8/25/2010	0	0	$8,000
NORFOLK CO.	8/28/2011	0	0	$0
NORFOLK CO.	8/15/2012	0	0	$0
NORFOLK CO.	10/29/2012	0	0	$0
NORFOLK CO.	6/7/2013	0	0	$0
NORFOLK CO.	7/29/2013	0	0	$0
NORFOLK CO.	8/9/2013	0	0	$15,000
NORFOLK CO.	10/22/2014	0	0	$0
NORFOLK CO.	10/23/2014	0	0	$0
NORFOLK CO.	8/15/2015	0	0	$0

Location	Begin Date	Deaths	Injuries	Property Damage
NORFOLK CO.	8/18/2015	0	0	$0
NORFOLK CO.	8/18/2015	0	0	$0
NORFOLK CO.	6/7/2016	0	0	$5,000
NORFOLK CO.	6/7/2016	0	0	$0
NORFOLK CO.	8/14/2016	0	0	$5,000
NORFOLK CO.	4/1/2017	0	0	$5,000
NORFOLK CO.	7/12/2017	0	0	$0
NORFOLK CO.	7/12/2017	0	0	$0
NORFOLK CO.	7/18/2017	0	0	$1,000
NORFOLK CO.	8/2/2017	0	0	$0
NORFOLK CO.	8/2/2017	0	0	$0
NORFOLK CO.	8/2/2017	0	0	$0
NORFOLK CO.	8/2/2017	0	0	$0
NORFOLK CO.	8/2/2017	0	0	$0
NORFOLK CO.	9/30/2017	0	0	$10,000
NORFOLK CO.	9/30/2017	0	0	$0
NORFOLK CO.	10/25/2017	0	0	$0
NORFOLK CO.	10/25/2017	0	0	$0
NORFOLK CO.	10/29/2017	0	0	$0
NORFOLK CO.	1/12/2018	0	0	$0
NORFOLK CO.	1/13/2018	0	0	$0
NORFOLK CO.	4/16/2018	0	0	$0
NORFOLK CO.	4/16/2018	0	0	$0
NORFOLK CO.	7/6/2018	0	0	$10,000
NORFOLK CO.	10/29/2018	0	0	$0
NORFOLK CO.	11/3/2018	0	0	$0
NORFOLK CO.	11/3/2018	0	0	$500

The most severe recent flooding occurred during March 2010 when a total of 14.83 inches of rainfall accumulation was recorded by the National Weather Service (NWS). The weather pattern that 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 one of the wettest months on record.

One indication of the extent of flooding is the measured stream discharge at the nearest USGS streamflow gauging station on the Charles River, at the nearby stream gage in Medway. Figure 5 illustrates that 2010 had the highest streamflow at nearly 2,000 cubic feet per second for the years of 1998-2016. Of the total $40 million in flood damages recorded for Norfolk County from 1999 to 2019, $24.9 million occurred during the March 2010 flooding (Table 3)

Figure 5 USGS Flood Gage Discharge Data for the Charles River at Medway, 2010.[9]

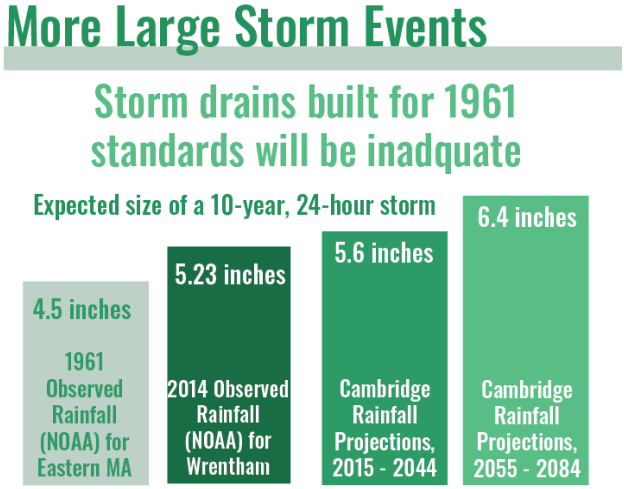


Potential damages from flooding in the Town of Medfield were estimated using FEMA's HAZUS-MH program. The results, shown in Table 25, indicate potential building related loses from a 1% Annual Chance Flood (100-year) at $6.3 million and from a 0.2% Annual Chance Flood (500-year) at $14.73 million.

With climate change, scientists project an increase in severity and frequency of precipitation events.[10] Because of its location in two major watersheds, the Charles River and Neponset River, extreme precipitation events, drought, and changing precipitation patterns could increase the frequency and severity of flooding on the community and down-river communities as well. In the future, Medfield will likely experience more frequent and intense precipitation events (Figure 6). By mid- to late-century, Medfield can anticipate 9-10 days with precipitation events with greater than one inch of rain or an increase in total precipitation from 46 inches to 50.[11]

[9] United States Geological Survey 2018
[10] Northeast Climate Science Center 2018
[11] www.Resilientma.org

Figure 6 Design storm projections for a 10-year, 24-hour storm. [12]



Overview of Town-Wide Flooding

As with most of eastern Massachusetts, flooding the natural hazard threat that is prevalent in the town of Medfield and therefore the focus of most of the town's hazard mitigation effort. Medfield has large expanses of little to no topographical relief and large expanses of wetland in the floodplain of the Charles River, which delineates one-third of its municipal boundary. In addition to the Charles River, the town is affected by several bodies of water, including but not limited to tributaries to the Charles River such as Stop River, Seawall Brook, Horse Brook, Mine Brook, and Mine Brook and some small ponds such as Kingsbury Pond, Danielson Pond, Jewetts Pond and Flynns Pond. However, the Charles River, the largest river in Massachusetts tends to have the largest impact on flooding, as does inadequate flood storage and under-sized drainage systems.

The Charles River is 80 miles in length - the longest river with its entire length in Massachusetts. The Charles River Watershed has a drainage area of approximately 308 square miles and encompasses all or part of 35 municipalities. The watershed drains northward and is divided into three distinct regions, which include the rural, forested upper watershed, the suburban lakes or middle watershed, and the urban lower watershed, which drains through the Boston metropolitan area. In general, the upper and middle watersheds are characterized by forest cover and residential land use, while the lower watershed is characterized by commercial land use. Since 1995, the water quality of the Charles River has improved dramatically, and is now clean enough for boating and swimming for the greater part of each year, according to the Environmental Protection Agency (EPA). The greatest source of pollution to the river is non-point source pollution, especially from stormwater runoff and Combined Sewer Overflows (CSOs). The quantity of water available for residential and commercial use is also threatened by overuse, which has lowered groundwater levels and decreased stream flow.

In the 1970's studies by the Corps of Engineers revealed that the communities above Newton had a history of only minimal flooding. Extensive marshes, swamps and wet meadows scattered around the upper watershed were holding floodwaters and then only slowly letting them go. In

[12] Cambridge Climate Vulnerability Assessment. Part 1. April 2017.

1974 Congress authorized the "Charles River Natural Valley Storage Area," allowing for the acquisition and permanent protection of 17 scattered wetlands in the middle and upper watershed. Final acquisition totaled 8,103 acres, with 3,221 acres of land acquired in fee and 4,882 acres in flood easement, at total project cost of $8,300,000. Medfield therefore, has in part the responsibility of preserving floodplains and other water storage areas in efforts reduce downstream flooding. It must be noted that within the Charles River Watershed, flooding within the lower watershed (Boston metro area) is controlled with dams and channelization, while the upper and middle watersheds, wetlands and other natural storage areas are relied upon to protect the area from flooding.

Most of the town's flood-related hazards are related to high rain events, such as heavy rainstorms, tropical storms or winter rain and snow storms and often occurs near floodplains. In addition, the spring rainy season is a particularly hazardous time, as runoff from winter snowfalls saturates much of the town's wetlands and fills the town's streams and brooks. A heavy or severe rain event at this time of year can often overwhelm the natural flood storage areas of the town and create flood hazards on streets and around residential and business areas in town. In some areas of town, localized flooding occurs due to beaver activity or improperly functioning drainage infrastructure. Medfield has over the years replaced outdated culverts, drainage systems, and other structures that regulate flow.

The Medfield water supply system depends solely on the subsurface aquifers; therefore water quality is an important main issue. The town has aggressive aquifer protection regulations that have been effective in protecting the water quality of the groundwater supply.

Dams and Dam Failure

Dam failure can arise from two types of situations. Dams can fail because of structural problems independent of any storm event. They can also fail following a natural disaster that causes structural damage, such as an earthquake. Dam overtopping is caused by floods that exceed the capacity of the dam, insufficient spillway, blockage of spillways, and/or settlement of the dam crest.[13] Climate change could further increase the risk of dam failure in several ways. Changing precipitation patterns could alter the flow behavior of a river where the dam was not designed to support, more intense of frequent precipitation events could alter the discharge rates creating greater structural stress to the dam and increasing scouring, erosion, and loss of flood storage capacity in nearby spillways or floodplain wetlands.[14]

In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the area in the path of the dam's floodwaters. An issue for dams in Massachusetts is that many were built in the 19th century without the benefits of modern engineering or construction oversight or consideration of changing weather patterns associated with climate change such as more frequent and/or extreme precipitation events or storms.

[13] Massachusetts Integrated Natural Hazard Mitigation and Climate Adaptation Plan. Section 4-5
[14] Massachusetts Integrated Natural Hazard Mitigation and Climate Adaptation Plan. Section 4-5

The Massachusetts Department of Conservation and Recreation (DCR) Office of Damn Safety (ODS) has three hazard classifications for dams:

High Hazard:	Dams located where failure or mis-operation will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard:	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 Hazard:	Dams located where failure or mis-operation may cause minimal property damage to others. Loss of life is not expected.

There are two dams located in Medfield, the Danielson Pond Dam and the Kingsbury Pond Dam. These are both owned publicly owned by the Town and are classified as "Significant Hazard". There have been no dam failures documented in the Town of Medfield. However, participants in the Municipal Vulnerability Preparedness workshop on preparing for climate change raised concerns on the future safety and efficacy of the Danielson Pond Dam with changing precipitation events and projected increase in frequency and severity of storms.[15] Based on the record of previous occurrences, dam failure in Medfield is a very low frequency event as defined by the Massachusetts State Hazard Mitigation Plan, 2013. This hazard may occur less frequently than once in 100 years (less than 1% chance of occurring per year).

Potential Flood Hazard Areas

Information on potential flood hazard areas was taken from several sources. The first was the National Flood Insurance Rate Maps (FIRM). The FIRM flood zones are shown on Map 3 in Appendix B and their definitions are listed below. In addition, information on areas subject to flooding was provided by local officials.

[15] MAPC. *Town of Medfield Community Resilience Building Municipal Vulnerability Preparedness Summary of Findings.* January 2019.

Flood Insurance Rate Map Zone Definitions

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

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

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

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

Through the Hazard Mitigation Core Team planning and the Municipal Vulnerability Preparedness workshop in January 2019, the Core Team, stakeholders, residents, and municipal staff identified "Locally Identified Areas of Flooding". These are areas locally known to cause regular, persistent, nuisance or severe flooding in addition to or outside of flood zones from the FIRM Maps. These are described in Table 4were identified by town staff as areas where flooding is known to occur. 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, "Local Hazard Areas."

Table 4: Locally Identified Areas of Flooding

Map Site ID	Name	Type	2018-2019 Update
3	Causeway Street, near Sewell Brook	Flooding	
4	Orchard Street at Charles River	Flooding	
5	Noon Hill Road at Stop River	Flooding	
6	South Street at Norfolk Line and Stop River	Flooding	
7	Main Street (Route 109) at Charles River	Flooding	
8	Elm Street at Mill Brook	Flooding	
9	State Hospital property, eastern side	Flooding	Brook by McCarthy Park
10	Frairy and Upham Road at train tracks	Flooding	Undersized culvert, undersized pipes, with extreme precipitation, causes severe flooding, there is no place for the water to go.
11	South Street near train tracks	Flooding	140 south, Tubadee's Pond because Mrs. Tubadee used to live there. Undersized culvert, feeds into Kingsbury Pond, controlled waterway.
12	Colonial Road, south to Hospital Road, and west of Harding Street	Flooding	Beavers can cause harm but flooding mostly due to undersized culvert under the railroad.
13	Causeway and Orchard streets	Flooding	Undersized culvert, floods personal property

Repetitive Loss Structures

There are no repetitive loss structures in Medfield. As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property for which the NFIP has paid two or more flood claims of $1,000 or more in any given 10-year period since 1978. For more information on repetitive losses see http://www.fema.gov/nfip/replps.shtm. However, there are residents in Medfield that do have flood insurance through the NFIP. These are summarized in Table 5.

Table 5: Flood Insurance Policies and Claims in Medfield.[16]

Flood insurance policies in force	8
Coverage amount of flood insurance policies	$1,701,100
Premiums paid	$3,605
Total losses (all losses submitted regardless of the status)	1
Closed losses (Losses that have been paid)	1
Open losses (Losses that have not been paid in full)	0
CWOP losses (Losses that have been closed without payment)	0
Total payments (Total amount paid on losses)	$1,600.45

Based on the record of previous occurrences, flood hazard events in Medfield are high frequency occurring once every three years as defined by the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan.

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 Medfield. Information on wind-related hazards can be found on Map 5 in Appendix B.

Hurricanes and Tropical Storms

A hurricane is a violent wind and rainstorm with wind speeds of 74-200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits the land. The Town of Medfield'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 has experienced approximately 32 tropical storms, nine Category 1 hurricanes, five Category 2 hurricanes, and one Category 3 hurricane. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm (Table 6).

Since 1861, Medfield has experience one tropical depression, one tropical storm, and two hurricanes. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. Medfield also experiences the impacts of hurricanes and tropical storms regardless of whether the storm track passes directly through the town, and numerous hurricanes have affected the eastern Massachusetts communities. The hazard Map 5 in Appendix B indicates that the 100 year wind speed is 110 miles per hour. No tornados have been recorded within the town.

[16] Flood insurance statistics as of January 2008. Flood Insurance statistics at the municipal level were not available at the date of this publication.

Table 6: Hurricane Records for Massachusetts, 1938-2019[17]

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

*Category 3

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. Figure 7 provides an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Figure 7: Saffir/Simpson Scale[18]

Scale No. (Category)	Winds (mph)	Surge (feet)	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

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 Medfield. Potential hurricane damages to Medfield have been estimated using HAZUS-MH. Total damages (building and business interruption) are estimated at $16 million for a Category 2 hurricane and $56 million for a Category 4 hurricane. Other potential impacts, including displaced households, sheltering needs, and debris generation, are detailed in Table 23.

[17] National Oceanic and Atmospheric Administration
[18] National Oceanic and Atmospheric Administration

Based on records of previous occurrences, hurricanes in Medfield are a medium frequency event. This hazard occurs once in 2 years as defined by the 2018 Massachusetts State Hazard Mitigation Plan.

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 7.

Table 7: Enhance Fujita Scale[19]

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

The most recent significant tornado events in Massachusetts were in Springfield in June 2011 and in Revere in 2014. The Springfield tornado caused significant damage and resulted in four deaths. The Revere tornado touched down in Chelsea just south of Route 16 and 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

[19] Massachusetts State Hazard Mitigation Plan, 2013

per hour. Approximately 65 homes had substantial damages and 13 homes and businesses were uninhabitable. In August of 2018 an EF1 tornado hit the town center of Webster, destroying at least two buildings and damaging others

Remains from the deadly 1953 Worcester tornado touched 75 miles across Massachusetts. Since 1958 there have been 10 additional tornadoes in surrounding Plymouth County recorded by the Tornado History Project. One of these was a F2 tornado, and four were F1 tornados. The 10 tornadoes resulted in a total of one fatality and two injuries and $119 thousand to $1.15 million in damages, as summarized in Table 8.

Table 8: Tornado Records for Plymouth County

Date	Fujita	Fatalities	Injuries	Width	Length	Damage
9/7/1958	0	1	1	10	0.1	$500-$5000
7/4/1964	1	0	0	10	2.3	$50K-$500K
6/9/1965	0	0	0	10	0.1	<$50
11/18/1967	2	0	0	17	.1	$50-$500
8/9/1968	1	0	0	100	1	$500-$5000
9/16/1986	1	0	0	50	.1	$50K-$500K
7/10/1989	1	0	1	23	.1	$5K-$50K
7/10/1989	0	0	0	23	.1	$5K-$50K
8/20/1997	0	0	0	10	0.1	$5K-$50K
7/24/2012	0	0	0	15	.03	$3K

Source: The Tornado History Project

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 Medfield, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Medfield would greatly depend on the track of the tornado. Generally, the more densely developed areas would likely be subject to more damage in the event of a tornado.

The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC). Based on the record of previous occurrences since 1950, Tornado events in Medfield are a low frequency event, but could cause severe damage. The frequency of tornados in Massachusetts is estimated at 1.7 per year according to the Massachusetts Integrated State Natural Hazard and Climate Adaptation Plan of 2018.

Nor'easters

A northeast coastal storm, known as a nor'easter, is typically a large counter-clockwise 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 10 to 40 mph with gusts of up to 70 mph. These storms are accompanied by heavy rains or snows, depending on temperatures. Previous occurrences of Nor'easters include the following:

- February 1978 Blizzard of 1978
- October 1991 Severe Coastal Storm ("Perfect Storm")
- December 1992 Great Nor'easter of 1992
- January 2005 Blizzard/Noreaster
- 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
- January 2018 Nor'easter
- March 2018 Nor'easter

Many of the historic flood events identified in the previous section were precipitated by nor'easters, including the "Perfect Storm" event in 1991. The recent blizzards in winter 2018, as well as those in December 2010, February 2013, and January 2015, were large nor'easters that caused significant snowfall amounts. Four nor'easters in the winter of 2018 had significant and cumulative impact on Massachusetts with high winds, flooding, fallen trees and electricity loss. In some municipalities, there was loss of life.

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

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

Based on the record of previous occurrences, nor'easters in Medfield are high frequency events as defined by the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan. This hazard may approximately once a 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, and 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 Medfield is for Norfolk County through the National Centers for Environmental Information. Between the years 1995 and 2018, records indicate 143 thunderstorm events in Norfolk County (Table 9). These storms resulted in a total of $1.07 million in property damages. There were no injuries or deaths reported.

Table 9: Norfolk County Thunderstorm Events, 1995-2018

BEGIN LOCATION	DATE	MAGNITUDE*	DEATHS	INJURIES	PROPERTY DAMAGE
MILTON & QUINCY	4/4/1995	53	0	0	$0
MILTON (BLUE HILL)	7/15/1995	55	0	0	$0
QUINCY	10/28/1995	0	0	0	$0
BROOKLINE	10/28/1995	0	0	0	$0
FOXBORO	5/21/1996	60	0	0	$0
MILTON	5/21/1996	63	0	0	$0
MEDFIELD	5/31/1998	50	0	0	$0
BROOKLINE	5/31/1998	50	0	0	$0
WELLESLEY	6/26/1998	50	0	0	$20,000
BELLINGHAM	7/20/1998	50	0	0	$0
MEDWAY	7/23/1998	50	0	0	$0
WALPOLE	7/6/1999	50	0	0	$0
WEYMOUTH	7/6/1999	70	0	0	$0
DEDHAM	7/24/1999	50	0	0	$0
WRENTHAM	7/24/1999	50	0	0	$0
WALPOLE	7/25/1999	50	0	0	$0
BELLINGHAM	8/5/1999	50	0	0	$0
MILTON	4/9/2000	61	0	0	$0
WALPOLE	6/2/2000	50	0	0	$0
RANDOLPH	6/2/2000	50	0	0	$0
BROOKLINE	6/17/2000	50	0	0	$0
QUINCY	6/27/2000	50	0	0	$0
QUINCY	7/18/2000	50	0	0	$0
MILTON	7/18/2000	55	0	0	$0
WALPOLE	8/10/2000	50	0	0	$0
MILLIS	6/30/2001	50	0	0	$0
MEDWAY	6/30/2001	50	0	0	$0
WALPOLE	6/30/2001	50	0	0	$0
WALPOLE	6/30/2001	50	0	0	$0
QUINCY	8/10/2001	50	0	0	$5,000
WALPOLE	8/10/2001	50	0	0	$15,000
WRENTHAM	6/16/2002	50	0	0	$5,000
MILTON	7/15/2002	62	0	0	$25,000
SHARON	7/23/2002	50	0	0	$2,000
WEYMOUTH	7/23/2002	50	0	0	$5,000
FOXBOROUGH	8/21/2004	50	0	0	$25,000
QUINCY	8/5/2005	50	0	0	$5,000
MEDWAY	8/5/2005	50	0	0	$10,000

BEGIN LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
MEDWAY	8/5/2005	50	0	0	$10,000
HOLBROOK	8/14/2005	50	0	0	$15,000
STOUGHTON	8/14/2005	50	0	0	$5,000
NEEDHAM	5/21/2006	50	0	0	$20,000
MILTON	5/21/2006	52	0	0	$15,000
MILTON	5/21/2006	51	0	0	$0
MEDWAY	6/1/2006	50	0	0	$15,000
BROOKLINE	6/23/2006	50	0	0	$10,000
PLAINVILLE	6/23/2006	50	0	0	$5,000
FRANKLIN	7/4/2006	50	0	0	$40,000
BRAINTREE	7/21/2006	50	0	0	$10,000
QUINCY	7/21/2006	50	0	0	$5,000
FRANKLIN	7/28/2006	50	0	0	$20,000
MEDWAY	8/2/2006	50	0	0	$5,000
MEDWAY	8/2/2006	50	0	0	$50,000
WEYMOUTH	6/28/2007	50	0	0	$0
WELLESLEY	7/28/2007	50	0	0	$0
SHARON	8/17/2007	50	0	0	$0
WETHERSFIELD	6/24/2008	50	0	0	$5,000
WINSLOWS	7/2/2008	53	0	0	$3,000
SOUTH BRAINTREE	7/2/2008	54	0	0	$15,000
RANDOLPH	7/2/2008	50	0	0	$2,000
STONE HAVEN	8/3/2008	50	0	0	$1,000
FRANKLIN	9/9/2008	50	0	0	$1,000
WOLLASTON	5/24/2009	50	0	0	$1,000
FOXBOROUGH	6/27/2009	50	0	0	$10,000
MEDWAY	7/7/2009	50	0	0	$500
MILLIS	7/8/2009	50	0	0	$1,000
WINSLOWS	7/31/2009	50	0	0	$1,000
RESERVOIR	7/31/2009	50	0	0	$10,000
STONE HAVEN	7/31/2009	50	0	0	$5,000
STOUGHTON	7/31/2009	50	0	0	$10,000
BROOKLINE	6/6/2010	50	0	0	$10,000
BROOKLINE	6/6/2010	53	0	0	$0
SHARON	6/20/2010	50	0	0	$5,000
FRANKLIN	6/20/2010	50	0	0	$1,000
WALPOLE	6/20/2010	50	0	0	$50,000
NORFOLK	6/20/2010	50	0	0	$30,000
PONKAPOG	6/20/2010	58	0	0	$0
SOUTH BRAINTREE	6/20/2010	50	0	0	$2,000

BEGIN LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
COHASSET	6/20/2010	50	0	0	$25,000
WESTWOOD	6/24/2010	50	0	0	$1,000
MILTON	6/24/2010	50	0	0	$0
MEDWAY	8/19/2011	50	0	0	$1,000
DOVER	8/19/2011	50	0	0	$3,000
BROOKLINE	8/19/2011	50	0	0	$3,000
WESTWOOD	6/23/2012	50	0	0	$15,000
NEEDHAM	6/23/2012	50	0	0	$1,000
BROOKLINE	6/23/2012	50	0	0	$0
COHASSET	6/23/2012	50	0	0	$25,000
WELLESLEY	8/10/2012	50	0	0	$5,000
FOXBOROUGH	8/15/2012	40	0	0	$500
BROOKLINE	6/17/2013	50	0	0	$3,000
DOVER	6/17/2013	50	0	0	$5,000
WALPOLE	6/17/2013	45	0	0	$3,000
WRENTHAM	7/29/2013	45	0	0	$500
WELLESLEY	7/29/2013	50	0	0	$20,000
WELLESLEY FELLS	7/3/2014	50	0	0	$20,000
NEEDHAM	7/28/2014	60	0	0	$50,000
FRANKLIN	6/23/2015	50	0	0	$5,000
WELLESLEY	8/4/2015	50	0	0	$10,000
BROOKLINE	8/4/2015	50	0	0	$15,000
BRAINTREE	8/4/2015	50	0	0	$5,000
WELLESLEY	8/15/2015	45	0	0	$5,000
AVON	8/15/2015	50	0	0	$20,000
BROOKLINE	8/15/2015	50	0	0	$10,000
PLAINVILLE	2/25/2016	50	0	0	$15,000
WALPOLE	2/25/2016	40	0	0	$5,000
WESTWOOD	2/25/2016	40	0	0	$2,000
SHARON	2/25/2016	45	0	0	$2,000
NORFOLK	2/25/2016	50	0	0	$15,000
WALPOLE	2/25/2016	50	0	0	$10,000
SOUTH BRAINTREE	2/25/2016	50	0	0	$5,000
FOXBOROUGH	2/25/2016	50	0	0	$5,000
BRAINTREE	2/25/2016	56	0	0	$0
WESTWOOD	2/25/2016	50	0	0	$5,000
WRENTHAM	2/25/2016	40	0	0	$5,000
PLAINVILLE	2/25/2016	50	0	0	$10,000
WALPOLE	2/25/2016	45	0	0	$10,000
CANTON	2/25/2016	50	0	0	$5,000

BEGIN LOCATION	DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
WOLLASTON	6/7/2016	50	0	0	$10,000
WELLESLEY	7/18/2016	50	0	0	$50,000
NEEDHAM	7/18/2016	50	0	0	$10,000
WOLLASTON	7/18/2016	50	0	0	$30,000
NEEDHAM	7/22/2016	50	0	0	$15,000
STOUGHTON	7/22/2016	50	0	0	$50,000
FOXBOROUGH	7/23/2016	40	0	0	$5,000
WRENTHAM	7/23/2016	40	0	0	$10,000
DEDHAM	7/23/2016	40	0	0	$5,000
FOXBOROUGH	7/23/2016	40	0	0	$15,000
WOLLASTON	8/14/2016	50	0	0	$5,000
STOUGHTON	6/9/2017	45	0	0	$1,000
NORTH WEYMOUTH	6/13/2017	48	0	0	$1,000
BEECHWOOD	6/13/2017	48	0	0	$1,000
WELLESLEY	6/23/2017	50	0	0	$1,000
NORTH BELLINGHAM	8/2/2017	50	0	0	$2,500
HOLBROOK	9/6/2017	50	0	0	$1,000
SOUTH WEYMOUTH	9/6/2017	50	0	0	$1,000
ENDICOTT	7/17/2018	45	0	0	$3,000
WETHERSFIELD	9/6/2018	50	0	0	$1,000
MEDWAY	9/6/2018	50	0	0	$2,000
WEST MEDWAY	9/6/2018	50	0	0	$1,000
ENDICOTT	9/6/2018	50	0	0	$1,000
FOXBOROUGH	9/6/2018	50	0	0	$2,000
RANDOLPH	11/3/2018	50	0	0	$500

*Magnitude refers to maximum wind speed (kts)

Severe thunderstorms are a town-wide hazard for Medfield. 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. While there are no existing town estimates for damages from thunderstorms in Medfield, the best available data for Norfolk County. Based on the record of previous occurrences, severe thunderstorms in Medfield are high frequency occurring once every 30-40 times a year as defined by the 2018 Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan.

