HOLDEN HAZARD MITIGATION PLAN

2025 Update



Photo Courtesy of the Holden Fire Department

Effective January 30, 2026 - January 29, 2031

Prepared by
Local Hazard Mitigation Team
Town of Holden, Massachusetts
&
Central Massachusetts Regional Planning Commission
One Mercantile Street, Suite 520
Worcester, MA 01608

[Last updated 9/28/2026]

This Certificate of Adoption helps meet the following FEMA local mitigation plan requirements:

- *F1. "For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance?" (Requirement 44 CFR § 201.6(c)(5)).*

CERTIFICATE OF ADOPTION
BOARD OF SELECTMEN
TOWN OF HOLDEN, MASSACHUSETTS

A RESOLUTION ADOPTING THE *HOLDEN HAZARD MITIGATION PLAN*

WHEREAS, the Town of Holden established a Committee to prepare the 2025 update of the *Holden Hazard Mitigation Plan*; and

WHEREAS, the updated *Holden Hazard Mitigation Plan* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Holden; and

WHEREAS, duly-noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on January 4, 2024; March 7, 2023; May 9, 2024; June 24, 2024; and September 10, 2024 and April 22, 2025; and

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

NOW, THEREFORE BE IT RESOLVED that the Town of Holden BOARD OF SELECTMEN adopts the 2025 update of the *Holden Hazard Mitigation Plan*, in accordance with M.G.L. 40 or the charter and bylaws of the Town of Holden.

ADOPTED AND SIGNED this date, January 20, 2026.

Name	Thomas Curran	Linda Long-Bellil	Anthony Renzoni
Title	Chair	Vice Chair	Member
Name	Christopher Faulkner	William Holmes	
Title	Member	Clerk	
Signatures			

U.S. Department of Homeland Security
FEMA Region 1
220 Binney Street
Cambridge, MA 02142

FEMA

January 30, 2026

Dawn Brantley, Director
Massachusetts Emergency Management Agency
400 Worcester Road
Framingham, Massachusetts 01702-3599

Director Brantley:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region 1 Mitigation Division has approved the *Holden Hazard Mitigation Plan* effective **January 30, 2026** through **January 29, 2031** in accordance with the planning requirements of the Robert T. Stafford Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

Mitigation plans may include additional content to meet Element H: Additional State Requirements or content the local government included beyond applicable FEMA mitigation planning requirements. FEMA approval does not include the review or approval of content that exceeds these applicable FEMA mitigation planning requirements.

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

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

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing disaster losses. Should you have any questions, please contact Brigitte Ndikum-Nyada at 617-378-7951 or brigitte.ndikum.nyada@fema.dhs.gov.

Sincerely,

Christopher Markesich
Floodplain Management and Insurance Branch Chief
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cc: Jeffrey Zukowski, Hazard Mitigation Planner, MEMA
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Brigitte Ndikum-Nyada, Community Planner, DHS, FEMA Region 1

ACKNOWLEDGEMENTS

This Acknowledgements section helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))"*

This Hazard Mitigation Plan (HMP) update was funded by the Federal Emergency Management Agency (FEMA) via the Massachusetts Emergency Management Agency (MEMA). This report was prepared for the community of Holden by the Central Massachusetts Regional Planning Commission (CMRPC).

The Holden Board of Selectmen extends its thanks to participants in the Local Hazard Mitigation Team for their time and hard work in participating in this timely project. Core Team members include:

Russ Hall, Fire Department, Fire Chief/EMD

Christopher Monteverdi, Fire Department, Assistant Fire Chief

Sean Smith, Fire Department, Deputy Chief

Bryan Patch, Fire Department, Emergency Management Coordinator

John Woodsmall, Department of Public Works, Director

Chris DeMoranville, Department of Public Works, Supervisor of Operations

Joseph Kenney, Department of Public Works, Water and Sewer Superintendent Brad

Stone, Department of Public Works, Civil Engineer II

Tim Sherblom, Police Department, Police Chief

Chris Noyes, Police Department, Dep. Police Chief

Austin Gatlin, Police Department, Intern

Peter Lukes, Town Administration, Town Manager

David George, Town Administration, Town Planner

David Lindberg, Building Department, Superintendent

Francis Dagle, Health Department, Health Agent

Glenda Williamson, Conservation Commission, Conservation Agent

Jocelyn LaPlante, Wachusett Regional Emergency Communications Center, Director

Alexa Owen, Wachusett Regional Emergency Communications Center, Deputy Director

Mark Wilde, Wachusett Regional School District, Facilities Director

Bernadette DeBlander, Department of Conservation and Recreation,

Michael Viano, Holden Municipal Light Department, Superintendent

In addition, thanks are extended to the staff of the Central Massachusetts Regional Planning Commission for process facilitation and preparation of this document.

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Thanks are also due to the Massachusetts Emergency Management Agency (MEMA) for guidance and feedback regarding this plan.

Thanks are due as well to the City of Worcester's Emergency Management Department and Department of Public Works.

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EXECUTIVE SUMMARY

The Town of Holden's Hazard Mitigation Plan (HMP) identifies the natural hazards facing the town and provides existing measures and actionable strategies to mitigate the risks associated with natural hazards. This plan enables the town to lessen the impacts of natural hazards on infrastructure and residents before hazard events happen.

A local planning team consisting of representatives from various town departments and local organizations provided insight and knowledge into the town's vulnerabilities, priorities, and past history of natural hazard events. The planning team also distributed a public survey to understand the insights and experiences of the Holden community. The Central Massachusetts Regional Planning Commission (CMRPC) provided technical assistance to the Town of Holden to complete the plan update.

Ultimately, a mix of local input and data analysis informs the findings and recommendations of this plan. Specifically, the knowledge and experience from the local planning team and the local community, as well as a hazards analysis using past climate data and mapping technology conducted by CMRPC, inform this plan.

After a summary of the planning process, the plan provides a profile of Holden, including an overview of critical infrastructure, facilities, and populations to protect from natural hazard events in Holden. It then identifies and analyzes the natural hazards impacting Holden, including: Flooding, Severe Snowstorms / Ice Storms / Nor'easters, Hurricanes, Severe Thunderstorms / Wind / Tornadoes, Wildfires, Earthquakes, Dam Failure, Drought, Extreme Temperatures, Invasive Species and other hazards that could affect the Town of Holden.

The plan then summarizes existing protection measures, or the measures that the town is currently taking to mitigate the impacts of natural hazards.

Next, the plan provides mitigation strategies, or actionable measures that the town can take to mitigate the impacts of natural hazards before they happen. The planning team classified strategies into four categories: infrastructure, planning and coordination, education and outreach, and local regulations and planning.

Lastly, the plan includes an implementation and maintenance plan for the next five years, including various funding sources at the state and federal levels available for hazard mitigation projects.

In CMRPC's and the local planning team's analysis, above all other hazards the threat of dam failures pose the greatest risk to the town of Holden. The combination of a high percentage of high and significant hazard dams in varying states of disrepair and with unclear or unknown ownership in some cases, and in other cases lacking the foundational safety of an up-to-date Emergency Action Plan (and in some cases, lacking an EAP entirely) and a potentially catastrophic impact to: Residential, Commercial and Municipal property; Essential Government Services; Schools; Community Centers; and Road and Rail Infrastructure located in Holden, Worcester and West Boylston. Should any one of these dams fail there also exists the potential for a cascade failure, as several of the dams in poor to fair condition are upstream or downstream of other dams also in varying states of repair. This is enough to elevate the towns vulnerability to the highest categorization, and this hazard and the others listed above are enumerated in section four of the plan, which also identifies the potential effects from climate change that may change the frequency or severity of these natural hazard events, based on the findings from the State of Massachusetts Climate Assessment (2022) as well as other data sources. Additionally, the dam hazards are gone into greater detail in the High Hazard Potential Dams Appendix located in the back of this plan.

Select key high-priority mitigation strategies that the local planning team included:

- Coordinate with the City of Worcester to address stormwater runoff and roadway pollutants as well as physical water supply protection barriers for the Holden Reservoir No 2 along Reservoir Road and Olean Street to prevent water supply contamination
- Replace Generator at Steel Street Water tower, currently functioning as the backup repeater system for the town's emergency communications and regional dispatch. Current generator system is unreliable.
- Replace Chaffin Fire Station (Station 2) to improve Fire Service to local neighborhood and Surrounds. Current fire station on 87 Adams Road [Note add to CI list if not included] is a 2 bay station constructed in the 1980's and is inadequate to meet current needs, as well as having significant structural deficiencies such as a collapsing roof and being not up to code for any significant seismic event.
- Renovate the Roof Structure of the Starboard Building, which currently faces snow load issues and houses many essential government functions in Holden
- Explore the Feasibility of a expansion of municipal power capabilities, Including developing additional redundant energy storage and municipally owned power generation infrastructure to support key locations during outages.
- Determine ownership of Current Meter Pond Dam. Ensure dam owner completes dam EAP and performs necessary maintenance of dam as indicated in the inspection report.

This list is not comprehensive, and the recommendation is that any reader review section seven of the plan for a complete list of the mitigation strategies identified.

The Federal Emergency Management Agency (FEMA) requires that localities maintain a hazard mitigation plan and update it every five years. The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region 1 Mitigation Division has approved the *Holden Hazard Mitigation Plan* effective **January 30, 2026** through **January 29, 2031** in accordance with the planning requirements of the Robert T. Stafford Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

1.0 INTRODUCTION

1.1 DISASTER MITIGATION PLAN

Congress enacted the Disaster Mitigation Act of 2000 (DMA 2000) on October 10, 2000. Also known as the Stafford Act Amendments, this bill was signed into law by President Clinton on October 30, 2000, creating Public Law 106-390. The law established a national program for pre-disaster mitigation and streamlined the federal administration of disaster relief. Specific rules on the implementation of DMA 2000 were published in the Federal Register in February 2002 and required that all communities must have a Hazard Mitigation Plan in place in order to qualify for future federal disaster mitigation grants following a Presidential Disaster Declaration. Hazard Mitigation Plans emphasize measures that can be taken to reduce or prevent future disaster damage caused by natural hazards. In the context of natural hazard planning, Pre-Disaster Mitigation refers to any action that permanently reduces or eliminates long-term risks to human life and property.

1.2 PLAN PURPOSE

Section 1.2 helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*

This plan identifies the natural hazards facing the Town of Holden, assesses the vulnerabilities of the Town's critical facilities, infrastructure, residents, and businesses to these hazards, and presents recommendations to mitigate the adverse effects of these hazards.

New England weather is renowned for its mercurial and dramatic nature. Late summer hurricanes, major winter blizzards, and summer droughts are all experienced in Central Massachusetts. These natural hazards occur frequently enough to be familiar scenes to residents of Holden. The negative effects of these natural hazards on the built environment can lead these events to be classified as natural disasters. As climate change continues to progress, the severity and frequency of natural hazard risk will increase.

This planning effort has drawn on the knowledge of local municipal officials and residents. The recommendations presented in the following report are intended to be realistic and practical steps for mitigating natural hazards and preparing Holden as best as possible for the effects of climate change. Implementation of these actions will translate into savings – fewer lives lost, less property destroyed, and less disruption to essential services and ecological systems.

1.3 PLANNING PROCESS

Section 1.3 helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1));*

- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*

- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

This Plan is funded through a Fiscal Year 2023 Pre-Disaster Mitigation grant to the Town of Holden from the Federal Emergency Management Agency (FEMA) through the Massachusetts Emergency Management Agency (MEMA) and local contributions from the Town of Holden.

The planning process in Holden was composed of two distinct but related phases:

1. data collection and technical review, and

2. public input and planning.

Identification of natural hazards impacting the Town of Holden was accomplished through a review of available information from various sources. These sources included federal and state reports and datasets, existing plans, and in some cases engineering documents. An assessment of risks and vulnerabilities was performed primarily using geographic information systems (GIS) to identify the infrastructure (critical facilities, public buildings, roads, neighborhoods, etc.) at the highest risk for being damaged by hazards, particularly flooding. Local knowledge as imparted by Town officials, staff, emergency management volunteers, and others was a critical element of this phase.

The second phase of the planning process was focused on outreach, public participation and input, and planning. This phase was critical to fostering awareness of the process among a wide range of local officials, coordinating updates to different plan elements in ways that included important stakeholders, and providing opportunities for public comment and input from a representative base of residents and other stakeholders, including community lifelines, in Holden. Through community engagement, CMRPC was better able to gauge community priorities for mitigation and to understand local resources as well as existing policies and procedures. With information from this phase of the planning process in hand, the local planning team was able to develop an informed list of mitigation strategies for the Town.

The Hazard Mitigation Planning team, consisting of local staff, included:

Russ Hall, Fire Department, Fire Chief/EMD

Christopher Monteverdi, Fire Department, Assistant Fire Chief

Sean Smith, Fire Department, Deputy Chief

Bryan Patch, Fire Department, Emergency Management Coordinator

John Woodsmall, Department of Public Works, Director

Chris DeMoranville, Department of Public Works, Supervisor of Operations

Joseph Kenney, Department of Public Works, Water and Sewer Superintendent

Brad Stone, Department of Public Works, Civil Engineer II

Tim Sherblom, Police Department, Police Chief

Chris Noyes, Police Department, Dep. Police Chief

Austin Gatlin, Police Department, Intern

Peter Lukes, Town Administration, Town Manager

David George, Town Administration, Town Planner

David Lindberg, Building Department, Superintendent

Francis Dagle, Health Department, Health Agent

Glenda Williamson, Conservation Commission, Conservation Agent

Jocelyn LaPlante, Wachusett Regional Emergency Communications Center, Director

Alexa Owen, Wachusett Regional Emergency Communications Center, Deputy Director

Mark Wilde, Wachusett Regional School District, Facilities Director

Bernadette DeBlander, Department of Conservation and Recreation,

Michael Viano, Holden Municipal Light Department, Superintendent

To discuss hazard areas, critical infrastructure and other assets, and plan priorities and strategies, the Hazard Mitigation Planning team met five times on January 4, 2024; March 7, 2023; May 9, 2024; June 24, 2024; and September 10, 2024. Between meetings and during development of the draft and final plans, information and comments were shared among the local team and CMRPC. On June 28, 2024, the Hazard Mitigation Planning team launched a public survey to gauge resident, worker, visitor, and business owner concerns about and experiences with natural hazards in Town. The survey was distributed on the Town's website and social media pages, the survey was advertised through the town social media as well as with a geographically targeted ad buy on Facebook, and flyers for and paper copies of the survey were distributed around Town, including at the town hall, senior center, public library, fire station, and police station. CMRPC also tabled the Holden Days festival to build awareness of the plan through public outreach and gathering survey responses from residents. A total of 98 responses were collected. Survey responses were discussed by the local planning team at its September 10, 2024 meeting and helped inform the development and prioritization of the plan's mitigation strategies. Representatives from the surrounding communities of Worcester, Paxton, Rutland, Princeton, Sterling and West Boylston were invited to comment on the draft plan during the public comment period in an effort gather input from surrounding communities who might have shared interests or concerns. As planning activities progressed, a public presentation was made by CMRPC and the local planning team on April 22, 2025 at a Holden Board of Selectmen meeting to provide a summary of key aspects of the draft plan report then being finalized. The presentation was televised on the local cable access channel, and the opportunity for public comment was emphasized during this presentation. Materials and notes from this presentation and the public comment period are included in Appendix D and Appendix E, respectively. A full draft Plan was provided to the Town for distribution and made available online at the Town website for public comment for four weeks from April 23rd to May 23rd. In addition, the final draft Plan was distributed to officials in all neighboring communities for

review and input regarding shared hazards. Feedback from Board of Selectmen members during the public presentation and from several town residents during the public comment period was received. This feedback was considered and, where deemed appropriate by the local planning team, incorporated as final edits were made to the plan.

The final draft Plan was submitted to MEMA for review on August 22nd, 2025, and was then relayed to FEMA for federal review. After receipt of FEMA's notice of approval pending adoption on December 25th, 2025, the plan was formally adopted by vote of the Board at the January 20th, 2026 meeting of the Board of Selectmen. The plan received final approval from FEMA on January 30th, 2026 and will remain active until January 29th, 2031.

The Holden Planning Board is the primary Town agency responsible for regulating development in town. Feedback to the Planning Board was ensured through the participation of the Town Planner on the local hazard mitigation planning team. In addition, CMRPC, which is the State-designated regional planning authority for Holden, works with all agencies that regulate development in its region; these agencies that CMRPC works with include both the municipal entities listed above and state agencies such as the Department of Conservation and Recreation and MassDOT. The regular collaboration between CMRPC and these municipal entities and state agencies ensured that the operational policies of and any mitigation strategies or hazards identified by these entities and agencies were incorporated in this Holden Hazard Mitigation Plan. The engagement of a diverse array of representatives, stakeholders, community lifelines, and organizations during the planning process promoted the creation of mitigation strategies for local recovery and resilience efforts in town. This hazard mitigation planning process included stakeholders from a broad range of sectors both inside and outside of local government; the inclusion of these stakeholders in the planning process is a critical step towards ensuring equitable, effective, and comprehensive risk reduction outcomes.

The following community lifelines were sent the full draft plan during the public comment period for their review and input. FEMA defines community lifelines as "the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.[1]" In addition, these community lifelines were sent a survey in which they could describe any concerns related to natural hazards in Holden they have as well as how they would like to participate in the Holden HMP planning process. Nine of these community lifelines responded to this survey, and their input was considered by CMRPC and the HMP planning team in town during the planning process. This survey is shown in Appendix B.

Safety and Security Lifelines:

- Local HMP Planning Team
- Holden Fire Department
- Holden Police Department
- Holden Town Government
- Rutland Town Government

[1] FEMA, "Local Mitigation Planning Policy Guide," FEMA.gov, Federal Emergency Management Agency, April 19, 2022, page 17, https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf.

- Princeton Town Government
- Sterling Town Government
- West Boylston Town Government
- Worcester City Government
- Paxton Town Government

Food, Water, and Shelter Lifelines:

- Mountview Middle School
- WRSD Central Office
- Wachusett Regional High School
- Senior Center
- Big Y
- Wachusett Food Bank
- Holden Grange
- American Red Cross
- Worcester County Food Bank

Health and Medical Lifelines:

- St. Vincents
- UMass Medical
- Holden Health Agent
- Holden Urgent Care 1
- Holden Nursing Home
- Miles Funeral Home

Energy Lifelines

- Holden Municipal Light Department
- Eversource
- National Grid

Communications Lifelines:

- Cell Towers
- Wachusett Regional Communications Center (WRECC)
- Rave Alerts – Alert Holden
- Holden Planning Department

Transportation Lifelines:

- MassDOT
- Senior Center Bus Service
- WRTA
- AA Transportation (School Bus Servicer)
- Genessee and Wyoming Rail Road
- Sterling Regional Airport
- Worcester Regional Airport
- Central Mass EMS Corp Ambu-bus

Hazardous Materials Lifelines:

- Tier II Facilities
- MassDEP
- State Hazmat Team

Water Systems

- Holden Department of Public Works
- Upper Blackstone Clean Water

2.0 Community Profile and Development Trends

2.1 Regional and Community Profile

The Central Massachusetts Regional Planning Commission (CMPRC) region occupies roughly 1,000 square miles in the southern two-thirds of Worcester County, Massachusetts. The City of Worcester, which is the second-largest city in Massachusetts and New England with a population of 206,518 according to the 2020 United States Census, is relatively in the central part of the region. Nearly 588,141 people live in the CMRPC Region, of whom 19905 reside in Holden.[2]

The CMRPC region is bordered to the west by the Central Massachusetts uplands, to the south by Rhode Island and Connecticut, to the east by the Boston metropolitan area, and to the north by the Montachusett region in northern Worcester County. The forty-community region has been divided for planning purposes into six sub-regions, as determined by shared characteristics and roadway corridors. Holden is located in the north sub-region consisting of 7 towns located to the north of Worcester, including: Barre, Holden itself, Oakham, Paxton, Princeton, Rutland and West Boylston.

Massachusetts has a humid continental climate, with maritime influences increasing from northwest to southeast. According to the National Oceanic and Atmospheric Association's National Weather Service, between 2000 and 2024, the Worcester, MA area saw monthly mean temperatures ranging from 15.1 degrees Fahrenheit in January to 74.7 degrees Fahrenheit in July.[3] According to this same source and over this same time period, average annual precipitation in the Worcester, MA area has been relatively high at 51.43 inches,[4] and average annual snowfall has been 70.7 inches.[5] Approximately 40 miles from the Atlantic coast, Holden and its neighboring communities are subject to a variety of types of severe storms, including hurricanes, nor'easters, thunderstorms, and blizzards.

The Town of Holden, Massachusetts was incorporated in 1741. Holden is located north of Worcester and west of route 190, a major north-south corridor connecting Worcester to Leominster. Route 122A runs through downtown and serves as Holden's Main Street and is bisected by route 31 at the town's geographic center. Route 122 bisects the Town, and feeds into Route 68 in the northwestern corner of Town near the township of Jefferson (a geographically distinct area within Holden). Holden is primarily a bedroom community for nearby Worcester and is home to the primary reservoirs for City of Worcester Water and its customers. Its employment base is healthy: as of November 2024, 10,702 Holden residents were employed[6] and, as of 2021, 2,524 people were employed in Holden.[7] Holden is bordered by Princeton to the north, Rutland and Paxton to

[2] Bureau, U. S. C. (2020). P1 "Race." Data.Census.gov. https://data.census.gov/table?q=Holden+town%2C+Massachusetts

[3] "Monthly Mean Avg Temperature for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[4] "Monthly Total Precipitation for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[5] "Monthly Total Snowfall for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[6] Massachusetts Department of Economic Research, Labor Market Information. Mass.gov. (2024). https://lmi.dua.eol.mass.gov/lmi/MunicipalEmploymentData/LmiTown?A=000507

[7] "United States Census Bureau. (n.d.). *Workers: Employed in Holden town (Worcester, MA)*. OnTheMap Work Area Profile Analysis. https://onthemap.ces.census.gov/

the west, Worcester to the south, and West Boylston and Sterling to the east.

Holden has a total area of 36.2 square miles and a population of 19905.[8] According to the Central Massachusetts Regional Planning Commission's (CMRPC) Long Range Transportation Plan, Holden's population is projected to remain stable in the coming decades .[9] Holden is expected to only grow by approximately 1% between 2020 and 2050, reaching 19,938 residents. The number of residents in town more than doubled from 5,975 to 12,564 between 1950 to 1970; The Town's population has grown by at least 6% each decade between 1970 and 2020, with an average growth of 9.7%.[10] According to the 2020 US Census, 87.7% of Holden's population identifies as white, 3.5% of the Town's population identifies as Asian, 2.1% of the Town's population identifies as Black or African American, 1.4% of the Town's population identifies as some other race, and 5.2% of the town's population identifies as belonging to two or more races.[11] According to the 2020 Census, about 4.2% of Holden's residents identify as Latino or Hispanic. According to the 2020 US Census, 26.3% of the Town's population is under 18 years old, while 18.4% of the population is 65 years and over.[12]

The median age in town, according to the 2020 US Census, is 42.3 years old, which is comparatively higher than the State's median age of 39.9.[13] At $142,880, median household annual income in Holden (according to 2022 American Community Survey 5-year estimates) is significantly higher than the State's median household annual income of $96,505 and Worcester County median household annual income of $88,524.[14] The poverty rate in town (according to 2022 ACS 5-year estimates) is 4.0%, less than half of the State's and Worcester County's poverty rates of, respectively, 9.9% and 10.0%.[15] With a median value of owner-occupied housing units of $409,800 according to 2022 ACS 5-year estimates, housing costs in Town are relatively lower compared to in the State and relatively higher to Worcester County, whose comparable numbers are $483,900 and $363,200, respectively.[16] According to 2022 ACS 5-year estimates, 80.7% of

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[8] Bureau, U. S. C. (2020). P1 "Race." Data.Census.gov. https://data.census.gov/table?q=Holden+town%2C+Massachusetts

[9] Central Massachusetts Metropolitan Planning Organization. "2050 Connections: 2024 Long Range Transportation Plan for the Central Massachusetts Metropolitan Planning Organization," Cmrpc.org, Central Massachusetts Regional Planning Commission, July 19, 2023, page III-5, https://cmrpc.org/wp-content/uploads/2024/05/2050-Connections-Endorsed-Document.pdf.

[10] Central Massachusetts Regional Planning Commission. (2024, July 5). *Holden*. CMRPC. https://cmrpc.org/data-center/community-snapshots/Holden/

[11] Bureau, U. S. C. (n.d.). *DP1 PROFILE OF GENERAL POPULATION AND HOUSING CHARACTERISTICS Holden MA*. Data.Census.gov. https://data.census.gov/table?q=dp1+holden+town+ma

[12] Ibid

[13] Ibid

[14] "S1903: Median Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars)," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSST5Y2022.S1903?q=ACS%20Massachusetts%20s1903&g=050XX00US25027_060XX00US2502746820.

[15] "S1701: Poverty Status in the Past 12 Months," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSST5Y2022.S1701?q=ACS%20Massachusetts%20s1701&g=050XX00US25027_060XX00US2502746820.

[16] United States Census Bureau. (2024). *ACS 5 Year Estimates DP04 Selected Housing Characteristics*. Data.Census.gov. https://data.census.gov/table?q=ACS+dp04+Holden+MA&g=060XX00US2502730560

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occupied homes in town are single-family homes (detached or attached), and 3.9% are multi-unit structures.[17] With a 2.5% vacancy rate according to the 2020 US Census, the vacancy rate in Holden is lower than the comparable rates in the State and Worcester County, which are with 8.3% and 5.7%, respectively.[18] Most homes in town are relatively new, with only 11.1% of them being built before 1940 according to 2022 ACS 5-year estimates.[19]

[17] United States Census Bureau. (2024b). *ACS 5 Year Estimates S2504 Physical Housing Characteristics for Occupied Housing Units*. Data.Census.gov. https://data.census.gov/table/ACSST5Y2022.S2504?q=ACS+Massachusetts+s2504&g=050XX00US25027_060XX00US2502730560%2C2502746820

[18] Bureau, U. S. C. (n.d.). DP1 PROFILE OF GENERAL POPULATION AND HOUSING CHARACTERISTICS Holden MA. Data.Census.gov. https://data.census.gov/table?q=dp1+holden+town+ma

[19] United States Census Bureau. (2024b). ACS 5 Year Estimates S2504 Physical Housing Characteristics for Occupied Housing Units. Data.Census.gov. https://data.census.gov/table/ACSST5Y2022.S2504?q=ACS+Massachusetts+s2504&g=050XX00US25027_060XX00US2502730560%2C2502746820

2.2 Development Trends

Section 2.2 helps meet the following FEMA local mitigation plan requirements:

E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))

Table 1: Town of Holden Development Projects between 2017 - 2024

Name	Status	Permitting Year	Housing Units	Commercial SQ Feet	Project Type
Single Family Homes	Complete	2017-2024	294	NA	Single Family Homes
Sunshine Ridge Subdivision	Under Construction	2025	7	NA	Seven lot Subdivision, single family detached
Fisher Road	Under Construction	2024	16	NA	Sixteen lot ANR plan, single family detached
Jefferson Mill Redevelopment	Under Construction	2023	63	NA	63 Units of Market Rate housing

Table 2: Town of Holden Potential Future Development

Name	Status	Year Permitted	Housing Units	Municipal / Commercial / Industrial SQ Feet	Project Type
724 Main Street	Permitted	2025	0	2500	Medical Office - Commercial
788 Main Street	Permitted	2025	0	2400	Restaurant - Commercial
2400 Main Street	Permitted	2025	0		Self Storage facility with 16 total buildings.