Winter Storms

Winter storms, including heavy snow, blizzards, and ice storms, are the most common and most familiar of the region's hazards that affect large geographic areas. The majority of blizzards and ice storms in the region cause more inconvenience than they do serious property damage,

injuries, or deaths. However, periodically, a storm will occur which is a true disaster, and necessitates intense large-scale emergency response.

Blizzards and Heavy Snow

A blizzard is a winter snowstorm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow reducing visibility to or below ¼ mile. These conditions must be the predominant condition over a 3-hour period. Extremely cold temperatures are often associated with blizzard conditions, but are not a formal part of the definition. The hazard created by the combination of snow, wind and low visibility significantly increases, however, with temperatures below 20 degrees.

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

Table 10: NESIS Categories[20]

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

The most significant winter storm in recent history was the "Blizzard of 1978," which resulted in over 3 feet of snowfall and multiple day closures of roadways, businesses, and schools. However, in 2015, Massachusetts experienced record-breaking snowfall of 108 inches through a series of blizzards and heavy snow fall in February. This caused major disruptions in transportation, schools, businesses, and other services for several weeks.

The Town of Medfield does not keep local records of winter storms. Data for Norfolk County, which includes Medfield, is the best available data to help understand previous occurrences and impacts of heavy snow events. According to National Centers for Environmental Information, Norfolk County has experienced 15 Blizzards since 1978. There were no injuries or death but a total property damage of $603,000 (Table 11).

[20] Massachusetts Integrated State Natural Hazard and Climate Adaptation Plan. 2018

Table 11: Blizzards in Norfolk County, 1978-2019

START LOCATION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN PLYMOUTH (ZONE)	2/12/2006	0	0	$15,000
EASTERN PLYMOUTH (ZONE)	12/20/2009	0	0	$100,000
WESTERN NORFOLK (ZONE)	2/8/2013	0	0	$0
SUFFOLK (ZONE)	2/8/2013	0	0	$0
EASTERN NORFOLK (ZONE)	2/8/2013	0	0	$8,000
EASTERN PLYMOUTH (ZONE)	2/8/2013	0	0	$345,000
EASTERN PLYMOUTH (ZONE)	1/2/2014	0	0	$5,000
SUFFOLK (ZONE)	1/26/2015	0	0	$0
EASTERN NORFOLK (ZONE)	1/26/2015	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/26/2015	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/14/2015	0	0	$10,000
EASTERN PLYMOUTH (ZONE)	1/23/2016	0	0	$50,000
EASTERN PLYMOUTH (ZONE)	2/8/2016	0	0	$10,000
EASTERN PLYMOUTH (ZONE)	3/13/2018	0	0	$50,000
SUFFOLK (ZONE)	3/13/2018	0	0	$10,000

Blizzards are considered high frequency events based on past occurrences, occurring approximately once a year as defined by the Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan, 2018.

Winter storms are a combination hazard because they often involve wind, ice and heavy snowfall. The National Weather Service defines "heavy snow fall" as an event generating at least 4 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 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 which can in turn cause property damage and potential injuries.

Winter storms are a potential town-wide hazard in Medfield, where the average annual snowfall is 36 - 48 inches (see Map 6 in Appendix B). Medfield's vulnerability is primarily related to restrictions to travel on roadways, temporary road closures, school closures, and potential restrictions on emergency vehicle access. The Town works to clear roads and carries out general snow removal operations to ensure vehicle access is maximized. Commuter rail operations may also 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 commuter rail lines for several weeks. Another winter storm vulnerability is power outages due to fallen trees and utility lines. According to NOAA, Norfolk County experienced 206 Heavy Snow events from 1995-2019. There were no deaths or injuries but property damage totaled $17,611,500 since 1995.[21] Heavy Snow Events are listed in Table 12.

Table 12: Heavy Snow Events in Norfolk County, 1995-2019

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
SUFFOLK (ZONE)	1/2/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/2/1996	0	0	$0
WESTERN NORFOLK (ZONE)	1/2/1996	0	0	$0
EASTERN NORFOLK (ZONE)	1/2/1996	0	0	$0
SUFFOLK (ZONE)	1/7/1996	0	0	$7,000,000
WESTERN NORFOLK (ZONE)	1/7/1996	0	0	$1,400,000
EASTERN PLYMOUTH (ZONE)	1/7/1996	0	0	$1,600,000
EASTERN NORFOLK (ZONE)	1/7/1996	0	0	$2,000,000
WESTERN NORFOLK (ZONE)	1/10/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/10/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/2/1996	0	0	$0
WESTERN NORFOLK (ZONE)	2/2/1996	0	0	$0
EASTERN NORFOLK (ZONE)	2/2/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/16/1996	0	0	$0
SUFFOLK (ZONE)	2/16/1996	0	0	$0
EASTERN NORFOLK (ZONE)	2/16/1996	0	0	$0
WESTERN NORFOLK (ZONE)	2/16/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/2/1996	0	0	$0
SUFFOLK (ZONE)	3/2/1996	0	0	$0
WESTERN NORFOLK (ZONE)	3/2/1996	0	0	$0
EASTERN NORFOLK (ZONE)	3/2/1996	0	0	$0
SUFFOLK (ZONE)	3/7/1996	0	0	$0
WESTERN NORFOLK (ZONE)	3/7/1996	0	0	$0

[21] National Oceanic and Atmospheric Administration. National Centers for Environmental Information.

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN NORFOLK (ZONE)	3/7/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/7/1996	0	0	$0
SUFFOLK (ZONE)	4/7/1996	0	0	$0
EASTERN NORFOLK (ZONE)	4/7/1996	0	0	$0
WESTERN NORFOLK (ZONE)	4/7/1996	0	0	$0
WESTERN NORFOLK (ZONE)	4/9/1996	0	0	$0
EASTERN PLYMOUTH (ZONE)	4/9/1996	0	0	$0
EASTERN NORFOLK (ZONE)	4/9/1996	0	0	$0
SUFFOLK (ZONE)	4/9/1996	0	0	$0
WESTERN NORFOLK (ZONE)	12/6/1996	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	1/11/1997	0	0	$0
WESTERN NORFOLK (ZONE)	1/11/1997	0	0	$0
EASTERN NORFOLK (ZONE)	1/11/1997	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	2/16/1997	0	0	$0
EASTERN NORFOLK (ZONE)	3/31/1997	0	0	$0
WESTERN NORFOLK (ZONE)	3/31/1997	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	3/31/1997	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	3/31/1997	0	0	$0
EASTERN NORFOLK (ZONE)	4/1/1997	0	0	$0
WESTERN NORFOLK (ZONE)	4/1/1997	0	0	$2,500,000
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	4/1/1997	0	1	$2,500,000
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	4/1/1997	0	0	$0
WESTERN NORFOLK (ZONE)	12/23/1997	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	12/23/1997	0	0	$0
EASTERN NORFOLK (ZONE)	12/23/1997	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	1/15/1998	0	0	$0
WESTERN NORFOLK (ZONE)	1/15/1998	0	0	$0
EASTERN NORFOLK (ZONE)	1/15/1998	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	12/24/1998	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	1/14/1999	0	0	$0

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN NORFOLK (ZONE)	1/14/1999	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	1/14/1999	0	0	$0
WESTERN NORFOLK (ZONE)	1/14/1999	0	0	$0
EASTERN NORFOLK (ZONE)	2/25/1999	0	0	$0
WESTERN NORFOLK (ZONE)	2/25/1999	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	2/25/1999	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	2/25/1999	0	0	$0
EASTERN NORFOLK (ZONE)	3/6/1999	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	3/6/1999	0	0	$0
WESTERN NORFOLK (ZONE)	3/6/1999	0	0	$0
EASTERN NORFOLK (ZONE)	3/15/1999	0	0	$0
WESTERN NORFOLK (ZONE)	3/15/1999	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	3/15/1999	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	3/15/1999	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	1/13/2000	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	1/13/2000	0	0	$0
WESTERN NORFOLK (ZONE)	1/13/2000	0	0	$0
EASTERN NORFOLK (ZONE)	1/13/2000	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	2/18/2000	0	0	$0
EASTERN NORFOLK (ZONE)	2/18/2000	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	2/18/2000	0	0	$0
WESTERN NORFOLK (ZONE)	2/18/2000	0	0	$0
WESTERN NORFOLK (ZONE)	12/30/2000	0	0	$0
EASTERN NORFOLK (ZONE)	1/20/2001	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	1/20/2001	0	0	$0
WESTERN NORFOLK (ZONE)	1/20/2001	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	1/20/2001	0	0	$0
WESTERN NORFOLK (ZONE)	2/5/2001	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	2/5/2001	0	0	$0

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN NORFOLK (ZONE)	2/5/2001	0	0	$0
WESTERN NORFOLK (ZONE)	3/5/2001	0	0	$0
SUFFOLK (ZONE)	3/5/2001	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/5/2001	0	0	$0
EASTERN NORFOLK (ZONE)	3/5/2001	0	0	$0
WESTERN NORFOLK (ZONE)	3/9/2001	0	0	$0
EASTERN NORFOLK (ZONE)	3/26/2001	0	0	$0
WESTERN NORFOLK (ZONE)	3/26/2001	0	0	$250,000
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	3/26/2001	0	0	$0
WESTERN NORFOLK (ZONE)	12/8/2001	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	12/5/2002	0	0	$0
WESTERN NORFOLK (ZONE)	3/16/2004	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	3/16/2004	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	3/16/2004	0	0	$0
EASTERN NORFOLK (ZONE)	3/16/2004	0	0	$0
WESTERN NORFOLK (ZONE)	11/12/2004	0	0	$0
SUFFOLK (ZONE)	2/21/2005	0	0	$0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	2/24/2005	0	0	$0
EASTERN PLYMOUTH / ALSO PART OF NORFOLK (ZONE)	2/24/2005	0	0	$0
EASTERN NORFOLK (ZONE)	2/24/2005	0	0	$0
WESTERN NORFOLK (ZONE)	2/24/2005	0	0	$0
WESTERN NORFOLK (ZONE)	12/13/2007	0	0	$0
EASTERN PLYMOUTH (ZONE)	12/13/2007	0	0	$0
WESTERN NORFOLK (ZONE)	12/16/2007	0	0	$0
EASTERN NORFOLK (ZONE)	12/16/2007	0	0	$0
SUFFOLK (ZONE)	12/16/2007	0	0	$7,500
EASTERN PLYMOUTH (ZONE)	12/16/2007	0	0	$0
EASTERN NORFOLK (ZONE)	12/19/2007	0	0	$0
SUFFOLK (ZONE)	12/19/2007	0	0	$0
WESTERN NORFOLK (ZONE)	1/14/2008	0	0	$36,000
EASTERN NORFOLK (ZONE)	1/14/2008	0	0	$30,000
SUFFOLK (ZONE)	1/14/2008	0	0	$55,000
EASTERN PLYMOUTH (ZONE)	1/27/2008	0	0	$0

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
SUFFOLK (ZONE)	2/22/2008	0	0	$0
WESTERN NORFOLK (ZONE)	2/22/2008	0	0	$0
EASTERN NORFOLK (ZONE)	2/22/2008	0	0	$0
EASTERN NORFOLK (ZONE)	12/19/2008	0	0	$0
SUFFOLK (ZONE)	12/19/2008	0	0	$10,000
WESTERN NORFOLK (ZONE)	12/19/2008	0	0	$0
EASTERN PLYMOUTH (ZONE)	12/19/2008	0	0	$3,000
WESTERN NORFOLK (ZONE)	12/31/2008	0	0	$0
EASTERN PLYMOUTH (ZONE)	12/31/2008	0	0	$0
EASTERN NORFOLK (ZONE)	12/31/2008	0	0	$0
SUFFOLK (ZONE)	12/31/2008	0	0	$0
WESTERN NORFOLK (ZONE)	1/18/2009	0	0	$0
EASTERN NORFOLK (ZONE)	1/18/2009	0	0	$0
SUFFOLK (ZONE)	1/18/2009	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/18/2009	0	0	$0
SUFFOLK (ZONE)	1/19/2009	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/19/2009	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/3/2009	0	0	$0
EASTERN NORFOLK (ZONE)	2/3/2009	0	0	$0
WESTERN NORFOLK (ZONE)	3/1/2009	0	0	$0
SUFFOLK (ZONE)	3/1/2009	0	0	$0
EASTERN NORFOLK (ZONE)	3/1/2009	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/2/2009	0	0	$0
EASTERN NORFOLK (ZONE)	12/19/2009	0	0	$0
WESTERN NORFOLK (ZONE)	12/19/2009	0	0	$0
EASTERN PLYMOUTH (ZONE)	12/19/2009	0	0	$0
SUFFOLK (ZONE)	12/19/2009	0	0	$0
EASTERN NORFOLK (ZONE)	2/16/2010	0	0	$0
EASTERN PLYMOUTH (ZONE)	12/20/2010	0	0	$0
WESTERN NORFOLK (ZONE)	1/12/2011	0	0	$0
EASTERN NORFOLK (ZONE)	1/12/2011	0	0	$0
WESTERN NORFOLK (ZONE)	1/26/2011	0	0	$0
SUFFOLK (ZONE)	1/26/2011	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/26/2011	0	0	$0
EASTERN NORFOLK (ZONE)	1/26/2011	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/21/2012	0	0	$0

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
WESTERN NORFOLK (ZONE)	12/29/2012	0	0	$5,000
WESTERN NORFOLK (ZONE)	2/8/2013	0	0	$0
SUFFOLK (ZONE)	2/8/2013	0	0	$0
EASTERN NORFOLK (ZONE)	2/8/2013	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/8/2013	0	0	$0
WESTERN NORFOLK (ZONE)	3/7/2013	0	0	$0
EASTERN NORFOLK (ZONE)	3/7/2013	0	0	$0
SUFFOLK (ZONE)	3/7/2013	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/7/2013	0	0	$0
WESTERN NORFOLK (ZONE)	3/18/2013	0	0	$0
EASTERN NORFOLK (ZONE)	3/18/2013	0	0	$0
SUFFOLK (ZONE)	3/18/2013	0	0	$0
EASTERN NORFOLK (ZONE)	12/14/2013	0	0	$0
WESTERN NORFOLK (ZONE)	12/14/2013	0	0	$0
SUFFOLK (ZONE)	12/17/2013	0	0	$0
WESTERN NORFOLK (ZONE)	1/2/2014	0	0	$0
SUFFOLK (ZONE)	1/2/2014	0	0	$0
EASTERN NORFOLK (ZONE)	1/2/2014	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/2/2014	0	0	$0
WESTERN NORFOLK (ZONE)	1/21/2014	0	0	$0
EASTERN NORFOLK (ZONE)	1/21/2014	0	0	$0
EASTERN PLYMOUTH (ZONE)	1/21/2014	0	0	$0
WESTERN NORFOLK (ZONE)	2/5/2014	0	0	$0
EASTERN NORFOLK (ZONE)	2/5/2014	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/5/2014	0	0	$0
SUFFOLK (ZONE)	2/5/2014	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/15/2014	0	0	$5,000
SUFFOLK (ZONE)	1/24/2015	0	0	$0
WESTERN NORFOLK (ZONE)	1/26/2015	0	0	$0
EASTERN PLYMOUTH (ZONE)	2/2/2015	0	0	$0
SUFFOLK (ZONE)	2/2/2015	0	0	$0
EASTERN NORFOLK (ZONE)	2/2/2015	0	0	$0
WESTERN NORFOLK (ZONE)	2/2/2015	0	0	$0
WESTERN NORFOLK (ZONE)	2/8/2015	0	0	$0
EASTERN NORFOLK (ZONE)	2/8/2015	0	0	$0
SUFFOLK (ZONE)	2/8/2015	0	0	$0

LOCATION	BEGIN DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN PLYMOUTH (ZONE)	2/8/2015	0	0	$0
WESTERN NORFOLK (ZONE)	2/14/2015	0	0	$0
EASTERN NORFOLK (ZONE)	2/14/2015	0	0	$0
SUFFOLK (ZONE)	2/14/2015	0	0	$0
EASTERN PLYMOUTH (ZONE)	3/5/2015	0	0	$0
WESTERN NORFOLK (ZONE)	1/23/2016	0	0	$0
SUFFOLK (ZONE)	1/23/2016	0	0	$0
WESTERN NORFOLK (ZONE)	2/5/2016	2	0	$100,000
EASTERN NORFOLK (ZONE)	2/5/2016	0	0	$0
SUFFOLK (ZONE)	2/5/2016	0	0	$10,000
EASTERN PLYMOUTH (ZONE)	2/5/2016	0	0	$100,000
EASTERN NORFOLK (ZONE)	2/8/2016	0	0	$0
SUFFOLK (ZONE)	2/8/2016	0	0	$0
EASTERN PLYMOUTH (ZONE)	4/4/2016	0	0	$0
EASTERN NORFOLK (ZONE)	4/4/2016	0	0	$0
EASTERN NORFOLK (ZONE)	3/14/2017	0	0	$0
WESTERN NORFOLK (ZONE)	3/14/2017	0	0	$0
SUFFOLK (ZONE)	3/14/2017	0	0	$0
WESTERN NORFOLK (ZONE)	11/15/2018	0	0	$0

Ice Storms

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow 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, as describe in Table 13.

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 Medfield. The best available local data is for Norfolk County through the NOAA's National Centers for Environmental Information. Norfolk County, which includes the Town of Medfield, has experienced no ice storm events since 1978. Ice storms and hail are considered to be high frequency events based on past occurrences, occurring approximately once a year, as defined by the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018.

Table 13: 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
Description	**Diameter (inches)**
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

Geologic Hazards

Geologic hazards include earthquakes and landslides. The Massachusetts Building Code requires new construction comply with seismic standards, there are still many structures that pre-date the most recent building code. Information on geologic hazards in Medfield can be found on Map 4 in Appendix B.

Earthquakes

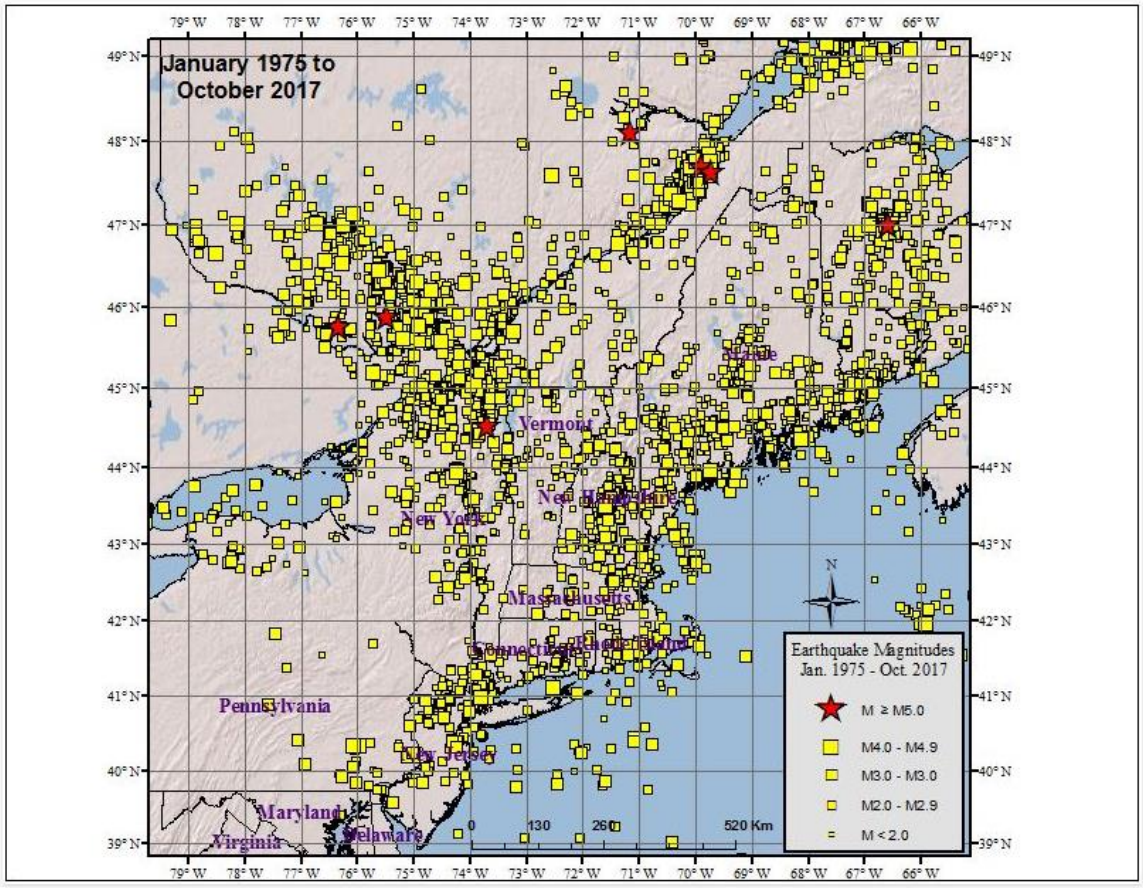
Damage in an earthquake stems from ground motion, surface faulting, and ground failure in which weak or unstable soils, such as those composed primarily of saturated sand or silts, liquefy. The effects of an earthquake are mitigated by distance and ground materials between the epicenter and a given location. An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology (NESEC).

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 in Figure 8.

Figure 8: Richter Scale and Effects[22]

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.

Figure 9: Map of Earthquakes of the Northeastern US and Southeastern Canada 1975 to 2017[23]



[22] Nevada Seismological Library (NSL), 20
[23] The Northeast States Emergency Consortium

From 1668 to 2019, 408 earthquakes were recorded in Massachusetts (NESEC). Most have originated from the La 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 Malbaie 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 are shown in Table 14 and Figure 9.

Table 14: Historical Earthquakes in Massachusetts or Surrounding Area[24]

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
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

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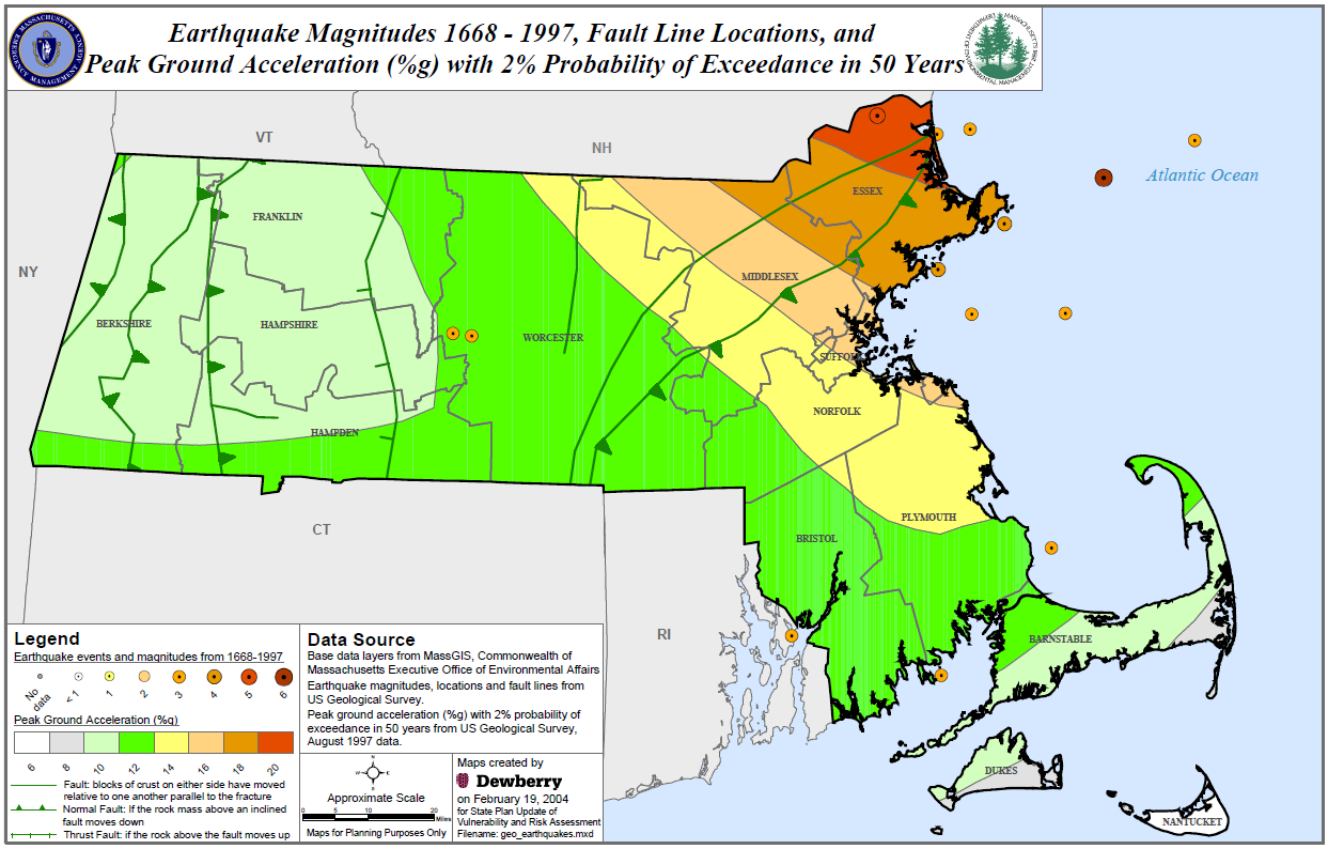
Location	Date	Magnitude
MA - Boston	12/27/74	2.3
VA - Mineral	8/23/11	5.8
MA - Nantucket	4/12/12	4.5
ME - Hollis	10/17/12	4.0
CT-Wauregan	1/12/2015	3.3
CT-Wauregan	1/12/2015	2.6
NH-East Kingston	2/15/2018	2.7

One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (1 g). The range of peak ground acceleration in Massachusetts is from 10g to 20g, with a 2% probability of exceedance in 50 years. Medfield is in the middle part of the range for Massachusetts, making it a relatively moderate area of earthquake risk within the state, although the state as a whole is considered to have a low risk of earthquakes compared to the rest of the country (Figure 10)

Figure 10: State of Massachusetts Earthquake Probability Map



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. 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 Medfield. The town has many older buildings that pre-date current building code which could be vulnerable in the event of a severe earthquake. Potential earthquake damages to Medfield have been estimated using HAZUS-MH. The total economic loss including building and lifeline related losses are $289.86 million for a Magnitude 5.0 and $2.161 billion for a Magnitude 7.0 earthquake (Table 24). Other potential impacts are detailed in Figure 8.

According to the Boston College Weston Observatory, in most parts of New England, there is a one in ten chance that a potentially damaging earthquake will occur in a 50 year time period. According to the Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan 2018, there is a 10% chance of Massachusetts experiencing a magnitude 5 earthquake in a 10-year period.

Landslides

According to the United States Geological Society (USGS), a landslide describes a process that results in movement of rock, soil, fill, or combination downward and outward by falling, toppling, sliding, spreading or flowing.[25] Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors. Among the contributing factors are: erosion by rivers or ocean waves over steepened slopes; rock and soil slopes weakened through saturation by snowmelt or heavy rains; 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.

[25] U.S. Dept. of Interior U.S. Geological Society. Landslide Types and Processes. Fact Sheet 2003-3072

There is no universally accepted measure of landslide extent but it has been represented as a measure of the destructiveness. Figure 11 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.

Figure 11: Estimated Landslide Intensity[26]

Estimated Volume (m^3)	Expected Landslide Velocity		
	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

All of Medfield is 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 in Medfield. 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, transportation and other infrastructure, and localized road closures. Potential damages would depend on the extent of impact and be based on how many properties were affected. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Medfield. Based on past occurrences and the Massachusetts Hazard Mitigation Plan 2018, landslides are a low risk but potentially occurring at least once a year in Massachusetts.

Tsunami

An additional natural hazard associated with earthquakes are tsunamis. Tsunamis are created when the epicenter of an earthquake, the area of the fault where a sudden rupture occurs, is beneath the ocean floor. This can sometimes create immense sea waves if the earthquake causes upward or downward movement of the sea floor.[27] According to the National Centers for Environmental Information, there are Tsunami's reported in the Northeast area of the United

[26] *A Geomorphological Approach to the Estimation of Landslide Hazards and Risks in Umbria, Central Italy*, M. Cardinali et al, 2002

[27] MA Integrated Natural Hazard and Climate Adaptation Plan, 2018

States. The 2018 Massachusetts Integrated State Natural Hazard and Climate Adaptation Plan reports tsunamis have a very low frequency, occurring once every 39 years but with extensive and catastrophic severity across the coast of Massachusetts. Since Medfield is not a coastal community, Tsunamis are not a risk to Medfield.

Fire-Related Hazards

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

- 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.

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

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

Medfield Potential Brush Fire Hazard Areas

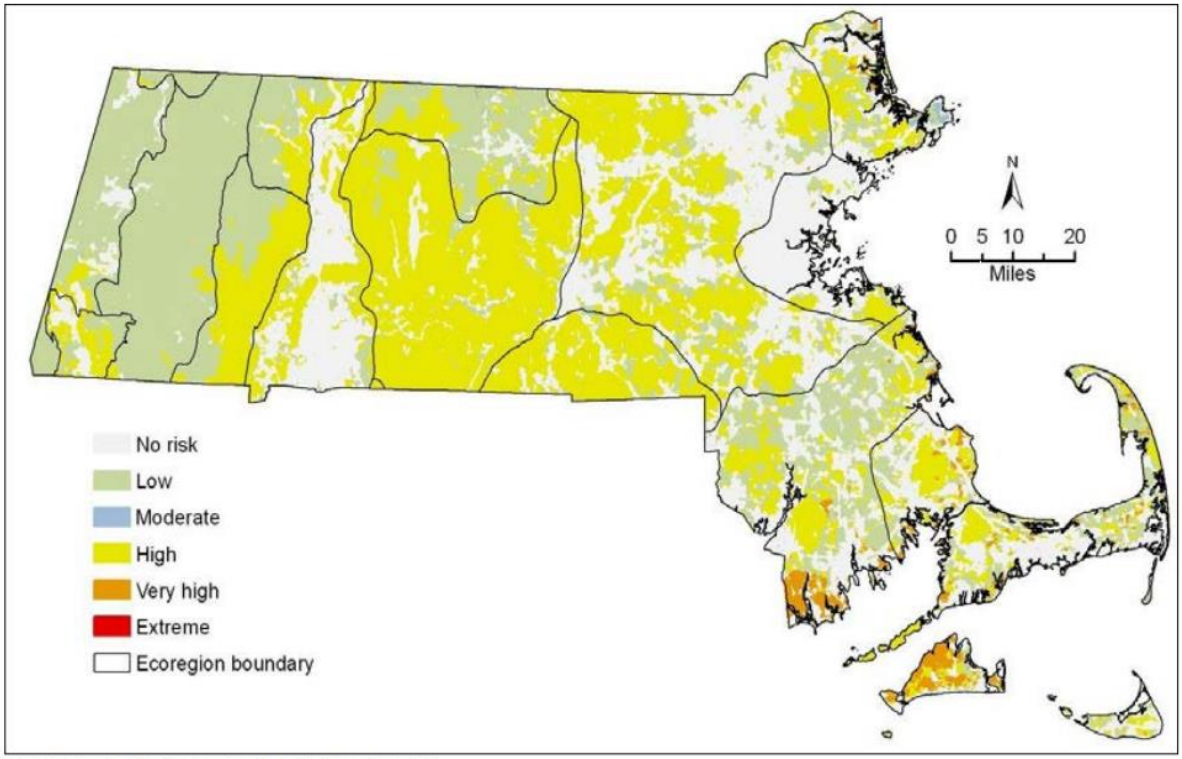
The Medfield Fire Department has occasionally had to respond to brush fires. The areas of town described in Table 15 were identified as having the highest potential for brush fires based either on higher concentration of brush or forest. The numbers correspond to the numbers on Appendix B Map 8, “Local Hazard Areas.”

Wildfires in Massachusetts are measured by the number of fires and the sum of acres burned. According the MA Integrated Natural Hazard and Climate Adaptation Plan, Medfield has moderate to high risk of wildfires (
Figure **12**). However, the Town of Medfield responded to 61 incidences of fire-related hazards in Medfield from 2014-2019. These are listed in Table 16.

Table 15: Locally Identified Brush Fire Locations in Medfield.

MAP ID	Location	Hazard Type	Core Team Comments
1	Noon Hill, at Town's southern border	Brush Fire	Have fire trails, Town cleaning the fire trails. Land Management during cold weather.
2	Rocky Woods Reservation, northeast corner of town	Brush Fire	TTOR promoting beaver habitat, increase in beaver population, beaver dams break and causing flooding during extreme precipitation events. Challenges in promoting wildlife habitat while managing flooding to residences and roads.

Figure 12: Massachusetts Wildfires Risk Areas[28]



Source: Northeast Wildfire Risk Assessment Geospatial Work Group, 2009

[28] Massachusetts Integrated Natural Hazard and Climate Adaptation Plan

Table 16 Fire Department reported and responded incidences of fire-related hazards 2014-2019

Incident	Date	Address	Type
14-379-IN	5/18/2014	9 Millbrook Rd	Brush or brush-and-grass mixture fire
15-1098-IN	11/15/2015	121 Harding St	Brush or brush-and-grass mixture fire
15-32-IN	1/11/2015	Westview Rd	Brush or brush-and-grass mixture fire
15-443-IN	4/28/2015	15 Knollwood Rd	Brush or brush-and-grass mixture fire
15-515-IN	5/17/2015	242 Main St	Brush or brush-and-grass mixture fire
15-604-IN	6/14/2015	Causeway St	Brush or brush-and-grass mixture fire
15-786-IN	8/11/2015	40 Hospital Rd	Brush or brush-and-grass mixture fire
15-875-IN	9/7/2015	90 Adams St	Brush or brush-and-grass mixture fire
16-1014-IN	10/11/2016	14 Forest St	Brush or brush-and-grass mixture fire
16-114-IN	2/2/2016	Noon Hill Rd	Brush or brush-and-grass mixture fire
16-115-IN	2/2/2016	Curve St	Brush or brush-and-grass mixture fire
16-365-IN	3/31/2016	Walpole St	Brush or brush-and-grass mixture fire
16-366-IN	3/31/2016	27 Park St	Brush or brush-and-grass mixture fire
16-369-IN	3/31/2016	Abbott Road	Brush or brush-and-grass mixture fire
16-446-IN	4/20/2016	91 Spring St	Brush or brush-and-grass mixture fire
16-447-IN	4/21/2016	12 Causeway Lane	Brush or brush-and-grass mixture fire
16-452-IN	4/22/2016	Bridie Ln	Brush or brush-and-grass mixture fire
16-668-IN	6/24/2016	Hartford St	Brush or brush-and-grass mixture fire
16-699-IN	7/4/2016	Tower Dr	Brush or brush-and-grass mixture fire
16-700-IN	7/4/2016	Tower Dr	Brush or brush-and-grass mixture fire
16-756-IN	7/21/2016	Hospital Rd	Brush or brush-and-grass mixture fire
16-854-IN	8/19/2016	12 Loeffler Lane	Brush or brush-and-grass mixture fire
17-115-IN	2/5/2017	235 Causeway St	Brush or brush-and-grass mixture fire
17-151-IN	2/19/2017	48 Hospital Rd	Brush or brush-and-grass mixture fire
17-217-IN	3/13/2017	387 Main St	Brush or brush-and-grass mixture fire
17-305-IN	4/8/2017	Hospital Rd	Brush or brush-and-grass mixture fire
17-329-IN	4/14/2017	Hatters Hill Rd	Brush or brush-and-grass mixture fire
17-332-IN	4/14/2017	38 Millbrook Rd	Brush or brush-and-grass mixture fire
17-336-IN	4/16/2017	Larch Road	Brush or brush-and-grass mixture fire
17-337-IN	4/16/2017	1 Larch Rd	Brush or brush-and-grass mixture fire
17-339-IN	4/17/2017	339 Main St	Brush or brush-and-grass mixture fire
17-562-IN	6/21/2017	120 N. Meadows Rd	Brush or brush-and-grass mixture fire
17-957-IN	10/20/2017	24 Pound St	Brush or brush-and-grass mixture fire
17-959-IN	10/21/2017	24 Pound St	Brush or brush-and-grass mixture fire
17-960-IN	10/21/2017	24 Pound St	Brush or brush-and-grass mixture fire
17-961-IN	10/22/2017	24 Pound St	Brush or brush-and-grass mixture fire
17-969-IN	10/23/2017	24 Pound St	Brush or brush-and-grass mixture fire

Incident	Date	Address	Type
18-00434-IN	4/7/2018	240 North St	Brush or brush-and-grass mixture fire
19-325-IN	3/20/2019	133 High St	Brush or brush-and-grass mixture fire
19-355-IN	3/30/2019	9 Summer St	Brush or brush-and-grass mixture fire
19-48-IN	1/15/2019	Ralph Wheelock School	Brush or Brush-and-grass mixture fire
16-671-IN	6/25/2016	Hartford St Forest,	woods or wildland fire
14-476-IN	6/21/2014	171 South St	Natural vegetation fire, other
14-519-IN	7/2/2014	48 Pleasant St	Natural vegetation fire, other
14-636-IN	8/9/2014	16 West Mill St	Natural vegetation fire, other
14-706-IN	9/1/2014	16 West Mill St	Natural vegetation fire, other
14-774-IN	9/27/2014	161 Granite St	Natural vegetation fire, other
15-504-IN	5/14/2015	5 North Meadows Rd	Natural vegetation fire, other
15-506-IN	5/15/2015	North St	Natural vegetation fire, other
15-784-IN	8/11/2015	45 Hospital Rd	Natural vegetation fire, other
15-876-IN	9/7/2015	59 Frairy St	Natural vegetation fire, other
16-321-IN	3/14/2016	Hospital Rd	Natural vegetation fire, other
16-641-IN	6/17/2016	1 Ice House Rd	Natural vegetation fire, other
16-678-IN	6/27/2016	Ice House Rd	Natural vegetation fire, other
16-771-IN	7/26/2016	14 Pondview Ave	Natural vegetation fire, other
16-800-IN	8/5/2016	5 Cedar Lane	Natural vegetation fire, other
16-838-IN	8/15/2016	8 Plain St	Natural vegetation fire, other
17-338-IN	4/17/2017	459 Main St	Natural vegetation fire, other
17-838-IN	9/12/2017	7 West Mill St	Natural vegetation fire, other
18-00759-IN	7/9/2018	446 Main St	Natural vegetation fire, other
18-00842-IN	7/29/2018	16 West Mill St	Natural vegetation fire, other

Potential damages from wildfires in Medfield would depend on the extent and type of land affected. Medfield has over 3,000 acres of forest and forested wetland, approximately 52% of Medfield's total land area. These forested areas are vulnerable to brush and wildfires, particularly if there are dry summer conditions or drought.

Potential vulnerabilities to wildfires include damage to structures and other improvements, and impacts on natural resources such as town conservation land. 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.

Based on past occurrences and the 2018 MA Integrated Natural Hazard and Climate Adaptation Plan 2018, brushfires are frequent, occurring once a year. However, given the extensive forest,

tree species composition, and numerous response to brush fires in the last five years, brushfires are a medium hazard for Medfield.

Extreme Temperatures

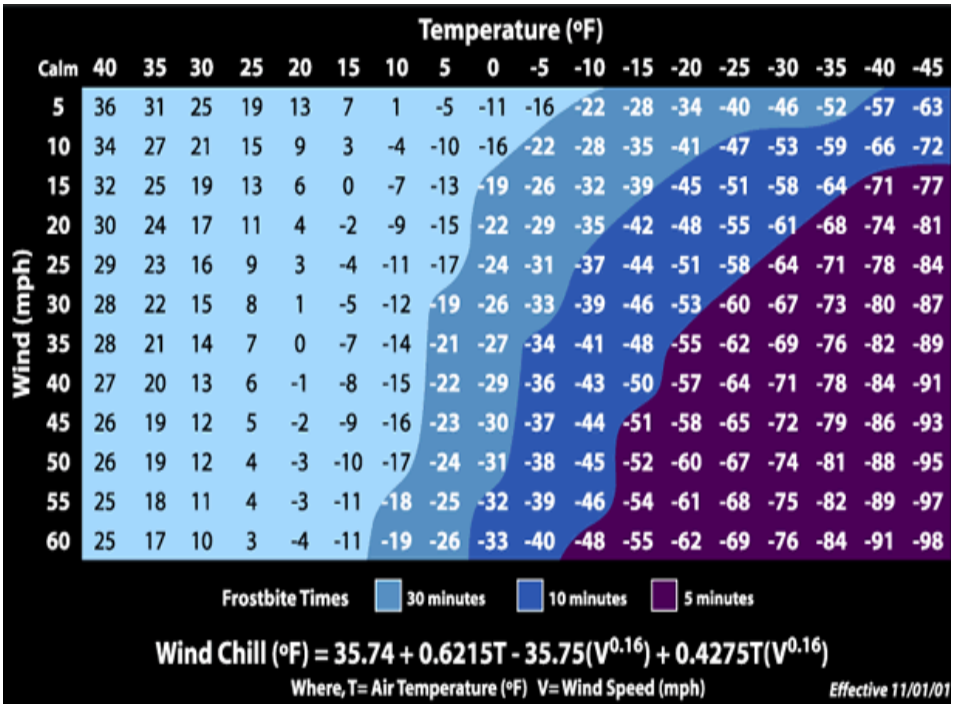
Extreme temperatures occur when either high temperature or low temperatures relative to average local temperatures occur. These can occur for brief periods of time and be acute, or they can occur over long periods of time when there is a prolonged period of excessively hot or cold weather.

Medfield 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 far outside of the normal seasonal ranges for Massachusetts. The average temperature for Massachusetts winter (December to February) is 31.8°F and the summer (June to August) average is 71°F. Extreme temperatures are a town-wide hazard.

Extreme Cold

For extreme cold, temperature is typically measured using Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The latest version of the index was implemented in 2001 and it meant to show how cold conditions feel on unexposed skin. The index is provided in Figure 13 below.

Figure 13: Wind Chill Temperature Index and Frostbit Risk[29]



[29] National Weather Service

Extreme cold is relative to the normal climatic lows in a region. Temperatures that drop decidedly below normal and wind speeds that increase can cause harmful wind chill factors. The wind chill is the apparent temperature felt on exposed skin due to the combination of air temperature and wind speed. Extreme cold is a dangerous situation that can result in health emergencies for susceptible people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat. Seniors and people with disabilities are often most vulnerable. In Medfield, 11.3% of the people are over 65 years old, and 5.3% of the population have a disability.

The Town of Medfield does not collect data for previous occurrences of extreme cold. The best available local data are for Norfolk County, through the National Centers for Environmental Information (NCEI). There are two extreme cold events on record which caused no deaths, injuries, or property damage (Table 17). Extreme cold events occur between 1.2-2 times a year.[30]

Table 17: Norfolk County and Area Extreme Cold and Wind Chill Occurrences 1995-2019[31]

LOCATION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE
SUFFOLK (ZONE)	2/3/2007	1	0	0
WESTERN NORFOLK (ZONE)	2/16/2015	0	0	0
SUFFOLK (ZONE)	2/16/2015	0	0	0
EASTERN NORFOLK (ZONE)	2/16/2015	0	0	0
EASTERN PLYMOUTH (ZONE)	2/16/2015	0	0	0
EASTERN NORFOLK (ZONE)	2/13/2016	0	0	0
SUFFOLK (ZONE)	2/14/2016	0	0	0
WESTERN NORFOLK (ZONE)	2/14/2016	0	0	0
EASTERN PLYMOUTH (ZONE)	2/14/2016	0	0	0

Extreme Heat

While a heat wave for 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 14) is forecast to exceed 100 degrees Fahrenheit (F) for two or more hours; an excessive heat advisory is issued if forecast predicts the temperature to rise above 105°F.

Global temperatures increased by nearly 2 degrees in the last century[32] and even small changes in temperature have widespread and significant changes to our climatic system. For example, the

[30] MA Integrated Natural Hazard and Climate Adaptation Plan. 2018
[31] NOAA, National Centers for Environmental Information
[32] USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018.

northeast has experienced a 10-day increase in the growing season in since 1980.[33] Historically, extreme temperature events are a medium frequency event based on past occurrences, as

Figure 14: Heat Index Chart[34]

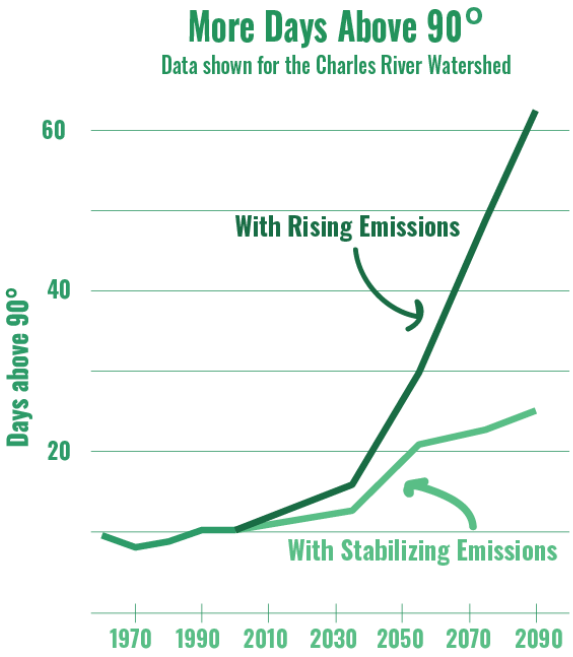
Relative Humidity (%) \ Temperature (°F)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Category	Heat Index	Health Hazards
Extreme Danger	130 °F – Higher	Heat Stroke or Sunstroke is likely with continued exposure.
Danger	105 °F – 129 °F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90 °F – 105 °F	Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80 °F – 90 °F	Fatigue possible with prolonged exposure and/or physical activity.

defined by the Massachusetts Integrated Hazard Mitigation and Climate Adaptation Plan. Extreme heat events occur between once in five years to once in 50 years, or a 2% to 20% chance of occurring each year. However, with our changing climate, extreme heat will likely become a more frequent experience. With climate change, the Town can expect 40-50 days over 90 degrees by mid to late century, a significant increase from the baseline of 7 days today (**Figure 15**).

[33] Knuckel, K.E., D.R. Easterling, K. Hubbard, and K. Redmond. 2004. Temporal variations in frost-free season in the United State: 1895-2000. Geophys. Res. Lett. 31:L03201.
[34] National Weather Service

Figure 15 Temperature change and projections for days over 90◦ with two emission scenarios.



The Town of Medfield does not collect data on excessive heat occurrences. The best available local data are for Norfolk County through the National Centers for Environmental Information. From 1995 to 2019, there were 17 day with excessive heat, with no deaths injuries, or property (Table 18).

Table 18: Norfolk County Extreme Heat Occurrences[35]

LOCATION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN NORFOLK (ZONE)	5/8/2000	0	0	0
EASTERN NORFOLK (ZONE)	5/9/2000	0	0	0
EASTERN NORFOLK (ZONE)	10/14/2000	0	0	0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	12/17/2000	0	0	0
EASTERN NORFOLK (ZONE)	5/3/2001	0	0	0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	5/3/2001	0	0	0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	5/4/2001	0	0	0

[35] NOAA, National Centers for Environmental Information

LOCATION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE
EASTERN NORFOLK (ZONE)	5/12/2001	0	0	0
SUFFOLK / ALSO PART OF NORFOLK (ZONE)	5/12/2001	0	0	0
EASTERN PLYMOUTH (ZONE)	7/22/2011	0	0	0
SUFFOLK (ZONE)	7/22/2011	0	0	0
WESTERN NORFOLK (ZONE)	7/22/2011	0	0	0
WESTERN NORFOLK (ZONE)	7/1/2018	0	0	0
WESTERN NORFOLK (ZONE)	7/3/2018	0	0	0
EASTERN PLYMOUTH (ZONE)	7/3/2018	0	0	0
SUFFOLK (ZONE)	7/3/2018	0	0	0
WESTERN NORFOLK (ZONE)	8/28/2018	0	0	0

MAPC performed a heat island analysis to ascertain the areas most at risk to extreme heat. A heat island is defined as an area whose temperature ranges more than 1.8-.54° F greater during the daytime or up to 22° F greater in the evening than the surrounding areas.[36] MAPC used LANDSAT satellite imagery at 30 m resolution to ascertain land surface temperatures during the daytime in the warmest months of 2016. Due to its 63% tree canopy cover and only 10% impervious surface, urban heat island is not a significant issue for the Town of Medfield. There are three current "hot spots" where the temperature is significantly hotter than surrounding areas. These include the high school, the site of Medfield State Hospital, and the commercial business area. (Appendix B Map 9).

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.

In Medfield, 11.3% of the people are over 65 years old. 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.[37,38]

[36] U.S. Environmental Protection Agency. https://www.epa.gov/heat-islands
[37] 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
[38] 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, where intense heat spikes electricity demand and 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.[39] 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.