The Town of Holden is a suburban town with large business districts along the several major roadways that cross the Town. These features of the Town's character contribute to ongoing development and redevelopment patterns throughout the Town. There are a few commercial development projects currently underway in Town, primarily along the town's Main Street redevelopment project. All subdivisions and new developments in town are rigorously reviewed by the Planning Board, Fire Department, Police Department, Zoning Board of Appeals, and Design

Review Committee, as well as any other applicable departments, boards, and committees, to ensure that new construction complies with bylaws and ensures emergency vehicle access.

A few residential construction projects are currently under construction in town. Residential development in town is primarily comprised of single-family construction, despite the town's proximity to the city of Worcester, which borders Holden to the south. Within that decade all of the multi-family development in Holden was built in the first three years and represents around 19% of the new housing stock developed.

Table 3: Number of New Construction Residential Building Permits Issued by Year in Holden[20]

YEAR	Single Family Permits	Attached Single-family Permits	Multi-family / Mixed Use	All Permits
2013	71	0	117	188
2014	55	2	0	57
2015	58	4	17	79
2016	35	0	0	35
2017	70	0	0	70
2018	52	0	0	52
2019	36	0	0	36
2020	37	0	0	37
2021	14	0	0	14
2022	28	0	0	28
2023	40	0	0	40
2024	55	0	0	55
2017-2023 Total	551	6	134	691

[20] HUD. (2024). *SOCDS building permits database*. SOCDS Building Permits Summary Holden Annual Summary for: 2013-2023. https://socds.huduser.gov/permits/

Recent development in Holden has affected and slightly increased the Town's overall vulnerability to natural hazards, as the distribution of single-family homes has increased the impervious surfaces in town as well as increased the risk to wildfires from a broader wildland urban interface slightly. Additionally, future developments and developments under construction could be located within the inundation zones for Holden's many dams, such as the properties along Main Street.

If a development is formally approved by the appropriate boards and departments, due consideration should be given to the protection of natural resources. The clearing of brush and trees lessens the chance of wildfires near new development. An increase in storm runoff in localized areas of town caused by new development is possible, and proper drainage infrastructure is necessary to mitigate disruption to surrounding properties, wetlands, streams, and aquifers caused by development-induced runoff. During the modern construction process, erosion control measures are installed to prevent the sedimentation of surface water resources, stormwater drainage facilities are installed to mimic undeveloped conditions and cleanse contaminants, trees are trimmed back from structures and power lines, utility lines are installed underground, roads are built wide enough to allow emergency vehicles to enter, modern building codes are followed, and setbacks from wetlands are required. According to the Executive Office of Housing and Livable Communities, this would mean considering hazards more intentionally at the local and state level when considering housing or community investments and creating new initiatives that invest in adaptive measures. In addition, the state and municipalities must consider seriously the option of relocation or retreat from the areas of highest vulnerability.[21]

The Town, including various responsible boards and commissions, should ensure that new development processes take potential and known hazards into account and ensure that the mitigation of hazards occurs when needed. Holden utilizes various methods to ensure that new development conforms with current Massachusetts General Laws as well as the Town's Bylaws. The Planning Board, Conservation Commission, and Zoning Board of Appeals (ZBA) in town consider water resource and open space preservation in decision making and, in the case of the ZBA, when hearing and deciding on appeals. This consideration includes specific evaluation criteria that are relevant to natural hazards – including requirements for preventing and mitigating flooding and stormwater impacts. The Town's Bylaws are amended and updated on an as needed basis to adapt to the needs of and the shifting forces that affect the Town.

New development in Holden needs to be in line with the state building code. Holden has not adopted the state's Stretch Energy Code, which is based on the International Energy Conservation Code (IECC) 2009 building code created by the International Code Council.[22] This Stretch Energy Code provides a more energy efficient alternative to the base energy code for both new construction and existing buildings and strengthens the town's climate resilience and hazard mitigation capabilities. It is recommended that Holden adopt this code to increase the resilience of

[21] HOUSING ADVISORY COUNCIL, Mass.gov (2025). Executive Office of Housing and Livable Communities. Retrieved February 6, 2025, from https://www.mass.gov/doc/a-home-for-everyone/download.

[22] "Massachusetts Building Energy Code Adoption by Municipality," Mass.gov, Massachusetts Department of Energy Resources, May 28, 2024, https://www.mass.gov/doc/building-energy-code-adoption-by-municipality/download.

the town to climate change.

Officials should seek to further integrate hazard mitigation practices into the Town's planning and development processes. In 2019, the Town of Holden updated its Master Plan and in 2022 the town updated its Open Space and Recreation Plan; these planning processes gave the Town an opportunity to identify threats and prioritize strategies to address them. Climate change, according to current predictions, will lead to an increase in extreme storm events, including more rain in shorter amounts of time. Planning for the future impacts of climate change is imperative to protecting the citizens of Holden.

3.0 Critical Facilities and Vulnerable Populations

A Critical Facility is defined as a building, structure, or location which:

- is vital to hazard response efforts,
- currently helps protect the community from hazards, and/or
- would create a secondary disaster if a hazard were to impact it.

3.1 Critical Facilities Within Holden

This Critical Facilities List for the Town of Holden has been created through the utilization of several online sources, several planning documents, and the knowledge and expertise of the local HMP planning team in town.

Planning documents and online resources which inform this plan include:

- Holden's Comprehensive Emergency Management Plan
- MassGIS data on dams
- Massachusetts Department of Early Education and Care data on childcare facilities
- Massachusetts Historical Commission data on historic sites
- Employment data from the Massachusetts Department of Economic Research and the Massachusetts Department of Education
- Critical infrastructure mapping undertaken by CMRPC under contract with the Central Region Homeland Security Advisory Council, which is charged by the Executive Office of Public Safety and Security to administer and coordinate the State Homeland Security Grant for central Massachusetts.

Holden's Local Hazard Mitigation Planning Team has broken up this list of critical facilities into four categories:

- emergency response facilities needed in the event of a disaster,
- non-emergency response facilities that have been identified by the local HMP planning team (these facilities are not required in an emergency response event, but are considered essential for the everyday operation of Holden),
- dams, and
- facilities that serve vulnerable populations and/or which the Town wishes to protect in the event of a disaster.

Critical infrastructure and facilities are mapped in Appendix A.

3.2 Category 1 – Emergency Response Facilities

The Town has identified emergency response facilities and services as the highest priority facilities and services to protect in instances of natural and manufactured hazards.

Table 4: Emergency Response Facilities in Holden

Type	Name	Address	Details	Has Emergency Generator?
Emergency Operations Center/Public Safety Complex	Holden Public Safety Complex/EOC	1370 Main Street	This facility has been noted as being vulnerable to dam failure.	Yes
Fire Station	Holden Fire Station 2 - Chaffins	87 Adams Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
Communications Facilities	Avery Heights Radio Antenna	14 Morgan Circle	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Chaffins Radio Antenna	79 Bartlett Street	There are no noteworthy concerns regarding natural hazard impacts on this facility. This site is also potentially being developed to include a battery storage substation.	Yes
	Wachusett Regional Emergency Communications Center	1370 Main St, Holden, MA	This facility has been noted as being vulnerable to dam failure.	Yes
	Comms. Tower	1384 Main Street	This facility has been noted as being vulnerable to dam failure.	No
	Steel Street Water Tower (Backup Repeater Site)	Steel Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
DPW Facilities	DPW Headquarters	18 Industrial Drive	This facility has been noted as being vulnerable to dam failure.	No
Light Department	Municipal Light Department	1 Holden Stret	This facility serves as the backup EOC.	Yes
	Municipal Light Department Substation 1	Bullard Street	This facility has been noted as vulnerable to snowstorms by the	No

			HMP local planning team in town	
	Municipal Light Department Substation [Temporary Substation]	87 Adams Road	This facility has been noted as vulnerable to snowstorms by the HMP local planning team in town	No
	Transformer	Shrewsbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Battery Storage Site	11 Adams Rd	This facility has been noted as vulnerable to localized flooding and dam failure by the HMP local planning team in town	Yes
	Battery Storage Site	21 Adams Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
Emergency Shelters	Wachusett Regional High School	1401 Main Street	This facility has been noted as being vulnerable to dam failure, as well as severe snowstorms.	No
	Mountview Middle School	270 Shrewsbury St	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Holden Senior Center	1130 Main Street	This facility has been noted as being vulnerable to dam failure.	No
	First Congregational Church	1180 Main Street	This facility has been noted as being vulnerable to dam failure.	Yes
Primary/Secondary/Tertiary Evacuation Routes	Route 122A	Route 122A/ Main Street	This facility has been noted as being vulnerable to dam failure.	N/A
	I-190	I-190	This facility has been noted as being vulnerable to dam failure.	N/A
	Route 31	Route 31	This facility has been noted as being vulnerable to dam failure.	N/A
	Shrewsbury Street	Shrewsbury Street	MassDOT improvement project underway at this location. This route has been noted as vulnerable to dam failure by the local planning team.	N/A

	Doyle Road	Doyle Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Manning Street	Maning Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Holden Street	Holden Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Salisbury Street	Salisbury Street	Phase 1 Dam Study currently underway, this street was identified as having flooding issues caused by beaver activity as well as undersized drainage culverts.	N/A
	Rte 68	Route 68	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Quinapoxet Street	Quinapoxet Street	This facility has been noted as being vulnerable to dam failure.	N/A
	Reservoir Street	Reservoir Street	This facility has been noted as being vulnerable to dam failure.	N/A
Urgent Cares	Urgent Care of Holden	5 Shrewsbury St D	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Unknown

3.3 Category 2 – Non-Emergency Response Facilities

The Town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Holden.

Table 5: Non-Emergency Response Facilities in Holden

Type	Name	Address	Details	Has Emergency Generator?
Water Supply	Worcester Water Filtration Plant	93 Stone House Hill Road	Owned by City of Worcester Water Department, this facility has been noted as being vulnerable to dam failure.	Yes
	Chapin Water Tank	190 Sycamore Drive	This facility has been noted as being vulnerable to wildfire.	No
	Avery Heights Water Tank	14 Morgan Circle	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Highland St Water Tank and Booster Station	281 Highland Street	This facility has been noted as being vulnerable to dam failure.	Yes
	Jefferson Water Tank	235 Muschopauge Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Spring Street Wellfield and Treatment Facility	69 Spring Street	This facility has been noted as being vulnerable to flooding.	No
	Quinapoxet Wellfield and Wachusett Street Treatment Facility	1195 Wachusett Street Street	This facility has been noted as being vulnerable to dam failure and Flooding	Yes
	Mill Street Wellfield	80 Mill Street	This facility has been noted as being vulnerable to dam failure.	No
	Mason Street Wellfield	200 Mason Rd	This facility has been noted as being vulnerable to flooding.	No
	Brattle Street Water Interconnection	273 Brattle Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Salisbury St Water Interconnection	970 Salisbury S	This facility has been noted as being vulnerable to dam failure.	No
	Chapin Water Tank Booster Pump	190 Sycamore Drive	This facility has been noted as being vulnerable to wildfire.	No
	Sycamore Large Booster Station	308 Sycamore Drive	This facility has been noted as being vulnerable to wildfire.	Yes

	Sycamore Small Booster Station	31 Sycamore Drive	This facility has been noted as being vulnerable to wildfire.	Yes
	Morgan Water Booster Pump	14 Morgan Circle	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
Sewer	Parker Avenue Metering Manhole	259 Parker Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Heritage Lane Sewer Pump Station	101 Paugus Road	This facility was replaced in 2020. There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Lincoln Ave Sewer Pump Station	15 Lincoln Ave	Received a generator in 2019, this facility has been noted as being vulnerable to dam failure.	Yes
	Gail Drive Sewer Pump Station	33 Gail Drive	This facility has been noted as being vulnerable to flooding.	No
	Industrial Drive Sewer Pump Station	106 Industrial Drive	This facility has been noted as being vulnerable to dam failure.	Yes
	Sycamore Sewer Pump Station	265 Sycamore Drive	This facility has been noted as being vulnerable to wildfire.	Yes
	Alden Sewer Pump Station	126 Wachusett Street	This facility has been noted as being vulnerable to dam failure.	Yes
	ECC Sewer Pump Station	150 Princeton Street	New generator in 2019, This facility has been noted as being vulnerable to dam failure.	Yes
	Jefferson Sewer Pump Station	1678 Main Street	New generator in 2019, This facility has been noted as being vulnerable to dam failure.	Yes
	Flagler Drive Sewer Pump Station	254 Flagler Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Jennifer Drive Sewer Pump Station	178 Jennifer Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Heather Circle Sewer Pump Station	50A Heather Circle	This facility has been noted as being vulnerable to dam failure.	Yes
	Dorothy Avenue Sewer Pump Station	99 Dorothy Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Sunnyside Avenue Sewer Pump Station	28 Sunnyside Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Winthrop Lane Sewer Pump Station	165 Winthrop Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes

	River Street Sewer Pump Station	50 River Street	This facility has been noted as being vulnerable to dam failure.	Yes
	Wachusett Street Sewer Station	1039 Wachusett Street	This facility has been noted as being vulnerable to dam failure.	Yes
	Quinapoxet Large Sewer Pumping Station	268 Quinapoxet Street	This facility has been noted as being vulnerable to dam failure.	Yes
	Quinapoxet Small Sewer Pumping Station	228 Quinapoxet Street	This facility has been noted as being vulnerable to dam failure.	Yes
	Mark Bradford Drive Sewer Pump Station	90 Mark Bradford Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Quaker Road Sewer Pump Station	6 Quaker Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Malden Street Sewer Pump Station	218 Malden Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Main Street (Clairs) Sewer Pump Station	690 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Twinbrook Sewer Pump Station	31 Twinbrook Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Bailey Road Sewer Pump Station	93 Bailey Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Nelson Street Sewer Pump Station	114 Nelson Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Shady Lane Sewer Pump Station	26 Snowberry Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wagner Sewer Pump Station	28 Wagner Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Tea Party Circle Sewer Pump Station	68 Tea Party Circle	Privately Owned, There are no noteworthy concerns regarding natural hazard impacts on this facility.	Unknown
	Stoneybrook Sewer Pump Station	58 Joel Scott Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Liberty Circle Sewer Pump Station	64 Freedom Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Jordan Road Sewer Pump Station	1 Jordan Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
Town Facilities	Town Hall	1196 Main Street	This facility has been identified as vulnerable to earthquakes and Dam Failure	No

	Town Hall Starboard Building	1204 Main Street	This facility has been noted as vulnerable to Severe Snowstorms, Earthquakes, and Dam Failure	No
	Public Library	23 Highland Street	This facility has been identified as vulnerable to earthquakes and Dam Failure	No
	Holden Post Office	140 Princeton Street	This facility is noted as being vulnerable to dam failure.	No
Utilities	Providence and Worcester Railroad (operated by Genesee and Wyoming)		This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified wildfire and dam failure hazards as well as the 1% and 0.2% flood zones.	N/A
	National Grid power lines		This utility has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified wildfire and dam failure hazards as well as the 1% and 0.2% flood zones.	N/A

3.4 Category 3 – Dams[23]

The third category of critical infrastructure sites in this plan is a listing of dams in Holden and dams relevant to Holden.

Table 6: Dams in / of Concern Relating to Holden

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00619	Holden Reservoir Dam #2	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00620	Unionville Pond Dam	Public – Department of Conservation and recreation	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G. This dam has been noted as at risk to dam failure by being within the inundation zone of Chaffin Pond Dam.
MA00622	Kendall Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00623	Pine Hill Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00929	Quinapoxet Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00960	Holden Reservoir Dam #1	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00979	Eagle Lake Dam	Private	Office of Dam Safety	High Hazard	This dam is discussed in greater detail in Appendix G. This dam has been noted as at risk to dam failure by being within the inundation zone of the Kendall Reservoir Dam and Pine Hill Dam.
MA01303	Dawson Pond Dam	Public – Department of Conservation and Recreation	Office of Dam Safety	Low Hazard	This Dam is discussed in greater detail in Appendix G.
MA01247	Peter Carr Pond Dam	Public – City of Worcester	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G. This dam has been noted as at risk to dam failure by being within the inundation zone of the Quinapoxet Reservoir Dam

[23] "MassGIS Data: Dams," Mass.gov, Massachusetts Bureau of Geographic Information, February 2012, https://www.mass.gov/info-details/massgis-data-dams.

MA01635	Cournoyer Pond Dam	Private	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G.
MA01636	Frank Marsh Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01637	Bock Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01638	Holden Trap Rock Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01639	Koenigs Lilly Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01640	Current Meter Pond Dam	Private	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G. This dam has been noted as at risk to dam failure by being within the inundation zone of Chaffin Pond Dam.
MA01641	Lindstroms Shiner Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01642	Swimming Pool Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01643	Parsons Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01644	S.H.S. Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01645	Lindstroms Shiner Pond #2 Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA01646	Regional School Pond Dam	Wachusett Regional School	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA02325	Old Grist Mill Pond Dam	Public – Town of Holden	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G. This dam has been noted as

					at risk to dam failure by being within the inundation zone of Chaffin Pond Dam.
MA02326	Kendall Diversion Dam	Public – Town of Holden	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA02328	Kendall Reservoir Lower Basin Dam	Public – City of Worcester	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G.
MA02573	Chaffin Pond Lower Basin Dam	Public – Department of Conservation and Recreation	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA02575	Parker Pond Dam	Public – Department of Conservation and Recreation	Office of Dam Safety	Low Hazard Dam	This Dam is discussed in greater detail in Appendix G.
MA02576	Upper Lovell Pond Dam	Public – Department of Conservation and Recreation	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.
MA02789	Holden District Reservoir Dam	Public – City of Worcester	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.

For additional information on dams and the dam failure hazard in Holden, also see Chapter 4.

3.5 Category 4 – Facilities/Populations to Protect

The fourth category of critical infrastructure sites in this plan is facilities that serve vulnerable populations and/or which the Town wishes to protect in the event of a disaster.

Table 7: Facilities and Populations to Protect in Holden

Type	Name	Address	Details
Facilities for People with Special Needs, Apartment Complexes, Assisted Living Facilities, and Housing Authority Properties	Holden Rehab and Skilled Nursing Center	32 Mayo Drive	Previous flooding issues have been mitigated through drainage improvements on Main Street. While this facility itself is at one of the highest points in town, the routes to and from it are vulnerable to dam failure.
	Colony Retirement Homes	68 Reservoir Street	There are no noteworthy concerns regarding natural hazard impacts on this facility, however routs to and from this facility have been identified as being vulnerable to dam failure and flooding.
	Oriol Healthcare	52 Boyden Rd	This facility has been noted as being vulnerable to dam failure and localized flooding
	Holden Housing Authority	9 Flagler Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Venture Community Services (Group Home)	2417 Main Steet	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Open Sky (Group Home)	20 Hilltop Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility, however all routes to and from this facility may be affected by dam failure and flooding.
	Aspire (Group Home)	511 Manning Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Bamsi (Group Home)	140 Mixter Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Venture Community Service (Group Home)	148 Paxton Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Open Sky (Group Home)	422 Malden Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	CIL (Group Home)	109 Nelson Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.

	Advocates (Group Home)	160 Doyle Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Bamsi (Group Home)	7 West Fairhill Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Seven Hills (Group Home)	350 Salisbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
Public Buildings/Areas	Holden Senior Center/ Council on Aging	1130 Main Street	This facility has been noted as being vulnerable to dam failure.
	Holden Rec Department	1420 Main Street	This facility has been noted as being vulnerable to dam failure.
	Dawson Recreational Facility (Swimming Pool)	200 Salisbury Street	This facility has been noted as being vulnerable to dam failure.
	Trout Brook Recreational Area	320 Manning Street	This facility is noted as being vulnerable to flooding and is near a high slope area.
	Recreational Fields	Industrial Drive	This facility has been noted as being vulnerable to flooding.
Schools/Daycares	Wachusett Regional High School	1401 Main Street	This facility has been noted as being vulnerable to dam failure.
	Wachusett School District Regional Office	1745 Main Street	This facility has been noted as being vulnerable to dam failure.
	Mayo Elementary School	351 Bullard Street	This facility hosts a before and after school program. There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Davis Hill Elementary School	80 Jamieson Road	This facility hosts a before and after school program. There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Mountview Middle School	270 Shrewsbury Street	This facility has been noted as being vulnerable to dam failure.
	Dawson Elementary School	155 Salisbury Street	This facility hosts a before and after school program. There are no noteworthy concerns regarding natural hazard impacts on this facility, however the routes to and from this facility may be affected by dam failure and localized flooding.
	Holden Christian Academy	279B Reservoir Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.

	Early Childhood Center	1745 Main Street	This facility is in the process of procuring a generator. This facility is noted as being vulnerable to flooding.
	First Congregational Church of Holden Nursery School	1180 Main Street	This facility has a generator. This facility has been noted as being vulnerable to dam failure.
	Immanuel Lutheran Nursery School	346 Shrewsbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Kidoodles Learning Center Inc.	659 Shrewsbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Montessori Country Day School	800-13 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Little Learning Adventures	391 Quinapoxet Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility, however routes to and from this facility are vulnerable to dam failures.
Faith Institutions	First Congregational Church of Holden	1180 Main Street	This Facility has a generator and has been identified by the local hazard mitigation planning team as a potential shelter location, due to the church having a backup generator as well as the institution's status as a Voluntary Organization Acting in a Disaster (VOAD). This facility has been noted as being vulnerable to dam failure.
	Immanuel Lutheran Church	346 Shrewsbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	St Mary's Catholic Church	103 Princeton Street	This facility has been noted as being vulnerable to dam failure.
	Holden Chapel	279 Reservoir Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	First Baptist Church	1216 Main Street	This facility has been noted as being vulnerable to dam failure.
	Chaffins Church	155 Shrewsbury Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Calvary Worship Center	256 Parker Ave	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Saint Francis Episcopal Church	70 Highland Street	This facility has been noted as being vulnerable to dam failure and localized flooding

Historic Buildings/Sites[24]	According to the Massachusetts Cultural Resources Information System (MACRIS) online database accessed in March 2025, there are 10 Areas, 367 Buildings, 4 Burial Grounds, 8 Objects, and 22 Structures listed in the MACRIS database in Holden. All 9 of 10 of these areas, which include the Eagleville Historic District and the Holden Center Historic District fall within or near to the inundation zones for dams and are at risk of dam failure hazards as well as flooding. The last historic area (the Quabbin aqueduct) lies partially within a 1% chance of flooding area. All of the above buildings, Burial Grounds, Objects, and Structures are within these affected Areas.

Employment Centers

Based on data obtained from the Massachusetts Executive Office of Labor and Workforce Development (EOLWD)[25] and the knowledge of local HMP committee members, the following table shows the largest employers in Holden:

Table 8: Employment Centers in Holden

Company name	Address	Number of Employees	NAICS Code
Advanced Business Concepts	Main St # 4	100-249	5418
Big Y	Reservoir St # 31	100-249	4451
Oriol Health Care	Boyden Rd	100-249	6231
Pepsi Cola of Worcester	Industrial Dr	100-249	3121
Wachusett Regional High School	Main St	100-249	6111
Associated Foot Specialists	Main St	50-99	6211
Davis Hill Elementary School	Jamieson Rd	50-99	6111
Davis Hill Elementary School	Main St	50-99	6111
Dawson Elementary School	Salisbury St	50-99	6111
Holden Fire Dept	Main St	50-99	9221
Inner-Tite Corp	Industrial Dr	50-99	3399
Jensen Hughes	Flagler Dr	50-99	5413
Mayo Elementary School	Bullard St	50-99	6111
Mc Donald's	Main St	50-99	7225
Mountview Middle School	Shrewsbury St	50-99	6111

[24] "Search Results," Mhc-macris.net, Massachusetts Historical Commission, accessed June 21, 2024, https://mhc-macris.net/queryresults.
[25] "Largest 100 Employers in Holden," Lmi.dua.eol.mass.gov, Massachusetts Department of Economic Research, accessed March 6, 2025, https://lmi.dua.eol.mass.gov/LMI/LargestEmployersArea/LEAResult?A=05&GA=000507.

Oriol Health Care	Mayo Dr	50-99	6231
Quick Lane	Salisbury St	50-99	4413
Reckitt Benckiser	Fox Hill Dr	50-99	4246
Sunnyside Motor Body Shop	Old Salisbury St	50-99	8111
Sunnyside Motor Co Inc	Main St	50-99	4411
Town Ambulance	Main St	50-99	6219
Val's Restaurant & Lounge	Reservoir St	50-99	7225
Wachusett Extended Care Fclty	Shops Way	50-99	6219

Environmental Justice and Vulnerable Populations

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) Environmental Justice (EJ) Policy sets the state's definition for Environmental Justice areas. The policy states that EJ populations are groups within the larger populace that EEA has determined to be most at risk of being unaware of or unable to participate in environmental decision-making, to be most at risk of being unable to gain access to state environmental resources, or to be especially vulnerable. The policy also states that EJ areas are defined as U.S. Census Bureau census block groups (which are often the size of neighborhoods) that meet one or more of the following criteria:

- The annual median household income is not more than 65% of the statewide annual median household income (according to American Community Survey 2020 5-year estimate data);
- Minorities comprise 40% or more of the population (according to 2020 US Census data);
- 25% or more of households lack English language proficiency (according to American Community Survey 2020 5-year estimate data); or
- Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the block group is located does not exceed 150% of the statewide annual median household income (according to 2020 US Census data and 2020 5-year estimate American Community Survey data, respectively).

According to the EEA, there are no Environmental Justice areas in Holden.[26] Although there are no EJ areas in town, it is still important for the Town to consider EJ populations and other vulnerable community members in the hazard mitigation planning process. In Holden, according to the 2020 US Census, 26.3% of the population is under the age of 18 and 18.4% of the population is 65 years and over.[27] According to 2023 ACS 5-year estimate data, approximately 12.4% of the population in town speaks a language other than English at home;[28] Approximately 9.1% of the population in Holden has a disability according to this same data.[29] This 2023 ACS 5-year estimate data also shows that people without health insurance account for about 2.0% of Holden's population[30] and that about 4.0% of the Town's population is living in poverty.[31]

Outreach to vulnerable community members was a vital part of the public outreach strategy for the Holden Hazard Mitigation Plan. Paper HMP surveys were made available at the town hall, library, and senior center, and CMRPC staff conducted a presentation at a hybrid Board of Selectmen meeting in town during the planning process; these measures allowed residents who lack access to reliable Internet service and/or who have difficulty using the Internet to have a chance to complete the survey as well as hear about the planning process. The public presentation for the draft plan

[26] "Massachusetts 2020 Environmental Justice Populations," Mass-eoeea.maps.arcgis.com, Massachusetts Executive Office of Energy and Environmental Affairs, November 12, 2022, https://mass-eoeea.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212.

[27] United States Census Bureau. (2020). *DP1: PROFILE OF GENERAL POPULATION AND HOUSING CHARACTERISTICS FOR HOLDEN MA*. Explore census data. https://data.census.gov/table/DECENNIALDP2020.DP1?q=DP1+Holden+MA

[28] United States Census Bureau. (2023b). *S1601 Language Spoken at Home - Holden MA*. Explore census data. https://data.census.gov/table?q=s1601+Holden+MA

[29] United States Census Bureau. (n.d.). *S1810 Disability Characteristics - Holden MA*. Explore census data. https://data.census.gov/table?q=s1810+Holden+MA

[30] United States Census Bureau. (2023e). *S2701: Selected Characteristics of Health Insurance Coverage in the United States*. Explore census data. https://data.census.gov/table?q=s2701+Holden+MA

[31] United States Census Bureau. (2023c). *S1701 Poverty Status in the Past 12 Months - Holden*. Explore census data. https://data.census.gov/table?q=s1701+Holden+MA

was also televised on local cable access TV.