Today, extreme temperatures are a medium frequency event based on past occurrences, occurring 1.5-2 times a year according to the 2018 MA Integrated Natural Hazard and Climate Adaptation Plan.

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.

Five levels of drought have been developed to characterize drought severity: Normal, Advisory, Watch, Warning, and Emergency. These drought levels are based on the conditions of natural resources and are intended to provide information on the current status of water resources. 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.

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. Average annual precipitation in Massachusetts is 44 inches per year, and during the 1965 drought, the statewide precipitation total of 30 inches was 68 percent of average. The drought was so severe, the Quabbin Reservoir was 20 feet below its current level today.[40] In 2016,

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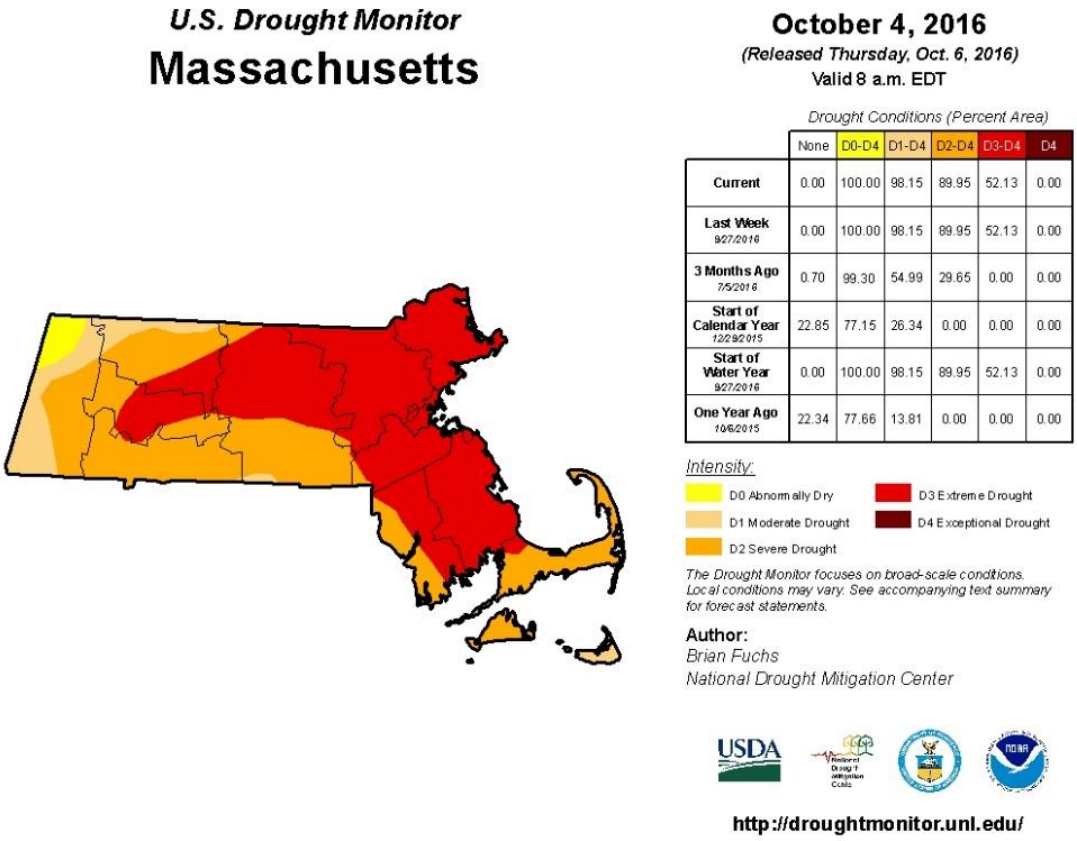
[39] Wicked Local Belmont "Power Outage in Belmont Affects 2,000 Customers" June 14, 2017. http://belmont.wickedlocal.com/news/20170612/power-outage-in-belmont-affects-2000-customers.
[40] Lathrop, Janet. Putting New England's Drought into Perspective. https://www.umass.edu/newsoffice/article/putting-new-england%E2%80%99s-drought-perspective

nearly half of Massachusetts was in extreme drought conditions with 15 inches of deficit rainfall (Figure 16), 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,[41] and prompting State aid to farmers for crop losses.

Average annual precipitation in Massachusetts is 44 inches per year, with approximately three to four inch average amounts 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% 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 six regions: Western, Central, Connecticut River Valley, Northeast, Southeast, and Cape and Islands. Medfield is located in the Southeast Region. In Medfield, drought is a potential town-wide hazard.

Figure 16 Drought Conditions in Massachusetts, 2016



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

Five levels of drought have been developed to characterize drought severity: Normal, Advisory, Watch, Warning, and Emergency. These drought levels are based on the conditions of natural resources and are intended to provide information on the current status of water resources. 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.

As dry conditions can have a range of different impacts, a number of drought indices are available to assess these various 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 six 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.

Determinations regarding the end of a drought or reduction of the drought level focus on two key drought indicators: precipitation and groundwater levels. These two factors have the greatest long-term impact on stream flow, water supply, reservoir levels, soil moisture and potential for forest fires. Greater percentage of impervious surface in Massachusetts reducing the amount of groundwater recharge have further enhanced drought occurrence and severity.

Previous Occurrences

Medfield does not collect data relative to drought events, however, in 2016 Medfield imposed mandatory outdoor watering bans to maximize water conservation during the most significant

drought Massachusetts has experienced since the 1960s. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for drought. The statewide scale is a composite of six regions of the state (Figure 17).

Figure 17: Droughts in Massachusetts based on Instrumental Records[42]

Table 4-13: Droughts in Massachusetts Based on Instrumental Records

Date	Area Affected	Recurrence Interval (years)	Remarks	Reference
1879-83	—	—		Kinnison (1931) as cited in USGS 1989
1908-12	—	—		Kinnison (1931) as cited in USGS 1989
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 and 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 and 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

Notes: (1) "—" denotes data not available; (2) USGS 1989 determined dry periods from streamflow and precipitation records. Dry periods that exceeded a recurrence interval of 10 years were deemed droughts; (3) DMP 2013 analyzed precipitation data only and as a statewide average of stations; (4) DCR 2017 compiled data based on historical drought declarations by the State under the protocol in its 2013 Drought Management Plan. DCR = Department of Conservation and Recreation; USGS = United States Geological Survey.

Drought Emergency

Drought emergencies have been reached infrequently, with five events occurring in the period between 1850 and 2018: 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.

[42] 2018 MA Integrated State Hazard Mitigation and Climate Adaptation Plan

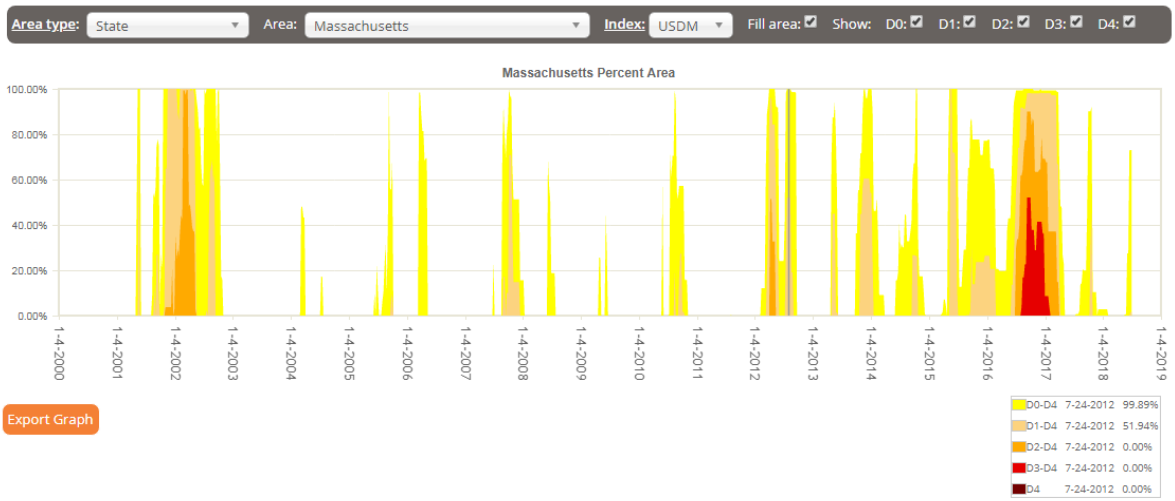
Drought Warning

Drought warning levels not associated with drought emergencies have occurred five times, in 1894, 1915, 1930, 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. Medfield was under a drought warning from July to December 2016.

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. A 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, 2002, and 2016. The overall frequency of being in a drought watch is 8% on a monthly basis over the 162-year period of record.

Figure 18: Statewide Drought Levels using SPI Thresholds, 1850-2012[43]



Under a severe long term drought, the Town of Medfield 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 Medfield, there are no data or estimates of potential damages, but under a severe long term drought scenario it would be reasonable to expect a range of potential damages from several million to tens of millions of dollars. Another potential vulnerability of droughts could be increased risk of wildfires.

[43] Mass. State Drought Management Plan 2013

Probability of Future Occurrences

The state has experienced emergency droughts five times between 1850 and 2019. Even given that regional drought conditions may occur at a different interval than state data indicates, droughts remain primarily regional and state phenomena in Massachusetts. The 2018 MA Integrated State Natural Hazard Mitigation and Climate Adaptation Plan states that there is an 8% chance of drought watch in any given month.

Changing precipitation patterns and the number of extreme weather events per year is difficult to project into the future.[44,45] The Northeast Climate Science Center does report an anticipated increase in rainfall for Massachusetts in the spring and winter months and their climate projection models suggest that the frequency of high-intensity rainfall events will also increase.[46] Consequently, warming temperatures can cause greater evaporation in the summer and fall, as well as earlier snow melt, leading to periods of either drought. The Northeast Climate Science Center projects a small decrease in average summer precipitation into the century; this combined with projected higher temperatures could increase the frequency of episodic droughts in the future.[47,48]

[44] Climate Ready Boston, "The Boston Research Advisory Group Report: Climate Change and Sea Level Rise Projections for Boston," June 2016

[45] Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 16-1-nn

[46] Northeast Climate Center UMass Amherst. Massachusetts Climate Change Projections. December 2017.

[47] Northeast Climate Center UMass Amherst. Massachusetts Climate Change Projections. December 2017.

[48] MAPC. 2018. MedfieldClimate Vulnerability Assessment and Action Plan.

LAND USE AND DEVELOPMENT TRENDS

Existing Land Use

The most recent land use statistics available from the state are from aerial photography done in 2005. Table 19 shows the acreage and percentage of land in 33 categories. Because the town has an extensive system of protected open space, forest makes up over 52% of land in Medfield. If the five residential categories are aggregated, residential uses make up about 25% of the area of the town (2,366 acres). Commercial and industrial combined make up 1.6% of Medfield, or approximately 149 acres.

Table 19: 2005 Land Use Data for Medfield[49]

Land Use	Acres	Percentage Land Area
Crop Land	230.59	2.5%
Pasture	102.04	1.1%
Forest	3,992.32	42.6%
Wetland	1,041.36	11.1%
Mining	1.61	0.0%
Open Land	84.04	0.9%
Participation Recreation	77.67	0.8%
Spectator Recreation	0.00	0.0%
Water-Based Recreation	4.89	0.1%
Multi-Family Residential	58.99	0.6%
High Density Residential	94.87	1.0%
Medium Density Residential	1,025.21	10.9%
Low Density Residential	1,089.81	11.6%
Salt Water Wetland	0.00	0.0%
Commercial	80.93	0.9%
Industrial	67.69	0.7%
Urban Open	11.49	0.1%
Transportation	37.22	0.4%
Waste Disposal	22.65	0.2%
Water	123.55	1.3%
Cranberry Bog	0.00	0.0%
Powerline	16.45	0.2%
Saltwater Sandy Beach	0.00	0.0%
Golf Course	0.00	0.0%
Marina	0.00	0.0%
Urban Public	137.63	1.5%
Cemetery	25.12	0.3%

[49] MassGIS

Land Use	Acres	Percentage Land Area
Orchard	0.00	0.0%
Nursery	8.19	0.1%
Forested Wetland	923.78	9.9%
Very Low Density Res.	97.54	1.0%
Junkyards	0.00	0.0%
Brushland/Successional	22.76	0.2%
TOTAL ACRES	9,378.41	100.0%

Economic Elements

The Town of Medfield has multiple neighborhood business districts, though commercial uses make up only about 1% of the municipality's land area. The center of Medfield is the main commercial area, and it contains a mixture of retail stores, dining options, municipal buildings and offices. The intersection of Route 27 and West Street is another commercial/industrial area for the Town. The former Medfield State Hospital is currently designed for a mixed use commercial, residential, historical, and recreational area which has the potential to advance the economic system in Medfield. In addition, Medfield contains the Medfield Employers & Merchants Organization (MEMO).[50] Organized in 1979, the organization has over 70 local business members and its mission is to support the business and Medfield community provides. For example, MEMO hosts Medfield Day, an important yearly community festival that brings residents, businesses, and families together. [51]

Historic, Cultural, and Natural Resource Areas

Historic and Cultural Assets

Medfield was founded in 1649 and has a rich history and cultural assets important to defining its character today. Medfield experienced the King Philip War creating large-scale damage to the Town's residences. However, it still retains large acres of natural lands and many historic buildings. Medfield was a leader in the anti-slavery movement with the Underground Railroad. In addition, the Town, like much of surrounding riverine communities, experienced a rise in the manufacturing industry including boots, wires, boxes, and horse-drawn carriages. The site of the former Medfield State Hospital was first a gathering space and venue for artists and musicians in the mid-1800s.[52] Toward the end of the century, the site became the Medfield State Hospital. Originally known as the Medfield Insane Asylum, the site was a psychiatric hospital for chronical mental patients. It contained approximately 58 buildings with a capacity of 2,200 patients

[50] Medfield Employers and Merchants Organization. https://medfieldmemo.org/
[51] MAPC. Town of Medfield Municipal Vulnerability Preparedness Community Resilience Building Summary of Findings. January 2018.
[52] Medfield Historical Society

raising its own livestock and produce as well as generating its own heat, light, and power.[53] The site was added to the National Historic Register in 1994.

Other historic assets in Medfield include a many First Period American Homes dating to the late 1600s including the Peak House, the Dwight-Derby House and the Lowell Mason House. The town also contains five additional sites listed on the National Register of Historic Places. These include the Dwight-Derby House, the First Baptist Church, George Inness Art Studio, Meeting House (the first Parish Unitarian Church), the Peak House, and Vine Lake Cemetery.[54]

Natural Assets

Medfield contains over 3,000 acres of conservation land comprising 33% of the land area in Town. In addition, the Town has 1,265 acres of BioMap Core Habitat and 1,052 acres of BioMap Critical Natural Landscape.[55] These are contiguous tracts of exemplary ecosystems more resilient to climate change stressors and provide important ecosystem services for resilience such as flood control, clean water, clean air, and cooling. In addition, Medfield has Sate-Designated one Exemplary or Priority Natural Community, four Wetland Cores, four Aquatic Cores, and 12 Species of Conservation Concern including one reptile, one insect, two mussels, and three plants.[56] The Charles and Neponset Rivers as important natural assets to the community, [57] and residents value these natural assets as strengths in the community particularly with the Town's partnership with The Trustees of Reservations, who owns significant conservation land in town as well as the Army Corps of Engineers Charles River Natural Floodplain Storage area lands which provides significant flood storage for Medfield and other down river communities.

Medfield also has a prominent tree canopy across the town mitigating the impact of extreme heat, stormwater, and air pollutants from vehicles. These trees sequester 4,473 tons of carbon/year work over $760,000. The trees mitigate 453,000 pounds per year of air pollutants (CO, NO_2, O_3, PM 2.5, SO_2, PM 10) worth $1.5 million, and avoid 76 million gallons of runoff a year saving Medfield $680,000 a year in avoided stormwater runoff expenses.[58]

Development Trends

Development trends in Medfield are based on a number of factors such as migration, population growth, housing supply and demand, and demographic distribution. MAPC performed an analysis on population projections based upon current patterns of births, deaths, and migration, as well as assumptions about how those trends might change in the coming decades. For understanding growth in Medfield, MAPC evaluated household projections from 1990-2030 (Figure 19).[59]

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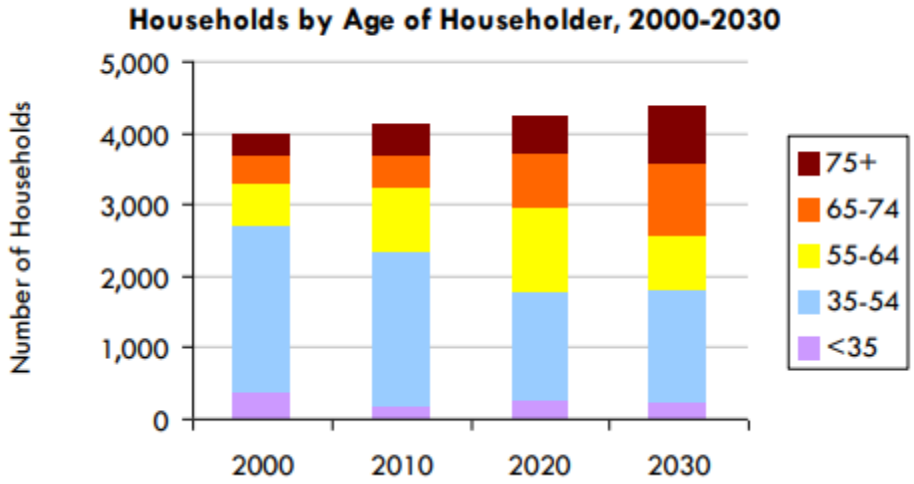
[53] Wikipedia
[54] Medfield Historical Society
[55] http://maps.massgis.state.ma.us/dfg/biomap/pdf/town_core/Medfield.pdf
[56] BioMap2.2012. Town of Medfield. http://maps.massgis.state.ma.us/dfg/biomap/pdf/town_core/Medfield.pdf
[57] MAPC. Town of Medfield Municipal Vulnerability Preparedness Community Resilience Building Summary of Findings. January 2018.
[58] iTree Landscape. Processed on Dec. 11, 2018
[59] https://www.mapc.org/learn/projections/

Figure 19: Household projections from 2000-2030 for Medfield



In addition Figure 20 compares housing demand for your municipality to demand for other municipalities in your Community Type, Medfield's Subregion, and the region overall.

Figure 20: Change in Housing Unit Demand from 2010-2030 in Medfield.

	Housing Units	% Multi-family	% Rental
Medfield	283	_____	_____
Maturing Suburbs	47,069	31%	18%
TRIC	11,334	33%	19%
Metro Boston	244,979	47%	30%

While these statistics provide insight into Medfield's potential growth, real data on development trends in the Metro Boston region are tracked through the "MassBuilds" Development Database. The database provides an inventory of new development over the last decade, both completed developments and those currently under construction. The developments listed in this database, are shown in Table 20. Medfield has 569-609 new, planned, or approved housing units and no new commercial space development.

Table 20: Summary of New and Pending Developments in Medfield, 2010-2019

Developments Completed (Year Completed)	Estimated Year Complete	Housing Units	Commercial Square Feet	Project Type
Chapel Hill Landing aka Country Estates of Medfield	2019	49	0	49 home ownership units (40B) / twenty four (24) single family residential units, 22 duplex units, and 11 duplex buildings.
Medfield State Hospital Redevelopment	Planning	294-334	0	Redevelopment of Medfield State Hospital, 2/3 vote of town meeting needed to change zoning use to residential. Master Plan complete
PARC at Medfield	2016	92	0	A 92-unit multi-family rental unit 40B project.
Hillside Village	2019	16	0	16 unit rental apartment building (40B)
Mayrock	2022	56	0	56-unit apartment building (40B)
Medfield Green	2021	36	0	24 town house style rental units and 23 townhouse style condominium units (40B)
Glover Place	2015	10	0	Renovation of an existing historic duplex. Two single family unites, three duplexes, 10-unit condominium development.
67-71 North Street	2019	16	0	Two 8-unit rental apartment buildings (40B)
Total		**569-609**	**0**	

Potential Future Development

MAPC consulted with the Town Planner and the Core Team to determine areas that may be under construction, potential development (speculative), and future development (in the planning and permitting phase). These are listed in Table 21and Appendix B Map 8).

In order to characterize any change in the town's vulnerability associated with new developments, a spatial analysis was conducted to ascertain development sites in relation to natural hazards, including FEMA Flood Zones, Locally Identified Hazards such as Brush Fires, Local Flooding, and Other Hazards. Table 21 shows the relationship of these parcels to the FEMA Flood Zones, Locally

Identified Hazards, and Urban Heat Islands. This information is provided so that planners can ensure that development proposals comply with flood plain zoning and stormwater management as well as the health of residents located in urban heat islands. There are three potential or future developments located in or around a FEMA Flood Zone, two in an urban heat island, and one in an area known locally for flooding.

All of the developments are in the areas defined as "Low Landslide Incidence." Other hazards are categorized at the same level throughout town. For snowfall, all of Medfield is in the zone of 36 to 48 inches average annual snowfall. With respect to wind, there is no variation across all sites; the hazard map depicts the entire town of Medfield with a 100-year wind speed of 120 miles per hour (Appendix B Map 5).

Table 21: Relationship of Potential and Future Development to Hazard Areas

Map Site ID	Name	Type	FEMA Flood	Urban Heat Island	Locally Identified Hazard
A	Hospital Property - mixed residential, in planning phase	Potential Development	1% Annual Chance Flood, BFE	Yes	
B	Hunt Club - potential at former golf course	Potential Development	1% Annual Chance Flood, no BFE		
F	North Glover Street Condominiums	Development			
G	30 Pound Street-Senior Rentals	Future Development		Yes	
H	41 Dale Street-12 condos and 24 rentals	Future Development			
J	Hinkley-~20 condominium units	Future Development			Flooding
K	90 North Meadows Road-16 Rental Apartments	Development			
L	67 North Street-8 rental units	Development			

Map Site ID	Name	Type	FEMA Flood	Urban Heat Island	Locally Identified Hazard
M	71 North Street-8 rental units	Development			
N	49 Dale Street, 4 single family	Future Development			
O	Hospital Road -49 condominiums	Development			
P	LCB Main Street-88 Units Assisted Living	Potential Development	0.2% Annual Chance Flood		

CRITICAL INFRASTRUCTURE IN HAZARD AREAS

Critical infrastructure includes 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.). There are 53 facilities identified in Medfield. Eleven of these facilities are located in 1% Annual Chance Flood and one is located in 0.2% Annual Chance Flood. Eight critical facilities are located in a locally identified area of flooding and three are located in a locally identified area of brush fires. Finally, four are located in an urban heat island. These include a senior housing facility, the Medfield High School, a daycare facility, and the water storage tank. Critical facilities located in hazard areas are listed in Table 22 and are shown on the maps in Appendix B.

Explanation of Columns in Table 22

Column 1: ID #: The first column 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.
Column 3: Type: The third column indicates what type of site it is.
Column 4: FEMA Flood Zone: This column addresses the risk of flooding based upon historic and potential current flooding according to the FEMA Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone as follows:
Zone AE (1% annual chance) - Zones AE is the flood insurance rate zone that correspond to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.
Zone AO (1% chance zone) Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
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.
Column 5: Locally-Identified Hazard: The locally identified hazard areas were identified by Local Steering Committee as areas where flooding, brush fires, or other hazards occur. 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, "Hazard Areas."
Column 6: Urban Heat Island MAPC performed a heat island analysis to ascertain the areas most at risk to extreme heat. A heat island is defined as an area whose temperature ranges more than 1.8-.54˚ F greater during the daytime or up to 22˚ F greater in the evening than the surrounding areas. MAPC used LANDSAT satellite imagery at 30 m resolution to ascertain land surface temperatures during the daytime in the warmest months of 2016.

Table 22: Medfield Critical Infrastructure and Natural Hazards

Map ID	NAME	TYPE	FEMA Flood Zone	Local ID Hazard	Urban Heat Island
1	Municipal Wells	Well		Brush Fire	
2	MAP at Memorial	Child Care			
3	MAP at Middle School	Child Care			Yes
4	MAP at Wheelock School	Child Care			
5	MAP at Dale Street	Child Care			
6	American Legion Post	Place of Assembly			
7	Beginning Years	Child Care			
8	Medfield Children's Center	Child Care			
9	Medfield Children's Center	Child Care			
10	Explorations	Child Care			
11	DPW Garage	Municipal			
12	Tilden Village	Elder Housing			Yes
13	Memorial School	School			
14	Wheelock School	School			
15	Dale Street School	School			
16	Fire Station	Fire Station			
17	Kingsbury High School	School			Yes
18	Blake Middle School	School			
19	Thomas Upham House	Nursing Home		Flooding	
20	CVS	Pharmacy		Flooding	
21	Shaw's Supermarket	Pharmacy			
22	Police Station	Police Station			
23	Town Hall	Municipal			
24	Water Storage Tank	Water Storage Tank		Flooding	Yes
25	Water Storage Tank	Water Storage Tank			
26	Wastewater Treatment Plant	Waste Water Treatment			
27	Medfield Vet Clinic	Veterinary Facility			
28	Metro Residential Services	Special Needs			
29	Tubular Wellfield	Well			
30	Tubular Wellfield	Well			
31	Well # 4	Well for Fire Suppression	A: 1% Annual Chance of Flooding, no BFE		

Map ID	NAME	TYPE	FEMA Flood Zone	Local ID Hazard	Urban Heat Island
32	Well # 3	Well			
33	Well # 6	Well	AE: 1% Annual Chance of Flooding, with BFE		
34	Well # 2	Well	AE: 1% Annual Chance of Flooding, with BFE	Flooding	
35	Well # 1	Well	AE: 1% Annual Chance of Flooding, with BFE	Flooding	
36	Castle Hill Academy	Child Care			
38	Medfield Fire Station - EOC Primary	Emergency Operations Center			
39	Town Hall - Secondary EOC	Emergency Operations Center			
40	Medfield Animal Shelter	Animal Shelter			
41	Charles River Bridge at Main Street	Bridge	AE: 1% Annual Chance of Flooding, with BFE	Flooding	
42	Charles River Bridge at North Meadows Ro	Bridge	AE: 1% Annual Chance of Flooding, with BFE		
43	Charles River Bridge at West Street	Bridge	AE: 1% Annual Chance of Flooding, with BFE		
44	Causeway Street Bridge	Bridge	AE: 1% Annual Chance of Flooding, with BFE	Flooding	

Map ID	NAME	TYPE	FEMA Flood Zone	Local ID Hazard	Urban Heat Island
45	Orchard Street Bridge	Bridge	AE: 1% Annual Chance of Flooding, with BFE	Brush Fire	
46	Medfield Adult Community Center	Place of Assembly			
47	Kingsbury Pond Dam	Dam	AE: 1% Annual Chance of Flooding, with BFE		
48	Cemetery Pond Dam	Dam	AE: 1% Annual Chance of Flooding, with BFE		
49	Kenney Pond Dam	Dam			
50	Verizon Communication Center	Communication Tower			
51	Mount Nebo Communication Tower	Communication Tower			
52	NYNEX Communication Tower (Sam Whites)	Communication Tower			
53	Civil Defense Communications	Communication Tower			
54	Danielson Pond Dam	Dam	X: 0.2% Annual Chance of Flooding		
55	Holts Pond Dam	Dam		Brush Fire	
56	Meetinghouse Dam	Dam	AE: 1% Annual Chance of Flooding, with BFE	Flooding	
57	Comcast Communications Center	Communications			
57	Comcast Communications Center	Communications			
58	Brothers Marketplace	Supermarket			

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 and earthquakes was the HAZUS-MH 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-MH

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

> "HAZUS-MH is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing and evaluating mitigation plans and policies as well as emergency preparedness, response and recovery planning.
>
> HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods and earthquakes on populations."

There are three modules included with the HAZUS-MH software: hurricane wind, 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 Medfield, 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-MH 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 23: Estimated Damages from Hurricanes

	100-Year	500-Year
Building Characteristics		
Estimated total number of buildings	4,000	
Estimated total building replacement value (2014 $)	$2,192,000,000	
Building Damages		
# of buildings sustaining minor damage	151.91	754.61
# of buildings sustaining moderate damage	10.18	120.19
# of buildings sustaining severe damage	0.26	7.23
# of buildings destroyed	0	2.74
Population Needs		
# of households displaced	2	21
# of people seeking public shelter	2	11
Debris		
Building debris generated (tons)	5,849	14,394
Tree debris generated (tons)	5,339	12,203
# of truckloads to clear building debris (25 tons/truck)	18	88
Value of Damages		
Total property damage (buildings and content)	$16,095,200	$53,821,140
Total losses due to business interruption	$345,980	$2,177,390

Estimated Damages from Earthquakes

The HAZUS-MH 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 24: Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics		
Estimated total number of buildings	4,000	
Estimated total building replacement value (2014 $)	$2,191,000,000	
Building Damages		
# of buildings sustaining slight damage	1,234	102
# of buildings sustaining moderate damage	649	786
# of buildings sustaining extensive damage	171	1,198
# of buildings completely damaged	43	2,091
Population Needs		
# of households displaced	109	2,2410
# of people seeking public shelter	56	1,142
Debris		
Building debris generated (tons)	36,000	309,000
# of truckloads to clear debris (@ 25 tons/truck)	1,440	12,360
Value of Damages		
Total property damage	$233,298,800	$2,082,850,000
Total losses due to business interruption	$30,312,100	$195,663,500

Estimated Damages from Riverine and Coastal Flooding

The HAZUS-MH flood risk module was used to estimate damages to the municipality at the 100 and 500 return periods. These return periods correspond to flooding events that have a 1% and a 0.2% likelihood of occurring in any given year.

Table 25: Estimated Damages from Flooding

	100-Year	500-Year
Building Characteristics		
Estimated total number of buildings	4,000	
Estimated total building replacement value	$2,192,000,000	
Building Damages		
# of buildings sustaining slight damage (<10%)	10	7
# of buildings sustaining moderate damage (11-50%)	3	7
# of buildings sustaining substantial damage (>50%)	0	1
Population Needs		
# of households displaced	50	62
# of people seeking public shelter	1	1
Value of Damages		
Total property damage (buildings and content)	$6,730,000	$14,730,000
Total losses due to business interruption	$10,580,000	$19,800,000

IV. HAZARD MITIGATION GOALS

The Medfield Local Hazard Mitigation/MVP Core Team determined the following goals for this Hazard Mitigation Plan and approved them at a meeting on December 18, 2018. All of the goals are reflective of the Town's priorities and concerns relative to natural hazard mitigation. They are all 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 climate change and incorporate climate mitigation and resilience in all planning efforts.

Goal 10: Prepared for the impacts of climate change. Align and implement Natural Hazard Mitigation with Municipal Climate Vulnerability Preparedness Actions.

V. EXISTING MITIGATION MEASURES

The existing protections in the Town of Medfield are a combination of zoning, land use, and environmental regulations, public education, infrastructure maintenance and infrastructure improvement projects. Infrastructure maintenance generally addresses localized drainage clogging problems while large scale capacity problems may require pipe replacement, invert elevation modifications, utility and road elevation, or large scale bridge improvements and replacements. 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 existing mitigation measures in the Town of Medfield are described below and summarized in Table 26 below.

FLOOD-RELATED MITIGATION MEASURES

Medfield 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:

a) Participation in the National Flood Insurance Program (NFIP). FEMA maintains a database on flood insurance policies and claims. This database can be found on the FEMA website at www.fema.gov/business/nfip/statistics/pcstat.shtm. 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 floodplain and building requirements.

b) Catch basins on public roads and property are cleaned annually.

c) The Highway Department provides maintenance to culverts, drainage pipes, and other drainage infrastructure on an as-needed basis. Drainage maintenance activities are coordinated with the Division of Natural Resources and are performed under the general maintenance permit issued by the Natural Resources Commission.

d) The town repairs and replaces drainage as needed.

e) Medfield's Zoning has a Flood Plain Conservancy District (Section 7.2) that restricts certain activities and requires a special permit for activities located within a flood zone.

f) Medfield's Zoning has a Wetlands By-Law intended to protect wetland resource areas and minimize flooding.

g) Medfield's zoning includes a restriction on the amount of impervious material that can be added to any new building or development in town, thus reducing runoff from new construction projects onto neighboring property.

h) The Massachusetts Stormwater Policy is applied to developments within the jurisdiction of the Natural Resources Commission.

i) The Town's subdivision regulations have general language about avoiding impacts to flood plains and minimizing drainage issues. Peak flows and runoff from the property cannot be greater than pre-development rates. Drainage requirements for Site Plans

are also general and require post-development rates to meet pre-development runoff rates.

j) Open Space Residential Developments are allowed under Medfield's Zoning.

k) The Town's Zoning also has a Groundwater Conservancy District to protect its drinking water supplies.

l) Medfield has substantial protected open space and preservation programs, including:
- Low-lying wetland areas provide significant flood storage for the town's rivers.
- Floodplain and Conservancy Districts, which have been enacted to protect the public health and welfare as well as the town's groundwater supply.
- Flood plain has been preserved and is effective at minimizing flooding.

m) The town continues to implement its NPDES Phase II stormwater program which includes a newly implemented Stormwater Bylaw in 2017 and public education programs.

DAM FAILURE MITIGATION MEASURES

a) DCR dam safety regulations – All dams are subject to the Division of Conservation and Recreation's dam safety regulations. The dams must be inspected regularly and reports filed with the DCR Office of Dam Safety.

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

WIND HAZARD MITIGATION MEASURES

a) The Highway Department has an effective tree trimming program in public areas and along Rights-of-Ways.

b) The Tree Warden coordinates on Site Plan Review on street tree placement for new development.

c) Street Tree policies.

d) Medfield is a Tree City USA for the last five years.

e) The Town coordinates with the Massachusetts Bay Transit Authority (MBTA) on vegetation management on MBTA-owned transportation corridors.

WINTER-RELATED HAZARD MITIGATION MEASURES

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

b) Overnight street parking bans are in effect year round.

c) Public Education - Winter Maintenance information is available on the town website

d) The town has a Snow and Ice Disposal bylaw that states no person shall put any snow or ice in any public place or upon any part of a public street or sidewalk.

e) The town has sufficient snow storage available.

f) New development requires snow storage onsite.

FIRE-RELATED HAZARD MITIGATION MEASURES

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

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

c) The town provides public education and notices during "drought watches."

d) The Fire Department has All Terrain Vehicles for suppressing brush and wildfires in natural areas.

GEOLOGIC HAZARD MITIGATION MEASURES

a) The town does have shelters and backup facilities (see multi-hazard mitigation below).

b) The town does have an evacuation plan as specified in its Comprehensive Emergency Management Plan (CEMP).

c) The subdivision regulations do have maximum slope requirements for new roads.

d) The town has an earth removal bylaw.

MULTIHAZARD MITIGATION MEASURES

a) Multi-Department Review of Developments – Multiple departments, such as Planning, Zoning, Health, Public Works, Fire, Police, and Natural Resources, review all subdivision and site plans prior to approval.

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

c) 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.

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

e) Emergency Preparedness public education is available on the town's website.

f) The Medfield High School is the designated community shelter site.

g) The Police and Fire Stations have backup generators.

h) The town works with the Council on Aging to help provide shelter to seniors during extreme heat and cold weather.

Table 26: Existing Natural Hazard Mitigation Measures in Medfield

Summary of Existing Mitigation Measures
FLOOD HAZARD MITIGATION
The town participates in the NFIP and has adopted the effective FIRM maps. The town actively enforces the floodplain regulations.
Street Sweeping
Catch Basin Cleaning
Roadway Treatments
Enforcement of the State Building Code
Acquisition of lands for conservation and open space.
Infrastructure Improvements
Regulations, By-Laws and Plans (Stormwater Bylaw, Flood Hazard Areas, Open Space Requirements, Drinking Water Protection Districts, Wetlands Bylaw, NPDES)
DAM FAILURE HAZARD MITIGATION
DCR Dam Safety Regulations
State Permits Required for Dam Construction
Comprehensive Emergency Management Plan
WIND RELATED HAZARDS
Massachusetts State Building Code
Tree Trimming and Street Tree policies
Tree Warden performs Site Plan Review on street tree placement for new development. Tree Warden
Tree City USA certification.
Coordination with the MBTA on vegetation management.
WINTER RELATED HAZARDS
Snow Removal
Roadway Treatments but with a restricted salt policy.
Ample Snow Storage
New subdivision development requires onsite snow storage or snow removal plan.
Overnight street Parking Ban
Snow Removal and Ice Disposal Bylaw
Public Education
BRUSH FIRE RELATED HAZARDS
Permits Required for Outdoor Burning
Subdivision Review by Fire Department
Comprehensive Emergency Management Plan
All-Terrain Vehicles to manage brush/wildfires
Public Education and notices during drought watches
GEOLOGIC/EARTHQUAKE HAZARDS
Massachusetts State Building Code
Earth Removal Bylaw

Subdivision regulations have maximum slope requirements
Shelters and back-up facilities.
Comprehensive Emergency Management Plan
EXTREME TEMPERATURES / MULTIPLE HAZARD MITIGATION
Multi-Department Review of Developments
Comprehensive Emergency Management Plan
Massachusetts Building Code
Local Emergency Management Planning Committee
Emergency Preparedness public education
Designated Community Shelter Site
Backup generators
Coordination with Council on Aging for shelter during extreme weather events

MITIGATION CAPABILITIES AND LOCAL CAPACITY FOR IMPROVEMENTS

Under the Massachusetts system of "Home Rule," the Town of Medfield 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. The Town of Medfield has recognized several existing mitigation measures that require implementation or improvements, and has the capacity based on these Home Rule powers within its local boards and departments to address these.

Several departments including Planning, Building, Facilities Management, Public Works and Conservation will address the many planned infrastructure projects. New strategies including paving reduction and drought resistant planting will be stewarded by the Conservation Commission. Many projects, including public education, encouragement of building elevation, open space planning, and incorporating climate issues into capital and other planning documents will be jointly pursued by departments and town leadership.

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.

VI. 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.

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

Hazard Mitigation Measures can generally be sorted into the following groups:[60]

- 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

[60] FEMA Local Multi-Hazard Mitigation Planning Guidance

of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

Introduction to Recommended Mitigation Measures

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 29, 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.

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 or USACE) – 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) – MEMA coordinates FEMA hazard mitigation grants. https://www.mass.gov/orgs/massachusetts-emergency-management-agency.

Abbreviations Used in Table 27

FEMA Mitigation Grants includes:

FMA = Flood Mitigation Assistance Program.

HMGP = Hazard Mitigation Grant Program.

PDM = Pre-Disaster Mitigation Program

ACOE = Army Corps of Engineers (aka USACE)

DHS/EOPS = Department of Homeland Security/Emergency Operations

DEP (SRF) = Department of Environmental Protection (State Revolving Fund)

USDA = United States Department of Agriculture

Mass DOT = Massachusetts Department of Transportation

DCR = MA Department of Conservation and Recreation

TOD= Town of Medfield

EEA=MA Executive Office of Energy and Environmental Affairs

CPA= Community Preservation Act

CZM= Massachusetts Office of Coastal Zone Management

MVP= MA EEA Municipal Vulnerability Preparedness Program

Table 27: Recommended Mitigation Measures

Recommended Mitigation Measure	Priority in 2011 Plan (or MVP Summary of Findings)	Lead Implementation	Time Frame (2019-2024)	Estimated Cost	Potential Funding Sources
FLOOD MITIGATION					
Expand/Replace culvert at Causeway and Orchard streets	High	Public Works	2019-2024	$100,000 t0 $250,000	MHD, Town, FEMA
Replace culvert on Elm Street at Mill Brook	High	Public Works	2020	$100,000 t0 $250,000	Town, FEMA, Public Safety Grants
Maintain existing culvert at Friary and Upham streets	High	Public Works	2019-2024	$25,000 to $75,000	Town
Use Natural Infiltration and green infrastructure to ensure stormwater remains onsite at the Medfield Hospital property redevelopment.	High	Developer or Private contractor	2023-2024	To be determined	Developer, Town, MVP
Collaborate with the Town of Millis and the State on replacing or upgrading existing roadway and bridge on Main Street/Rt. 109 at Charles River. Ensure climate change precipitations projections are considered in the design and rehabilitation.	Medium	Public Works	2019	$75,000 to $150,000	Town, State, FEMA
Expand or replace existing railroad culvert at South St.	High	Public Works/ Railroad company	2023	$100,000 t0 $250,000	Town, Railroad company

Recommended Mitigation Measure	Priority in 2011 Plan (or MVP Summary of Findings)	Lead Implementation	Time Frame (2019-2024)	Estimated Cost	Potential Funding Sources
FLOODING (CONT'D)					
Continuation of Open Space Protection and Land Acquisition, Implement the Open Space and Recreation Plan	NFIP	Natural Resources / Planning	2019-2024	Varies from town staff time to up to $750k to purchase land	Town, Gifts
Vulnerability study on transportation, bridges, and culverts affected by and/or located in flood zones.	MVP High	DPW	2023	$75,000	MVP, Town
Engineering study to determine repairs needed for Danielson Pond dam	MVP High	DPW, Conservation Agent	2019	$50,000	MVP, DFW
Perform a culvert capacity and design study	MVP High	DPW	2020	$35,000-$50,000	MVP, DFW
Outreach and education on best management practices for MS4 and clean water quality for reducing stormwater and inland flooding.	MVP High	DPW, Board of Water of Sewer	2019	Staff Time	MVP, DEP, MAPC
Become a Community Preservation Act community.	MVP High	Open Space Committee, Conservation Commission	2022	Staff Time	Town
Work with the Neponset Stormwater Partnership to reduce stormwater and to mitigate flooding as a regional/watershed effort.	NEW	DPW	2019-2024	$20,000	MAPC, Town

Recommended Mitigation Measure	Priority in 2011 Plan (or MVP Summary of Findings)	Lead Implementation	Time Frame (2019-2024)	Estimated Cost	Potential Funding Sources
Work consultants for stormwater management for MS4 compliance and stormwater management plan.	NEW	DPW	2019-2024	$100,000	Town
BRUSH FIRE MITIGATION					
Develop Brush Fire Mitigation Plan including emergency response and mutual aid. Collaborate with private landowners with large holdings on mutual Brush Fire Mitigation Plan	MVP High	Fire Department/ LPEC	2020	$25,000	Town, MVP
Cart Path Restoration	NEW	DPW Director, Fire Dept.	2019-2024	$25,000	Town, EEA
75- foot required setback regulation	NEW	Planning Department	2019-2024	Staff Time	Town
Public Education on Fire Prevention	NEW	Fire Department, Board of Selectmen	20192024	Staff Time	Town
DROUGHT MITIGATION					
Feasibility on water conservation measures, regulations, and incentives. Require irrigation system permits.	MVP High	DPW, Board of Water and Sewer	2020	$20,000	MAPC, Town, MVP

Recommended Mitigation Measure	Priority in 2011 Plan (or MVP Summary of Findings)	Lead Implementation	Time Frame (2019-2024)	Estimated Cost	Potential Funding Sources
GEOLOGIC HAZARDS (EARTHQUAKES/LANDSLIDES)					
Evaluation of municipal assets to earthquakes and landslides.	NEW	Building Dept/Engineering	2021	$35,000-$50,000	HGMP, TOM
EXTREME TEMPERATURES					
Cool the High School Urban Heat Island with Green Roof, Solar Panels, solar canopy and/or Tree Planting	MVP High	School Department/Facilities	2020-2023	>$100,000	DOER, MassCEC, MAPC, MVP, Developer
EXTREME TEMPERATURES					
Investigate cooling and warming centers as well as upgrades to serve the community. Install a generator at Council on Aging	NEW	Council on Aging, Facilities, LPEC	2020	$35,000-$50,000	Town
Public education on cooling centers and warming centers.	NEW	LEPC/Medfield Emergency Management	2019-2024	Staff Time	Town
Site Design to increase tree plantings near buildings, increase the percentage of trees used in parking areas, and along public ways.	NEW	Planning Department	2019	Staff Time	Town
Add shade structure to Hinckley Pond to protect children in summer camp.	NEW	Recreation Department/Town Meeting	2020	$40,000	Town
Add solar canopies to municipal parking lots where applicable	NEW	Facilities	2020-2023	>$100,000	MassCEC, DOER, MVP, Developer

Recommended Mitigation Measure	Priority in 2011 Plan (or MVP Summary of Findings)	Lead Implementation	Time Frame (2019-2024)	Estimated Cost	Potential Funding Sources
WIND RELATED HAZARDS (TORNADOS, HURRICANES, NOR'EASTERS)					
Town-wide tree plan for maintenance and Planting, education/outreach on importance of trees and species of trees. Create requirement for tree planting with new development. Consider forest management on public and private land.	MVP High	Planning Department, Conservation Commission, DPW	2019-2022	$15,000-$35,000	Town, MAPC, MVP
Tree trimming program and collaborate with utilities.	NEW	DPW, Tree Warden	2019-2024	$25,000-$35,000	Town
WINTER STORM RELATED HAZARDS (Snow Storms, Ice Storms, Blizzard)					
Become Fully "Storm Ready" / Incorporate social media and the Town website in storm communications.	NFIP	Emergency Management/Fire Department	2020	$5,000-$15,000	Town or Public Safety Grants
Assessment of Schools Roofs and DPW for Susceptibly to Snow Loads	NEW	DPW / Building	2019	$25,000-$40,000	Town, FEMA
MULTIPLE HAZARDS					
Build a garage to house buses for emergency transportation during extreme weather event and natural hazards for seniors or residents	NEW	Council on Aging/ Facilities/Emergency Management	2019-2020	>$100,000	Town, FEMA, Public Safety Grants

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 (Table 28).

Table 28: Prioritization qualifications for Hazard Mitigation Recommendations.

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

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 or not 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.

Table 29 below demonstrates the prioritization of the Town's recommended hazard mitigation measures. For each mitigation measure, the geographic extent of the potential benefiting area is identified as is an estimate of the overall benefit and cost of the measures. The benefits, costs, and overall priority were evaluated in these terms.

Table 29: Prioritization of Recommended Mitigation Measures for a Hazard Mitigation Strategy

Recommended Mitigation Measure	Geographic Coverage	Estimated Cost	Estimated Benefit	2019 Priority
FLOOD MITIGATION				
Expand/Replace culvert at Causeway and Orchard streets.	Causeway/Orchard	High	Medium	High
Replace culvert on Elm Street at Mill Brook.	Elm/Mill	High	Medium	High
Maintain existing culvert at Friary and Upham streets.	Friday/Upham	Medium	Medium	High
Use Natural Infiltration and green infrastructure to ensure stormwater remains onsite at the Medfield Hospital property redevelopment.	Townwide	Medium	High	High
Collaborate with the Town of Millis and the State on replacing or upgrading existing roadway and bridge on Main Street/Rt. 109 at Charles River. Ensure climate change precipitations projections are considered in the design and rehabilitation.	Regional	Medium to High	High	High
Expand or replace existing railroad culvert at South St.	South	High	Medium	High
Continuation of Open Space Protection and Land Acquisition, Implement the Open Space and Recreation Plan	Townwide	Low to High	High	Medium
Vulnerability study on transportation, bridges, and culverts affected by and/or located in flood zones.	MVP High	Medium	High	Medium

Recommended Mitigation Measure	Geographic Coverage	Estimated Cost	Estimated Benefit	2019 Priority
Engineering study to determine repairs needed for Danielson Pond dam	Townwide	Medium	Medium	High
Perform a culvert capacity and design study	Townwide	Medium	High	High
Outreach and education on best management practices for MS4 and clean water quality for reducing stormwater and inland flooding.	Townwide	Low	High	High
Become a Community Preservation Act community.	Townwide	Low	High	Low
Work with the Neponset Stormwater Partnership to reduce stormwater and to mitigate flooding as a regional/watershed effort.	Regional	Medium	High	High
Work consultants for stormwater management for MS4 compliance and stormwater management plan.	Regional	High	High	High
BRUSH FIRE MITIGATION				
Develop Brush Fire Mitigation Plan including emergency response and mutual aid. Collaborate with private landowners with large holdings on mutual Brush Fire Mitigation Plan	Townwide	Medium	Medium	Low
Cart Path Restoration	Townwide	Medium	Low	Low
75- foot required setback regulation	Townwide	Low	Medium	Low
Public Education on Fire Prevention	Townwide	Low	Low	Medium
DROUGHT MITIGATION				
Feasibility on water conservation measures, regulations, and incentives. Require irrigation system permits.	Townwide	Medium	Medium	Medium

Recommended Mitigation Measure	Geographic Coverage	Estimated Cost	Estimated Benefit	2019 Priority
GEOLOGIC HAZARDS (EARTHQUAKES/LANDSLIDES)				
Evaluation of municipal assets to earthquakes and landslides.	Townwide	Medium	Medium	Low
EXTREME TEMPERATURES				
Cool the High School Urban Heat Island with Green Roof, Solar Panels, solar canopy and/or Tree Planting	High School	High	Medium	High
Investigate cooling and warming centers as well as upgrades to serve the community. Install a generator at Council on Aging	Townwide	Medium	Medium	High
Public education on cooling centers and warming centers.	Townwide	Low	Low	High
Site Design to increase tree plantings near buildings, increase the percentage of trees used in parking areas, and along public ways.	Townwide	Low	Low	High
Add shade structure to Hinckley Pond to protect children in summer camp.	Hinkley Pond	Medium	Low	High
Add solar canopies to municipal parking lots where applicable.	Townwide	High	Medium	High
WIND RELATED HAZARDS (TORNADOS, HURRICANES, NOR'EASTERS)				
Town-wide tree plan for maintenance and Planting, education/outreach on importance of trees and species of trees. Create requirement for tree planting with new development. Consider forest management on public and private land.	Townwide	Medium	Medium	Medium
Tree trimming program and collaborate with utilities.	Townwide	Medium	Medium	High
WINTER STORM RELATED HAZARDS (Snow Storms, Ice Storms, Blizzard)				
Become Fully "Storm Ready" / Incorporate social media and the Town website in storm communications.	Townwide	Low to Medium	Low	High

Recommended Mitigation Measure	Geographic Coverage	Estimated Cost	Estimated Benefit	2019 Priority
Assessment of Schools Roofs and DPW for Susceptibly to Snow Loads.	Municipal Buildings	Medium	Low	High
MULTIHAZARD MITIGATION				
Build a garage to house buses for emergency transportation during extreme weather event and natural hazards for seniors or residents.	Council on Aging	High	Medium	High Priority

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 many communities, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are a complex system of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including but not limited to the Town of Medfield, the Department of Conservation and Recreation (DCR), and Massachusetts Department of Transportation (MassDOT). The planning, construction, operations, and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. As such, these agencies must be considered the community's regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do, including budgetary and staffing constraints and numerous competing priorities. In the sections that follow, the plan includes recommendations for activities where cooperation with these other agencies may be necessary. Implementation of these recommendations will require that all parties work together to develop solutions.