4.0 HAZARD PROFILES, RISK ASSESSMENT & VULNERABILITIES

Sections 4.0-4.13 help meet the following FEMA local mitigation plan requirements:

- B1. "Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events?" (Requirement 44 CFR § 201.6(c)(2)(i);
- *B2. "Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods?" (Requirement 44 CFR § 201.6(c)(2)(ii));*
- *C1. "Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?" (Requirement 44 CFR § 201.6(c)(3));*
- *C2. "Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?" (Requirement 44 CFR § 201.6(c)(3)(ii));*
- *C4. "Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?" (Requirement 44 CFR § 201.6(c)(3)(ii)); and*
- *E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))*

The following section of this plan includes a summary of natural hazards that have affected or could affect Holden in the future. Natural hazards are weather-related, climatic, or other environmental processes which threaten people's lives as well as property and/or other valuable assets to human society. By examining historical data on natural hazard occurrences, as well as future projections on how climate change will interact with natural hazards, it is possible to approximate the future risk of natural hazards.

Historical documents relating to natural hazard occurrences, discussions with local officials and emergency management personnel, available hazard mapping and databases, and weather-related databases were used to develop the following list of the most significant identified natural hazards which affect Holden:

- Flooding
- Severe Snowstorms / Ice storms/ Nor'easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires
- Earthquakes
- Dam Failure
- Drought

- Extreme Temperatures
- Invasive Species
- Other Hazards

4.1 State-wide Overview of Hazards

4.1.1 Massachusetts State Hazard Mitigation and Climate Adaptation Planning

The state of Massachusetts under Governor Healy's administration has updated the 2018 State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) pursuant to Executive Order 569. The 2023 ResilientMass Plan updates and expands upon the previous SHMCAP and outlines how the state of Massachusetts must prepare strategies to prevent, respond to, and mitigate natural hazards.[32] This plan incorporates climate change adaptation into a state-level hazard mitigation plan. The plan is also the document which makes Massachusetts eligible for federal disaster recovery and hazard mitigation funding. The plan is effective under FEMA from September 12, 2023 to September 13, 2028. The Massachusetts SHMCAP is a useful model for incorporating considerations relating to the effects of climate change into the natural hazard mitigation planning process.

4.1.2 Climate Change Interactions

As part of the SHMCAP planning process, the state of Massachusetts performed a statewide analysis which detailed the effects of climate change on the cities and towns of Massachusetts. This analysis was included in the 2022 Climate Change Assessment, which detailed the impacts of climate change on the central region of Massachusetts (which includes 55 cities and towns) along with the other regions of the state. This report refocuses climate change impact assessment away from the specific hazards and towards how the most urgent of those hazards would affect the region in the following sectors: Human, Infrastructure, Natural Environment, Governance and Economy. The hazards identified as having the most urgent impacts for Central Massachusetts are **Extremes in Temperature and Precipitation**, with wide fluctuations in both precipitation extremes (including both flooding and droughts) as well as extremes in temperatures (both in extremely hot days becoming more prevalent, as well as extreme lows in temperature) being anticipated to having the greatest future risk to the central region across these sectors.

The State plan, while being comprehensive, places different priorities on the impacts of climate change and natural hazards than this Holden municipal plan. These different priorities are based more on the specificities of local conditions in Holden rather than any contradictions with the State's Analysis, and this local hazard mitigation planning effort was informed by the state planning process.

The following descriptions provide an overview of climate change impacts on the five sectors identified in the 2022 Climate Change Assessment.

- **Human Impacts**: The assessment identified a **Reduction in Food Safety and Security** and **Health and Cognitive Effects** from extreme heat as the most urgent human sector climate change impacts for the Central Region. The reduction in food safety and security is likely to occur at all levels of production and distribution because of both extreme heat and extreme cold causing spoilage, power outages, and extremes in precipitation creating a more unpredictable environment for the growth of produce. According to multiple studies, reductions in crop yields across the state and within the region are anticipated to occur; research has shown that key commodity crop yields in the Central Region could decline by 12 percent by 2030.[33] These impacts to the regional food supply chain are expected to be

[32] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs, accessed June 10, 2024, https://www.mass.gov/info-details/2023-resilientmass-plan.

[33] Estimates derived from application of data from the following two sources:

similar to impacts on state and national crop yields and food distribution patterns. While our food supply networks are currently anticipated to be able to withstand these shocks, the increases in food prices which these shocks will cause will correspondingly lead to an increase in food insecurity within the central region.

The impacts of extreme temperatures are also projected to have a significant impact on health and cognition within the central region, particularly in our more urbanized areas. Currently, three annual premature deaths are attributed to extreme temperature in the region, but approximately 35 additional premature deaths per year are expected in the region as a result of climate change by the end of the century,[34] assuming that no new mitigation measures are taken to reduce the threat of temperature extremes. The negative impacts of extreme heat on people's physical and cognitive health can cause declines in learning outcomes, declines in workplace productivity, and increases in the usage of and strain upon emergency rooms dealing with heat related illnesses and injuries.

Additional Human Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: Increases in Mental Health Stressors; Increases in Vector Borne Disease Incidence and Bacterial Infections; Damage to Cultural Resources; Health Effects from Aeroallergens and Mold; Emergency Service Response Delays and Evacuation Disruptions; Health Effects of Extreme Storms and Power Outages; and Health Effects from Degraded Air Quality.

- **Infrastructure Impacts**: The assessment identified the **Loss of Urban Tree Cover** and **Damage to Electric Transmission and Distribution Infrastructure** as the most urgent infrastructure sector climate change impacts for the central region. Urban trees face a broad range of climate impacts and stressors, including increasing extreme weather activity, increasing threats from invasive pests and diseases, and reduced water and soil quality; All of these impacts and stressors correspond to an increased rate of tree mortality and therefore increased urban forest management costs for municipalities. Central Massachusetts has both urban and suburban centers where projected temperature increases make urban tree coverage particularly valuable at reducing the heat island effect. A prime example of a community which could benefit from increased tree coverage is the city of Worcester, which is the state's second most populous city. 75 percent of the city's area falls within state-designated environmental justice block groups, but the city has relatively low canopy coverage and is at disproportionate risk for urban tree loss.[35]

  Across the central region, damage to electric transmission and distribution infrastructure is

USEPA, "Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment," U.S. Environmental Protection Agency, 2017, EPA 430-R-17-001; Robert H. Beach et al., "Climate change impacts on US agriculture and forestry: benefits of global climate stabilization," *Environmental Research Letters* 10, no. 9 (2015). doi:10.1088/1748-9326/10/9/095004.

[34] Estimates derived from application of David Mills et al.," Climate change impacts on extreme temperature mortality in select metropolitan areas in the United States.," *Climatic Change* 131 (2014): 83-95. https://doi.org/10.1007/s10584-014-1154-8.

[35] "2022 Massachusetts Climate Change Assessment," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2022, https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-iii-regional-reports/download, pages RS36-RS37.

projected to cost orders of magnitude more in the coming decades, with additional annual costs projected to grow to $6 million by 2030; $12 million by 2050; $19 million by 2070; and $28 million by 2090.[36] These costs are anticipated to be caused by the need for repair activities in response to climate-related damages and failures, and they take into account a wide range of climate stressors beyond extremes in temperature and precipitation.

Additional infrastructure sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Damage to Roads and Loss of Road Service; Reduction in Clean Water Supply; Increased Risk of Dam Overtopping or Failure; Loss of Energy Production and Resources; Damage to Inland Buildings; and Damages to Rails and Loss of Rail/Transit Service.**

- **Natural Environment Impacts**: The assessment identified **Freshwater Ecosystem Degradation** and **Forest Health Degradation** as the most urgent natural environment sector climate change impacts in the central region. Increased nutrient load and harmful algal bloom growth in freshwater ecosystems from increased precipitation runoff as well as increased concentrations of contaminants in these ecosystems under drought conditions are both exacerbated by climate extremes. In addition, shifts in habitat caused by increased average air and water temperatures especially threaten the cold-water habitats and fisheries of the central region.

  The effect of climate change on the region's forests is harder to predict, but the potential for significant forest ecosystem loss in the region caused by climate change cannot go understated. Statewide, a third of tree species are classified by the U.S. Forest Service as having low capacity for adapting to projected climate change, and an increased frequency of extreme events poses an additional threat to forests in the Central Region.[37]

  Additional Natural Environment Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Shifting Distribution of Native and Invasive Species and Soil Erosion.**

- **Governance Impacts**: As is true for other parts of the state, the assessment identified **Increase in Costs of Responding to Climate Migration**; an **Increase in Demand for State and Municipal Government Services**; and a **Reduction in State and Municipal Revenues**

[36] Estimates derived from application of Charles Fant et al., "Climate change impacts and costs to U.S. electricity transmission and distribution infrastructure," *Energy*, 195 (2020). https://doi.org/10.1016/j.energy.2020.116899.
[37] Estimates derived from application of US Forest Service Tree Atlas for Massachusetts.
Northern Research Station Landscape Change Research Group: Iverson, Peters, Prasad, Matthews. "Massachusetts - Climate Change Atlas Tree Species: Current and Potential Future Habitat, Capability, and Migration," Fs.usda.gov, United States Department of Agriculture Forest Service, September 2022, https://www.fs.usda.gov/nrs/atlas/combined/resources/summaries/states/Massachusetts.pdf; "Climate Change Atlas," Fs.usda.gov, United States Department of Agriculture Forest Service, accessed June 10, 2024, https://www.fs.usda.gov/nrs/atlas/combined/resources/summaries/states.

caused by climate change as the most urgent governance sector climate change impacts in the Central Region. Climate Migration, whether forced or voluntary, is already being felt by Massachusetts communities; it has been identified by the state as an impact which causes major consequences and will be the most difficult climate change impact to adapt to in the Central Region. Urban centers, particularly in and around Worcester, as well as towns serviced by state and regional transit services, are likely to become receiving zones for climate migration based on the relative assessment of climate hazards nationwide. The new influx of population caused by climate migration is expected to increase demand for government services. The need to increase government expenditures to maintain the current level of service for the existing population in addition to climate migrants and refugees is expected to be a significant stressor for local governments. Increased needs for MassHealth, food security support, and emergency services are expected in the Central Region due to population growth caused by climate migration in addition to other climate change impacts.

Many climate change impacts are expected to be concentrated in low-income areas. Existing inequalities in the Region may become exacerbated if steps are not taken to prepare for these impacts, as an influx of climate migrants and refugees may increase demand for and place strain on public services.

An increase in natural hazard impacts due to climate change is expected to increase disruptions to state and municipal revenue generation in the region; these disruptions may include property tax and sales tax losses caused by interruptions to business and the economy.

Additional Governance Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **an Increased Need for State and Municipal Policy Review and Adaptation Coordination and Damage to Inland State and Municipal Buildings.**

- **Economic Impacts**: The assessment identified a **Reduced Ability to Work** and a **Decrease in Agricultural Productivity** caused by climate change as the most urgent economic sector climate change impacts in the Central Region. Both of these impacts relate to an increase in dangerous temperature extremes causing a decrease in workers' abilities to work; these impacts also relate to other natural hazards affecting workers' abilities to get to the job safely and increases in illnesses among workers caused by primary or secondary effects of natural hazards and climate change. Workers in the Region in high-risk industries (those exposed to outdoor conditions) are projected to lose 31 hours of work per worker per year by 2050 and 128 hours of work per worker per year by 2090; these projected losses in work hours by the end of the century are the highest in the Commonwealth.[38]

[38] Estimates derived from application of Matthew Neidell et al., "Temperature and work: Time allocated to work under varying climate and labor market conditions," *PloS One*, 16, no. 8 (2021), https://doi.org/10.1371/journal.pone.0254224.

While the agricultural sector is a small part in the Central Region's economy, the impacts to this sector of the economy through climate change-induced lower crop yields have the potential to severely disrupt the local economy and regional food systems. Key commodity crop yields in the Central Region could decline by 12 percent by 2030 and by 14 percent by 2070; these declines in key commodity crop yields carry potentially disproportionate impacts on the local economies that rely on agricultural production and the individual farm workers and employers who work in this sector.[39]

Additionally, though not identified as the one of the most urgent economic sector climate change impacts in the Central Region in the state's assessment, the expected **Reduction in Availability of Affordably Priced Housing** has become a more prevalent issue since the assessment was released. As affordable properties are typically situated in more hazard-prone areas, climate change-induced natural hazard impacts may lead to a decrease in the supply of affordable housing over time. Also, as increases in demand for housing continue in the Region due to a disproportionate economic impact on working families from climate change-induced natural hazard, the overall resiliency of the Region to shocks will also decrease.

Additional Economic Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Damage to Tourist Attractions and Recreation Amenities and Economic Losses from Commercial Structure Damage and Business Interruptions.**

During the local Hazard Mitigation Planning process, the local HMP planning team in Holden noted that their chief concerns related to the natural hazard impacts of climate change are extremes in precipitation in the form of rain or snow; these concerns are in concurrence with the state assessment. In Holden in particular, the Increased Risk of Dam Overtopping or Failure caused by these precipitation extremes is particularly noteworthy, the risk of which is addressed later on in this plan.

Previous Federally Declared Disasters in Worcester County

From 2014 to Present, the following Federally Declared Disasters have occurred in Worcester County:

Table 9: Previous Federally Declared Disasters in Worcester County[40]

Disaster Declaration	Disaster Type	Incident Period	Declaration Date
Massachusetts Severe Storms and Flooding (DR-4780-MA)	Flooding	September 11, 2023 - September 13, 2023	May 15, 2024

[39] Estimates derived from application of USEPA (2017) and Beach et al. (2015)

[40] "Disaster Declarations for States and Counties," FEMA.gov, Federal Emergency Management Agency, accessed September 16, 2024, https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties.

Massachusetts Hurricane Lee (EM-3599-MA)	Hurricane	September 15, 2023 - September 17, 2023	September 15, 2023
Massachusetts Covid-19 Pandemic (DR-4496-MA)	Pandemic	January 20, 2020 - May 11, 2023	March 27, 2020
Massachusetts Severe Winter Storm and Snowstorm (DR-4379-MA)	Snow	March 13, 2018 - March 14, 2018	July 19, 2018
Massachusetts Severe Winter Storm, Snowstorm, and Flooding (DR-4214-MA)	Snow	January 26, 2015 - January 28, 2015	April 13, 2015

The majority of these disaster occurrences directly relate to the natural hazard concerns of towns within Worcester County; flooding from rain events and other extremes in precipitation (such as snowfall events) are the chief concerns of residents and local hazard mitigation planners alike in the Region.

4.2 Natural Hazard Identification and Analysis

This section of the plan examines the hazards in the Massachusetts SHMCAP which are identified as likely to affect Holden. This analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, Exposure, Potential Climate Change Effects, Vulnerability, and Mitigation Strategies. A description of each of these sections of the analysis and the risk assessment summary table which includes each hazard identified are provided below.

4.2.1 Hazard Description

The natural hazards identified for Holden are: Flooding, Severe Snowstorms / Ice Storms / Nor'easters, Hurricanes, Severe Thunderstorms / Wind / Tornadoes, Wildfire, Earthquakes, Dam Failure, Drought, Extreme Temperatures, and Invasive Species. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms all may cause wind-related damage.

4.2.2 Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion of the planning area, such as a floodplain or area that is susceptible to wildfires. Location classifications (large, medium, or small) are based on the area that would potentially be affected by the hazard, on the following scale:

Table 10: Percentage of Town Impacted by Natural Hazard

Land Area Affected by Occurrence	Percentage of Town Impacted
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

4.2.3 Extent

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, and duration.

4.2.4 Previous Occurrences

Previous hazard events that have occurred are described in this section. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

4.2.5 Probability of Future Events

The likelihood of future events occurring in the planning area for each natural hazard was classified according to the following scale:

Table 11: Frequency of Occurrence and Annual Probability of Given Natural Hazard

Frequency of Occurrence	Probability of Future Events
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

4.2.6 Impact

Impact refers to the effect that a hazard may have on people and property in planning area, based on the assessment of extent described above and the severity of the hazard. Impacts are classified according to the following scale:

Table 12: Impacts, Magnitude of Multiple Impacts of Given Natural Hazard

Impacts	Magnitude of Multiple Impacts
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Temporary shutdown of facilities.

4.2.7 Exposure

Certain features of a community's infrastructure, society, and environment may face more of, or may be disproportionately impacted by, natural hazards; these features therefore can be described as experiencing increased exposure to natural hazards. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3.

4.2.8 Potential Climate Change Effects

Each natural hazard is influenced by one or more of the climate change interactions listed in Section 4.1.2 Climate Change Interactions. Climate change interactions can modify the location, extent, and/or probability of future events depending on the hazard. The hazard risk assessment table in section 4.2.11 of this plan lists climate change interactions as described by the 2023 ResilientMass Plan.

4.2.9 Vulnerability

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 through 5 as follows:

1 – Highest risk

2 – High risk

3 – Medium risk

4 – Low risk

5 – Lowest risk

This ranking is qualitative and is based, in part, on the local HMP planning team's knowledge of past experiences with each hazard. The size and impacts of a natural hazard can be unpredictable; However, many of the mitigation strategies currently in place and many of those proposed for implementation in Holden can be applied to expected natural hazards, regardless of their unpredictability.

4.2.10 Mitigation Strategies

Based on meetings with the local planning team, a selection of mitigation strategies that address the specific hazard is included at the end of each hazard analysis section.

4.2.11 Risk Assessment

Table 13: Hazard Risk Assessment for Each Natural Hazard in Holden

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
Flooding	Small	Moderate	Minor	Increase extent; increase probability	3
Severe Snowstorms / Ice Storms / Nor'easters	Large	Very High	Limited	Increase extent	3
Hurricanes	Large	Low	Limited	Increase extent; increase probability	4
Severe Thunderstorms / Wind	Small	Moderate	Minor	Unclear	3
Tornadoes	Small	Very Low	Limited	Unclear	3

Wildfire	Large	Moderate	Limited	Increase extent; increase probability	3
Earthquakes	Large	Very Low	Minor	None	5
Dam Failure	Medium	Moderate	Catastrophic	Indirect effects related to flooding	1
Drought	Large	Low	Minor	Increase extent; increase probability	4
Extreme Temperatures	Large	Moderate	Minor	Increase in average temperature; increase in probability of extreme heat	4
Invasive Species	Large	Very High	Critical	Increase in range and severity of invasive species	3

Source: based on Massachusetts Resilient Mass Plan 2023;[41] modified to reflect conditions in Holden.

4.2.11 Natural Hazard Impacts from Changes in Future Conditions

The following table summarizes how changes in future conditions, including changes in population, changes in land use and development, and climate change could potentially change natural hazard impacts on people and vulnerable community assets in Holden. According to CMRPC's Community Snapshots for the town of Holden, by 2030 the town's population is expected to shrink by 5.4%, from 19,905 to 18,829.[42] The town's largest population cohorts fall within the age range of 55 to 59 years of age, with its second largest cohort being in the 10-14 age bracket.[43] This indicates that Holden is a moderately sized suburb comprising primarily of parents with young children and teens. As these children age into young adulthood and move away to college or towards employment outside of the community that parents may also move as well.

[41] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[42] Central Massachusetts Regional Planning Commission. (2025, May 30). *Holden*. Community Snapshots. https://cmrpc.org/data-center/community-snapshots/holden/
[43] Ibid

Table 14: Natural Hazard Impacts from Changes in Future Conditions

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Flooding	As the population declines in the next 5 years, we would likely see a corresponding decrease in vulnerability from flooding.	If commercial and industrial development continues to be built in town and/or the pace of residential development in town increases from its currently low level, the Town will face increased flooding risk (and therefore increased risk from hurricanes and severe thunderstorms) if these developments are built near the 100-year, 500-year, and locally identified flooding hazard areas and/or have large amounts of impervious surface.	The Town may no longer be able to safely develop in areas of town that experience frequent flooding, so the Town may need to change its zoning bylaw to emphasize stormwater resilience. New areas of town may be subject to severe and/or frequent flooding. Dams in town may face more pressure from flooding.
Severe Snowstorms / Ice Storms / Nor'easters	As the town's population continues to decline, so too will the risk from snowstorms and ice storms.	If developments with flat roofs are built in town in the future, the Town will face increased snow and ice load risk.	An increase in wintertime rains may lead to more frequent occurrences of hazardous roadway conditions. Snow and ice storms will become less frequent but will become more severe when they occur; this may lead to a need for more sheltering infrastructure in town.
Hurricanes	There are no anticipated impacts from changes in population on the impacts of hurricanes in Holden.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from hurricanes.	More intense hurricanes may lead to the need to increase stormwater resilience measures in the Town's zoning bylaw and the need for more sheltering infrastructure in town.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Severe Thunderstorms / Wind	There are no anticipated impacts from changes in population on the impacts of severe thunderstorms/wind in Holden.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from severe thunderstorms and wind.	More intense severe thunderstorm and wind events may lead to the need to increase stormwater resilience measures in the Town's zoning bylaw and the need for more sheltering infrastructure in town.
Tornadoes	There are no anticipated impacts from changes in population on the impacts of tornadoes in Holden.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from tornadoes.	More research needs to be conducted on the anticipated climate change impacts of tornadoes in Holden, but some studies indicate that the number of days with tornadoes will decrease but the number of tornadoes on these days will increase.[44]
Wildfire	There are no anticipated impacts from changes in population on the impacts of Wildfires in Holden.	If commercial and industrial development continues to be built in town and/or the pace of residential development in town increases from its currently low level, the Town will face increased wildfire risk if these developments are built near the densely forested areas of the wildland-urban interface.	The Town may no longer be able to safely develop near densely forested areas in the wildland-urban interface. The Town may have less access to water to fight wildfires due to the increased prevalence of drought. Wildfire-related air quality risks may become more prevalent in town.

[44] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-56.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Earthquakes	The Holden's Public Library and the Holden Town Hall have been identified as vulnerable to earthquakes by CMRPC's GIS analysis; if more adults and young people frequent these sites the Town would be at higher risk in the event of earthquakes occurring.	If new developments in town continue to not be built to the Massachusetts State Building Code's seismic standards, the Town may continue to face increased risk from earthquakes.	There are no anticipated climate change impacts on earthquakes in Holden.
Dam Failure	As the population declines in the next 5 years, we would likely see a slight decrease in vulnerability from dam failures. However, as will be noted later in the plan, high traffic areas of town including churches and schools are located within the inundation zones of the dams in town.	If new developments in town are built in the potential inundation zones of dams, the Town will face increased risks from potential dam failure.	Dams in town may face more pressure from flooding and therefore will face a higher risk of overtopping.
Drought	As the population declines in the next 5 years, we would likely see a slight decrease in vulnerability from drought. The town is a Worcester Water Customer, with a smaller proportion of town residents on private wells.	If commercial and industrial development is built in and/or the pace of residential development in town increases from its currently low level in areas of town the Town will face increased risk from wells drying out during drought.	The Town may see an increase in population that is not currently accounted for in population projections, with people from parts of the country facing more severe drought impacts moving to the northeast.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Extreme Temperatures	As the Town's population ages, the Town will face increased risk from extreme temperatures, as older adults are more vulnerable to extremely hot and cold conditions.	If the town does not sufficiently prioritize artificial and/or passive/natural heating and cooling measures, both inside and outside, as the Town's development pattern changes in the future, the Town will face increased risk from extreme temperatures.	Growing seasons, ecosystem types, and migratory patterns in Holden will shift, and farmers and wildlife may be forced to adapt. More intense extreme heat events will lead to a need for more sheltering infrastructure in town, and residents and businesses in town may need to alter work patterns due to more frequent and severe extreme heat events. Holden may see an increase in population, with people from parts of the country facing more severe extreme heat impacts moving to the northeast.
Invasive Species	There are no anticipated impacts from changes in population on the impacts of invasive species in Holden.	If the town does not sufficiently prioritize the control of invasive species when new developments and changes in land use encroach on wild areas, the town will face increased risk from invasive species.	Changing climatic conditions, including warming temperatures, may assist in invasive species in outcompeting native species in town. Invasive species may take advantage of climatic shocks and disturbances and may be more easily able to damage agricultural crops. Invasive vegetation species may be more easily able to build up as fuel that can increase the town's wildfire risk.

If older adults continue to live in town after they retire, the town's number of retirement-age residents facing increased vulnerability to natural hazard impacts will rise. If a greater number of families with school-aged children choose to live in town in the future, the town's number of young residents facing increased vulnerability to natural hazards will rise. If the proportion of new construction built in vulnerable areas in town remains the same, the town's vulnerability to natural hazards will slightly increase over time if the population continues to increase.

4.3 FLOODING

The local HMP planning team identified flooding as one of the more prevalent natural hazards in Holden. Flooding is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms; Global climate change has the potential to exacerbate the hazards which cause flooding over time by leading to more severe and frequent storm and rainfall events. There are several different types of flood hazards – from stormwater inundation and poor drainage infrastructure to riverine flooding and storm surges to dam failures. Riverine and stormwater flooding both occur in Holden, though stormwater flooding is more common. Riverine flooding occurs when the surge of water comes from the top of streams, ponds, and rivers. Stormwater flooding occurs when the amount of precipitation in a storm is greater than the volume that the stormwater management system can handle.

LOCATION

Flooding and flood-prone areas in Holden are closely associated with the 1% (or 100-year) flood areas identified by FEMA. According to a GIS analysis performed by CMRPC, there are 384 parcels in Holden that are susceptible to 1% (100-year) floods, with 210 of them containing structures. See below for a discussion of previous flood occurrences in town and their locations. Building footprints that overlap with flood zones may be impacted by flooding, especially if residents and building owners do not act to mitigate their personal flood risk. Despite Holden having numerous flooding problems, most of Holden is upland and built away from rivers and ponds. Holden's affected area from this hazard, or its location, is considered "small" (less than 10% of the Town). Map 2 in Appendix A illustrates the FEMA FIRM 1% flood zones in town as well as locally identified flooding areas.

FEMA Flood Zones

FEMA creates and manages Flood Insurance Rate Maps (FIRMs) that identify local Special Flood Hazard Areas (SFHAs). These SFHAs are locations that will be inundated by a flood event with a 1% or greater chance of occurring in any year. These areas are also referred to as the base flood, or 1% flood zone. These areas are considered at high risk of flooding and have around a 1 in 4 chance of flooding during a 30-year mortgage.

FEMA FIRMs also identify areas with a "moderate" flood risk, defined as locations outside of the 1% flood zone that will be inundated by a flood event with between a 1% and a .2% chance of occurring in any year. These areas are also known as the 0.2% flood zone.

The Town of Holden lies primarily within the Nashua River watershed, with the southeastern portion of town falling within the bounds for in the Blackstone River watershed. The 2023 Worcester County Flood Insurance Study from FEMA does not list any specific flooding sources for Holden, however the local planning team noted that there were flooding concerns for the homes along the Quinapoxet River as well as within the neighborhood on the eastern shores Chaffin Pond.

The 2023 Worcester County FIS also notes that causes of severe flooding in the county include hurricanes, melting snow in combination with rain in the spring, heavy thunderstorms and resulting rapid downstream runoff, ice jams, and the accumulation of debris at bridges. In addition, the study notes that flooding can occur in any season in the county, but that major flooding is less common in the summer than in other seasons.[45]

[45] Federal Emergency Management Agency, "Flood Insurance Study: Worcester County, Massachusetts (All Jurisdictions)," Map1.msc.fema.gov., FEMA Flood Map Service Center, accessed August 21, 2024, https://map1.msc.fema.gov/mipdata/25027CV001C.pdf?LOC=2cdcfcb8d29a9ba73c75a69614806808.

As of November 2023, the Town of Holden has no repetitive loss structures according to FEMA's National Flood Insurance Program (NFIP). As defined by the NFIP , a repetitive loss property is any property which the NFIP has paid out two or more flood claims of $1,000 or more for in any given 10-year period since 1978. For more information on repetitive loss properties, see https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet. The Town of Holden has 8 NFIP policy holders in town, and the NFIP insures up to $ 2,255,000.00 of property in the Town. NFIP has paid out 3 claims in total to policy holders in Holden.[46]

EXTENT

The average annual precipitation for the closest weather station to Holden (which is located at the Worcester Regional Airport) has been 53.64 inches for the period from 2017 to 2024.[47] Over the past five years, Holden has received an average of 15 days annually with precipitation over 1 inch.[48] Water levels in Holden's rivers, streams, and wetlands rise and fall seasonally and rise during high rainfall events. High water levels in town are typical in spring due to snowmelt and ground thaw; This is the period when flood hazards are normally expected. Low water levels occur in summer due to high evaporation and plant uptake (transpiration). Monthly precipitation levels in town are highly variable, but for the period between 2017 and 2024, Holden received on average the most precipitation in the months of July, September, October, and December; July was also uncharacteristically rainy in 2021 and 2023, in a deviation from expected norms. At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage; this results in overflow which floods adjacent lands.

More severe flooding occurrences in town will lead to more impactful changes in the levels and quality of groundwater. The United States Geological Survey National Groundwater Conditions web application measures groundwater levels by monthly percentiles as compared to historic levels at each particular site.[49] In Massachusetts, the quality of drinking water, including from groundwater sources, is assessed by measuring maximum containment levels (MMCLs) from a number of inorganic and organic chemical, radionuclide, and biological contaminants.[50]

Based on past records and the knowledge and experience of members of the Holden Hazard Mitigation Planning Team as well as town residents, the extent of the impact of localized flooding would be "minor" in town.

PREVIOUS OCCURRENCES

In addition to experiencing flooding in the floodplains mapped by FEMA as 1% and .2% annual chance flood zones, Holden periodically experiences minor flooding at isolated locations due to drainage problems or problem culverts. Town staff have reported that flooding events have become more frequent in recent years. The Holden hazard mitigation planning team identified the following specific flooding locations (mapped in Appendix A):

[46] "Community Overview: Holden, Town of," NFIP Community Information System, accessed January 13, 2025.
[47] Temperature and precipitation data were obtained from the Applied Climate Information System (ACIS) provided by the NOAA Regional Climate Centers.
"Climate," Weather.gov, National Oceanic and Atmospheric Administration National Weather Service, accessed June 10, 2024, https://www.weather.gov/wrh/Climate?wfo=box.
[48] Ibid.
[49] Lee Stanish, "Introducing the National Groundwater Conditions web application," Waterdata.usgs.gov, United States Geological Survey, accessed April 7, 2025, https://waterdata.usgs.gov/blog/groundwater-levels-app/.
[50] "Drinking Water Standards and Guidelines," Mass.gov, the Massachusetts Department of Environmental Protection, accessed April 7, 2025, https://www.mass.gov/guides/drinking-water-standards-and-guidelines.

- Highland Street
- Main Street
- Salisbury Street Flooding
- Chaffin Area Flooding
- Quinapoxet River Area (Located within the 100-year Floodplain)

Most of the flood hazard areas listed here were identified due to known past occurrences in the respective area. There are other areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff. Additionally, some areas in town have experienced erosion and stormwater drainage failures. It is important to note that many of these areas are near or along evacuation routes and cause concern in cases of evacuation from affected parts of town.

In the past 10 years, there have been a number of major flooding events that have occurred in and around Holden;[51] these major events are listed below:

- 7/01/2013 – Flash Flood: A series of shortwaves moved along a stationary boundary to the west of Southern New England, igniting showers and thunderstorms. An atmosphere characterized by low CAPE and decent deep layer shear resulted in showers and thunderstorms producing heavy rain and rotating thunderstorms. One of these storms produced a microburst in Agawam.
- 7/27/2014 – Flash Flood: An upper-level disturbance moving out of the Great Lakes initiated showers and thunderstorms over New York and New England. Enough instability was present in the region for some of these storms to become severe, producing strong to damaging winds and at least one funnel cloud.
- 08/15/2015 – Flood: A weak cold front moving through southern New England brought showers and thunderstorms to the region. These storms produced hail and damaging winds as well as some poor drainage street flooding.
- 10/21/2016 – Flash Flood: Low pressure tracking toward southern New England tapped into a plume of tropical moisture and produced torrential rainfall over parts of central and northeast Massachusetts in the matter of a few hours. This resulted in prolific urban flash flooding in the greater Worcester area and significant urban flooding in greater Boston. The highest single rainfall total from this event was within the City of Worcester, where a Skywarn Spotter reported 5.24 inches of rainfall.
- 06/27/2017 – Flood: A disturbance at mid-levels in the atmosphere moved from the Great Lakes across New England during the afternoon and evening. This along with daytime heating through partly sunny skies allowed afternoon and evening thunderstorms to develop.

[51] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Flash+Flood&eventType=%28Z%29+Flood&eventType=%28C%29+Heavy+Rain&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=2000&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

- 10/24/2017 – Flood: Low pressure moved north through the Great Lakes. This swung a cold front slowly east into Southern New England on October 25. The front stalled over the region during the 25th before moving off to the east on the 26th. Strong low-level winds brought a flow of tropical moisture ahead of the front. The strong winds aloft were brought to the surface in damaging wind gusts, with speeds reaching 45 to 55 mph. The tropical moisture was converted to heavy downpours, with storm rainfall totals ranging from 2 inches to 6 1/2 inches. This brought widespread urban and poor drainage flooding. State Route 9 at Saybrook Road in Shrewsbury was flooded.
- 7/17/2018 – Flash Flood: A cold front moved east from the Great Lakes, crossing Massachusetts during the night of the 17th. The thunderstorms brought strong wind gusts and wind damage during the afternoon and evening. Thunderstorms also brought downpours in Western, Central, and Northeast Massachusetts. Two to four inches of rain fell from Westfield through Worcester to Boston.
- 08/11/2018 – Flood: A cold front stalled over Southern New England on the 11th. Low pressure from the Midwest then moved slowly east along the front. The weather system drew upon warm and very humid air to create showers with local downpours, resulting in rainfall amounts of two to five inches in Northern Massachusetts on August 11th and 12th. An exceptionally powerful downpour left 8.15 inches in the city of Lynn.
- 8/23/2020 – Flash Flood: Diurnally driven thunderstorms brought wind damage, hail, and some flooding to mainly western and central Massachusetts.
- 7/14/2023 –Flood: A cluster of thunderstorms moved northward into Connecticut during the morning ahead of a short-wave trough southwest of southern New England. The showers and thunderstorms spread northeastward into the early afternoon. One storm produced a lightning strike that started a house fire in northeast Massachusetts. Several roads were flooded in Worcester County. In Holden, Main St and several side streets were flooded in spots up to one ft.

While not directly affecting Holden, the Massachusetts Severe Storms and Flooding disaster (DR-4780-MA) affected nearby towns and Holden was involved in the response and recovery efforts.

In addition, minor flooding related to changes in groundwater was identified as affecting the Town, as basement flooding has been experienced by town residents who responded to the survey. The 2023 ResilientMass Plan describes how flooding resulting from changes in groundwater can impact communities in Massachusetts.[52]

Probability of Future Events

Based upon previous data, there is a "moderate" probability (a 10% to 40% chance) of localized flooding occurring in Holden in the next year. This represents a slight increase as compared to the last HMP update in town due to increased precipitation driven by climate change.

Impact

The Town faces a minor impact from flooding, with less than 10% of properties in the affected area

[52] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.

of town likely to be damaged or destroyed by a 1% annual chance flooding event. Based on the HAZUS analysis described below, a .2% annual chance flood event in Holden is unlikely to destroy any buildings, but such a .2% annual chance flood event could displace residents and come at a significant economic cost.

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The HAZUS software was used to model potential damage to the community from a .2% annual chance flood event, assuming a 1 square mile data resolution.

Table 15: HAZUS Potential Damages to Holden from .2% Annual Chance Flood Event

	.2% annual chance flood event
Building Characteristics	
Estimated total number of buildings in Holden	6,822
Estimated total building replacement value (2024 $)	$ **3,289,665,000.00**
Building Damages	
# of buildings sustaining minor damage (1-10%)	1
# of buildings sustaining moderate damage (11-40%)	1
# of buildings sustaining severe damage (41-50%)	0
# of buildings destroyed	0
Population Needs	
# of households displaced	28
# of people seeking public shelter	25
Value of Damages	
Total property damage (buildings and content)	$ 6,690,000.00
Total losses due to business interruption	$ 4,750,000.00
Total Economic loss	**$ 11,260,000.00**

Though there are no recorded instances of a flood event of this size in Holden, this model shows a reasonable "worst case scenario" that would help planners and emergency personnel evaluate the impacts of flooding that might be more likely in the future as the region experiences a period of more intense and frequent storms. For more information on the HAZUS-MH software, go to http://www.fema.gov/hazus-software.

EXPOSURE

Certain features of Holden's infrastructure, society, and environment may face more flooding, or may be disproportionately impacted by it, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Low-lying areas, including but not limited to the FEMA 1% and .2% annual chance flood zones;
- Specific locations with undersized or outdated storm water infrastructure that cannot handle sudden surges in precipitation;
- Residents who may have trouble evacuating from their residences due to age, health concerns, or lack of a vehicle;
- Flood-prone municipal buildings and critical infrastructure that are subject to flooding and potential contamination from flood waters;
- Septic systems, especially in flood prone areas or locations with high water tables;
- Aquatic ecosystems, which may suffer from erosion, eutrophication, or sedimentation due to stormwater;
- The municipal financial burden of infrastructure maintenance and upgrades needed to address flooding;
- Highway department staff, who sometimes must unclog storm drains during extreme weather events. Due to limited staffing, highway department employees often have to go out alone, making safety a concern; and
- Sides of roadways, which may be eroded due to excessive rainfall. Lack of funding to make road repairs may compound this issue.

The local hazard mitigation planning team identified areas in town exposed to flood risk, namely:

- Jefferson Service Station at 1594 Main Street
- Rail Infrastructure in town
- Properties located along the Quinapoxet River

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 State Hazard Mitigation and Climate Adaptation Plan, climate change effects coupled with changes in development and population density can increase the risk of flooding from precipitation. As noted earlier in this plan, the Central Region in particular is most likely to be impacted by extremes in precipitation in the following ways:

- Climate change is projected to increase the variability of precipitation events in any given year, including the potential for extreme precipitation events. Instances of inland flooding, river overflows, and pressure on dams may result; and
- Projected changes in precipitation patterns in all seasons, as well as higher frequency of extreme weather (including hurricanes and nor'easters), will change patterns of river flow and increase the frequency and severity of inland riverine flooding.

According to the 2023 ResilientMass Plan, climate change is predicted to affect groundwater

levels; Sea level rise, extreme temperature events, and changes in precipitation patterns will all affect groundwater conditions and may increase the risk in town of minor basement flooding.[53]

In summary, climate change is likely to increase the extent and probability of future flood events in Holden, which will make it more likely for multiple storms in a short duration to cause cumulative damage; These impacts can affect land use and development by causing people to no longer be able to develop in parts of town that flood frequently and causing the Town's government to zone for increased stormwater resilience.

VULNERABILITY

Based on this analysis and the assessment of the Holden local planning team, Holden faces a hazard index rating of "3 – moderate risk" from flooding. This does not include the pluvial flooding caused dam failure (which is covered in a later section).

MITIGATION STRATEGIES

The Town of Holden is currently able to effectively respond to flooding through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to flooding. The local HMP planning team identified the following strategies that could be used to reduce the threat of flooding in Holden:

- Drainage and Culvert Upgrades at Salisbury Street near Dawson Pond Dam in accordance with recommendations following evaluation of the dam and in accordance with recommendations of the Dam EAP
- Assess green infrastructure opportunities for stormwater management to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects. Coordinate with Town departments to incorporate green infrastructure into planned road improvements.
- Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Identify legal authority to enforce established O/M requirements.

[53] Ibid.

4.4 Severe Snowstorms / Ice Storms / Nor'easters

Severe winter storms can pose a significant risk to property and human life. Severe snowstorms and ice storms can involve rain, freezing rain, ice, snow, cold temperatures, and wind. Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold event. Winter storms can result in flooding, storm surges, closed highways, blocked roads, downed power lines, and hypothermia among residents. A northeast coastal storm, known as a nor'easter, is typically a large counterclockwise wind circulation around a low-pressure center; nor'easters often result in heavy snow, high winds, and rain.

Location

The entire town of Holden is susceptible to severe snowstorms, ice storms, and nor'easters; this means that the location of occurrence of severe snowstorms in town is "large." Because these storms occur regionally, the entire town is equally vulnerable to them.

Extent

The Northeast Snowfall Impact Scale (NESIS) characterizes and ranks high-impact snowstorms in the northeast USA. These storms have large areas of 10-inch or greater snowfall accumulations. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impact.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the storm's path. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one (for smaller storms) to over ten (for extreme storms). The raw score is then classified into one of the five NESIS categories. The largest NESIS values are given to storms producing heavy snowfall over large areas which include major metropolitan centers.

Table 16: Northeast Snowfall Impact Scale Categories[54]

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

The Sperry-Piltz Ice Accumulation Index rates approaching ice storms based on the potential damage they are projected to cause, their projected footprint, and their predicted total ice accumulation.

[54] National Centers for Environmental Information, "The Northeast Snowfall Impact Scale (NESIS)," Ncei.noaa.gov, National Oceanic and Atmospheric Association, accessed June 12, 2024, https://www.ncei.noaa.gov/access/monitoring/rsi/nesis.

Table 17: The Sperry-Piltz Ice Accumulation Index[55]

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

The Miller classification is a system used to classify nor'easters.[56] The types of storm classification under the Miller classification are listed below.

Table 18: The Miller Classification for Nor'easters

Miller Classification	Description
Miller A / Storm Type A	Miller A, or Storm Type A, nor'easters form in the southeastern USA or along the Gulf of Mexico and intensify as they move north until turning east to the Atlantic Ocean. They are most impactful the mid-Atlantic region but can also lead to major snow events in New England if they are strong enough.
Miller B / Storm Type B	Miller B, or Type B, nor'easters form in the midwestern USA and move slightly southeast to the southern mid-Atlantic region until they combine with / transfer energy to a storm originating along the coast in this region. This combined storm then travels north, impacting inland and coastal areas of the northeast USA with major snow events, before turning east to the Atlantic Ocean.
Miller C / Storm Type C	Miller C, or Type C, nor'easters are similar to Miller B nor'easters but are stronger and tend to be more impactful in the midwestern USA and southern New England.

[55] "What is the Sperry-Piltz Ice Accumulation Index?," Spia-index.com, SPIA Index, accessed March 18, 2025, https://spia-index.com/

[56] Mike Priante, "The Miller Classification," Weatherworksinc.com, WeatherWorks, December 4, 2020, https://weatherworksinc.com/news/Miller-A-vs-Miller-B; "Mid-Atlantic Winter Storm Patterns," Glenallenweather.com, Glen Allen, VA Weather, accessed March 20, 2025, https://glenallenweather.com/alink/18snow/stormtypes.htm.

Miller D / Storm Type D	Miller D, or Type D, nor'easters are similar to Miller B nor'easters but are weaker and tend to have more limited impacts in the southern mid-Atlantic region.
Miller E / Storm Type E	Miller E, or Type E, nor'easters are similar to Miller B nor'easters but form further to the south and tend to have a long band of area they are highly impactful in which stretches from the northern part of the inland southeastern states, through the mid-Atlantic region, and to inland New England.

The extent of damages broadly speaking in this category of natural hazard you can expect to see heavy snowfall, strong winds, freezing rain, and snow and ice accumulation. A nor'easter, being the worst type of winter storm event can be categorized under the NEISIS Scale and/or the Sperry-Piltz Ice Accumulation Index depending on what kind of wintery precipitation is to be expected, which is partially dependent on what Miller Classification the storm can be categorized into, and partially dependent on the specific weather conditions of the storm in question. Typically, the damage extent is lesser for a snowstorm, greater for an ice storm, and greatest for a nor'easter, which combines both snow and ice with high winds.

Previous Occurrences

Based on data available from the National Oceanic and Atmospheric Administration, there have been 88 high-impact snowstorms since 1956 that have affected the northeast USA. Of these, approximately 35 storms resulted in at least 10 inches of snow fall in Holden. These storms are listed in the table below:[57]

Table 19: High-Impact Snowstorms with Snow Falls in Holden of at Least 10 Inches Since 1958[58]

Start Date	NESIS Value	NESIS Category	NESIS Classification
1/28/2022	1.73	1	Notable
1/30/2021	4.93	3	Major
12/14/2020	3.21	2	Significant
3/03/2019	1.29	1	Notable
3/11/2018	3.16	2	Significant
1/3/2018	2.27	1	Notable
3/12/2017	5.03	3	Major
2/8/2015	1.32	1	Notable
1/29/2015	5.42	3	Major
1/25/2015	2.62	2	Significant
3/4/2013	3.05	2	Significant
2/7/2013	4.35	3	Major
1/26/2011	2.17	1	Notable
1/9/2011	5.31	3	Major

[57] Ibid.

[58] This data was unavailable for review on 02/21/2025

Start Date	NESIS Value	NESIS Category	NESIS Classification
12/24/2010	4.92	3	Major
12/18/2009	3.99	2	Significant
2/12/2006	4.10	3	Major
1/21/2005	6.80	4	Crippling
2/15/2003	7.50	4	Crippling
3/31/1997	2.29	1	Notable
2/8/1994	5.39	3	Major
3/12/1993	13.2	5	Extreme
2/10/1983	6.25	4	Crippling
4/6/1982	3.35	2	Significant
2/5/1978	5.78	3	Major
1/19/1978	6.53	4	Crippling
2/18/1972	4.77	3	Major
2/22/1969	4.29	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.50	2	Significant
2/2/1961	7.06	4	Crippling
1/18/1961	4.04	3	Major
12/11/1960	4.53	3	Major
3/2/1960	8.77	4	Crippling
2/14/1958	6.25	4	Crippling

Additionally, the National Centers for Environmental Information (NCEI) database notes the following instance of heavy snowfall in the area of Worcester County:[59]

- 01/07/2024 – Heavy Snow: A strong storm moved up the east coast passing near the 70/40 benchmark brought heavy snow to southern New England beginning late Monday night and continuing on Sunday. The first round of heavy snow fell overnight followed by a lull in the snow and mixing with rain Sunday morning. Comma head snow then filled back into eastern MA and RI bringing moderate to heavy snow Sunday afternoon and evening. Snow amounts ranged from 2 to 18 inches.

The local planning team noted a number of concerns around town relating to snow:

- In January 2015 during the so called "Snow Blitz" the Dollar Store's Roof collapsed due to snow load issues, though no damages were reported from municipal infrastructure.

[59] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Heavy+Snow&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2020&endDate_mm=06&endDate_dd=30&endDate_yyyy=2024&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

- On October 31st, 2011, the town experienced an Ice storm that led to power outages town wide, and was described as being almost as bad as the 2008 storm. This storm being caused by a wintery mix of freezing rain and sleet does not appear on the snowfall index.
- During the two snow disaster declarations of 2018 Holden was only affected by Massachusetts Severe Winter Storm and Snowstorm DR-4379-MA occurring in March, with the other DR4372 only being declared along the Massachusetts coast.

However, the 2008 ice storm remains one of the worst events to have affected the town in regard to snow. The local planning team noted that the town was without power for 2 weeks, and town emergency management opened up shelters for duration. All roads with the exception of Main Street were rendered impassable by the ice storm. The 2008 Ice storm weighs heavily on the minds of the people of Holden: the community survey performed by the local hazard mitigation planning team indicated that over 70% of respondents indicated that they had been impacted by winter storm events, with many direct responses noting the 2008 ice storm.

The 2023 ResilientMass Plan notes that, on average, Massachusetts experiences one to two nor'easters per year.[60] Between 2013 and 2022, there were 63 heavy snow days, 12 blizzard days, and two ice storm days in Massachusetts.

Probability of Future Events

Based upon the availability of records for Worcester County, the likelihood that a severe snowstorm, ice storm, or nor'easter will affect Holden in any given year is "very high" (70% or greater).

The 2023 ResilientMass Plan notes that, on average, Massachusetts experiences one to two nor'easters per year. Between 2013 and 2022, there were 63 heavy snow days, 12 blizzard days, and two ice storm days in Massachusetts.

Impact

Holden faces a "limited" impact, with less than 10% of total property in affected areas damaged, from snowstorms, ice storms, and nor'easters. The weight from multiple snowfall events can test the load ratings of building roofs and can potentially cause significant damage. Multiple freeze-thaw cycles can also create large amounts of ice and can lead to even heavier, even more dangerous roof loads.

Other impacts from snowstorms, ice storms, and nor'easters include:

- Tree damage and fallen branches that cause utility line damage and roadway blockages;
- Disrupted power and phone service;
- Unsafe roadways and increased traffic accidents;
- Infrastructure and other property also being at risk from severe winter storms and the associated flooding that can occur following heavy snow melt;
- Damage to telecommunications structures; and

[60] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

- Reduced ability of emergency officials to respond promptly to medical emergencies and fires.

The local HMP planning team in Holden noted snow load concerns on some of the municipal infrastructure, like the Starboard Building attached to the library where many of the meetings were held. Additionally, the roof of the high school was noted to have difficulties in clearing snow due to rooftop structures like cables and lightning rods.

EXPOSURE

Certain features within Holden's infrastructure, society, and environment may face more exposure to severe snowstorms, ice storms, and nor'easters, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3 of this plan. These features include:

- Elderly residents, who may have more difficulty clearing snow and walking on icy or snow-covered sidewalks. Elderly residents may also be more vulnerable to extremely low temperatures;
- Households with low or fixed incomes, who may be less able to afford sufficient heating or home improvements to improve energy efficiency and insulation;
- Renters, who may have less control over their living situation and indoor environment than homeowners;
- Public safety, utility, and highway department workers, who are tasked with responding to emergency calls, keeping the heat and power on, and keeping the streets clear during winter storms.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, sea level rise, warming ocean temperatures, and changing atmospheric circulation patterns are likely to increase the frequency and severity of winter storms. Warmer temperatures indicate that more precipitation will fall as rain rather than snow throughout the 21st century. The result of this will be fewer overall snowstorms; however, the snowstorms that do occur will likely be worse. Increased wintertime rain also creates a greater risk for wintery mix, sleet, and ice storms; in addition, it will cause hazardous roadway conditions, as temperature drops overnight will cause transportation infrastructure to ice over if mitigation measures are not put in place.

In summary, climate change is likely to increase the extent and probability of future severe snowstorms, ice storms, and nor'easters in Holden. This may have societal impacts; more frequent severe winter storms may change land use and development protocols, as more homes and community buildings may need to have greater sheltering infrastructure to prepare for heavy snowfall. In the community survey, 70.53% noted that they had been affected by winter storms, making it one of the more prevalent disasters for the town.

VULNERABILITY

Based on the above assessment, Holden has a hazard index rating of "3 – Moderate risk" from snowstorms, ice storms, and nor'easters. Snowstorms, ice storms, nor'easters, and other forms of winter precipitation are a frequent occurrence in Massachusetts, and they are expected to only become more frequent over time. Additionally, the expected increase in "wintery mix" precipitation may lead to increased roadway hazards, as standing water freezing in overnight

temperatures creates hazardous road conditions for travelers and responders. While the town is able to effectively respond to a winter storm event, the vulnerability to town infrastructure from snow and ice remains relevant.

Mitigation Strategies

The Town of Holden is currently able to effectively respond to severe snowstorms, ice storms, and nor'easters through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. Given that Holden, as well as other towns in the region, experience snowstorms frequently, local and state officials as well as emergency response personnel amply prepare for major snow events. However, there are numerous opportunities to expand upon the Town's existing capabilities to mitigate and respond to severe snowstorms, ice storms, and nor'easters. The local HMP planning team identified the following strategies that could be used to reduce the threat of snowstorms in Holden:

- Renovate the Roof Structure of the Starboard Building, which currently faces snow load issues and houses many essential government functions in Holden.
- Explore the Feasibility of a expansion of municipal power capabilities, including developing additional redundant energy storage and municipally owned power generation infrastructure to support key locations during outages.
- Provide information to residents and businesses (especially in the Chaffin Pond area) on generator purchase, Use and Maintenance to reduce basement flooding in the event of power outages and in the use of Sump Pump usage. Use FEMA/MEMA Templates for educational materials.

4.5 HURRICANES

Hurricanes begin as tropical storms that form over warm ocean waters in the Atlantic Ocean off the west coast of Africa or the Pacific Ocean. These storms form as heated, moist air is drawn up into the atmosphere and begin circulating clockwise or counterclockwise, depending on which hemisphere they are in. Tropical storms become hurricanes when their sustained winds exceed 74 miles per hour. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricane winds can reach speeds of up to 200 miles per hour and can grow to 500 miles in diameter. The official hurricane season starts on June 1st; in New England, hurricanes generally occur in August, September, and the first half of October due to the time required for the waters south of Long Island to warm enough to sustain hurricane activity this far north. Hurricanes in the region can result in flooding and wind damage to structures and above-ground utilities.[61]

LOCATION

Because of this hazard's regional nature, all of Holden is at risk from hurricanes, meaning the location of occurrence is "large." Ridgetops in town are more susceptible to wind damage. Areas susceptible to flooding are also likely to be affected by heavy rainfall from hurricanes.

EXTENT

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, is given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour, the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

Table 20: The Saffir-Simpson Scale (1)[62]

Category	Maximum Sustained Wind Speed
1	74–95 mph: very dangerous winds will produce some damage
2	96–110 mph: extremely dangerous winds will cause extensive damage
3	111–129 mph: devastating damage will occur
4	130–156 mph: catastrophic damage will occur
5	157 + mph: catastrophic damage will occur

[61] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[62] National Hurricane Center and Central Pacific Hurricane Center, "Saffir-Simpson Hurricane Wind Scale," National Oceanic and Atmospheric Association, accessed June 10, 2024, https://www.nhc.noaa.gov/aboutsshws.php.