Overview of Regional Facilities within Medfield

Major facilities owned, operated and maintained by federal, state, regional or private entities in Medfield include:

- Massachusetts Routes 109 and Route 27 (MassDOT)
- Myles Standish Monument State Reservation (DCR)
- Route 109 Bridge over the Charles River- a major transportation corridor to Boston.

- West Street Bridge over the Charles River- a major transportation corridor to Boston.
- The Charles River
- Conservation Lands-Medfield Rhododendron Reservation, Fork Factory Reservation, Medfield Charles River Reservation

Inter-Community Considerations

1) *Stormwater Management*. Medfield lies along the Charles River, an important area for natural ecosystems, recreation, wildlife, and groundwater recharge and regulation. It is also within the Neponset River Watershed. The Towns of Millis and Medfield should continue to collaborate and coordinate on stormwater management strategies for National Pollution Discharge Elimination Program for the Clean Water Act for the Charles River and continue to participate in the Neponset River Stormwater Partnership and its participating communities to uphold the recreational, natural and groundwater systems important for the economy and well-being of residents of Massachusetts.

2) *Route 109 and West Street Bridges over the Charles River*. The route 109 bridge is susceptible to flooding by the Charles River which impedes emergency response and important commuter transportation routes. Further, the both bridges are in need of repairs and restoration. As a state-owned resource, Medfield and Mills can coordinate on the restoration and redesign of the bridge and ensure that it will be able to withstand increasing flooding and extreme precipitation events associated with climate change.

3) *Coordinate and Review Developments on a Regional Basis*. As Medfield 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. Priority development areas established with the 495 Metro West Partnership is a good example of inter-community coordination.

VII. PLAN ADOPTION AND MAINTENANCE

PLAN ADOPTION

The Medfield Hazard Mitigation Plan Update 2019 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

The Town of Medfield joint Hazard Mitigation and Municipal Vulnerability Preparedness Core Team met on three occasions to update this plan. After approval of the plan by FEMA, this group will continue to meet annually to function as the Hazard Mitigation Implementation Team, with the Town Planner 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 Planner, will have primary responsibility for tracking progress, evaluating, and updating the plan.

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

The Hazard Mitigation Implementation Team will use the information from the Mid-Term progress review to identify the needs and priorities for the plan update and seek funding for the plan update process. Potential sources of funding may include FEMA Pre-Disaster Mitigation grants and

the Hazard Mitigation Grant Program. Both grant programs can pay for 75% of a planning project, with a 25% local cost share required.

Prepare and Adopt an Updated Local Hazard Mitigation Plan –Once the resources have been secured to update the plan, the Hazard Mitigation Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The Medfield 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 Medfield Hazard Mitigation Plan Update 2019 by FEMA, the Hazard Mitigation and Municipal Vulnerability Preparedness Core 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
- Facilities
- Police/Harbormaster
- Public Works
- Planning
- Conservation
- Health
- Building

Other groups that will be coordinated with include large institutions, Chambers of Commerce, land conservation organizations and watershed groups. These include the Medfield Employers & Merchants Organization, the Charles River Water Association, the Neponset River Watershed Organization, the Trustees of Reservations, and others. The plans will also be posted on the community's website with the caveat that 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 Medfield Master Plan, Open Space and Recreation Plan, Comprehensive Emergency Management Plan, Capital Investment Program, and Municipal Vulnerability Preparedness Plan.

IX. LIST OF REFERENCES

Bosma, K., Douglas, E., Kirshen, P., McArthur, K., and Miller, S. MassDOT-FHWA Pilot Project Report. Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery. June 2015.

Blue Hills Observatory and Science Center. Weather Archives. http://bluehill.org/observatory/

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

Climate Ready Boston, "The Boston Research Advisory Group Report: Climate Change and Sea Level Rise Projections for Boston," June 2016

City of Cambridge, *Climate Change Vulnerability Assessment*, (City of Cambridge, 2015), Temperature and Precipitation Projections

Douglas, E.M., Kirshen, P.H., Bosma, K., et al. 2017. Simulating the Impacts and Assessing the Vulnerability of the Central Artery/Tunnel System to Sea level Rise and Increased Coastal Flooding. J Extreme Events 3 (4): 1650013 (28 pages).

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

Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 16-1-nn.

FEMA Disaster Designations by State/Tribal Area 2019. https://www.fema.gov/disasters/state-tribal-government/0/MA

FEMA, Flood Insurance Rate Maps for Norfolk County, MA, 2017

FEMA, Local Mitigation Plan Review Guide; October 1, 2011.

FEMA LOMR, Effective 12/13/17

FEMA, Local Mitigation Plan Review Guide; October 1, 2011.

Massachusetts State Drought Management Plan 2013

Massachusetts Emergency Management Agency. *Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan*. 2018.

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

Massachusetts Emergency Management Agency. *Massachusetts State Hazard Mitigation Plan*. 2013.

MA Geographic Information System, *McConnell Land Use Statistics*, 2005

MA Office of Dam Safety, Inventory of Massachusetts Dams

Metropolitan Area Planning Council, Geographic Information Systems Lab

Metropolitan Area Planning Council, Regional Growth Projections

Metropolitan Area Planning Council. *Town of Medfield Municipal Vulnerability Preparedness Community Resilience Building Summary of Findings*. January 2019.

Fourth National Climate Assessment, 2017

New England Seismic Network, Weston Observatory, http://aki.bc.edu/index.htm

Northeast States Emergency Consortium, website http://www.nesec.org/

NOAA, National Centers for Environmental Information, https://www.ncei.noaa.gov/

Resilient MA Climate Change Clearinghouse for the Commonwealth. www.resilientma.org

Town of Medfield Zoning By-Laws

Town of Medfield Open Space and Recreation Plan, 2002

The Tornado Project.

U. S. Census, 2010, and American Community Survey, 2016

U.S. Dept. of Interior U.S. Geological Society. Landslide Types and Processes. Fact Sheet 2003-3072

U.S. Environmental Protection Agency. 2016. Climate Change Indicators in the United States, Fourth Edition. EPA 430-R-16-004. www.epa/gov/climate-indicators.

U.S. Environmental Protection Agency. https://www.epa.gov/heat-islands

USGS, National Water Information Center, website

Appendix A Local Team Meetings

AGENDA

Medfield Hazard Mitigation Plan 2019 Update
Local Hazard Mitigation Planning Team

Municipal Vulnerability Preparedness Core Meeting #1

Medfield Town Hall, Chenery Room, 1 PM

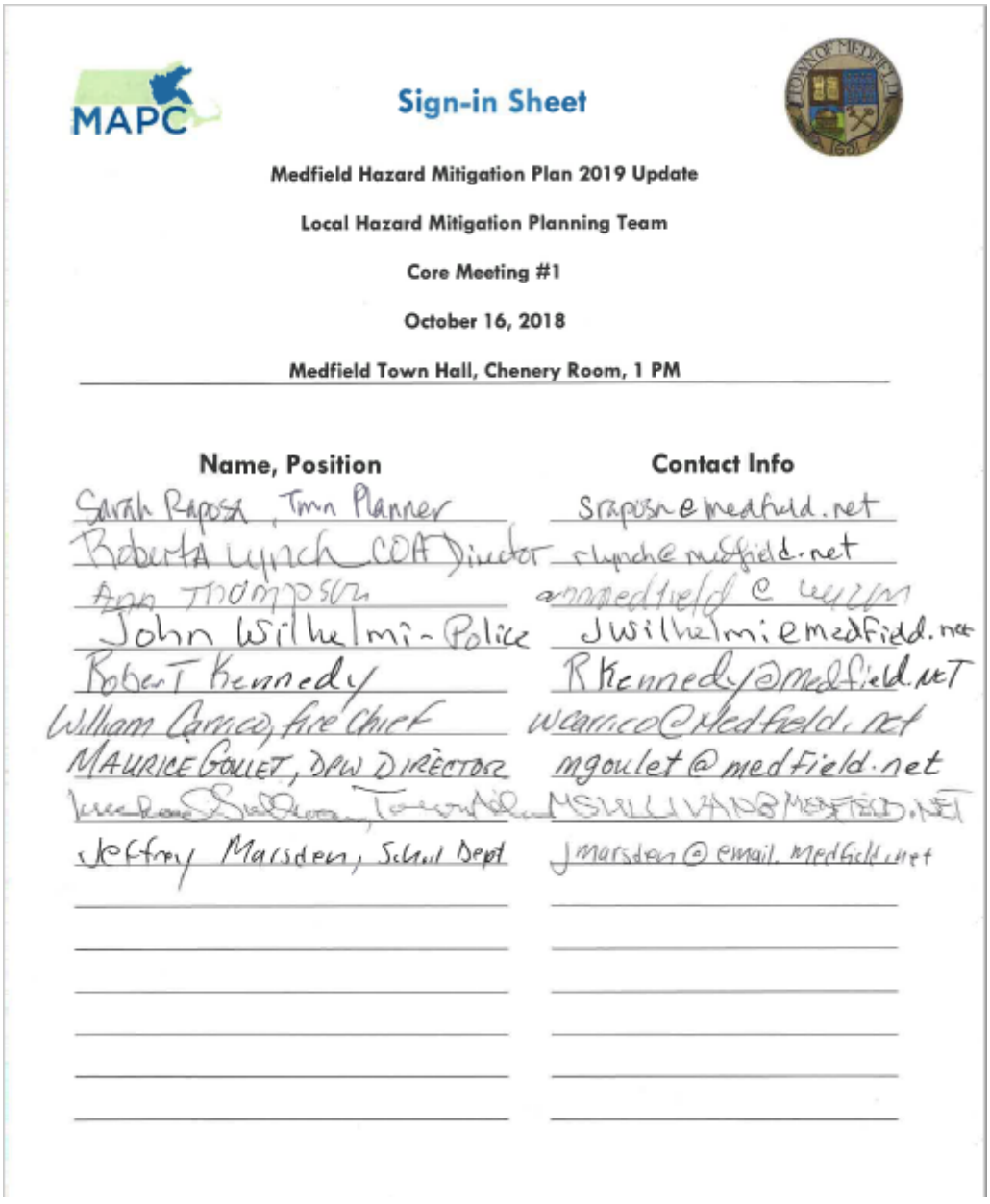
1:00 PM- 2:15 PM Natural Hazard Mitigation Planning Meeting

1. Intro Natural Hazard Mitigation Planning
2. Review Project Scope of Work and Schedule
3. Update Critical Facilities Inventory and Mapping
4. Identify/update local hazards:
    a) Flood Hazard Areas
    b) Fire Hazard Areas (brushfires/wildfires)
    c) Dams
    d) Other hazards
5. Identify/Update New and Potential Development Sites

2:15- 3:00 PM Municipal Vulnerability Preparedness Meeting

1. MVP overview
2. MVP Goals for Medfield
3. Workshop Date and Location
4. Workshop Format and Materials
5. Discussion on workshop participants and outreach
6. Other/Next Steps

MVP Core Team MVP Toolkit:
About MVP
About Community Resilience Building
Workshop Sample Materials
Stakeholder outreach worksheet



MAPC

Sign-in Sheet

Medfield Hazard Mitigation Plan 2019 Update

Local Hazard Mitigation Planning Team

Core Meeting #1

October 16, 2018

Medfield Town Hall, Chenery Room, 1 PM

Name, Position	Contact Info
Sarah Raposa, Town Planner	Sraposa@medfield.net
Roberta Lynch COA Director	rlynch@medfield.net
Ann Thompson	amedfield@verizon
John Wilhelmi - Police	JWilhelmi@medfield.net
Robert Kennedy	RKennedy@Medfield.NET
William Carnico, Fire Chief	wcarnico@Medfield.net
MAURICE GOULET, DPW DIRECTOR	mgoulet@medfield.net
[illegible]	MSULLIVAN@MEDFIELD.NET
Jeffrey Marsden, School Dept	Jmarsden@email.Medfield.net

AGENDA

Town of Medfield
Hazard Mitigation Plan 2019 Update & Municipal Vulnerability Preparedness
Core Meeting #2
December 18, 2018
Medfield Town Hall, Chenery Room, 1-3 PM

1:00 PM- 2:15 PM Natural Hazard Mitigation Planning Meeting

1. Introductions
2. Review original existing mitigation measures from 2010 plan (15 minutes)
   - confirm effectiveness
   - note any needed changes
3. Review recommended mitigation measures from 2010 plan (40 minutes)
   - current status
   - decide which to carry forward into 2018 plan
   - evaluate priority
4. Review Mitigation Goals and update as needed (20 minutes)
5. Next Steps (10 minutes)
6. Schedule a public meeting (Planning Board, Conservation Commission, etc.)

2:15- 3:00 PM Municipal Vulnerability Preparedness Meeting

1. Set MVP Workshop Date and Location
2. Catering Options
3. Review Workshop Materials
4. Create Workshop Invitation List
5. Other/Next Steps

MAPC

MEDFIELD NATURAL HAZARD MITIGATION/MVP TEAM MEETING #2
December 18, 2018 – 1:00 PM – Medfield Town Hall

Name	Department	Email	Phone
Ann Thompson			
Gene Pelletier	Building		
Sarah Raposa	Planning		
Amy Colleran	Facilities	acolleran@email.medfield.net	508-613-5227
Maurice Goulet	Public Works		
Robert Kennedy	DPW		
John Wilhelmi	Police		
Michael Sullivan	Town Admin.	msullivan@medfield.net	508-878-2474
Leslee Willitts	Conservation	lwillitts@rcn.com	508 #906-3028

AGENDA

Town of Medfield
Hazard Mitigation Plan 2019 Update & Municipal Vulnerability Preparedness
Core Meeting #3
May 6, 2019 10AM-12 PM
Medfield Town Hall, Chenery Room, 1-3 PM

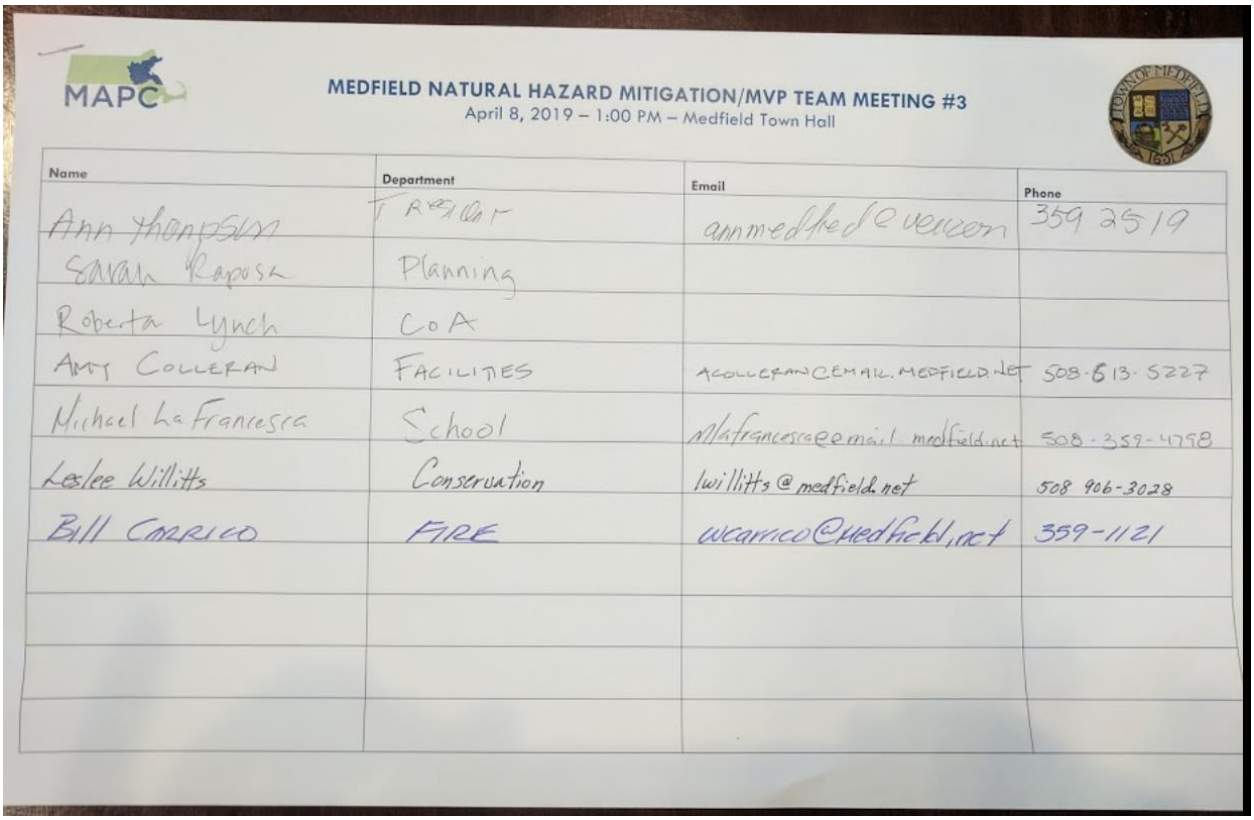
1:00-1:30 PM Municipal Vulnerability Preparedness Meeting

1. Reflections/Comments on CRB Workshop
2. Discussion/Suggestions on CRB Summary of Findings Report

1:30PM- 2:45 PM Natural Hazard Mitigation Planning Meeting

1. Hazard Mitigation Plan and Update
2. Review Medfield Vulnerability to Natural Hazards (10 minutes)
3. Review recommended mitigation measures from 2010 plan (10 minutes) from last meeting.
4. Draft new action recommendations to natural hazards (55 minutes)
5. Identify Stakeholders for plan review and public meeting announcement.

Joint Public Listening Session
Medfield MVP and Natural Hazard Mitigation Plan
Meeting of the Board of Selectmen
May 21, or May 28, 2019 87 PM



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MEDFIELD NATURAL HAZARD MITIGATION/MVP TEAM MEETING #3

April 8, 2019 – 1:00 PM – Medfield Town Hall

Name	Department	Email	Phone
~~Ann Thompson~~	~~TREASURER~~	annmedfield@verizon.com	359 2519
Sarah Raposa	Planning		
Roberta Lynch	CoA		
Amy Colleran	Facilities	acolleran@email.medfield.net	508-813-5227
Michael LaFrancesca	School	mlafrancesca@email.medfield.net	508-359-4758
Leslee Willitts	Conservation	lwillitts@medfield.net	508 906-3028
Bill Carrico	FIRE	wcarrico@medfield.net	359-1121

Appendix B Hazard Mapping

The MAPC GIS (Geographic Information Systems) Lab produced a series of maps for each community. 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 eight maps as described below. The maps in this appendix are necessarily reduced scale versions for general reference.

Map 1.	Population Density
Map 2.	Potential Development
Map 3.	Flood Zones
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Hazard Areas
Map 9	Areas of Extreme Heat

Map1: Population Density – This map uses the US Census block data for 2010 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 2: Land Use – This map depicts existing land use, based on the MacConnell Land Use map series from University of Massachusetts, available from MassGIS. The map displays 33 categories of land use based on interpretation of aerial photos. For more information on how the land use statistics were developed and the definitions of the categories, please go to http://www.mass.gov/mgis/lus.htm

Map 3: Flood Zones – The map of flood zones used the FEMA NFIP Flood Zones as depicted on the FIRMs (Federal Insurance Rate Maps) for Norfolk County dated July 17, 2012 as its source. This map is not intended for use in determining whether or not a specific property is located within a FEMA NFIP flood zone. The currently adopted FIRMS for Medfield are kept by the Town. 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 repetitive loss areas.

Map 4: Earthquakes and Landslides – 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.

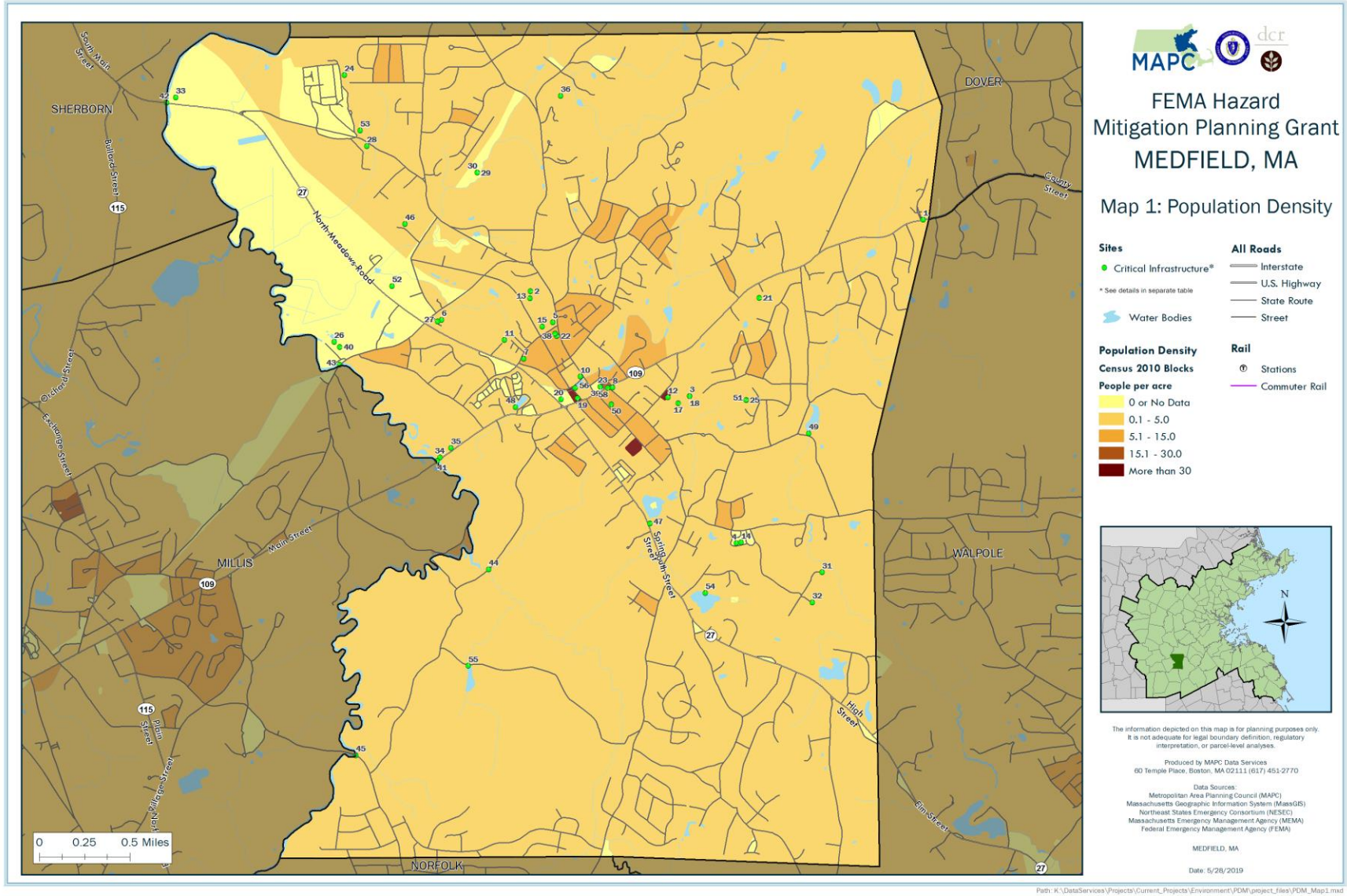
Map 5: Hurricanes and Tornadoes – This map shows a number of different items. The map includes the storm tracks for both hurricanes and tropical storms, if any occurred in this community. This information must be viewed in context. A storm track only shows where the eye of the storm passed through. In 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.

Map 6: Average Snowfall - - This map shows the average snowfall. It also shows storm tracks for nor'easters, if any storms tracked through the community.

Map 7: Composite Natural Hazards - 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: Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph dated April, 2009. The source of the aerial photograph is Mass GIS. This map also shows potential future developments, and critical infrastructure sites. MAPC consulted with town staff to determine areas that were likely to be developed or redeveloped in the future.