Previous Occurrences

Hurricanes which have affected the region near Holden are shown in the following table:[63]

Table 21: Hurricanes Which Have Affected the Region Near Holden

Storm Name	Year	Saffir/Simpson Category (when the storm reached MA)
Belle	1976	Tropical Storm
Gloria	1985	1
Henri	1985	Tropical Storm
Chris	1988	Minor Storm
Bob	1991	2
Beryl	1994	Tropical Storm
Bertha	1996	Tropical Storm
Floyd	1999	Tropical Storm
Gordon	2000	Minor Storm
Hermine	2004	Tropical Storm
Barry	2007	Minor Storm
Hanna	2008	Minor Storm
Irene	2011	Tropical Storm
Sandy	2012	"Super Storm"
Andrea	2013	Minor Storm
Elsa	2021	Tropical Storm
Fred	2021	Extratropical Storm
Henri	2021	Tropical Storm/Depression

The local HMP team noted that during Hurricane Sandy the town was hit with the remnants of the hurricane, and that parts of town lost power due to trees being downed.

Probability of Future Events

Holden's inland location in central Massachusetts reduces the risk to in town of extremely high winds that are associated with hurricanes, although the Town can still experience some high wind events. Based upon past occurrences, it is reasonable to say that there is a "low" probability (1% to 10% in any given year) of hurricanes in Holden. However, climate change is projected to result in more severe weather, including increased occurrence of hurricanes and tropical storms. Because of this, the occurrence of hurricanes will likely increase in town in the future.

[63] "Historical Hurricane Tracks," Coast.noaa.gov, National Oceanic and Atmospheric Administration, accessed September 17, 2024, https://coast.noaa.gov/hurricanes/#map=6.02/42.065/-71.688&search=eyJzZWFyY2hTdHJpbmciOiJNYXNzYWNodXNldHRzLCBVU0EiLCJzZWFyY2hUeXBlIjoiZ2VvY29kZWQiLCJvc21JRCI6IjYxMzE1IiwiY2F0ZWdvcmllcyI6WyJINSIsIkg0IiwiSDMiLCJIMiIsIkgxIiwiVFMiLCJURCIsIkVUll0sInllYXJzIjpbXSwibW9udGhzIjpbXSwiZW5zbyI6W10sInByZXNzdXJlIjp7InJhbmdlIjpbMCwxMDMwXSwiaW5jbHVkZVVua25vdQcmVzc3VyZSI6dHJ1ZX0sImJ1ZmZlciI6NjAsImJ1ZmZlclVuaXQiOlsiTmF1dGljYWwgTWlsZXMiXSwic29ydFNlbGVjdGlvbiI6eyJ2YWx1ZSI6InllYXJzX25ld2VzdCIsImxhYmVsIjoiWWVhciAoTmV3ZXN0KSJ9LCJhcHBseVRvQU9JIjp0cnVlLCJpc1N0b3JtTGFiZWxzVmlzaWJsZSI6dHJ1ZX0=.

IMPACT

Descriptions of damages that could occur due to hurricanes of different storm categories of the Saffir-Simpson scale are shown below:

Table 22: The Saffir-Simpson Scale (2)

Storm Category	Damage Level	Description of Damages	Wind Speed (MPH)
1	MINIMAL Very dangerous winds will produce some damage	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
2	MODERATE Extremely dangerous winds will cause extensive damage	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
3	EXTENSIVE Devastating damage will occur	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
4	EXTREME Catastrophic damage will occur	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
5	CATASTROPHIC Catastrophic damage will occur	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to the lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The HAZUS software was used to model potential damage to Holden from 1% and 0.2% hurricane events (storms that are 1% and .0.2% likely to happen in a given year, and roughly equivalent to Category 1 and Category 2 hurricanes, respectively). The damage 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.

Table 23: HAZUS Potential Damages to Holden from 1% and .2% Annual Chance Hurricane Events

	1% storm (89 mph winds)	0.2% storm (102-105 mph winds)
Building Characteristics		
Estimated total number of buildings	6822	
Estimated total building replacement value (2014 $)	$ 3,289,945,000.00	
Building Damages		
# of buildings sustaining minor damage	281	1159

# of buildings sustaining moderate damage	16	165
# of buildings sustaining severe damage	0	7
# of buildings destroyed	0	9
Population Needs		
# of households displaced	2	28
# of people seeking public shelter	0	12
Debris		
Building debris generated (tons)	877	3,841
Tree debris generated (tons)	17,953	31,151
# of truckloads to clear building debris	35	154
Value of Damages		
Total property damage (buildings and content)	$ 23,075,570.00	$ 72,637,070.00
Total losses due to business interruption	$ 761,600.00	$ 4,491,900.00

Though there are no recorded instances of a hurricane equivalent to a 0.2% storm passing through Massachusetts, this model was included in this plan in order to present a reasonable "worst case scenario" that can help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as more intense and frequent storms become more common. For more information on the HAZUS-MH software, go to http://www.fema.gov/hazus-software.

Holden faces a "limited" impact from hurricanes, with 10% or less of property in the affected area of town being damaged or destroyed in any given hurricane instance.

EXPOSURE

Certain features within Holden's infrastructure, society, and environment may face more exposure to hurricanes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- The electrical grid, which is vulnerable to outages from trees falling across power lines.
- Municipal buildings have been impacted by high winds in the past. Damage to these buildings could impact critical town functions and distract people from other essential emergency response and recovery activities; and
- Public safety, utility, and highway department workers, who are tasked with responding to emergency calls and keeping the streets clear during hurricanes.

In addition to high winds, hurricanes can also bring heavy precipitation and cause flooding. The vulnerable features identified in the flooding section above also apply to hurricanes.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences hurricanes and tropical storms:

- Warming oceans will provide more energy for hurricanes and tropical storms, which could lead to more intense or potentially damaging storms in the future, and larger storms could result in more storms that are likely to impact Massachusetts; and
- Warmer air can hold more water vapor and will enable greater precipitation rates during future storms.

In summary, climate change is likely to increase the frequency and extent of hurricanes in Holden.

VULNERABILITY

Based on the above analysis, Holden has a hazard index rating of "4 – low risk" from hurricanes. Its location and elevation decrease the risk of hurricane force winds and rains, though it does not remove them entirely. Historically, by the time a storm has arrived in Holden, it has been typically downgraded to a tropical storm or tropical depression; however, climate change may increase the severity of these types of storms in town in the future.

MITIGATION STRATEGIES

The Town of Holden is currently able to effectively respond to hurricanes through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities to expand upon the Town's existing capabilities to mitigate and respond to hurricanes. The local HMP planning team identified the following strategies that could be used to reduce the threat of hurricanes in Holden:

- Identify and Resolve drainage issues and groundwater intrusion along Highland Street area.
- Investigate Community Rating System (CRS) Benefits and Requirements and Decide Whether to participate.
- Communicate awareness and availability of Preparedness Package and other information about emergency preparedness.

4.6 Severe Thunderstorms / Wind / Tornadoes

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud; thunderstorms usually produce gusty winds as well as heavy rain and sometimes generate hail. Effective January 5, 2010, the National Weather Service (NWS) modified the hail size criterion to classify a thunderstorm as 'severe' when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado.

Every thunderstorm has an updraft (rising air) and a downdraft (sinking air). Sometimes strong downdrafts, known as downbursts, can cause tremendous wind damage that is similar to that of a tornado. A small (less than 2.5-mile path) downburst is known as a "microburst", and a larger downburst is called a "macro-burst." An organized, fast-moving line of microbursts traveling across large areas is known as a "derecho" – these occasionally occur in Massachusetts. The strongest downburst ever recorded was a 175-mph downburst in North Carolina. Downburst winds exceeding 100 mph have been measured in Massachusetts.[64]

Wind is air in motion relative to the surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (for sustained winds of 31 to 39 mph for at least 1 hour and for any gusts of 46 to 57 mph) or a High Wind Warning (for sustained winds 40+ mph and for any gusts 58+ mph). For non-tropical events over water, the NWS issues a small craft advisory (for sustained winds of 25 to 33 knots), a gale warning (for sustained winds of 34 to 47 knots), a storm warning (for sustained winds of 48 to 63 knots), or a hurricane force wind warning (for sustained winds of 64+ knots). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph, and a hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph or greater. High winds are a hazard for the boating, shipping, and aviation industry sectors. They can also cause scattered power outages, downed trees and/or power lines, and damage to parts of structures like roofs and windows.

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along paths that range from a few dozen yards to over a mile in width. The path of a tornado can be unpredictable because tornadoes can stall or change direction abruptly. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property. In Massachusetts, tornadoes have occurred most frequently in the Connecticut River Valley and in western Worcester County, with Holden approximately 35 miles east of the zone of most frequent past occurrences.

Location

As per the 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, the entire Town is at risk of high winds, severe thunderstorms, and tornadoes. This plan identifies Holden and the communities surrounding it as having a moderate frequency of tornado occurrence within the Massachusetts context. However, the area affected by thunderstorms, wind, or tornadoes in town is "small," with less than 10 percent of the Town generally affected.

Extent

An average thunderstorm is 15 miles across and lasts for 30 minutes; severe thunderstorms can be

[64] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. Thunderstorms can cause hail, wind, lightning damage, and flooding.

High wind is linked to a number of other hazards, including hurricanes and winter storms, in addition to thunderstorms and tornadoes. High winds can cause damage to structures and trees and can also increase the risk of wildfire.

Tornadoes are measured using the Enhanced Fujita Scale, which is shown below with the following categories and corresponding descriptions of damage:

Table 24: Enhanced Fujita Scale Levels and Descriptions of Damage[65]

EF-Scale Number	Intensity Phrase	3-Second Gust (MPH)	Type of Damage Done
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damage to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

Table 25: Extent Scale for Hail[66]

HAIL SIZE (in.)	OBJECT ANALOG REPORTED
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half Dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.0	Hen egg
2.5	Tennis ball
2.75	Baseball
3.00	Tea cup

[65] National Weather Service, "The Enhanced Fujita Scale (EF Scale),"Weather.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.weather.gov/oun/efscale.
[66] Storm Prediction Center, "Converting Traditional Hail Size Descriptions," Spc.noaa.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.spc.noaa.gov/misc/tables/hailsize.htm.

4.00	Grapefruit
4.50	Softball

Previous Occurrences

Because thunderstorms and wind affect Holden regularly, there are not significant records available for these events. As per the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year.

In Worcester County, there have been several F1 tornadoes over the years; Tornadoes with a rating of 3 or above and tornadoes resulting in a death or injury, or significant property damage, are listed below.

- In 1953, an F4 tornado struck Worcester. The event resulted in at least 90 fatalities and more than 1,200 injuries. There was extensive property damage. On the same date, an F3 tornado began in the Town of Sutton.
- In 1981 an F3 tornado struck Westminster, resulting in 3 injuries and very little reported property damage.
- In June 2011, an F3 tornado struck Massachusetts. Few deaths were reported, all in Hampden County. No deaths were reported in Worcester County.

In the last 6 years, there has only been one small tornado that has affected communities near Holden:

- 2018 Tornado (East Douglas, Uxbridge, Upton)

Holden has experienced tornado warnings since the last plan from high wind events but has not had a tornado in some time. The local HMP team noted that they more frequently experienced thunderstorms in their area. This is reflected in the survey, with 36.84% of participants noting that they had been impacted by thunderstorms and other high wind events. One respondent noted that they had lightning strike their well. Many residents were concerned about power failures following high wind events. The local planning team has noted that they have been seeing an increase in severe thunderstorms with high winds since the last plan.

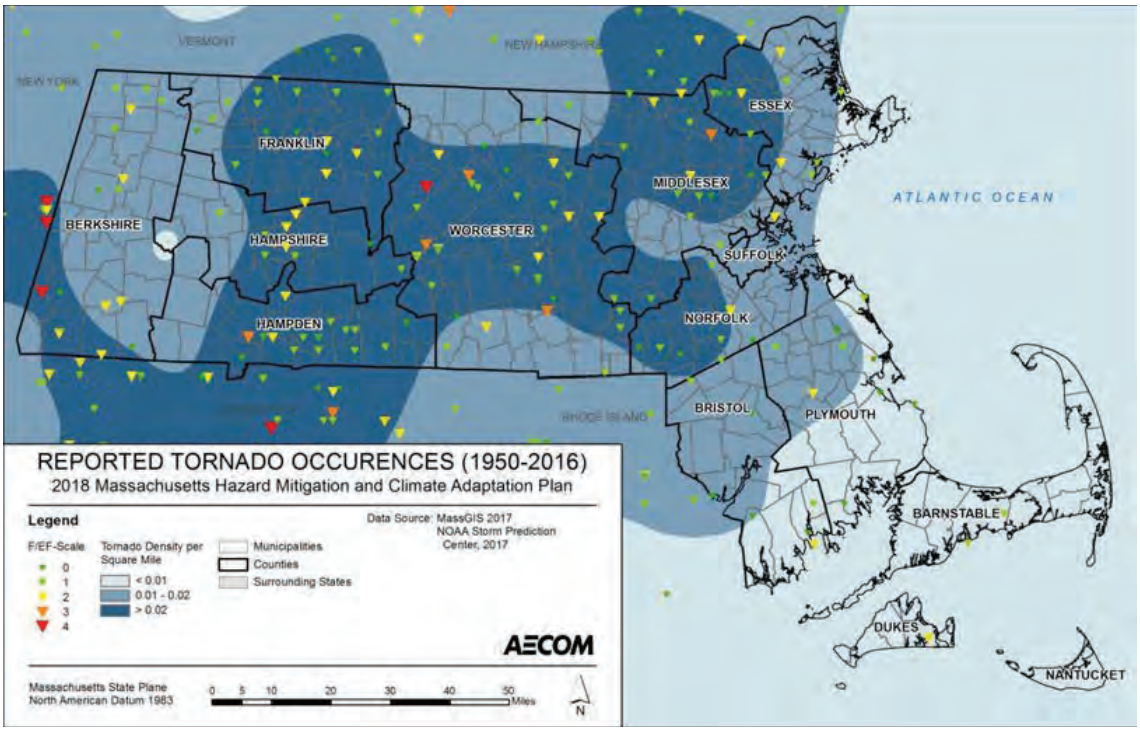


Figure 1: Density of Reported Tornados per Square Mile (1950-2016).[67]



Image 1: Above - NASA released this image of part of the 39-mile-long tornado track through south-central Mass. The image was captured on June 5, 2011, by the Landsat 5 satellite.

[67] "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, September 2018, https://www.mass.gov/doc/state-hazard-mitigation-and-climate-adaptation-plan/download.

Thunderstorm occurrences are more frequent in Massachusetts than occurrences of tornados, and thunderstorms have the potential to produce tornadoes. Supercells are the type of storm that most commonly produces tornadoes; they are severe, long-lived thunderstorms. Approximately 20 percent of supercells produce tornadoes. In Holden there have been several severe thunderstorm/wind occurrences:[68]

- 01/31/2013 – High Wind: A warm front moved northward across southern New England. This brought a period of mainly rain and warm temperatures. In addition, a strong low-level jet (up to 80 kts) resulted in high winds across much of southern New England. There was some tree damage and downed power lines with winds gusting to 60 to 70 mph. An amateur radio operator in Milford recorded a wind gust to 64 mph on their home weather station. The Automated Surface Observation System at Worcester Regional Airport (KORH) recorded a wind gust to 55 mph.
- 02/25/2015 – High Wind: A storm moving north through the Great Lakes redeveloped along the Mid Atlantic coast on the 24th, then moved up the coast past Southern New England. This coastal storm brought damaging west-northwest winds to Massachusetts as it moved off through the Maritimes on the 25th.
- 08/16/2016 – Thunderstorm Wind: A warm front brought widespread rainfall and an isolated thunderstorm or two to southern New England. A tree on Malden Street in Holden was downed by thunderstorm winds.
- 07/27/2021 – Thunderstorm Wind: A cold front entered a marginally unstable, but highly sheared environment during the late afternoon and evening hours. A broken line of severe thunderstorms moved across most of Massachusetts and a portion of northern Connecticut and northern Rhode Island. In Holden, a trained spotter reported a gust to 65 mph. There had been a gust to 60 mph 12 minutes earlier at the same location. Additionally, a tree was downed on top of a car. Wires were downed as well by this. The location was not specified in the report.
- 02/28/2024 – High Wind: A strong cold front crossed southern New England on Wednesday night the 28th bringing soaking rains and strong wind gusts to southern New England followed by sharply falling temperatures. This cold frontal passage included a fine line stronger storm. Winds generally gusted 45 to 55 mph. The strongest gusts were 59 mph at the Worcester Airport ASOS (KORH) at 2:18 AM EST on the 29th and a gust to 55 mph at the Fitchburg Airport ASOS (KFIT) at 1:57 AM EST on the 29th.

[68] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed February 21, 2025, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Hail&eventType=%28Z%29+High+Wind&eventType=%28Z%29+Strong+Wind&eventType=%28C%29+Thunderstorm+Wind&eventType=%28C%29+Tornado&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2013&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

Probability of Future Events

According to the 2023 ResilientMass Plan, Massachusetts averages two to five tornadoes per year. Only two tornadoes in the state (which occurred in 1953 and 2011) received disaster declarations. Massachusetts has experienced 12 EF0 to EF1 tornadoes since 2018; six EF0 tornadoes occurred in the state in 2021, and these 2021 EF0 tornadoes caused under $50,000 in property damage. Because tornadoes are relatively rare in the Commonwealth, residents are less likely to be prepared for them in the Commonwealth than in other parts of the country. People who live in manufactured housing, such as mobile homes, are more at risk to tornadoes. Tornadoes can affect all sectors and populations, and their primary effect is damage from their high winds to structures and the environment. Any structure located in a tornado zone or path is at risk. Tornado activity may become more variable due to climate change, so predicting the likelihood of future tornado events in Holden is difficult.

Based upon the available historical record, as well as Holden's location in a moderate-density cluster of tornado activity for Massachusetts, there is a "very low" probability (less than 1% chance in any given year) of a tornado affecting the Town, and a moderate (10% to 40% chance in any given year) probability of a severe thunderstorm and/or high winds affecting the Town.

Impact

Overall, Holden faces a "minor" impact from severe thunderstorms, with less than 10% of property in the affected area of town expected to be damaged in this type of hazard event. Holden also faces a "limited" impact from severe winds and tornados, with between 10% and 25% of property in town expected to be damaged in these types of hazard events.

As indicated in Table 21 above, the following likely impacts on the physical environment can result from tornadoes of different levels:

- EF0 - Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damage to sign boards.
- EF1 - The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving automobiles pushed off the roads; attached garages may be destroyed.
- EF2 - Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
- EF3 - Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
- EF4 - Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. In Holden, a tornado that hits residential areas would leave much more damage than a tornado with a travel path that ran along the town's less developed areas away from state routes where there is less settlement. Most buildings in the town have not been built to Zone 1 Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and 58.2% of the Town's 7,145 total housing units were constructed in 1979 or earlier

(according to 2022 American Community Survey 5-year estimates).[69]

Holden's median home value is $433,300.00 (according to 2022 American Communities Survey 5-year estimates).[70] Utilizing the total value of all property in town, $3,657,532,857,[71] and an estimated 10 percent of damage to 5 percent of all structures, the estimated amount of damage from a tornado in town is $18,287,664.29. The cost of repairing or replacing roads, bridges, utilities, and contents inside structures is not included in this estimate.

Exposure

Certain features within Holden's infrastructure, society, and environment may face more exposure to severe thunderstorms/wind/tornadoes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. Vulnerable features to severe thunderstorms/wind/tornadoes overlap with the features vulnerable to hurricanes and flooding described in the sections of this plan focusing on these other hazards.

Potential Climate Change Effects

The 2023 ResilientMass Plan identifies that current climate models predict an increase in severe thunderstorms, which have the potential to produce tornadoes. However, it is unknown if tornado frequency will increase with climate change. Some studies suggest there will be a decrease in the number of tornado days, but an increase in the number of tornadoes per day.[72]

Without a clear understanding of how climate change will impact tornadoes, the Town is not able to determine exactly how this hazard will impact population patterns and land use needs for the Town of Holden. However, if climate change does increase the likelihood of tornado occurrence, the Town may have to incorporate additional emergency shelters into development and land use.

Vulnerability

Based on the above assessment, Holden has a hazard index rating of "2 – high risk" from severe thunderstorms and winds, and a "3 – medium risk" hazard index rating from tornadoes. This is due to the relatively old age of the housing stock in Holden making the Town particularly vulnerable to tornadoes, despite their relative infrequency. There is a greater risk to the town from thunderstorms and severe winds due to their increase in frequency, and there is currently no information on the coverage of lightning rods on private and public facilities.

Mitigation Strategies

The Town of Holden is currently able to effectively respond to severe thunderstorms, wind, and tornadoes through the emergency response facilities and services identified in the critical

[69] United States Census Bureau. (2023a). *DP04 Selected Housing Characteristics: Holden MA*. Explore census data. https://data.census.gov/table?q=dp04+Holden+MA&g=060XX00US2502746820

[70] Ibid.

[71] Data Analytics and Research Bureau, "Assessed Values by Class," Dlsgateway.dor.state.ma.us, Massachusetts Department of Revenue, February 21, 2025, https://dlsgateway.dor.state.ma.us/reports/rdPage.aspx?rdReport=PropertyTaxInformation.AssessedValuesbyClass.assessedvaluesbyclass&tblassessedvalues-PageNr=17&rdDataCache=400584956&rdShowModes=&rdSort=&rdNewPageNr=True1&rdRequestForwarding=Form

[72] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-56.

infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to severe thunderstorms, wind, and tornadoes. The local HMP planning team identified the following strategies that could be used to reduce the threat of severe thunderstorms and tornados in Holden:

- Investigate and become Stormready Certified, and provide information to residents around preparedness for weather related issues, especially tornadoes.
- Replace generator at Steel Street Water Tower, currently functioning as the backup repeater system for the town's emergency communications and regional dispatch. Current generator system is unreliable.
- Install generators at town well and interconnection sites to ensure uninterrupted water services in the event of an emergency.

4.7 WILDFIRES

Wildfires are fires involving full-sized trees, meadows, and/or scrublands Typical causes of wildfires are lightning strikes, human carelessness, and arson. Relative humidity and wind and two weather-related factors that influence fire danger. Relative humidity refers to "the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure."[73] When relative moisture drops, light fuels like grasses become drier and burn more easily.[74]

FEMA has classifications for 3 different types of wildfires:

- Surface fires are the most common type of wildfire, with the surface burning slowly along the floor of a forest, killing or damaging trees.
- Ground fires burn on or below the forest floor and are usually started by lightening.
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Potential effects of wildfires include damage to structures and other human infrastructure as well as impacts on natural resources. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly, and people with respiratory and cardiovascular diseases.

LOCATION

Approximately 64% of total land area in Northern Worcester County is forested land.[75] Much of this region of Massachusetts, including the Holden area, has a high risk of wildfires for the state.[76] In Holden, an estimated 74 % of the land is forested.[77] Holden is developed in a semi-rural development pattern, favoring large lots of single family detached housing dispersed throughout the town. This creates a significant wildland interface and the total amount of the Town that could be affected by a wildfire is categorized as "large," with more that 50% of its area that could be affected by wildfires.

Holden is vulnerable to interface problems (fires spreading from unoccupied land to human development) because of its development patterns being more dispersed. While there is some higher density development around its major transportation routes, such as Route 122A, this does not represent the majority of housing stock. Human activity, which may involve cooking and camping fires as well as carelessly tossed cigarettes and other fire sources, can lead to problems for residents.

[73] "Understanding Fire Danger," Nps.gov, United States National Park Service, August 17, 2023, https://www.nps.gov/articles/understanding-fire-danger.htm.
[74] Ibid.
[75] Massachusetts Bureau of Geographic Information, "MassGIS Data: 2016 Land Cover/Land Use," Mass.gov, Massachusetts Executive Office of Technology Services and Security, May 2019, https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use.
[76] "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," September 2018
[77] Massachusetts Bureau of Geographic Information, "MassGIS Data: 2016 Land Cover/Land Use"

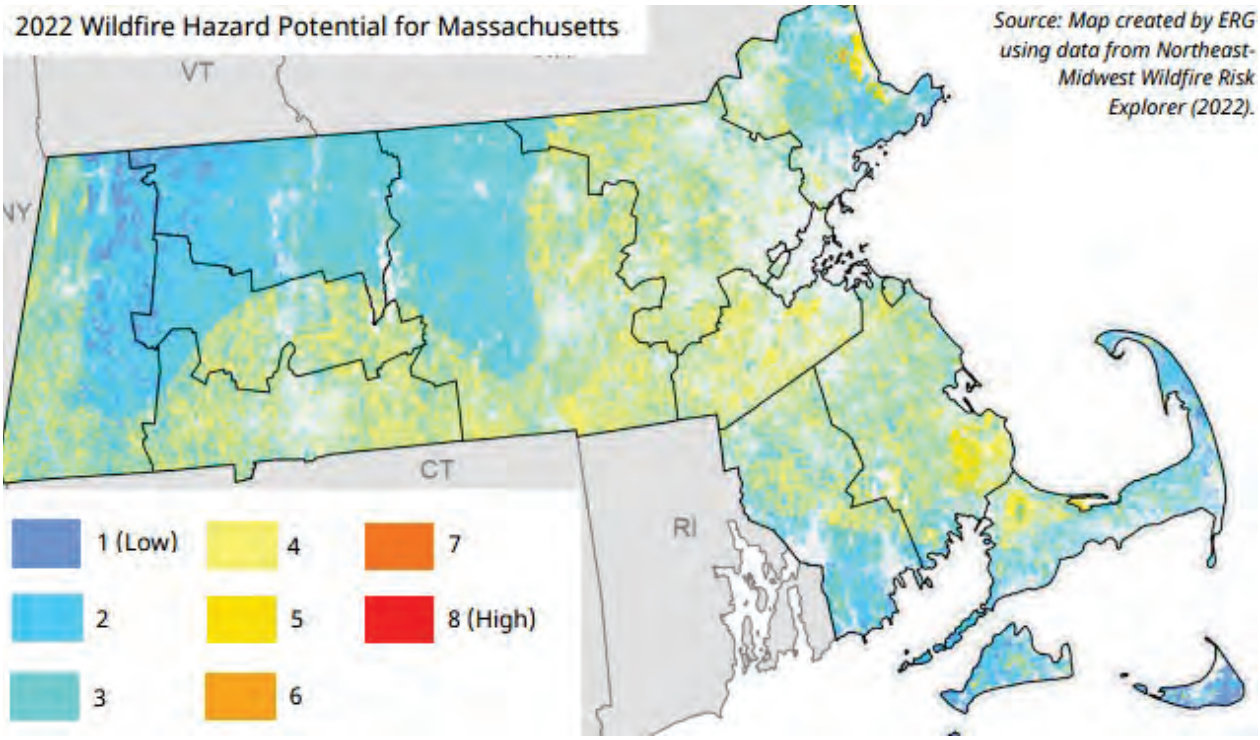


Figure 2: Wildfire Risk Areas for the Commonwealth of Massachusetts.[78]

EXTENT

Wildfires can cause widespread damage. They can spread very rapidly, depending on local wind speeds, and can be very difficult to get under control. Wildfires can last from several hours up to several days.

As was previously stated, approximately 74% of Holden's total land area is deciduous forest, evergreen forest, or forested wetland. These areas are at risk of fire and are spread evenly throughout the community, with developed areas, rivers, and major transportation corridors (such as Interstate 190) breaking up the forest. In drought conditions, a wildfire would be a matter of concern in town.

The National Fire Danger Rating system illustrates the potential extent of wildfires should they occur under different fire danger conditions:

[78] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

Table 26: The National Fire Danger Rating System

Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) Color Code: Green	Fires not easily started	Fire starts are unlikely. Weather and fuel conditions will lead to slow fire spread, low intensity, and relatively easy control with light mop up. Controlled burns can usually be executed with reasonable safety.
CLASS 2: Moderate Danger (M) Color Code: Blue	Fires start easily and spread at a moderate rate	Some wildfires may be expected. Expect moderate flame length and rate of spread. Control is usually not difficult and light to moderate mop up can be expected. Although controlled burning can be done without creating a hazard, routine caution should be taken.
CLASS 3: High Danger (H) Color Code: Yellow	Fires start easily and spread at a rapid rate	Wildfires are likely. Fires in heavy, continuous fuel, such as mature grassland, weed fields, and forest litter, will be difficult to control under windy conditions. Control through direct attack may be difficult but possible, and mop up will be required. Outdoor burning should be restricted to early morning and late evening hours.
CLASS 4: Very High Danger (VH) Color Code: Orange	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and may spread faster than suppression resources can travel. Flame lengths will be long with high intensity, making control very difficult. Both suppression and mop up will require an extended and very thorough effort. Outdoor burning is not recommended.
CLASS 5: Extreme (E) Color Code: Red	Fire situation is explosive and can result in extensive property damage	Fires will start and spread rapidly. Every fire start has the potential to become large. Expect extreme, erratic fire behavior. NO OUTDOOR BURNING SHOULD TAKE PLACE IN AREAS WITH EXTREME FIRE DANGER.

Beyond the direct hazards that wildfires pose, wildfires pose the indirect hazard of air quality reduction from smoke particulates. Smoke particulates are measured, along with other particulates that affect air quality, by the EPA's Air Quality Index.[79] For each pollutant, an AQI value of 100 generally corresponds to an ambient air concentration that equals the level of the short-term national ambient air quality standard for the protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values rise above 100, air quality is unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher. The EPA establishes an AQI for five major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health, and these pollutants are: ground-level ozone; particle pollution (also known as particulate matter, including

[79] "Air Quality Index (AQI) Basics," Airnow.gov, United States Environmental Protection Agency, accessed June 10, 2024, https://www.airnow.gov/aqi/aqi-basics/.

PM2.5 and PM10); carbon monoxide; sulfur dioxide; and nitrogen dioxide.

The AQI is divided into six categories. Each category corresponds to a different level of health concern. Each category also has a specific color. The color makes it easy for people to quickly determine whether air quality is reaching unhealthy levels in their communities.

Table 27: AQI Basics for Ozone and Particle Pollution

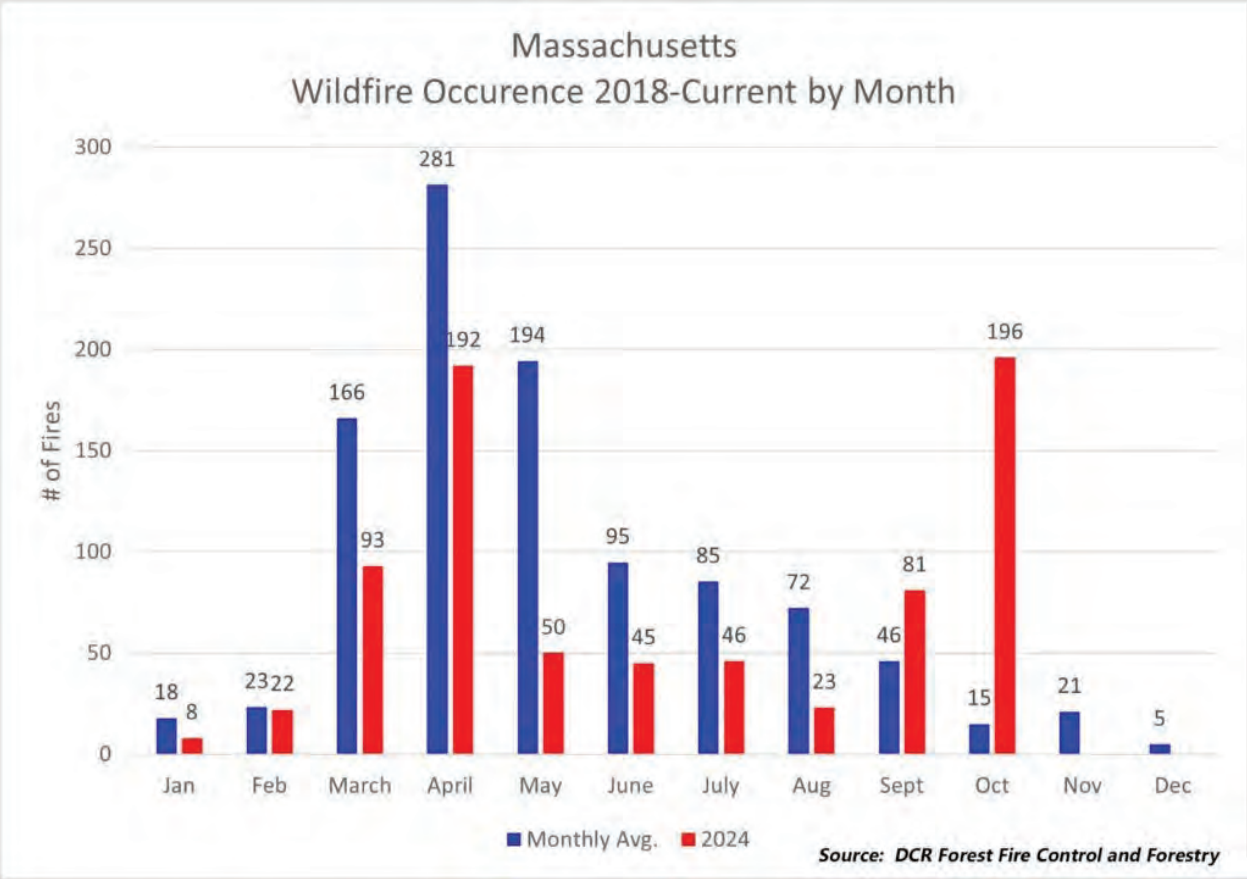
Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Previous Occurrences

Holden has a combination fire department made up of paid professional full-time and on-call members providing 24/7 coverage. In addition, Holden is part of the North Worcester County Fire Department (Mutual Aid District 8) with 30 other Towns. Holden experienced one hundred and four wildfires between 2001-2023; however, each of these fires were quite small. The largest of these fires was only two acres in size, and altogether they consumed only three acres of brush/wildland.[80]

[80] "Wildfire Data," Cmrpc-my.sharepoint.com, Massachusetts Fire Incident Reporting System, accessed September

The local HMP planning team noted that during the most recent wildfire season the town was engaged with a significant wildfire near the border with Paxton that lasted for more than 4 days and burned several acres, but was successfully contained.



Probability of Future Events

The 2023 ResilientMass Plan notes that climate-change driven changes in the intensity and frequency of precipitation and thunderstorms, prolonged drought conditions, and rising temperatures are expected to increase the frequency and severity of wildfires. In drought conditions, forest types that are not typically prone to wildfires will become more likely to burn. Globally, wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% by 2100.

Changes in weather patterns driven by climate change can intensify fires which in turn heighten the effects of climate change. By mid-century, mean summer temperatures in the Nashua River Basin

17, 2024, https://cmrpc-my.sharepoint.com/:x:/r/personal/wtalbot_cmrpc_org/_layouts/15/Doc.aspx?sourcedoc=%7B1F0B29EB-3A47-4669-B4E6-FA4FC08AD498%7D&file=Wildfire%20Data.xlsx&action=default&mobileredirect=true.

are projected to increase by between 4.5° F and 8.1° F due to climate change.[81] Rising temperatures coupled with variable precipitation could exacerbate summer drought and could encourage more high-elevation wildfires; These wildfires release stores of carbon that contribute to the buildup of greenhouse gases and therefore further exacerbate climate change.

Climate change is also predicted to bring increased wind damage from major storms and bring new types of pests, including invasive species, to the region. Both increased wind and the introduction of new pests could potentially create more debris in wooded areas and result in a larger risk of fires.

The Holden Hazard Mitigation Planning Team found it difficult to predict the likelihood of wildfires in a probabilistic manner because of the number of variables involved; fuel availability, weather and climate conditions, and human activity all factors into wildfire occurrences. However, based on regular previous occurrences of minor wildfires in town and the increase in invasive species within the Town of Holden (which is elaborated on in greater details in Section 4.12), the planning team determined the probability of future damaging wildfire events to be "moderate" (10% to 40% probability in the next year).

IMPACT

The town's development pattern puts many single-family homes within a wildland urban interface and these homes could be impacted by significant wildfire or wildfires. For this reason, the Town faces a "Limited" impact from wildfires, with damage to 10% or more of property in the affected area of town likely to occur in the case of a wildfire hazard event.

Wildfires can consume homes, other buildings, and/or agricultural resources. Wildfires impact:

- Benefits that people receive from the environment, such as food/water and the regulation of floods and drought;
- Local heritage, through the destruction of natural features;
- The economy, due to damage to property and income from land following a wildfire;
- The overall destruction of property, loss of life, and/or injuries.

Utilizing the total value of all property, $3,818,936,750.00[82] and an estimated 10 percent of damage to 1 percent of all structures, the estimated amount of damage from a wildfire in town is $3,818,936.75. The cost of repairing or replacing roads, bridges, utilities, and contents inside structures is not included in this estimate.

The Wildland Urban Interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation; the WUI represents a large percentage of the land use within Worcester County as a whole.[83]

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[81] ResilientMass Maps and Data Center, "Climate Change Projections Dashboard," Resilientma-mapcenter-mass-eoeea.hub.arcgis.com, ResilientMass, accessed July 1, 2024, https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard.

[82] Data Analytics and Resources Bureau. (2025, February 26). *Assessed Values by Class*. Division of Local Services. https://dlsgateway.dor.state.ma.us/reports/rdPage.aspx?rdReport=PropertyTaxInformation.AssessedValuesbyClass.assessedvaluesbyclass&rdScrollX=0&rdScrollY=91.19999694824219

[83] Volker C. Radeloff et al., "The 1990-2020 wildland-urban interface of the conterminous United States - geospatial data," FS.USDA.gov, Forest Service Research Data Archive, 2023, https://www.fs.usda.gov/rds/archive/products/RDS-2015-0012-4/_metadata_RDS-2015-0012-4.html.

Exposure

Certain features within Holden's infrastructure, society, and environment may face more exposure to wildfires, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- People who are sensitive to smoke, including children, the elderly, and individuals with health conditions. Air pollution from wildfires is a public health concern, as it leads to smoke inhalation which can be severe. Smoke can exacerbate respiratory conditions like asthma and can carry toxic chemicals and particulate matter. In 2021, wildfire smoke from western states and Canada extended across the continental US and forced the Massachusetts Department of Environmental Protection to issue an air quality alert;[84] and
- First responders, especially the town's firefighters.

As previously described in the 2021 example above, wildfires do not have to take place within town to affect the Town; in March through July of 2023, historic wildfires in Canada sent smoke across a broad swath of New England, peaking in June of that year. In Worcester County, these fires reduced air quality throughout the months of May and June. The AQI for Worcester County peaked at 148 – Unhealthy for Sensitive Groups for fine particulate matter (PM2.5) – on June 6th, 2023.[85]

Potential Climate Change Effects

Climate change effects will impact future wildfires, as is noted in the "Probability of Future Events" section above. According to the 2023 ResilientMass Plan, precipitation changes, prolonged drought, rising temperatures, and increased frequency of lightning are expected to contribute to increased frequency and severity of wildfire. As droughts become more frequent and severe, forest types that do not usually burn and are not fire adapted will be more likely to burn. Wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% by 2100.

Seasonal drought exacerbated by climate change may also make it more difficult to ensure a reliable water source for firefighting.

In summary, climate change is likely to increase the frequency and extent of wildfires in Holden. This increase in wildfires may lead to changes in land use, such as the Town no longer being able to develop near dense forest. Additionally, if wildfires worsen significantly, residents may desire to move away from dense forest, shifting populations from more rural areas to cities or downtown communities. The future air quality risks to Holden from wildfires are hard to predict with any certainty and represent a threat to the broader region; town officials could consider including air purifying equipment as a needed aspect of shelter planning in the future.

Vulnerability

Based on the above assessment, Holden has a hazard risk index of "3 – Moderate risk" from wildfires, due to its development patterns. However, this risk assessment is highly dependent on short-term weather patterns like wind, lightning, and rainfall, which are nearly impossible for the

[84] Kat J. McAlpine (2021, July 27). "Wildfire Smoke in New England Is 'Pretty Severe from Public Health Perspective'," BU.edu, The Brink: Pioneering Research from Boston University, July 27, 2021, https://www.bu.edu/articles/2021/wildfire-smoke-in-new-england/.

[85] "Pre-Generated Data Files," Aqs.epa.gov, United States Environmental Protection Agency, October 26, 2023, https://aqs.epa.gov/aqsweb/airdata/download_files.html.

Town to predict with certainty. Sustained drought conditions could put Holden at risk to a greater frequency and ferocity of wildfires, and wildfires outside of Holden could reduce air quality to dangerous levels in town.

Mitigation Strategies

The Town of Holden is currently able to effectively respond to wildfires through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to wildfires. The local HMP planning team identified the following strategies which could reduce the threat of wildfires in Holden:

- Maintain access points to the DCR and Worcester Watershed to prevent wildfires and brushfires. Improve Mapping of Access Points and trails and integrate into Town's GIS systems.
- Improve Coordination with Genesee and Wyoming to prevent brush fires along G&W owned rail tracks in town with Vegetative and Debris Management.
- Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wildfires and brushfires.

4.8 EARTHQUAKES

An earthquake is a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly and without warning at any time of the year. Ground shaking from earthquakes can rupture gas mains and disrupt other utility services, can damage buildings, bridges and roads, and can trigger other hazardous events such as avalanches, flash floods (which can be caused by dam failure), and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated and unstable soil, and mobile homes not tied to their foundations are especially vulnerable during an earthquake.

LOCATION

Because of the regional nature of the hazard, the entire Town of Holden is susceptible to earthquakes. This makes the location of occurrence for this hazard "large."

EXTENT

Earthquake magnitude and intensity are two measures of the overall extent of earthquakes in a given area. Magnitude is defined as the energy produced by an earthquake, and intensity is defined as an earthquake's level of effect on the Earth's physical environment, nature, people, and structures.

The magnitude of an earthquake can be measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on a seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) indicates an increase in energy of an earthquake of more than 30 times. Earthquakes are also commonly measured using the moment magnitude scale, which provides similar measurements to the Richter scale but more accurately measures earthquakes with magnitudes greater than 8.[86]

Table 28: Richter Scale Magnitudes and Effects

Magnitude	Effects
< 3.5	Generally not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
5.4 – 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 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

[86] "How Do We Measure Earthquake Magnitude? Michigan Technological University," MTU.edu, Michigan Tech, accessed June 10, 2024, https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/.

The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII; I denotes a weak earthquake and XII denotes an earthquake that causes almost complete destruction.

Table 29: Modified Mercalli Intensity Scale for and Effects[87]

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Cars move uncontrollably; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

[87] Earthquake Hazards Program, "The Modified Mercalli Intensity Scale," USGS.gov, United States Geologic Survey, accessed June 10, 2024, https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects.

Previous Occurrences

The last recorded earthquake to cause major damage in New England occurred in 1755,[88] though seismologists state that another serious earthquake occurrence in the region in the future is possible. There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Additionally, earthquakes that are based in more seismologically active regions like parts of Canada may also impact Massachusetts.[89] Earthquakes occur without warning and may be followed by aftershocks. Figure 3 below shows the locations of earthquakes that have occurred across the New England region and beyond from January 1975 through October 2017.

The last recorded earthquake to cause major damage in New England occurred in 1755,[90] though seismologists state that another serious earthquake occurrence in the region in the future is possible. Earthquakes which caused damage in New England occurred in:

- 1638 (magnitude 6.5, Concord, New Hampshire),
- 1727 (magnitude 5.6, Newburyport, MA),
- 1755 (magnitude 6.2, off the coast of Cape Ann, MA),
- 1791 (magnitude 4-5, East Haddam, Connecticut),
- 1904 (magnitude 5.9, far eastern Maine, at the border with New Brunswick),
- 1940 (magnitude 5.5, west of Whittier, New Hampshire), and
- 1973 (magnitude 4.8, across the Quebec border from northern Oxford County, Maine)[91]

There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Additionally, earthquakes that are based in more seismologically active regions like parts of Canada may also impact Massachusetts.[92] Earthquakes occur without warning and may be followed by aftershocks. Central New Hampshire is one of the most seismically active regions of New England, and earthquakes with epicenters in this region could cause damage in Holden, as New England's often very hard igneous and metamorphic bedrock causes earthquake shockwaves to travel further than they do in other regions, such as the US West Coast.[93] Figure 3 below shows the locations of earthquakes that have occurred across the New

[88] Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, "Massachusetts Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed June 10, 2024, http://nesec.org/massachusetts-earthquakes/.

[89] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[90] Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, "Massachusetts Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed June 10, 2024, http://nesec.org/massachusetts-earthquakes/.

[91] Ibid; "New England Significant Earthquake Atlas," Aki.bc.edu, Weston Observatory at Boston College, accessed February 14, 2025, http://aki.bc.edu/quakes_historical.htm; Juli Mancini, "Big Noises: The Great Connecticut Quake of 1791," Patch.com, Patch: The Haddams-Killingworth, CT, March 27, 2011, https://patch.com/connecticut/thehaddams-killingworth/big-noises-the-great-connecticut-quake-of-1791; Henry N. Berry IV, "Earthquakes in Maine," Maine.gov, Maine Department of Agriculture, Conservation, and Forestry, January 26, 2015, https://www.maine.gov/dacf/mgs/hazards/earthquakes/quake.htm.

[92] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[93] "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, https://nesec.org/new-york-earthquakes/; Kevin Skarupa, "Why New England earthquakes are felt so far from

England region and beyond from January 1975 through October 2017.

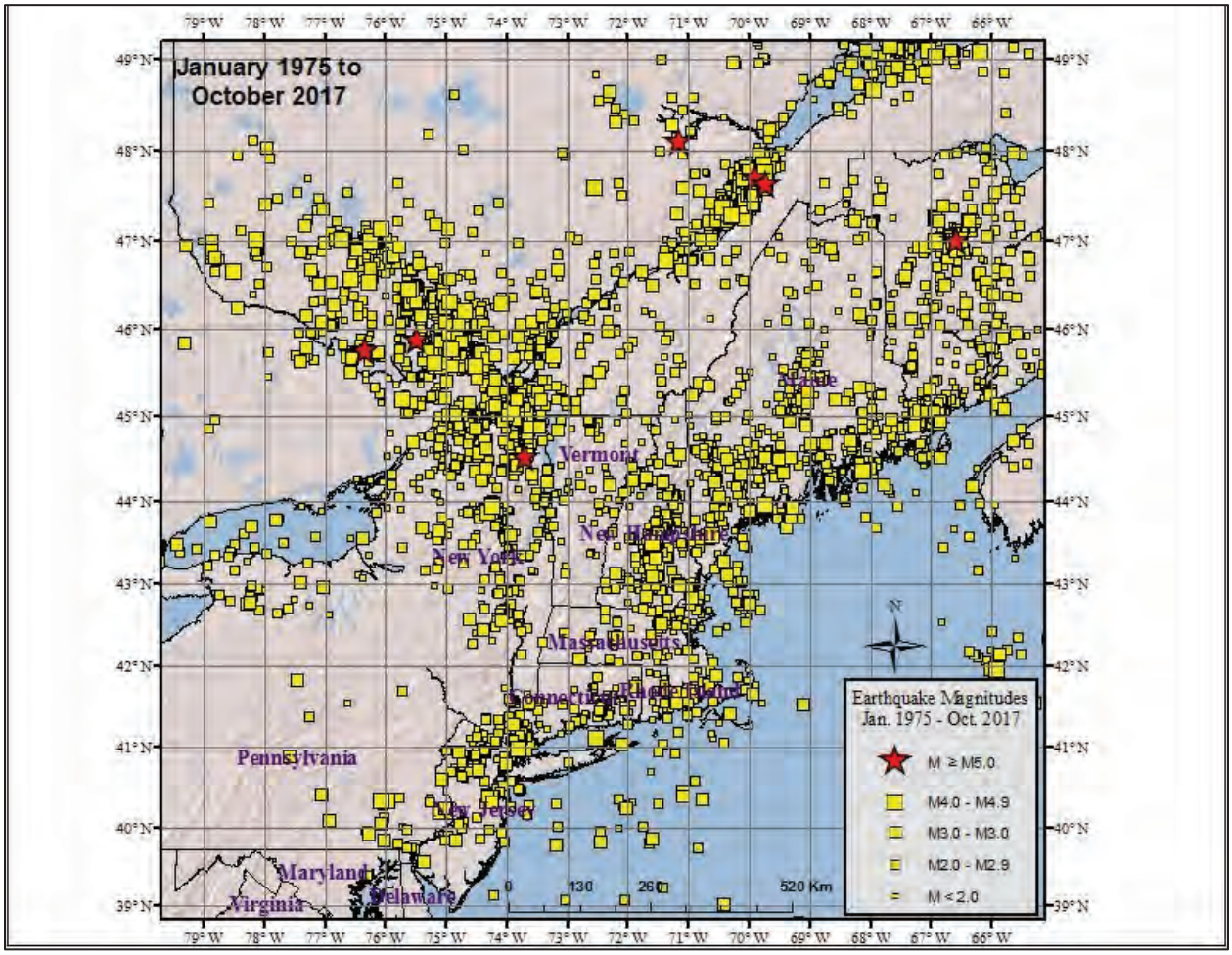


Figure 3: Map of Earthquakes of the Northeastern US and Southeastern Canada 1975 to 2017.[94]

The local hazard mitigation planning team reports that no earthquakes have recently been felt in Holden. To determine whether earthquakes have occurred recently near Holden, earthquake data over the past six years for all Massachusetts cities and towns gathered by the Weston Observatory at Boston College was reviewed.

The Weston Observatory utilizes two scales to track the magnitude of earthquakes. One of these scales is the Nuttli magnitude (Mn) for North America east of the Rocky Mountains. Weston Observatory also utilizes the Coda Duration magnitude (Mc) scale, which is based on the duration of shaking at a particular station. The Coda Duration magnitude can quickly estimate the magnitude of an earthquake before its exact location is known.

The following earthquakes with a magnitude of over 2.0 on either the Nuttli magnitude or Coda

epicenters," WMUR.com, WMUR9-ABC, January 27, 2025, https://www.wmur.com/article/feeling-new-england-earthquakes-bedrock/63574691.

[94] "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, https://nesec.org/new-york-earthquakes/.

Duration magnitude scales have been recorded at the Weston Observatory since 2018:

- 12/21/2018 – 3 km WSW of Gardner, 2.1/2.1 [Mn*/Mc**]
- 8/21/2019 – 2 km SSE of Wareham, 1.7/2.4
- 12/3/2019 – 4 km SSE of Plymouth, 1.6/2.2
- 11/8/2020 – 11 km SW of New Bedford, 3.8/3.4
- 11/22/2020 – 12 km WSW of New Bedford, 1.7/2.6
- 07/25/2021 – 5.0km W OF PEABODY 1.4/2.5 [Mn*/Mc**]
- 01/01/2022 – 13.0km N OF ROCKPORT 2.3/3.0
- 03/04/2022 – 5.0km WSW OF ORANGE 2.2/2.7
- 11/10/2022 – 12.0km NW OF NANTUCKET 2.6/3.0
- 11/13/2023 – 208.0km E OF CHATHAM 2.8/3.3
- 12/26/2023 – 52.0km ENE OF ROCKPORT 2.2/2.8
- 03/11/2024 – 6.0KM E OF LAWRENCE 1.1/2.1

*Mn is the Nuttli Magnitude (see below)
**Mc is the Coda Duration Magnitude (see below)

Each of these earthquakes are minor. Additionally, earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally.

On August 23, 2011, an earthquake measuring 5.8 on the Richter scale centered in Virginia was felt in much of the northeast, but this earthquake was not felt in Holden according to the local HMP planning team.[95]

Probability of Future Events

The 2023 ResilientMass Plan notes that "The probability of a magnitude 5.0 or greater earthquake centered in New England in a 10-year period is about 10–15%."[96] Additionally, this plan notes that while Massachusetts is not near any tectonic plate boundaries, it is still susceptible to earthquakes on the North American Plate. Earthquakes elsewhere could also have secondary effects to the state and the region, such as potentially disrupting supply chains.

Based upon existing records, there is "very low" frequency (less than 1 percent probability in any given year) of damaging earthquakes in Holden.

Impact

Massachusetts introduced earthquake design requirements into its state building code in 1975 and improved its state building code for seismic resilience in the 1980s. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, and electrical power lines and facilities built before the 1980s may not be designed to withstand the forces of an earthquake. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and 58.3% of the Town's 7,145 total housing units, according

[95] Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, "Massachusetts Earthquakes," NESEC.org.
[96] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-42.

to 2022 American Community Survey 5-year estimates, were constructed in 1979 or earlier.[97] Seismic standards in Massachusetts were upgraded with the 1997 revision of the state building code. Despite its fairly old housing stock, Holden faces a "minor" impact from earthquakes, with damage to less than 10% of property in town likely to occur in the event of an earthquake due to the extreme rarity of damaging events.

HAZUS-MH (multiple-hazards) is a computer program developed by FEMA which estimates losses due to a variety of natural hazards. The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter is at the geographic center of the study area. For the purposes of this plan, a magnitude 5.0 earthquake was selected for analysis. Historically, major earthquakes are rare in New England, although a magnitude 5 earthquake occurred in the region in 1963.

Table 30: HAZUS Potential Damages from a Magnitude 5.0 Earthquake with an Epicenter in Holden

	Magnitude 5.0
Building Characteristics	
Estimated total number of buildings	6822
Estimated total building replacement value (2024 $)	$ 3,289,945,000.00
Building Damages	
# of buildings sustaining slight damage	2,066
# of buildings sustaining moderate damage	959
# of buildings sustaining extensive damage	186
# of buildings completely damaged	34
Population Needs	
# of households displaced	113
# of people seeking public shelter	51
Debris	
Building debris generated (tons)	42,000
# of truckloads to clear debris (@ 25 tons/truck)	1,680
Value of Damages (dollars)	
Total property damage	$342,160,500.00
Total losses due to business interruption	$45,539,200.00

For more information on the HAZUS-MH software, go to www.fema.gov/hazus-software.

EXPOSURE

Certain features within Holden's infrastructure, society, and environment may face more exposure to earthquakes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Older buildings constructed prior to the first edition of the Massachusetts State Building

[97] United States Census Bureau. (2024). ACS 5 Year Estimates DP04 Selected Housing Characteristics. Data.Census.gov. https://data.census.gov/table?q=ACS+dp04+Holden+MA&g=060XX00US2502730560

Code (these buildings would see substantial damage in the case of an earthquake similar in magnitude and length to the 1755 Cape Ann earthquake); and

- Underground infrastructure, which is especially vulnerable to earthquakes due to the glacial outwash sand and gravel and glacio-lacustrine fine sand, silt and clay which make up a large portion of the Town's soils being prone to liquefaction during prolonged shaking when the water table is shallow.[98]

Potential Climate Change Effects

The 2023 ResilientMass Plan identifies no climate change effects that pertain to earthquake hazards.

Vulnerability

Based on the above analysis, Holden has a hazard index rating of "5 – lowest risk" from earthquakes.