Map 9: Extreme Heat- MAPC uses LANDSAT 30m spatial resolution satellite data to extract land surface temperature to assess a community's exposure to present-day extreme heat and any vulnerabilities to rising temperatures with climate change. The extreme heat analysis uses date from 2016 with satellite images on days of 90° or higher at Logan Airport, July 13 and August 30, 2016 and created land surface temperature using a methodology development by Walawender, Hajto, and Iwaniuk (2012) called Landsat TRS Tools. This map illustrates the hottest areas in the top fifth percentile for the 101 towns in Metropolitan Boston.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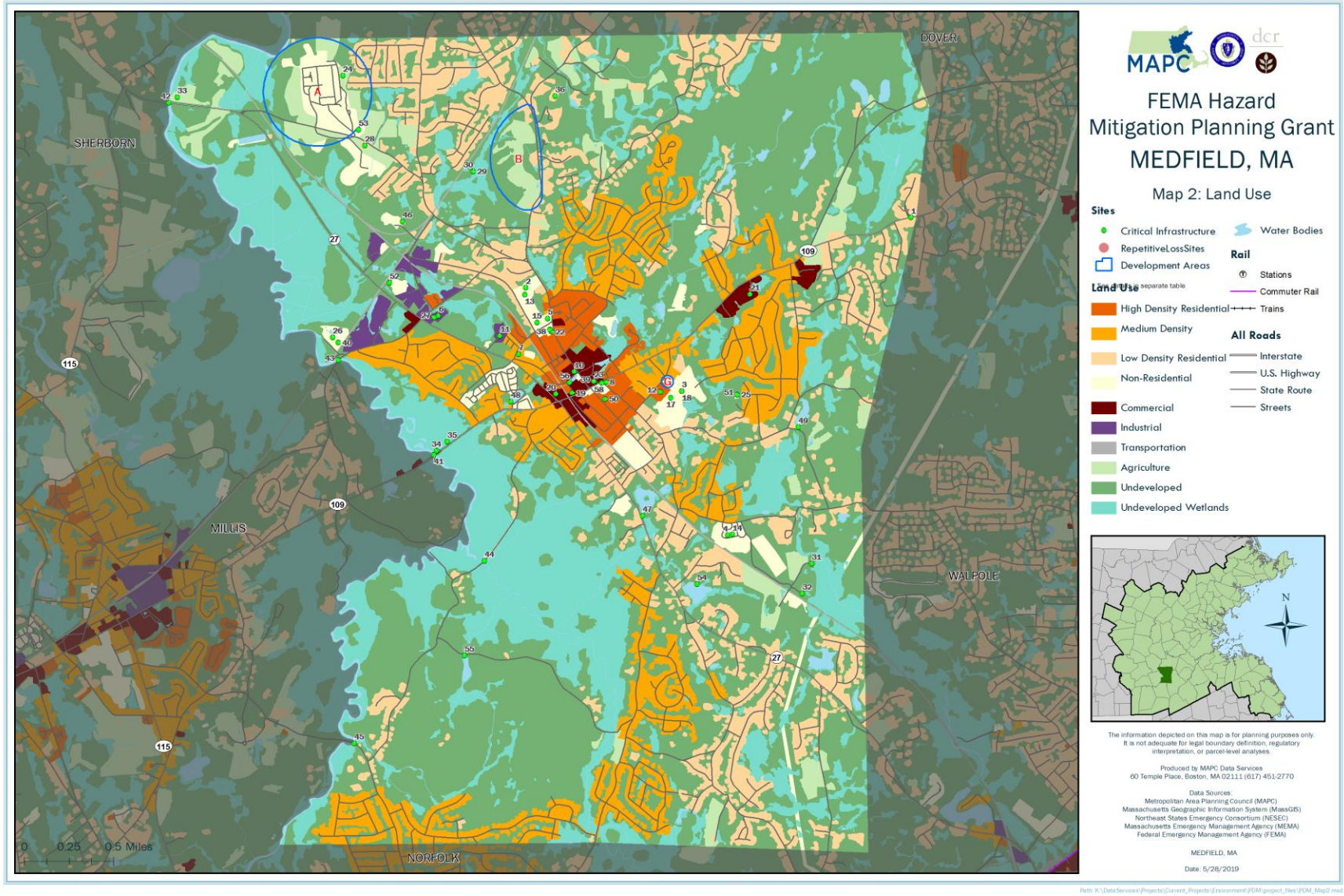
FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA
Map 1: Population Density
Sites
Critical Infrastructure*
* See details in separate table
Water Bodies
All Roads
Interstate
U.S. Highway
State Route
Street
Population Density
Census 2010 Blocks
People per acre
0 or No Data
0.1 - 5.0
5.1 - 15.0
15.1 - 30.0
More than 30
Rail
Stations
Commuter Rail
SHERBORN
DOVER
MILLIS
WALPOLE
NORFOLK
North Meadows Road
Main Street
Springdale Street
High Street
Elm Street
0 0.25 0.5 Miles
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)
MEDFIELD, MA
Date: 5/28/2019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MEDFIELD, MA
Map 2: Land Use
Sites
Critical Infrastructure
RepetitiveLossSites
Development Areas
Water Bodies
Rail
Stations
Commuter Rail
Trains
Land Use
High Density Residential
Medium Density
Low Density Residential
Non-Residential
Commercial
Industrial
Transportation
Agriculture
Undeveloped
Undeveloped Wetlands
All Roads
Interstate
U.S. Highway
State Route
Streets
SHERBORN
MILLIS
DOVER
WALPOLE
NORFOLK
0 0.25 0.5 Miles
N
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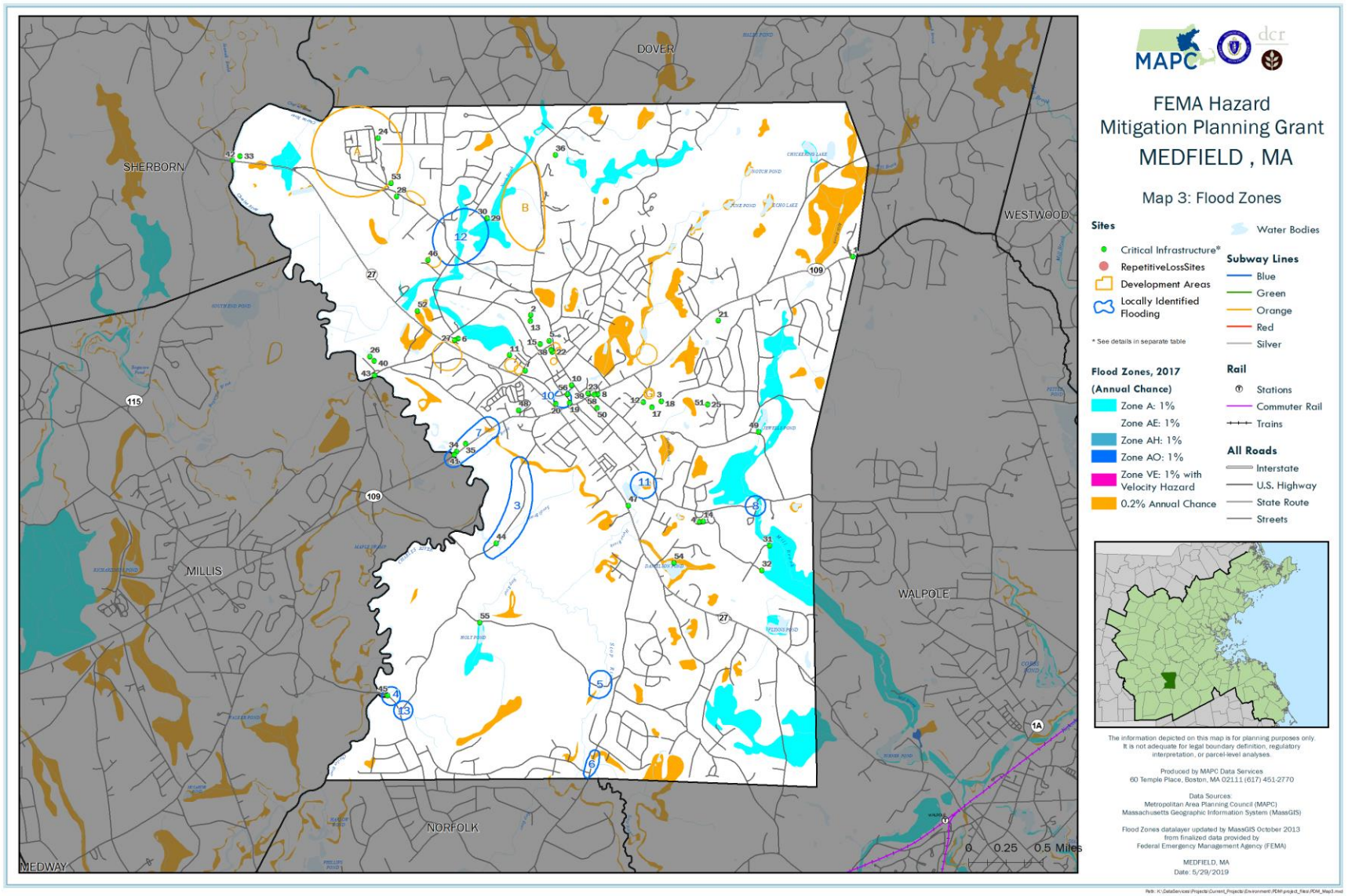
DOVER
SHERBORN
WESTWOOD
MILLIS
WALPOLE
NORFOLK
MEDWAY
0 0.25 0.5 Miles
MAPC
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FEMA Hazard
Mitigation Planning Grant
MEDFIELD , MA
Map 3: Flood Zones
Sites
Critical Infrastructure*
RepetitiveLossSites
Development Areas
Locally Identified Flooding
* See details in separate table
Water Bodies
Subway Lines
Blue
Green
Orange
Red
Silver
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
Rail
Stations
Commuter Rail
Trains
All Roads
Interstate
U.S. Highway
State Route
Streets
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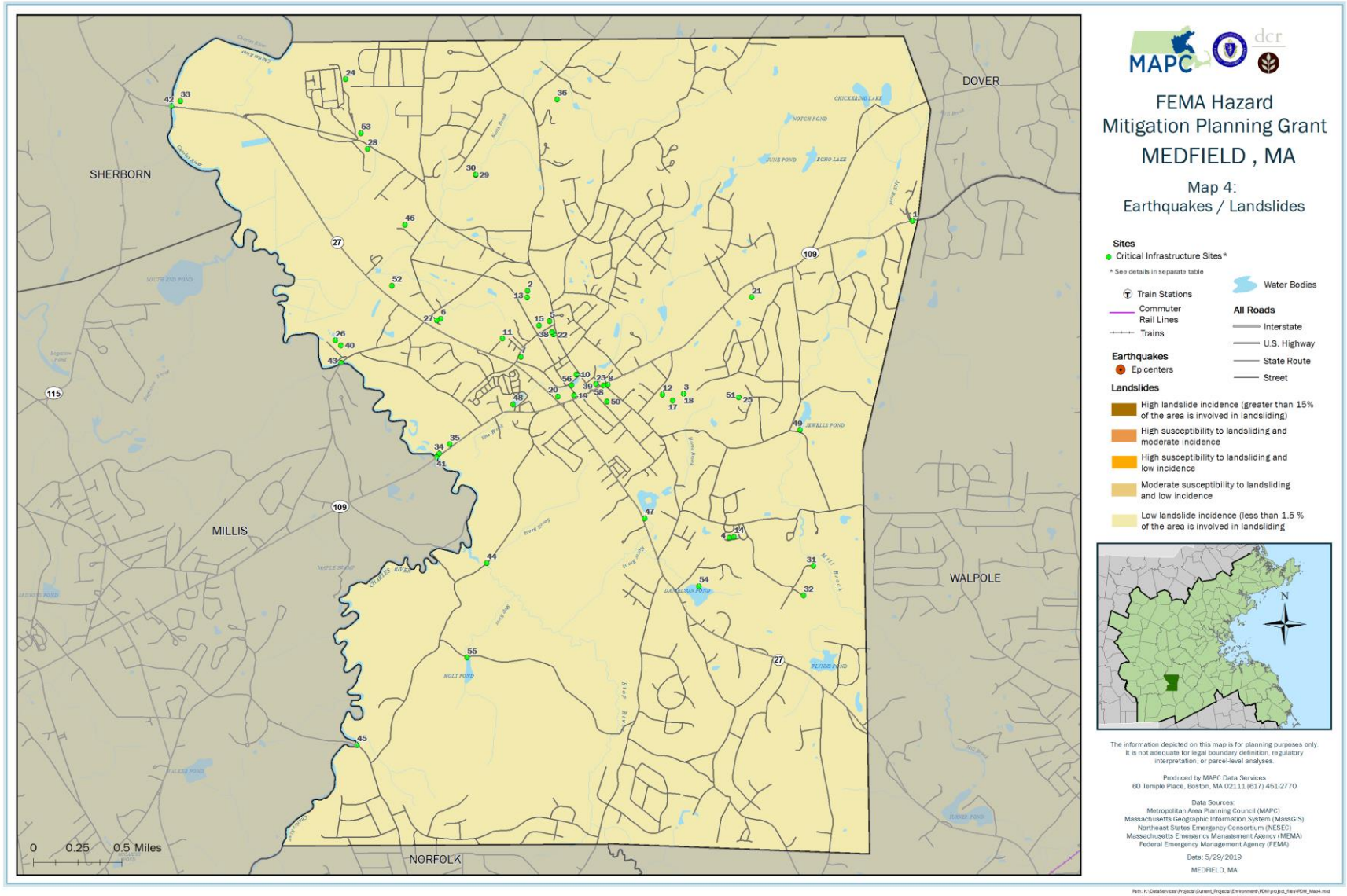
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Flood Zones datalayer updated by MassGIS October 2013 from finalized data provided by Federal Emergency Management Agency (FEMA)
MEDFIELD, MA
Date: 5/29/2019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Map 4:
Earthquakes / Landslides
Sites
Critical Infrastructure Sites*
* See details in separate table
Train Stations
Commuter Rail Lines
Trains
Water Bodies
All Roads
Interstate
U.S. Highway
State Route
Street
Earthquakes
Epicenters
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
SHERBORN
DOVER
MILLIS
WALPOLE
NORFOLK
0 0.25 0.5 Miles
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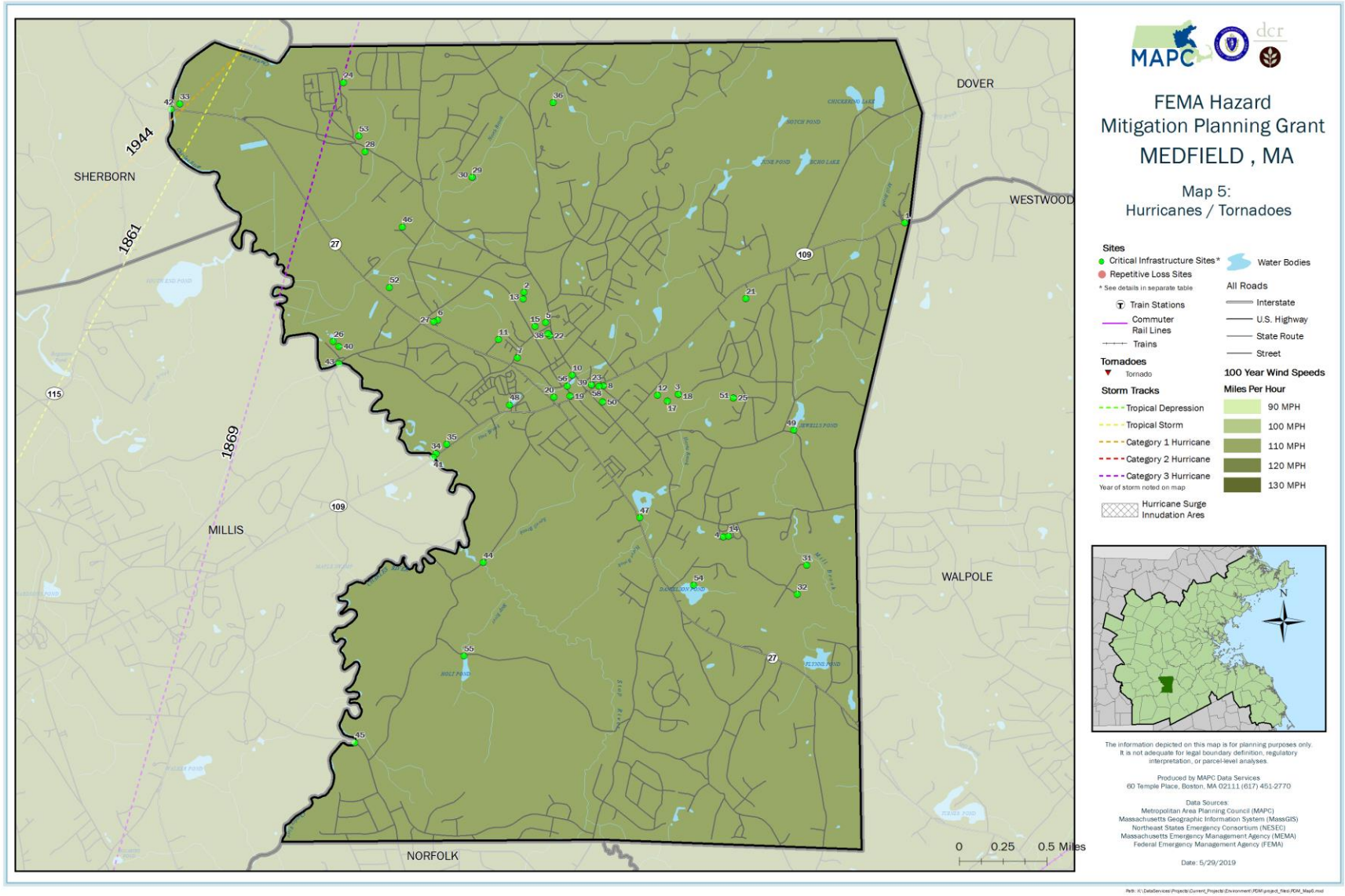
Federal Emergency Management Agency (FEMA)
Date: 5/29/2019
MEDFIELD, MA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FEMA Hazard
Mitigation Planning Grant
MEDFIELD , MA
Map 5:
Hurricanes / Tornadoes
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Train Stations
Commuter Rail Lines
Trains
Tornadoes
Tornado
Storm Tracks
Tropical Depression
Tropical Storm
Category 1 Hurricane
Category 2 Hurricane
Category 3 Hurricane
Year of storm noted on map
Hurricane Surge Innudation Ares
Water Bodies
All Roads
Interstate
U.S. Highway
State Route
Street
100 Year Wind Speeds
Miles Per Hour
90 MPH
100 MPH
110 MPH
120 MPH
130 MPH
DOVER
WESTWOOD
SHERBORN
MILLIS
WALPOLE
NORFOLK
1944
1861
1869
0 0.25 0.5 Miles
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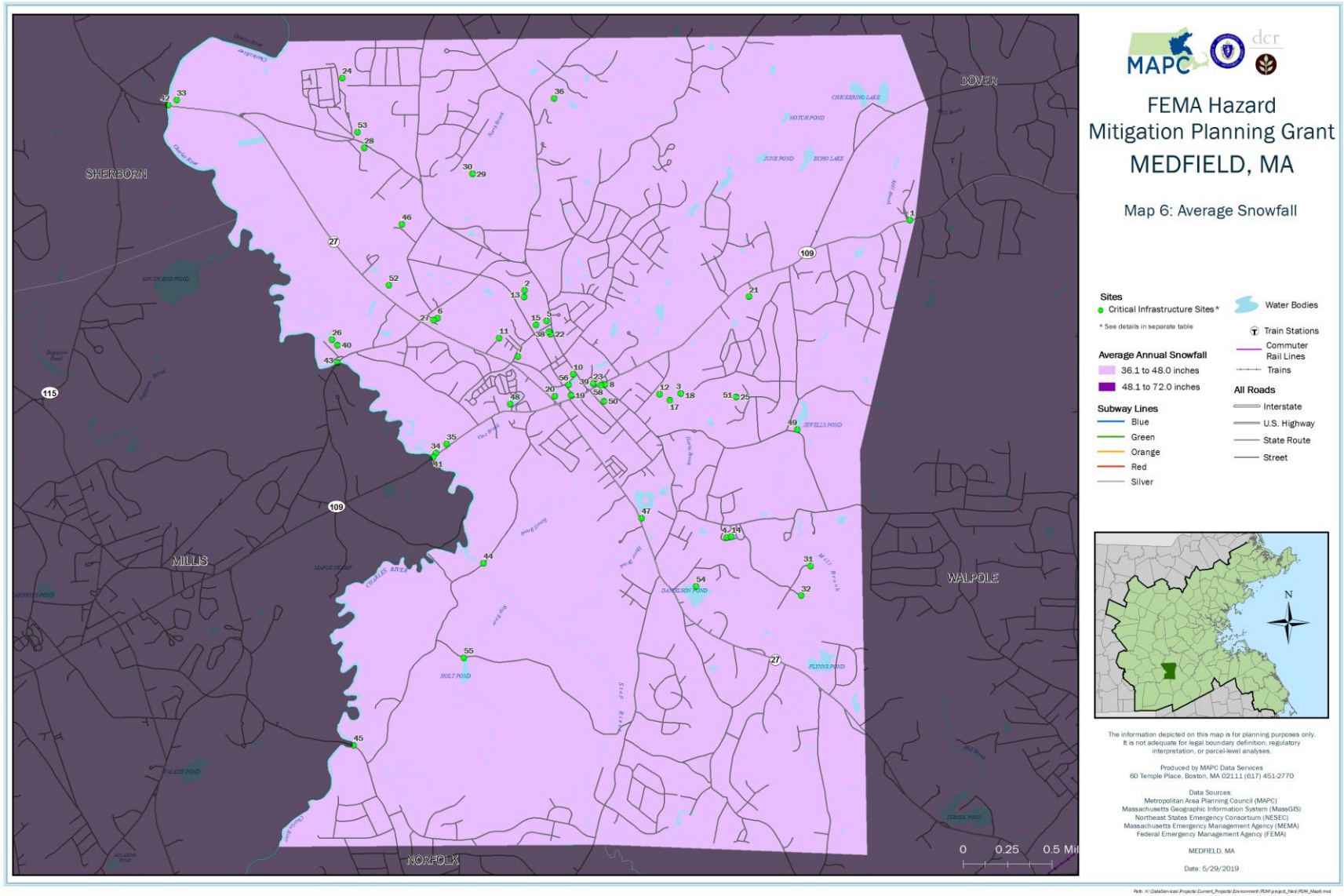
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FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA
Map 6: Average Snowfall
Sites
Critical Infrastructure Sites *
* See details in separate table
Average Annual Snowfall
36.1 to 48.0 inches
48.1 to 72.0 inches
Subway Lines
Blue
Green
Orange
Red
Silver
Water Bodies
Train Stations
Commuter Rail Lines
Trains
All Roads
Interstate
U.S. Highway
State Route
Street
N
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.
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DOVER
NORFOLK
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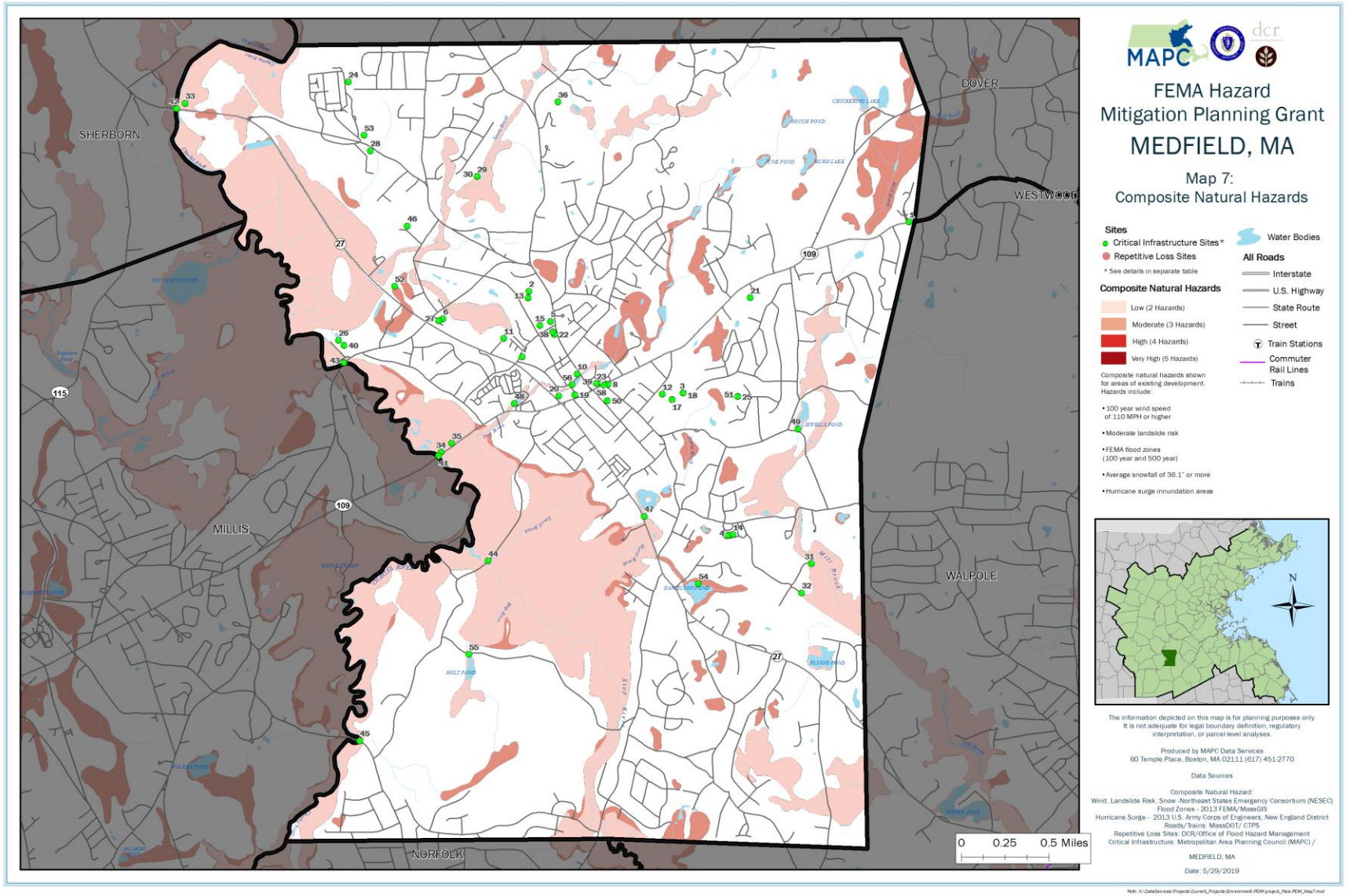
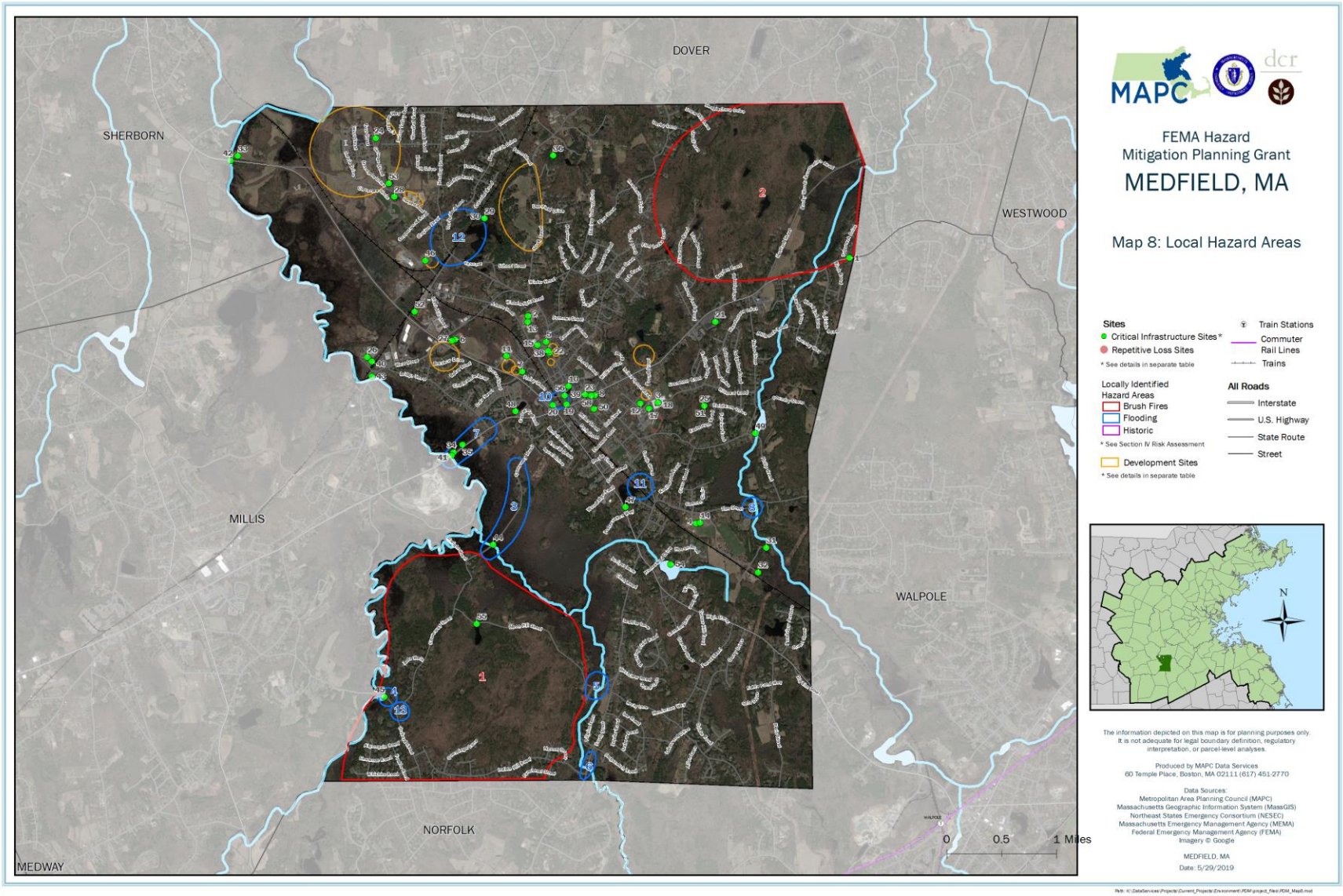
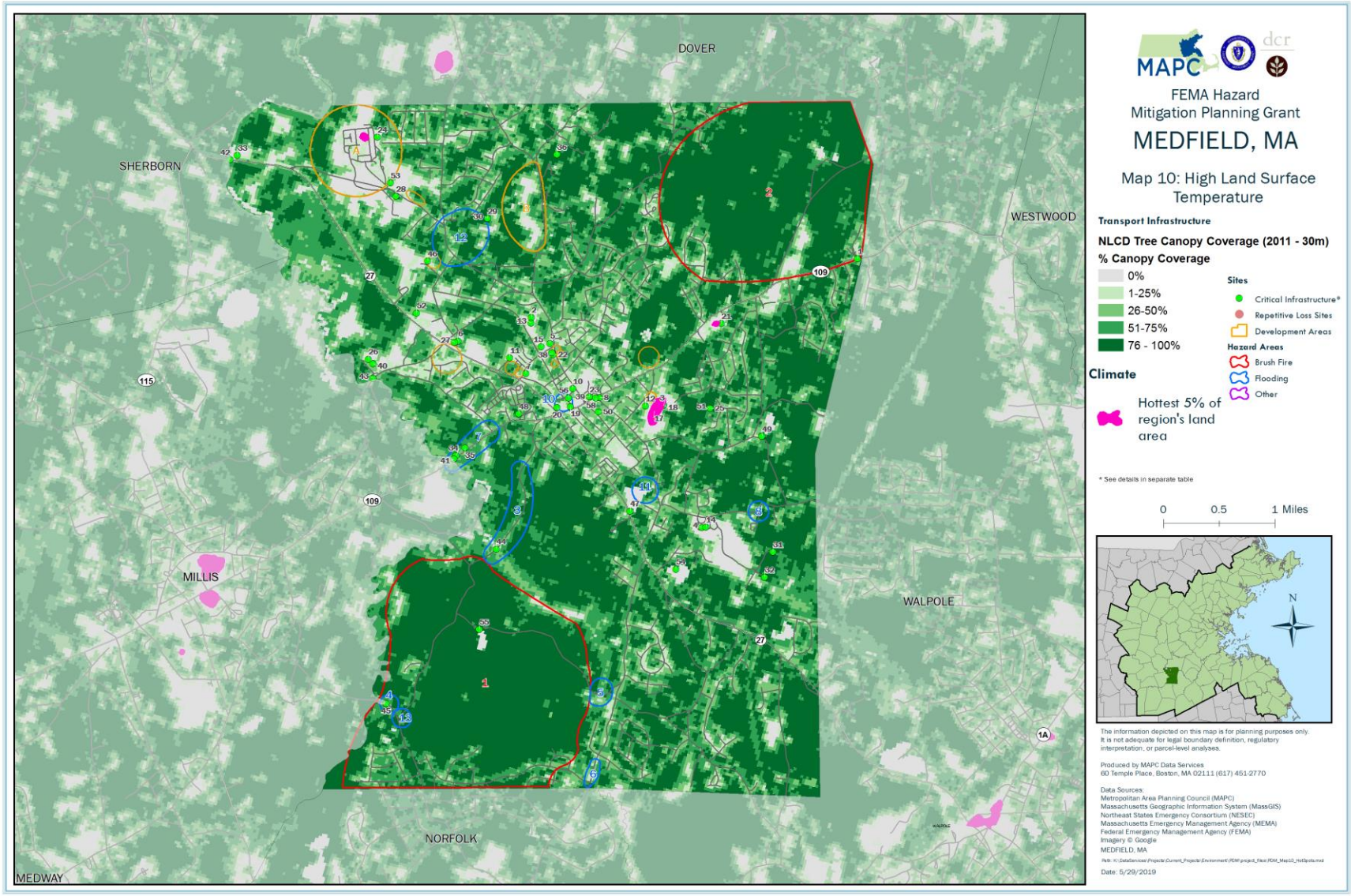
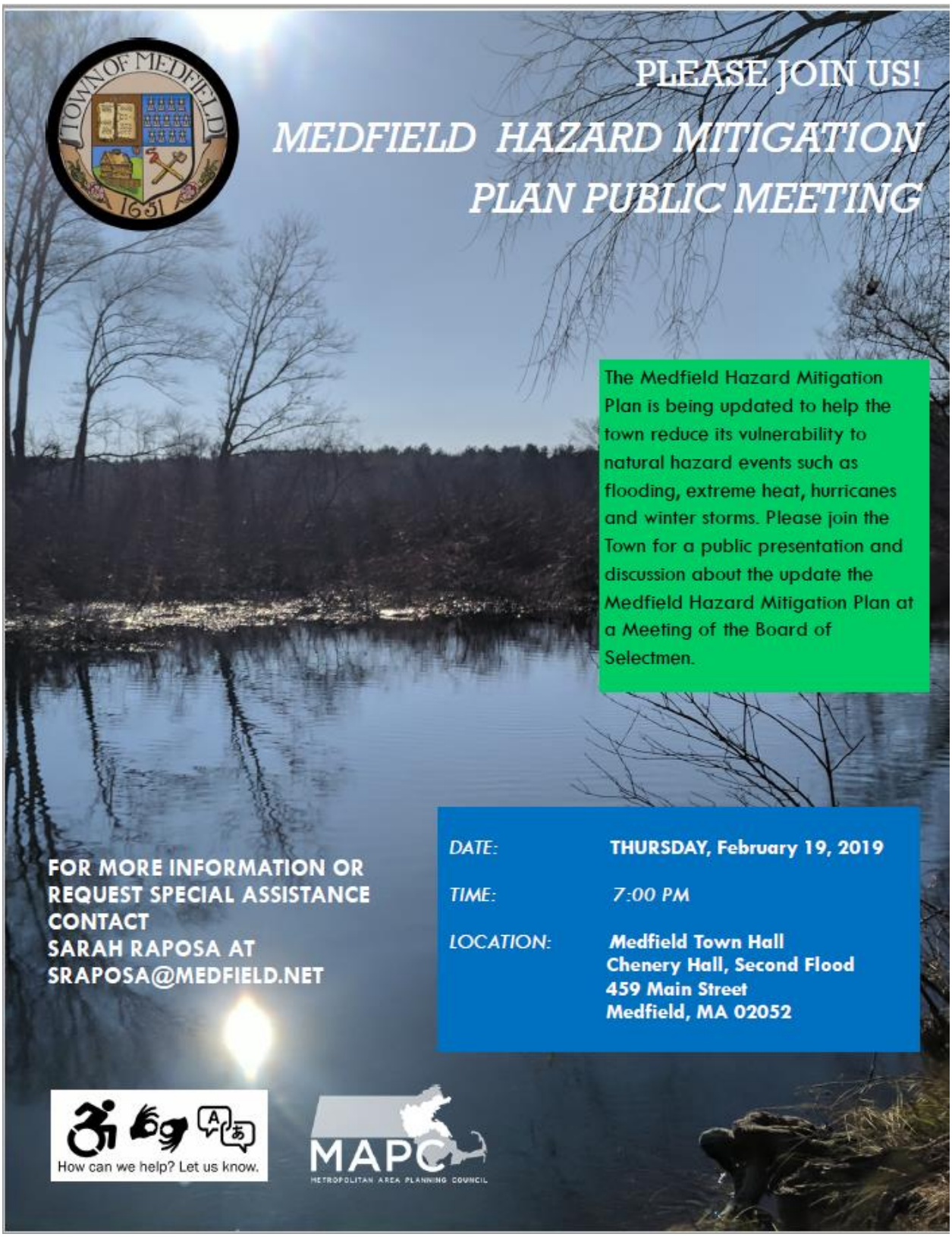

FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA
Map 7:
Composite Natural Hazards
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Composite Natural Hazards
Low (2 Hazards)
Moderate (3 Hazards)
High (4 Hazards)
Very High (5 Hazards)
Composite natural hazards 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 innundation areas
Water Bodies
All Roads
Interstate
U.S. Highway
State Route
Street
Train Stations
Commuter Rail Lines
Trains
SHERBORN
MILLIS
DOVER
WESTWOOD
WALPOLE
NORFOLK
0 0.25 0.5 Miles
N
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
Composite Natural Hazard:
Wind, Landslide Risk, Snow -Northeast States Emergency Consortium (NESEC)
Flood Zones - 2013 FEMA/ MassGIS
Hurricane Surge - 2013 U.S. Army Corps of Engineers, New England District
Roads/Trains: MassDOT/ CTPS
Repetitive Loss Sites: DCR/Office of Flood Hazard Management
Critical Infrastructure: Metropolitan Area Planning Council (MAPC) /
MEDFIELD, MA
Date: 5/29/2019


DOVER
SHERBORN
WESTWOOD
MILLIS
WALPOLE
NORFOLK
MEDWAY
0
0.5
1 Miles
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA
Map 8: Local Hazard Areas
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Locally Identified
Hazard Areas
Brush Fires
Flooding
Historic
* See Section IV Risk Assessment
Development Sites
* See details in separate table
Train Stations
Commuter
Rail Lines
Trains
All Roads
Interstate
U.S. Highway
State Route
Street
N
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)
Imagery © Google
MEDFIELD, MA
Date: 5/29/2019


DOVER
SHERBORN
WESTWOOD
MILLIS
WALPOLE
NORFOLK
MEDWAY
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
MEDFIELD, MA
Map 10: High Land Surface Temperature
Transport Infrastructure
NLCD Tree Canopy Coverage (2011 - 30m)
% Canopy Coverage
0%
1-25%
26-50%
51-75%
76 - 100%
Sites
Critical Infrastructure*
Repetitive Loss Sites
Development Areas
Hazard Areas
Brush Fire
Flooding
Other
Climate
Hottest 5% of region's land area
* See details in separate table
0
0.5
1 Miles
N
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)
Imagery © Google
MEDFIELD, MA
Date: 5/29/2019

Appendix C Public Participation


PLEASE JOIN US!
MEDFIELD HAZARD MITIGATION PLAN PUBLIC MEETING
The Medfield Hazard Mitigation Plan is being updated to help the town reduce its vulnerability to natural hazard events such as flooding, extreme heat, hurricanes and winter storms. Please join the Town for a public presentation and discussion about the update the Medfield Hazard Mitigation Plan at a Meeting of the Board of Selectmen.
DATE: THURSDAY, February 19, 2019
TIME: 7:00 PM
LOCATION: Medfield Town Hall
Chenery Hall, Second Flood
459 Main Street
Medfield, MA 02052
FOR MORE INFORMATION OR REQUEST SPECIAL ASSISTANCE CONTACT
SARAH RAPOSA AT
SRAPOSA@MEDFIELD.NET
How can we help? Let us know.
MAPC
METROPOLITAN AREA PLANNING COUNCIL

TOWN OF MEDFIELD

MEETING NOTICE

POSTED:

TOWN CLERK

RECEIVED
TOWN OF MEDFIELD, MASS

2019 FEB 14 P 4:09

OFFICE OF THE
TOWN CLERK

POSTED IN ACCORDANCE WITH THE PROVISIONS OF M.G.L. CHAPTER 39 SECTION 23A AS AMENDED.

Board of Selectmen

Board or Committee

PLACE OF MEETING	DAY, DATE, AND TIME
Town Hall, Warrant Committee Room, 1st floor	Tuesday February 19, 2019 @ 6:30 PM
Town Hall, Chenery Meeting Room, 2nd floor	Tuesday February 19, 2019 @ 7:00 PM

AGENDA (SUBJECT TO CHANGE)

6:30 PM Declare meeting open
6:30 PM Vote to go into Executive Session to consider the lease or value of real property with respect to Town property currently leased to the Kingsbury Club

7:00 PM Call to order
Disclosure of video recording
We want to take a moment of appreciation for our Troops serving in the Middle East and around the world

Appointments
7:05 PM Presentation Mayrock Development LLC; proposing Chapter 40B project under the Local Initiative Program for 56 non-aged restricted rental units located at 50 Peter Kristof Way

7:30 PM Darci Schofield, MAPC
Present Natural Hazard Mitigation Plan

7:50 PM Resident Andrea Costello
Discuss Medfield Plastic Reduction Initiative and Annual Town Meeting Article

8:05 PM Medfield Historical Commission
Discussion of Warrant Article / Demolition Delay Bylaw

Citizen Comment

Action Items
Vote to appoint Richard Hooker and George Darrell to the Conservation Commission

Vote to appoint Cynthia Greene and Matthew Triest to the Town Wide Master Planning Committee


Medfield
Natural Hazard Mitigation Plan
Public Meeting of the
Board of Selectmen
February 19, 2019
dcr
Massachusetts
MAPC

From:	Sarah Raposa
To:	Schofield, Darci
Cc:	ktrierweiler@medfield.net; Maurice Goulet; RKennedy@medfield.net; John Wilhelmi; William Carrico; Jeffrey Marsden; Michael LaFrancesca; Roberta Lynch; Leslee Willitts; Jon Cogan; Ann Thompson; Gary Pelletier; Amy Colleran; Kerry Snyder; Ian Cooke (cooke@neponset.org); Emily Norton
Subject:	HMP & MVP Presentation to BoS 5/28
Date:	Monday, May 20, 2019 3:19:53 PM

Hi all - Please join us for a final presentation on May 28th (~7 pm, BoS meeting) for the draft Natural Hazard Mitigation and Municipal Vulnerability Preparedness Plans prepared by MAPC; a culmination of the work we've done over the past 6 months. The report will also be available for public comments for 2 weeks following the presentation.

Medfield's Draft Hazard Mitigation Plan (HMP) and Municipal Vulnerability Preparedness (MVP) Plans to be Presented at May 28 Public Meeting

Meeting to present the 2019 update of Medfield's Natural Hazard Mitigation and Municipal Vulnerability Preparedness Plans and solicit public comments

Who: Medfield residents, business owners, representatives of non-profit organizations and institutions, and others who are interested in preventing and reducing damage from natural hazards and climate change.

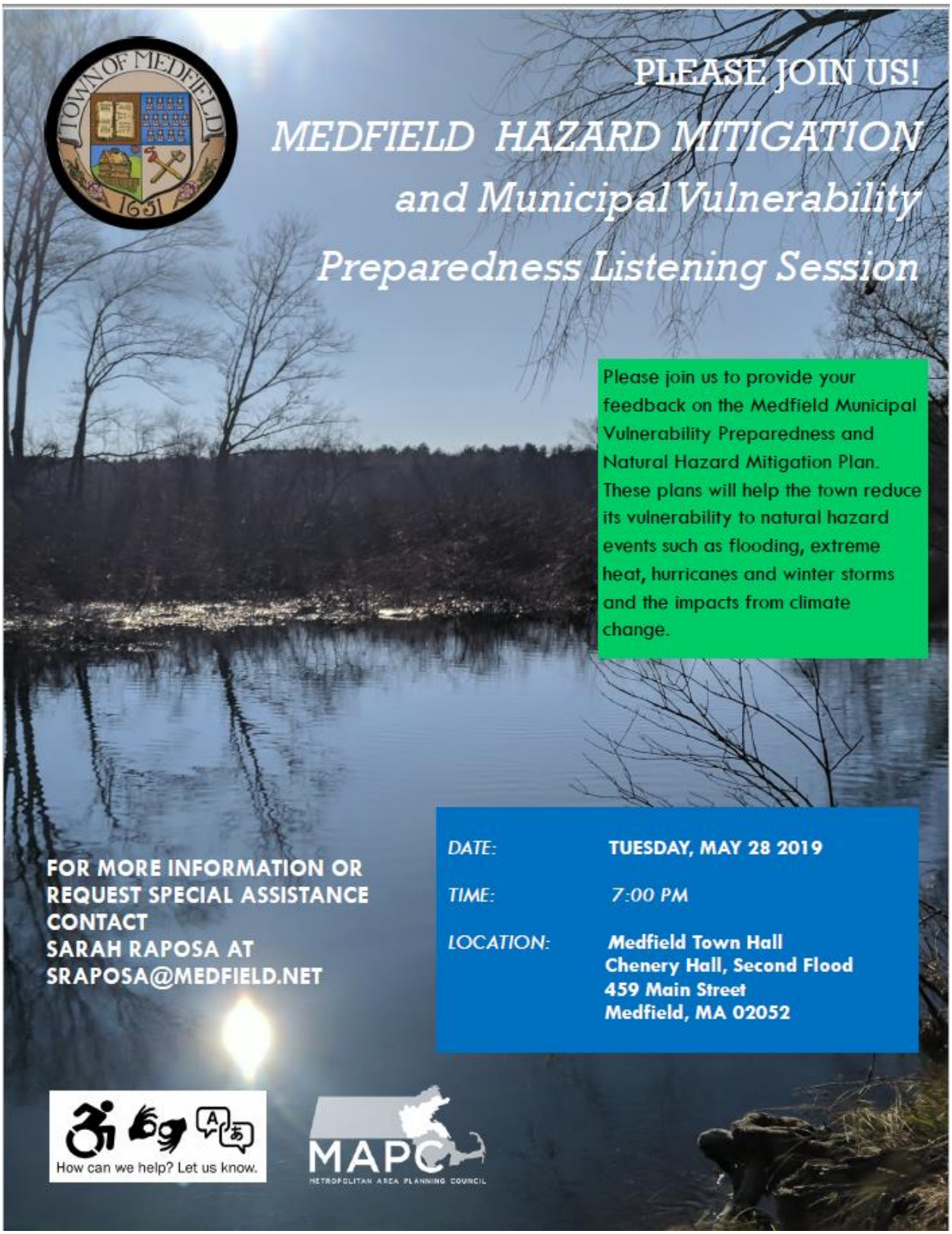
What: At the Medfield Board of Selectmen's meeting on Tuesday, May 28, at 7:00 PM, a presentation will be made by the Metropolitan Area Planning Council (MAPC), which is assisting the Town on its Municipal Vulnerability Preparedness Plan and its 2019 update of its Hazard Mitigation Plan.

The Town of Medfield adopted its first Hazard Mitigation Plan in 2011, which was approved by the Federal Emergency Management Agency (FEMA). This plan will update the 2011 plan. The Town also pursued simultaneously a Municipal Vulnerability Preparedness Plan to prepare for the impacts of climate change. Both plans identify natural hazards affecting Medfield such as floods, hurricanes, winter storms, and earthquakes, as well as future impacts with climate change that the Town can take to reduce its vulnerability to these hazards.

When: Tuesday, May 28, at 7:00 PM

Where: Medfield Town Hall,
459 Main Street, Chenery Hall, Medfield, MA 02052

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.


PLEASE JOIN US!
MEDFIELD HAZARD MITIGATION
and Municipal Vulnerability
Preparedness Listening Session
Please join us to provide your feedback on the Medfield Municipal Vulnerability Preparedness and Natural Hazard Mitigation Plan. These plans will help the town reduce its vulnerability to natural hazard events such as flooding, extreme heat, hurricanes and winter storms and the impacts from climate change.
DATE: TUESDAY, MAY 28 2019
TIME: 7:00 PM
LOCATION: Medfield Town Hall
Chenery Hall, Second Flood
459 Main Street
Medfield, MA 02052
FOR MORE INFORMATION OR REQUEST SPECIAL ASSISTANCE CONTACT
SARAH RAPOSA AT
SRAPOSA@MEDFIELD.NET
How can we help? Let us know.
MAPC
METROPOLITAN AREA PLANNING COUNCIL

TOWN OF MEDFIELD

POSTED:

TOWN CLERK

MEETING NOTICE

POSTED IN ACCORDANCE WITH THE PROVISIONS OF M.G.L. CHAPTER 39 SECTION 23A AS AMENDED.

Board of Selectmen

Board or Committee

PLACE OF MEETING	DAY, DATE, AND TIME
Town Hall, Chenery Meeting Room, 2nd floor	Tuesday May 28, 2019 @ 6:00 PM

AGENDA (Subject to change)

6:00 PM Call to order
Disclosure of video recording
We want to take a moment of appreciation for our Troops serving in the Middle East and around the world

6:00 PM Powers & Sullivan, LLC, Wakefield MA, Town Auditors / discuss FY2018 Audit

7:00 PM Appointments
Town Clerk to swear-in Police Chief Michelle Guerette

Sally Bangoura / request common victualler license for new restaurant at 26 Park Street

Sarah Raposa, Town Planner and Darci Schofield, MAPC / discuss Medfield Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan Listening Session

State Hospital Development Committee, Todd Trehubenko, Chair / summary and findings

Medfield Garden Club / request Town contribution to Club's civic beautification efforts

7:30 PM Public Hearing / Zelus Beer Company requests a pouring permit from the Town;
location One Green Street

Citizen Comment


Medfield
Municipal Vulnerability Preparedness
and Natural Hazard Mitigation Plans
Public Listening Session
May 28, 2019
Sarah Raposa, Medfield Town Planner
Darci Schofield, MAPC Senior Environmental Planner
MAPC
Google

Appendix D Local Adoption

Certificate to Document Adoption of the
Hazard Mitigation Plan Update
By the Board of Selectmen

TOWN OF MEDFIELD
Office of
BOARD OF SELECTMEN

KRISTINE TRIERWEILER
Town Administrator

TOWN HOUSE, 459 MAIN STREET
MEDFIELD, MASSACHUSETTS 02052-0315

(508) 359-8505

CERTIFICATE OF ADOPTION
BOARD OF SELECTMEN
TOWN OF MEDFIELD, Massachusetts

A RESOLUTION ADOPTING THE
TOWN OF MEDFIELD HAZARD MITIGATION PLAN 2019

WHEREAS, the *Town of Medfield Hazard Mitigation Plan Update 2019* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Medfield, and

WHEREAS, duly-noticed public meetings were held by the Board of Selectmen on February 19, 2109 and on May 28, 2019

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

NOW, THEREFORE BE IT RESOLVED that the Town of Medfield Board Of Selectmen adopts the *Town of Medfield Hazard Mitigation Plan Update 2019,* in accordance with M.G.L. 40 §4 or the charter and bylaws of the Town of Medfield .

ADOPTED AND SIGNED this Date. _____

Name(s)

Title(s)

Signature(s)

ATTEST