Mitigation Strategies

The Town of Holden is currently able to effectively respond to earthquakes through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand its existing capabilities to mitigate and respond to earthquakes. The local HMP planning team identified the following strategies that could be used to reduce the threat of earthquakes in Holden:

- Replace Chaffin Fire Station (Station 2) to improve Fire Service to local neighborhood and Surrounds. Current fire station on 87 Adams Road [Note add to CI list if not included] is a 2 bay station constructed in the 1980's and is inadequate to meet current needs, as well as having significant structural deficiencies such as a collapsing roof and being not up to code for any significant seismic event.
- Participate in regional evacuation plan updates as they arise.
- Distribute an emergency kit list to all citizens to encourage self-preparedness for hazard
- events.

[98] "What is liquefaction," USGS.gov, United States Geological Survey, April 19, 2023, https://www.usgs.gov/faqs/what-liquefaction; "Soil Survey Map," ArcGIS.com, ESRI, accessed February 14, 2025, https://www.arcgis.com/apps/View/index.html?webmap=38a93357a08b4f6d94d7e07a424fafd5.

4.9 Dam Failure

Dams and their associated impoundments provide many benefits, such as water supply, recreation, hydroelectric power generation, and flood control, to communities. However, dams also pose a risk to lives and property in cases in which they fail. Dam failure is not a common occurrence, but dams do represent a potentially disastrous hazard.

When a dam fails, the potential energy of the stored water behind the dam is released rapidly. Some dam failures occur when floodwaters overtop and erode the material components of the dam. Other dam failures are caused by foundation defects, inadequate maintenance, internal erosion caused by seepage, and other specific causes.[99] Dam failures may be influenced by storm floodwaters, but most dam failures are caused by structural, mechanical, or hydraulic failures.[100] Dam breaches can lead to catastrophic consequences; they cause water to rush in a torrent downstream, flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage resulting from a dam failure will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built during the 19th century without the benefit of modern engineering design and construction oversight. Dams of this age are more vulnerable to failing because of structural problems caused by their age and/or lack of proper maintenance, as well as due to structural damage caused by an earthquake or flooding. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00).[101] Dams that are in excess of 6 feet in height (regardless of storage capacity) and that have more than 15 acre-feet of storage capacity (regardless of height) are under DCR regulation. Dam safety regulations enacted in 2005 transferred significant responsibilities for dams from the Commonwealth of Massachusetts to dam owners, including the responsibility to conduct dam inspections.

During the planning process it was determined that the town would require a specific appendix for High and Significant Hazard Dams that affect the town of Holden. This appendix is included in the appendix of this plan, and the hazard analysis is summarized in this section of the plan.

Location

According to the Massachusetts Office of Dam Safety, there are 29 dams in Holden. Of these dams, six are ranked as High Hazard and seven are ranked as Significant Hazard and two are ranked as Low Hazard. The remainder are rated N/A or not applicable. Holden is home to several reservoirs that feed into the Worcester Water system and is a downstream customer of Worcester

[99] Association of State Dam Safety Officials. (n.d.). Dam Failures and Incidents. Association of State Dam Safety Officials. Retrieved December 29, 2021, from https://damsafety.org/dam-failures

[100] "Living with Dams: Know Your Risks (FEMA P-956)," Federal Emergency Management Agency, February 2013, page 9, https://www.fema.gov/sites/default/files/2020-08/fema_living-with-dams_p-956.pdf.

[101] "Section 44: Definitions applicable to Secs. 44 to 48B," MAlegislature.gov, The 193rd General Court of the Commonwealth of Massachusetts, accessed September 17, 2024, https://malegislature.gov/Laws/GeneralLaws/PartIII/TitleIV/Chapter253/Section44; "302 CMR 10.00: Dam safety," Mass.gov, The Commonwealth of Massachusetts, Massachusetts Court System, February 10, 2017, https://www.mass.gov/regulations/302-CMR-1000-dam-safety#:~:text=302%20CMR%2010.00%20provides%20regulatory%20guidelines%20for%20the,public%20review%20of%20the%20performance%20of%20a%20dam.

Water as well.

Table 31: Dams within and/or Owned by Holden

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00619	Holden Reservoir Dam #2	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00622	Kendall Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00623	Pine Hill Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00929	Quinapoxet Reservoir Dam	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00960	Holden Reservoir Dam #1	Public – City of Worcester	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA00979	Eagle Lake Dam	Private	Office of Dam Safety	High Hazard	This Dam is discussed in greater detail in Appendix G.
MA01303	Dawson Pond Dam	Public – Department of Conservation and Recreation	Office of Dam Safety	Low Hazard	This Dam is discussed in greater detail in Appendix G.
MA01247	Peter Carr Pond Dam	Public – City of Worcester	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G.
MA01635	Cournoyer Pond Dam	Private	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G.
MA01636	Frank Marsh Pond Dam	Private	Non-Jurisdictional - Other	N/A	
MA01637	Bock Pond Dam	Private	Non-Jurisdictional - Other	N/A	

MA01638	Holden Trap Rock Pond Dam	Private	Non-Jurisdictional - Other	N/A	
MA01639	Koenigs Lilly Pond Dam	Private	Non-Jurisdictional - Other	N/A	
MA01640	Current Meter Pond Dam	Private	Office of Dam Safety	Significant Hazard	This Dam is discussed in greater detail in Appendix G.
MA01641	Lindstroms Shiner Pond Dam	Private	Non-Jurisdictional – Other	N/A	
MA01642	Swimming Pool Dam	Private	Non-Jurisdictional – Other	N/A	
MA01643	Parsons Pond Dam	Private	Non-Jurisdictional – Other	N/A	

Inundation areas for these dams within Holden cover less than 10% of the Town, or a "small" portion of its area.

EXTENT

As stated in the introduction to this dam failure section, dam or levee breaches often lead to catastrophic consequences; water released by a breach ultimately rushes in a torrent downstream, flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage which a dam failure causes will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Dams in Massachusetts are assessed according to their risk to life and property. The state has three hazard classifications for dams:

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

Some dams do not have a hazard rating.

The extent of the risk that dam failure poses in Holden is greater due to the high number of high and significant hazard dams in town that are in "fair to poor" condition. Greater detail is included in the HHPD Appendix at the end of this plan.

Previous Occurrences

To date, there have been no catastrophic dam failures in Holden.

Probability of Future Events

The probability of future dam failure events in Holden is difficult to quantify, as dam failures are rare occurrences. According to the 2023 ResilientMass Plan, the frequency of 1% or 0.25% annual chance river flow events at High or Significant hazard dams is likely to increase in both the near and mid-term in Worcester County[102]. Presently, we estimate the likelihood of a dam failure event in Holden to be approximately 1.3%, or "low" in the next year.

Impact

The Town faces a "catastrophic impact" from the failure of dams, with more than 50% of property in affected area damaged or destroyed in the case of a dam failure event.

It is not possible to estimate the property loss impacts of dam failure quantitatively given the large number of variables involved in failure events. Qualitatively, losses from failure of an individual dam could be significant but would likely be geographically limited to portions of the dam's inundation zone. The geographic areas included in dam inundation zones may change with future improvements to dam breach modeling software which are being developed and are currently in early trial stages, such as the DSS-WISE™ (Decision Support System for Water Infrastructural Security) program.[103]

Exposure

Certain features within Holden's infrastructure, society, and environment may face more exposure to dam failures, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Structures located within the inundation areas of Significant and High Hazard Dams;
- Downstream waterway infrastructure; and
- Poorly maintained or inspected dam infrastructure held in public or private hands.

In the aggregate, if we look at all the properties located within the inundation zones of all of the high and significant hazard dams in Holden there are 813 properties in Holden, 1025 properties in the city of Worcester, and 3 properties in nearby West Boylston that are at risk. Within Holden itself the properties consist of Residential, Commercial, Municipal, Essential Government Services, Schools, Community Centers and Road and Rail Infrastructure. This includes the Town Hall, Police Department, Fire Department, High School and even other downstream dams.

Potential Climate Change Effects

Intensified and more frequent flooding caused by climate change can increase dam failure risk. Flooding can cause dam failure through overtopping; Overtopping occurs when floodwaters flowing into a dammed body of water exceed the spillway capacity of the dam and cause water to flow over the top of the dam. If the water flowing over the dam erodes the dam, then a dam failure can

[102] 2023 ResilientMass Plan, Appendix 5.8, Pgs 39-40

[103] "About DSS-WISE™ Web," Dsswiseweb.ncche.olemiss.edu, University of Mississippi, accessed June 10, 2024, https://dsswiseweb.ncche.olemiss.edu/userpages/about.php.

occur. Therefore, the risk of dam failure may be indirectly impacted by climate change through intensified flooding.

VULNERABILITY

Based on a mostly qualitative assessment, Holden has a hazard index rating of "1 – Highest risk" from dam failure. Further analysis to support this vulnerability assessment is included in the HHPD appendix, but to summarize many of the high hazard dams in Holden are in Fair to Poor condition, indicating that there are significant structural, operational and maintenance deficiencies in 9 of the 14 high and significant hazard dams. Additionally, many of these dams have an unclear ownership structure, being split between multiple parties with an unclear responsibility for maintenance and monitoring of those dams. Finally, many of these dams lack the foundational safety of an up-to-date Emergency Action Plan (and in some cases, lack an EAP entirely). Each of these items alone would be enough to give pause but taken together they represent the greatest natural hazard concern to the Town of Holden and catastrophic damage to property and the Town's current and future assets and/or injuries to people may occur should any one of these dams fail, potentially causing a cascade failure of dams in town that affects the region more broadly.

MITIGATION STRATEGIES

The Town of Holden is currently in an ad hoc/emerging resilience maturity model as it pertains to High Hazard Potential Dams[104]: The risks that these dams pose are well understood, however the ability to mitigate from and respond to this is hampered by a number of factors that are elaborated on in the HHPD appendix. There are several opportunities identified by the local hazard mitigation planning team for the Town to expand on its existing capabilities to mitigate and respond to dam failures. The local HMP planning team identified the following strategies that could be used to reduce the threat of dam failure in Holden:

- Coordinate with the City of Worcester on the repairs of Pine Hill Reservoir Dam and other City of Worcester owned Dams in Holden.
- Determine ownership of Old Grist Mill Pond Dam. Conduct Inspections and Evaluations of Old Grist Mill Pond Dam, following confirmation of town's ownership of the Dam. Carry out recommended repairs and improvements of structural components of the dams.
- Enforce dam safety rules and regulations in coordination with the Office of Dam Safety to ensure that inspections and evaluation reports for privately owned dams in town are being created and followed through with recommended action items for structural improvements.

[104] FEMA National Resilience Guidance (August 2024), page 34.

4.10 DROUGHT

Drought is a normal and recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Drought is a lack of precipitation over an extended period of time which results in a prolonged water shortage for some activity, group, or environmental sector. The direct impacts of droughts include: reduced crop yields; reduced rangeland and forest productivity; increased fire hazards; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat. Drought impacts can have far-reaching effects throughout the region and even the country.

LOCATION

Because of this hazard's regional nature, a drought would likely impact the entire community, meaning the location of occurrence within Holden of this hazard is "large."

EXTENT

The National Drought Mitigation Center records information on historical drought occurrences. Unfortunately, drought data are only available at the state and county levels and not at the local level. The National Drought Mitigation Center categorizes drought severity on a D0-D4 scale as is shown below.

Table 32: National Drought Mitigation Center D0-D4 Scale[105]

Classification	Category	Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells leading to water emergencies

More severe drought will lead to more impactful changes in groundwater by reducing water table levels and affecting groundwater quality. The United States Geological Survey's National Groundwater Conditions web application measures groundwater levels by monthly percentiles as

[105] "Drought Classification," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx.

compared to historic levels at each particular site.[106] In Massachusetts, the quality of drinking water, including from groundwater sources, is assessed by measuring maximum containment levels (MMCLs) from a number of inorganic and organic chemical, radionuclide, and biological contaminants.[107]

Previous Occurrences

In Massachusetts, nine extreme droughts have occurred statewide since 1930. These historic major droughts range in severity and in length, lasting from three to eight years. During many of these droughts, water supply systems around the state were found to be inadequate; At the times of these droughts, water was piped into urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The Holden area has been spared the most severe impacts in each of these droughts according to the information for Massachusetts included in the USGS Water Supply Paper #2375.[108]

The following table shows peak drought severity data in Massachusetts from the National Drought Mitigation Center for each year since 2000:

Table 33: Peak Drought Severity Data in Massachusetts Per Year Since 2000[109]

Year	Maximum Severity
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 100% of the state
2003	No drought
2004	D0 conditions in 48% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 69% of the state
2009	D0 conditions in 45% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state
2013	D1 conditions in 60% of the state
2014	D1 conditions in 54% of the state

[106] Lee Stanish, "Introducing the National Groundwater Conditions web application," Waterdata.usgs.gov, United States Geological Survey, accessed April 7, 2025, https://waterdata.usgs.gov/blog/groundwater-levels-app/.
[107] "Drinking Water Standards and Guidelines," Mass.gov, the Massachusetts Department of Environmental Protection, accessed April 7, 2025, https://www.mass.gov/guides/drinking-water-standards-and-guidelines.
[108] Richard W. Paulson et al., "National Water Summary 1988-89 – Hydrologic Events and Floods and Droughts," *United States Geological Survey Numbered Series Water Supply Paper,* no. 2375 (1991), https://doi.org/10.3133/wsp2375, page 329.
[109] "Statistics by Threshold," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/DmData/DataDownload/StatisticsbyThreshold.aspx.

2015	D1 conditions in 58% of the state
2016	D3 conditions in 52% of the state
2017	D3 conditions in 9% of the state
2018	D1 conditions in 36% of the state
2019	D0 conditions in 85% of the state
2020	D3 conditions in 36% of the state
2021	D2 conditions in 1% of the state
2022	D3 conditions in 70% of the state
2023	D1 conditions in 0.4% of the state
2024 (through late August)	D2 conditions in 0.4% of the state

The following table shows peak drought severity data in Worcester County from the National Drought Mitigation Center for each year since 2018:

Table 34: Peak Drought Severity Data in Worcester County Per Year Since 2018[110]

Year	Maximum Severity
2018	D1 conditions in 33% of Worcester County
2019	D0 conditions in 100% of Worcester County
2020	D3 conditions in 14% of Worcester County
2021	D1 conditions in 51% of Worcester County
2022	D3 conditions in 53% of Worcester County
2023	D0 conditions in 74% of Worcester County
2024	D0 conditions in 11% of Worcester County

In Holden, there have been no recorded drought events with substantial impacts in recent decades. The Town is supplied through town water, which is well fed, and approximately 82% of town residents are on the town water system, with the remainder of households in town on private wells. The town has a number of interconnections with the Worcester Water system that the town uses to supplement town water sources during the summer and during shortages. The town is home to several reservoirs for Worcester Water as well, so groundwater recharge is currently not a significant concern. Worcester county is, as of time of writing, in critical drought conditions as declared by the Massachusetts Executive Office of Energy and Environmental Affairs.[111]

Probability of Future Events

In Holden, as in the rest of the state, the probability of extreme and exceptional droughts is "low" (a 1% to 10% chance in the next year). Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, Central Massachusetts may be slightly more vulnerable than parts of eastern Massachusetts to severe drought conditions.[112] However, many factors such as

[110] Ibid.

[111] Massachusetts Drought Alert November 8, 2024

[112] "Massachusetts Drought Management Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2023,

water supply sources, population, economic factors (i.e., if an area has an agriculture-based economy), and infrastructure may affect the severity and length of a drought event in different parts of the state.

The long-term risk of drought, including extreme and exceptional drought, may increase in Holden due to climate change influences. Specifically, climate change may cause an increase in consecutive dry days over time.

IMPACT

The specific impacts of drought in Massachusetts are categorized by the National Drought Mitigation Center in Table 23 below:

Table 35: Historic Impacts of Drought in Massachusetts[113]

Category	Historically observed impacts
D0	Crop growth is stunted; planting is delayed
	Fire danger is elevated; spring fire season starts early
	Lawns brown early; gardens begin to wilt
	Surface water levels decline
D1	Irrigation use increases; hay and grain yields are lower than normal
	Honey production declines
	Wildfires and ground fires increase
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
D2	Specialty crops are impacted in both yield and fruit size
	Producers begin feeding cattle; hay prices are high
	Warnings are issued on outdoor burns; air quality is poor
	Golf courses conserve water
	Trees are brittle and susceptible to insects
	Fish kills occur; wildlife move to farms for food
	Water quality is poor; groundwater is declining; irrigation ponds are dry; outdoor water restrictions are implemented
D3	Crop loss is widespread; Christmas tree farms are stressed; dairy farmers are struggling financially
	Well drillers and bulk water haulers see increased business
	Water recreation and hunting are modified; wildlife disease outbreak is observed
	Extremely reduced flow to ceased flow of water is observed; river temperatures are warm; wells are running dry; people are digging more and deeper wells

The 2023 ResilientMass plan notes that while drought is a naturally occurring climate phenomenon,

https://www.mass.gov/doc/massachusetts-drought-management-plan/download.

[113] "State Impacts," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx.

its impacts can be exacerbated by human behavior. The volume and rate of groundwater withdrawn from underground aquifers can impact the amount of water that flows through surface water bodies; high rates of groundwater withdraw can negatively impacting aquatic ecosystems. Additionally, more impervious surface coverage, and some forms of stormwater infrastructure, can prevent the natural infiltration of precipitation into groundwater and can therefore exacerbate drought.[114]

Specific drought impacts in Holden may vary among and between customers of the Town's water system and private well users. While the impact of a drought can be assessed as "minor" overall, with very little damage to property (damage to less than 10% of property in the area affected by the hazard), injuries, or loss of life likely to occur in town, drought impacts may be higher in the parts of town that are not located within the Town's water service area.

Exposure

Certain features within Holden's infrastructure, society, and environment may face more exposure to drought, or be disproportionately impacted by it, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Residences or businesses with shallow wells;
- Wild plants and animals, including trees; and
- Vegetation, which may become more vulnerable to wildfire due to prolonged drought.

Higher water bills and/or the cost of re-drilling private wells due to drought impacts could also negatively affect residents in town. Other factors like PFAS contamination of water sources could compound drought-related water supply challenges. Contaminants, including PFAS, can pose greater risk to the community after shifting position due to drought-driven changes in groundwater.[115]

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences drought frequency and severity.

- The frequency and extent of droughts are projected to increase in summer and fall as higher temperatures result in more evaporation, snow melts earlier in the year, and precipitation becoming less frequent yet more extreme when it does occur.
- Rising temperatures and changes in precipitation patterns will reduce snowpack and hasten snowmelt and therefore can exacerbate drought. The process of reduced snowmelt can result in less snowmelt recharge of groundwater, less snowmelt feeding stream flows, and less snowmelt available as an agricultural water source.

A common concern among town residents who responded to the survey was that wells in town may dry up in the future during drought events. Holden is less vulnerable to dried-up wells resulting from drought than other communities in the CMRPC region, as the majority of the Town's residents are connected to the Town's public water system and get their water from Massachusetts Water Resources Authority-owned reservoirs. According to the 2023 ResilientMass Plan, climate change is

[114] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[115] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.

predicted to affect groundwater availability;[116] the increased frequency and duration of drought conditions will increase the risk in town of wells drying up.

In summary, climate change is likely to increase the frequency and extent of drought in Massachusetts. Drought that is worsened by climate change can have numerous community-wide implications in Holden. Due to the impacts of drought on crop yield, land use designated for farming could be altered or reduced. In addition, drought is predicted to worsen significantly in other parts of the country, particularly in the southwestern United States, and it is possible that this could result in people from other parts of the country moving to the northeast, including to Holden.

VULNERABILITY

Based on the above assessment, Holden has a hazard index rating of "4 – low risk" from drought. Minimal or no loss of or damage to property, injuries, or loss of life is expected from drought in town.

MITIGATION STRATEGIES

The Town of Holden is currently able to effectively respond to drought through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand its existing capabilities to mitigate and respond to drought. The local HMP planning team identified the following strategies that could be used to reduce the threat of drought in Holden:

- Provide information to residents and businesses on water conservation through low-impact landscaping and other measures (to conserve water in times of drought)
- Continue to utilize the MA Drought Management Plan as a template for the Town's own plan and integrate State's recommendations and actions according to town needs.
- Continue to follow Worcester's Drought Plan and help enforce water conservation measures as a successor water system.

[116] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.

4.11 Extreme Temperatures

The 2023 ResilientMass Plan states that there are no universal definitions of "extreme heat," "extreme cold," or "extreme temperatures"; these terms are relative terms whose meaning depends on the normal average temperatures and climatic highs and lows in a region. Extreme heat in Massachusetts is typically defined as a period of three or more consecutive days with temperatures above 90 °F.[117] Extreme heat may also refer to any prolonged period of especially hot weather (which is called a heat wave) which may also be accompanied by high humidity. Extreme cold, like extreme heat, is a dangerous situation that can result in health emergencies for susceptible people. People without shelter, who are stranded, or who live in homes that are poorly insulated or are without heat and/or air conditioning are especially at risk to extreme temperatures.

For Massachusetts, extreme temperatures can be defined as those that are far outside the normal ranges. Normal temperatures within the period ranging from 1991-2020 for the Holden:[118]

Table 36: Normal Temperatures in the Period Between 1991-2020 in the Holden Area[119]

	July (Hottest Month)	January (Coldest Month)
Average High (°F)	79.8°	32.3°
Average Low (°F)	61.7°	17.1°

The National Weather Service's (NWS's) specific criteria for issuing extreme heat and extreme cold watches, warnings, and advisories are described in the Extent section below.

Location

Extreme temperatures can be expected to be uniform across Holden during a given extreme temperature event, due to the Town's lack of extreme elevations, urban areas, and coastal areas. Therefore, this hazard has a "large" geographic coverage in town.

Extent

The NWS uses the heat index scale to categorize extremely hot temperatures. This scale combines relative humidity with actual air temperature to determine the risk to humans. The NWS issues an Excessive Heat Advisory if the heat index is forecast to reach 95°F-99°F for 2 or more hours over 2 consecutive days, or 100°F-104°F for 2 or more hours over 1 day. The NWS issues an Excessive Heat Warning when the daytime heat index is forecasted to reach 105°F for 2 or more hours. The NWS defines a Heat Wave as 3 or more days of greater than or equal to 90°F temperatures. The following chart indicates the relationship between heat index and relative humidity:

[117] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-2.
[118] "Climate," Weather.gov.
[119] "U.S. Climate Normals Quick Access," Ncei.noaa.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 25, 2024, https://www.ncei.noaa.gov/access/us-climate-normals/.

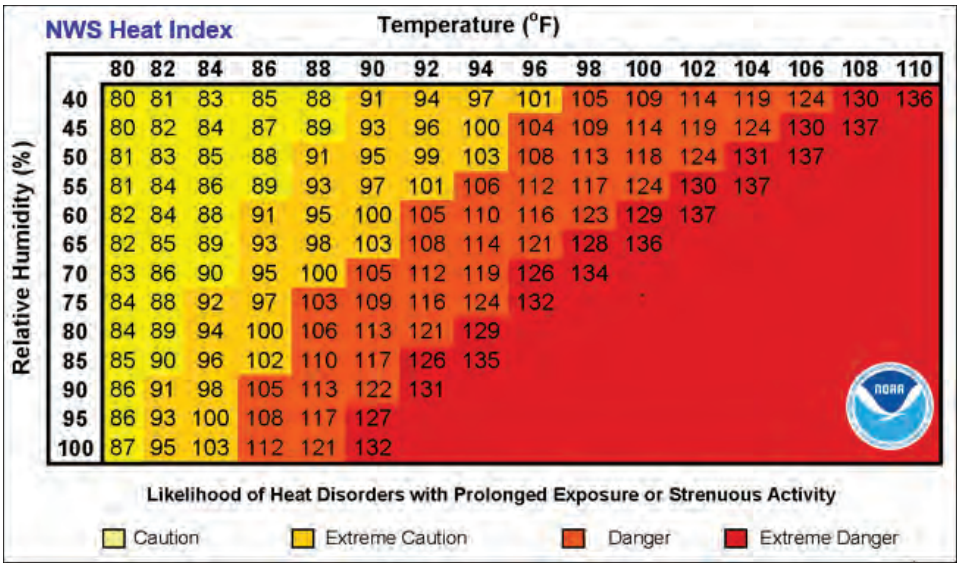


Figure 4: Heat Index[120]

Extreme heat causes more fatalities in the United States that all other weather-related natural hazards combined.[121] Extreme heat can be the underlying cause of death or can worsen other medical conditions like heart disease, hypertension, alcohol poisoning, and drug overdoses.[122] The heat-related mortality rate is higher among males and people aged 65 years and older.[123]

Table 34: Heat Effects on Body lists the effects of extreme heat on the body at different levels of the heat index. It is important to note that while temperatures exceeding 100°F are unusual for Central Massachusetts, high humidity is very common during the summer and can drive the heat index in the region to dangerous levels / temperatures above 100°F.

Table 37: Heat Effects on Body[124]

Classification	Heat Index	Effect on Body
Caution	80°-90°F	Fatigue possible with prolonged exposure and/or physical activity.
Extreme Caution	90°-103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°-124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F+	Heat strokes highly likely

[120] National Weather Service, "What is the heat index?," Weather.gov, National Oceanic and Atmospheric Administration, accessed September 16, 2024, https://www.weather.gov/ama/heatindex.
[121] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[122] Ambarish Vaidyanathan et al., "Heat-Related Deaths—United States, 2004–2018," *Morbidity and Mortality Weekly Report* 69, no. 24 (2020): 729-734. https://doi.org/10.15585/mmwr.mm6924a1.
[123] Ibid.
[124] National Weather Service, "What is the heat index?"

Other impacts of high temperatures include drought, wildfire, and the formation of ground-level ozone.[125] Prolonged heat can cause power use to spike and in turn can overload the electrical grid, causing outages.[126] Extreme heat and cold can both negatively impact transportation infrastructure; Railroad tracks are a particular concern because metal rails can kink in high temperatures.[127]

The 2023 ResilientMass Plan notes that the extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. The wind chill temperature is the temperature that people and animals feel when outside; it is based on the rate of heat loss from exposed skin due to the effects of wind and cold.[128] In Massachusetts, the National Weather Service (NWS) Norton Forecast Office issues a wind chill warning when the Wind Chill Temperature Index, based on sustained wind, is –25°F or lower for at least three hours. The NWS Wind Chill Chart below shows three shaded areas of combinations of wind and temperature conditions in which there is frostbite danger; Each shaded area shows how long a person can be exposed before frostbite develops.

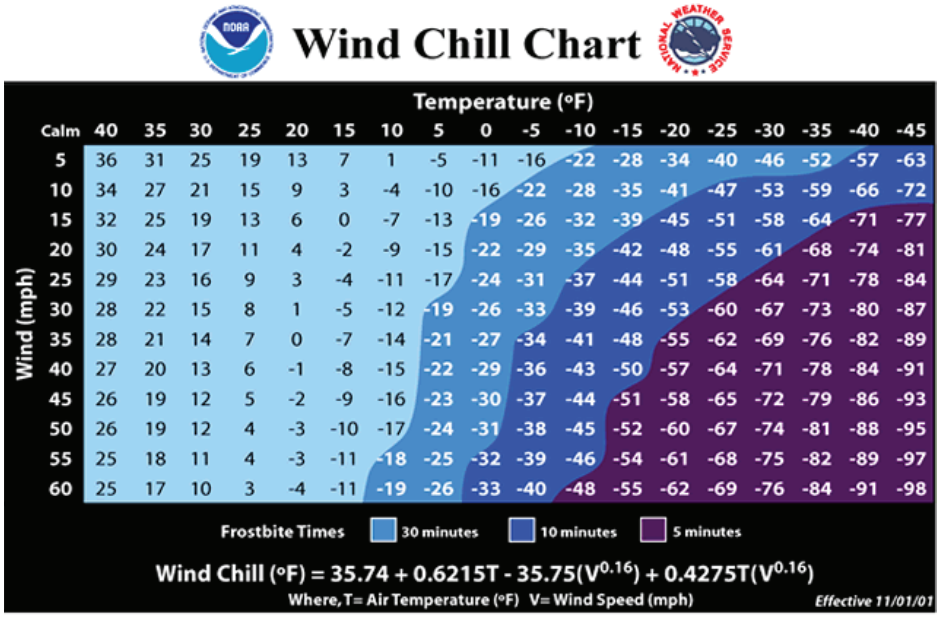


Figure 5: NWS Wind Chill Temperature (WCT) index.[129]

Cold temperatures are often combined with winter storms. People may experience the loss of heat and power in their homes and workplaces due to storm damage, which could further subject them to the cold.[130] Carbon monoxide poisoning is another risk during cold weather, especially when households lack adequate power or heat.[131]

[125] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[126] Ibid.
[127] Ibid.
[128] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.
[129] National Weather Service, "Understanding Wind Chill," Weather.gov, National Oceanic and Atmospheric Administration, accessed September 16, 2024, https://www.weather.gov/safety/cold-wind-chill-chart.
[130] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.
[131] Ibid.

Previous Occurrences

There is not a comprehensive data source that lists instances when the National Weather Service has issued extreme heat or cold warnings or advisories in Worcester County.

According to the 2023 Resilient Mass Plan, there have been 118 warm weather events (heat and excessive heat events) in the state between 1995 and 2022.[132] 2010–2022 had seven of the 10 warmest summers on record in the state.

2012 and 2013 were notably hot summers in Massachusetts[133] In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the heat index reached 100°F.[134]

The hottest two summers on record in the Commonwealth were 2020 and 2022.[135] August 2022 was the hottest August ever recorded in the Commonwealth, with temperatures more than 6°F greater than the 20th century average. In August 2022, Boston experienced at least 17 days above 90 degrees, including two six-day heat waves.

Statewide, there were 33 extreme cold weather events between 1994 and 2018. The NOAA storm Events database lists the following Extreme Cold / Wind Chill Events as having occurred in Southern Worcester County since the last Holden HMP was developed in 2018:[136]

- 01/06/2018: Strong west winds trailed the January 4 winter storm. These winds drew bitterly cold arctic air over Massachusetts. The combination of strong wind and low temperatures created a dangerous wind chill, with readings reaching 25 degrees below zero or colder in a couple of locations during the early mornings of January 6 and 7.
    - On January 6, wind chills were at 25 below zero or lower from 130 AM to 730 AM EST at Worcester Regional Airport. The lowest value was 32 below zero at 400 AM EST.
    - On January 7, wind chills were at 25 below zero or lower from 530 AM to 730 AM EST at Worcester Regional Airport. The lowest value was 27 below zero at 600 AM EST.
- 01/21/2019: Strong west to northwest winds trailing the January 20th storm drew cold air across Southern New England on January 21st and caused wind chill values of 25 below zero or colder in Central and Western Massachusetts. The wind diminished during the afternoon and evening of January 21st allowing wind chill values to become less extreme, in the teens below zero. The Automated Surface Observing System platform at Worcester Regional Airport reported wind chill values as low as 34 degrees below zero.

Inland portions of Massachusetts are more subject to extreme temperatures because they lack the

[132] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-7-5.2-8.
[133] Ibid.
[134] Ibid.
[135] Ibid.
[136] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp.

moderating effect of the Atlantic Ocean. However, densely developed cities are more likely to be impacted by heat waves than smaller towns like Holden.

Probability of Future Events

The probability of future extreme heat or extreme cold events occurring in Holden is considered to be "moderate," or between 10% and 40% in the next year.

Impact

The impact of extreme heat or cold in Holden is considered to be "minor," with no property damage and a limited effect on humans anticipated in the case of extreme temperature events.

Exposure

Certain features within Holden's infrastructure, society, and environment may face more exposure to extreme temperatures, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Children and elderly residents, who are more vulnerable to the effects of extremely hot or cold conditions;
- Low-income residents who are unable to afford adequate cooling or heating;
- Renters who may have few home improvement options for mitigating extreme heat and cold;
- People who work outdoors such as construction or farm workers;
- The utility grid, which could be vulnerable to outages due to surges in power use during extreme temperatures. Power outages during extremely hot or cold days could cause further problems for people who rely on air conditioners or electric heaters; and
- Certain forms of agriculture that may be negatively affected by extreme temperatures, especially extreme heat.

The local planning team noted that there have been some instances of pipes bursting at residences following low temperature events.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change is already causing more high heat days and fewer extreme cold events in Massachusetts and beyond. Climate change is also shifting the average temperature in Massachusetts to higher temperatures, leading to longer warm seasons as well as shifts to growing seasons, habitat and vegetation ecosystems, and migratory patterns. Rising temperatures will also cause warming seas, a degradation in air quality, impacts on people's health, and an increased demand for energy and government services. Secondary climate change effects of extreme temperatures include increased severity of wildfires, droughts, and flooding as well as encroachment by invasive species. According to the 2023 ResilientMass Plan:

- By 2050, average annual temperatures are expected to increase between 5.9° and 7.9°F. This is a drastically shortened timeline from the 2018 state hazard mitigation plan, where

increases of this magnitude were not expected until the end of the century.[137]

- By 2100, annual average temperatures are expected to increase by between 10.0° and 12.9°F compared to the 1971-2000 baseline.

According to the 2022 Massachusetts Climate Change assessment, by 2030, the summer mean temperature could increase by 3.6°F from the period between 1950 and 2013, worsening stress on electric transmission and utility distribution infrastructure.[138]

In summary, climate change is likely to increase the frequency and duration of extreme heat events in Massachusetts. Changes to average annual temperatures will also impact Holden. Seasonal temperatures will shift, with spring and summer temperatures extending through more of the year.[139] Winters may also be milder than historical norms.[140] Changes to average temperatures could impact the agricultural industry and the natural environment. Farmers may need to shift their practices to account for new climate conditions, and certain specific plants and animals may need to migrate to new ranges to find suitable habitat.[141]

To respond to climate change-induced changes in temperatures, Holden residents and businesses may have to alter work patterns during extreme heat days and events to reduce workplace injuries in vulnerable jobs such as construction trades and agricultural labor. The Town may have to plan to offer more cooling stations for residents, particularly vulnerable populations such as the elderly and low-income residents. Holden may also have to account for an increase in people moving to town and/or visiting town to seek refuge from extreme heat in other parts of the country.[142]

Vulnerability

Holden's vulnerability to extreme heat and cold is considered to be, "4 – low risk, The Town has operated heating and cooling centers and continues to do so at their Senior Center as well the Gale Free Public Library.

Mitigation Strategies

The Town of Holden is currently able to effectively respond to extreme temperatures through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, the Town has numerous opportunities to expand upon its existing capabilities to mitigate and respond to extreme temperatures. The local HMP planning team identified the following strategies that could be used to reduce the threat of extreme temperatures in Holden:

- Obtain a generator or generators for the Town Hall and nearby Public Buildings, including the public Library. Generators at these facilities protect and serve the Town by providing emergency communications infrastructure and shelters for extreme temperatures/ refrigerated food storage, as well as emergency response measures, continuity of government, and allows for other emergency response and mitigation to occur.

[137] "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," September 2018
[138] "2022 Massachusetts Climate Change Assessment," page RS30.
[139] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[140] Ibid.
[141] Ibid.
[142] Ibid.

- Review and update local plan and development review processes (planning, zoning, stormwater management, conservation, ect.) to encourage utilizing hazard mitigation measures in all new construction.
- Coordinate with Housing Authority on group home response and evacuation planning for vulnerable populations in the event of an emergency.

4.12 Invasive Species

An invasive species, as defined by the Invasive Species Advisory Committee (ISAC) of the U.S. Department of the Interior, is "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health."[143] Invasive species are not the same as native pest species, such as beavers and deer. The State of Massachusetts, being heavily forested with relatively new growth forests, as well as having a great deal of its water sourced from open reservoirs, is vulnerable to the threat of both land and aquatic invasive species. Invasive species can damage and disrupt existing ecosystems by outcompeting the native flora and fauna: many invasive aquatic species harm water quality, and many land-borne invasive species increase the risk of wildfires. The effects of invasives are species-dependent, and a challenge for invasive species management is that many municipalities are affected by some invasive species but not others.

Location

Several invasive species affect broad regions of Massachusetts. The Emerald Ash Borer (*Agrilus planipennis*) has been detected in every city and town within the Central Region.[144] However, invasives and their effects can also be very species-dependent and localized, so invasive species hazards can also bear a resemblance to other more localized hazards such as localized flooding. Holden's semi-rural development along with is geography lends itself towards being more vulnerable to invasives. Holden is characterized by its rolling hills interspersed with streams and reservoirs, and vulnerable to intrusion from both land based and aquatic invasives. More than 50% of the Town is vulnerable to invasives.

Extent

It is difficult for local officials to understand the extent of the impact that invasive species have on their communities. Factors that lead to a dearth of knowledge about the extent of impacts of invasive species include: the unpredictable nature of invasives, the lack of verified data clearinghouses about invasive species, and the lack of resources and capacity for local conservation officials to track invasives. Often, it is not until the damage caused by invasives is apparent that local officials discover the true extent of the hazard. Still, there are some resources available to the local hazard mitigation planning team; this plan utilizes the Massachusetts Department of Agriculture's Invasive Pest Dashboard;[145] the Center for Invasive Species and Ecosystem Health's Early Detection and Distribution Mapping System (EDDMapS) hosted by the University of Georgia;[146] and the Forest Ecosystem Monitoring Cooperative's Northeastern Forest Health Atlas.[147]

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[143] Definitions Subcommittee of the Invasive Species Advisory Committee (ISAC). "Invasive Species Definition Clarification and Guidance," Doi.gov, United States Department of the Interior, April 27, 2006, https://www.doi.gov/sites/doi.gov/files/uploads/isac_definitions_white_paper_rev.pdf.

[144] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-48.

[145] "MDAR Invasive Pest Dashboard," Experience.arcgis.com, Massachusetts Department of Agricultural Resources, accessed June 10, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Page-2/?views=Town-by-Town.

[146] "My EDDMapS," EDDMapS.org, Center for Invasive Species and Ecosystem Health, accessed June 10, 2024, https://www.eddmaps.org/tools/query/index.cfm?observationDateStart=06/03/2017&observationDateEnd=06/03/2024&eradicationstatus=1,2&country=926&state=92625000&fipscode=92625027.

[147] "Northeastern Forest Health Atlas," UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10, 2024, https://www.uvm.edu/femc/forest-health-atlas.

In Worcester County from 2017 to 2024, according to EDDMapS analysis of verified invasive species reporting, there have been 378 records of locations with invasive species; In the county, 353 distinct sightings of invasive species ranging from plants to insects have been left unchecked, 2 invasive species are being treated, and a total of 47 acres are considered to be infested with invasive species.[148]

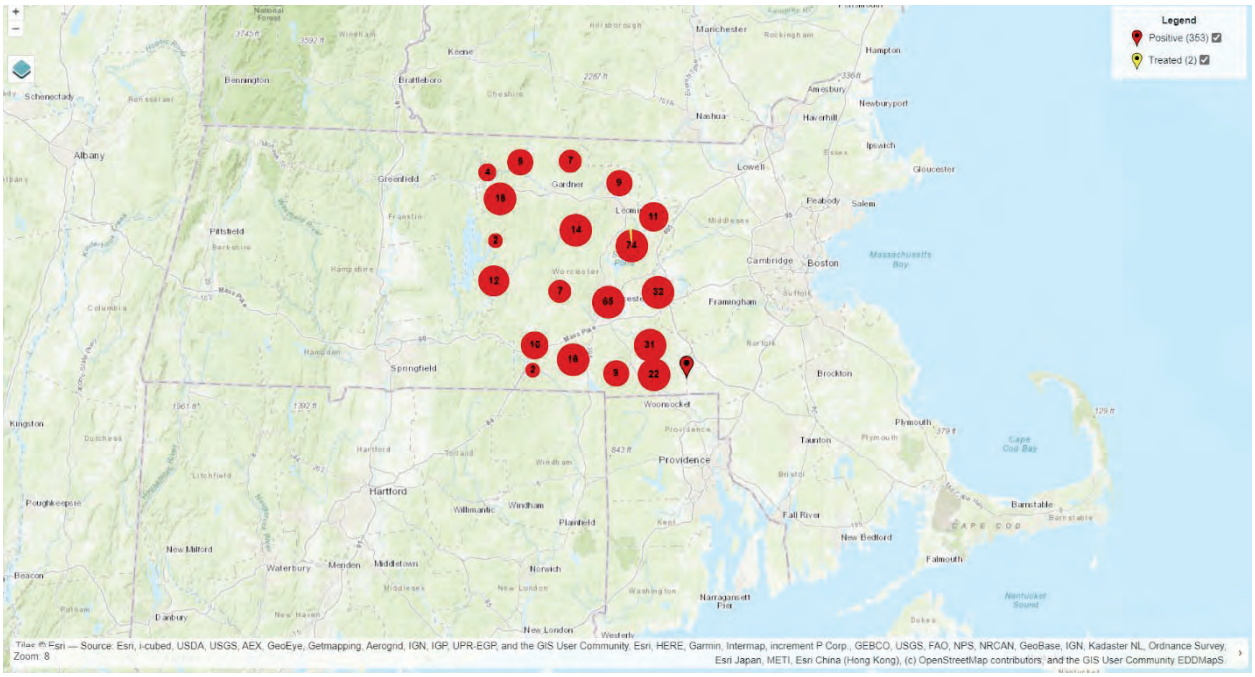


Figure 6: EDDMapS Analysis of Worcester County Invasives 2017-2024

The Massachusetts Department of Agriculture's Invasive Pests Dashboard notes that Emerald Ash Borer was detected in Holden in 2019, Mile-A-Minute Vine was detected in town in 2011 and 2012, Beech Leaf Disease was detected in town in 2023, and Holden shares a border with Worcester, which is currently combatting a Spotted Lanternfly infestation.[149] At present no infestation has be reported in this town.[150] Holden is currently located within the only Asian Longhorn Beetle (ALB) regulated area in the state of Massachusetts.[151] According to DCR's forest health aerial survey data, the encroachment of ALB is centered primarily in the southern corner of town, near the border with Paxton and Worcester, with other damages located in and around Holden Town Forest.[152] This aerial survey also notes the presence of tree diseases in town, such as

[148]"My EDDMapS," EDDMapS.org.

[149] "MDAR Invasive Pest Dashboard: Spotted Lanternfly *(Lycorma delicatula)*Experience.arcgis.com, Massachusetts Department of Agricultural Resources, March 6, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Dashboard?views=Spotted-Lanternfly#data_s=id%3AdataSource_3-17f4202b73c-layer-3%3A61%2Cid%3AdataSource_16-19258ae6d0f-layer-8%3A98%2Cid%3AdataSource_22-18fe99032b3-layer-6%3A1

[150] Ibid

[151] "MDAR Invasive Pest Dashboard: Emerald Ash Borer (Agrilus planipennis)," Experience.arcgis.com, Massachusetts Department of Agricultural Resources, March 6, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Page-2/?views=Emerald-Ash-Borer#data_s=id%3AdataSource_3-17f4202b73c-layer-3%3A87.

[152] MA DCR Forest Health Aerial Survey Results

Red Pine Scale and White Pine Needle Disease. As of writing the entire state of Massachusetts is under a Box Tree Moth quarantine, including Holden.[153]

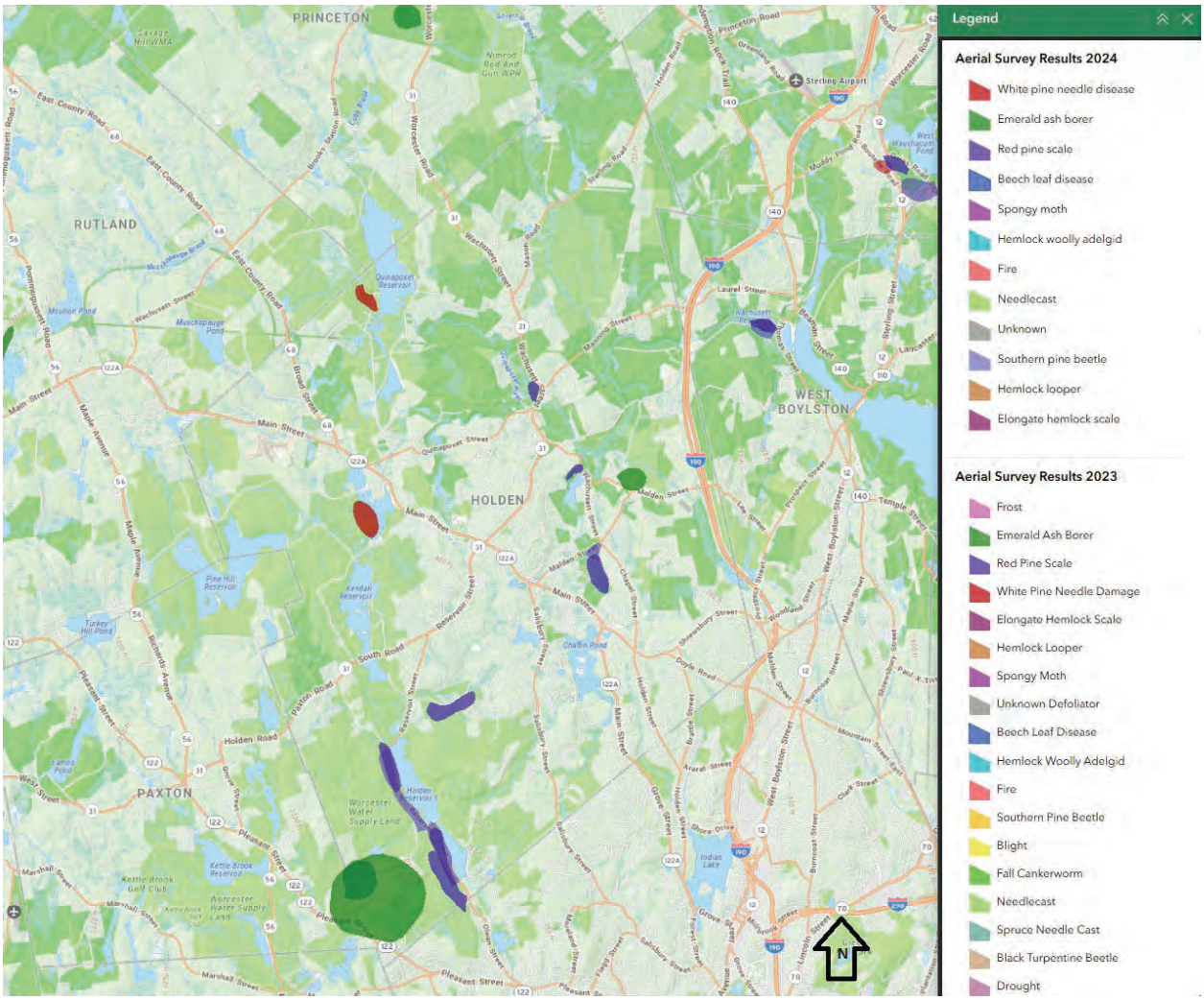


Figure 7: MA DCR Forest Health Aerial Survey Results[154]

A lack of reporting on invasives may mean that the extent of invasives in Holden is far greater than these databases report.

Previous Occurrences

According to the Northeast Forest Health Atlas, in the past 20 years of reporting, Massachusetts has experienced tree damage (including defoliation and mortality events) to 43,127,411 acres of forests from a variety of invasive pests; alarmingly, the greatest proportion of this damage has

[153] "MDAR Invasive Pest Dashboard: Box Tree Moth *(Cydalima perspectalis)*," Experience.arcgis.com, Massachusetts Department of Agricultural Resources, March 6, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Dashboard?views=Box-Tree-Moth#data_s=id%3AdataSource_3-17f4202b73c-layer-3%3A61%2Cid%3AdataSource_16-19258ae6d0f-layer-8%3A98%2Cid%3AdataSource_22-18fe99032b3-layer-6%3A1

[154] Ibid

occurred in the past 3 years.[155]

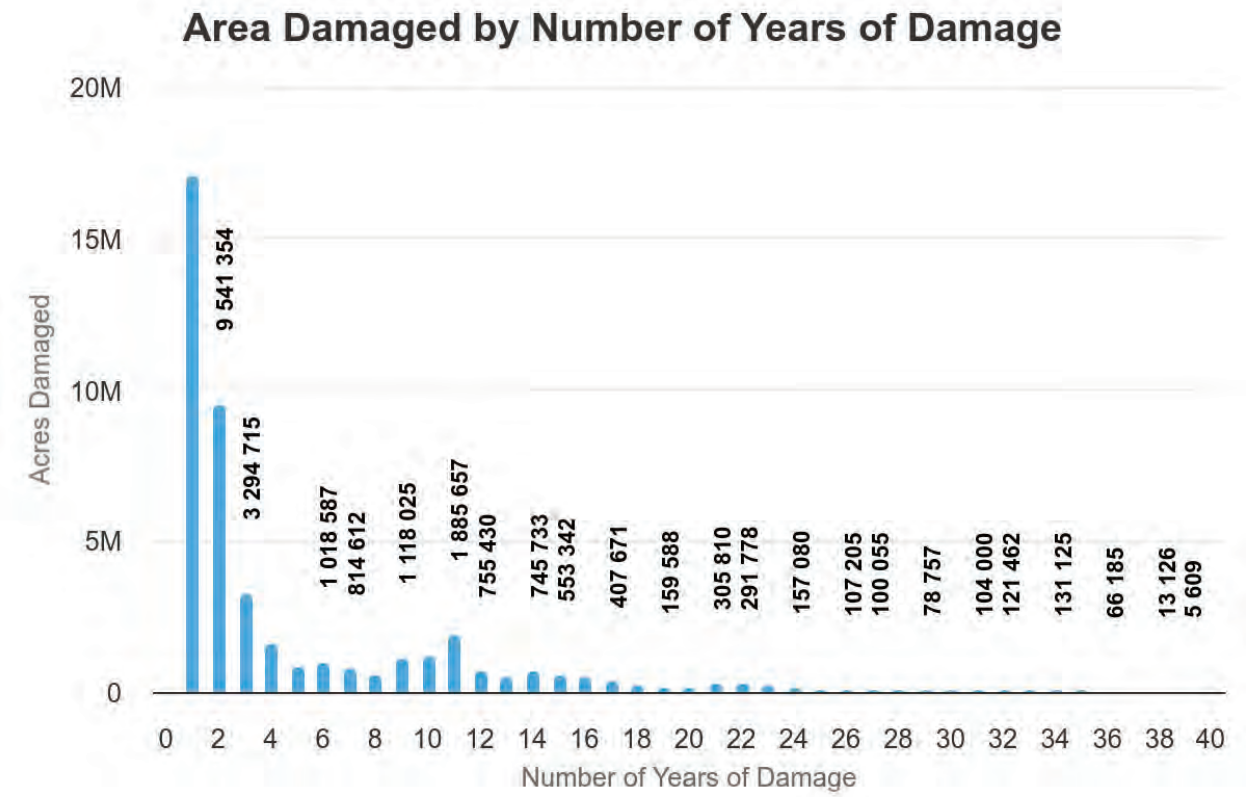


Figure 7: Area Damaged by Spongy Moth, Forest Tent Caterpillar, and Winter Moth from 1979 to 2019

In Worcester County, the vast majority of these invasive pest tree damage events occurred in the southern part of the county. Significant damage events have also occurred in the west and southwest of the county (near the border with Hampshire and Hamden Counties). In addition, localized defoliation events have occurred around the Town of Barre, the Tatnuck neighborhood of Worcester, and other communities. Tree mortality correlated with invasive species has been concentrated in the southern half of Worcester County.[156] In 2008, an outbreak of Asian long-horned beetles in Worcester destroyed nearly 30,000 trees.[157]

Holden has experienced invasives-related defoliation events from 1998 through 2020, with significant mortality events occurring in 2018, 2019, and 2020. Based on trends identified in the Atlas, there is no reason to assume that invasive forest species hazards have lessened in more recent years.

Probability of Future Events

The 2023 ResilientMass Plan notes that increased globalization of trade has created new paths for invasive species to spread. Climate change is also an aggravating factor in the spread of invasives, as natural ecosystems become strained by increased temperatures and shifting precipitation

[155] "Northeastern Forest Health Atlas - Defoliation: Years of Damage," UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10, 2024, https://www.uvm.edu/femc/forest-health-atlas?premade=All_Defo.
[156] Ibid.
[157] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

patterns; Climate change therefore creates more opportunities for invasives to disrupt an already fragile ecology. Based on the previously identified occurrences and trends, the probability of an invasive species event occurring in Holden is very high, with a 70% to 100% probability of occurrence in the next year.

Impact

Specific impacts of invasive species in Holden may vary, depending on the type of invasive, the habitat that it is supplanting within the native ecosystem, and other factors. Invasive species' direct impact on the natural ecology has many notable secondary impacts. The 2023 ResilientMass plan identifies that invasive species can introduce new diseases to a region (such as the 2005 Chikungunya Epidemic, spread in part by a viral mutation that allowed for the virus to be more commonly present in the *Aedes albopictus* mosquito, an invasive subspecies).[158] Invasives are also one of the costliest natural hazards in terms of control efforts, costing the United States and estimated $21 billion per year.[159] Given what information is known about the extent of invasive species within Holden the local HMP planning team estimates a "critical" impact on the Town from invasive species, with between 25% and 50% of property in the areas affected by this hazard being damaged or destroyed.

Exposure

Certain features within Holden's infrastructure, society, and environment may experience more exposure to invasive species. These features include:

- People with compromised immune systems or preexisting health conditions, children under the age of five, and people over 65 years old who might be particularly vulnerable to new diseases or aggravated health problems caused by invasives;
- Roadways, as Japanese Knotweed, an invasive known to cause streambank destabilization, can contribute to flood damages and can affect sightlines along roadways, potentially causing roadway hazards;
- Local government, as invasive species may pose a management cost burden that exceeds local financial capacity, especially for departments tasked with their management and for departments tasked with the maintenance of facilities that are impacted by invasives;
- The local ecology, as invasive species can also change the local ecology to make it more fire prone, either by damaging the native plants or by being prone to fire themselves.
- Local Reservoirs for drinking water can be affected by invasive aquatics, which can reduce water quality and damage/clog outlet structures.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change is predicted to increase the spread of invasive species and expand their range. Already fragile ecosystems, if left unmanaged, will suffer the worst effects of invasive species; native flora and fauna species could be supplanted by invasive species that outperform or outright damage them. The vast majority of invasive species introductions

[158] Konstantin A. Tsetsarkin et al., "A single mutation in chikungunya virus affects vector specificity and epidemic potential," *PLOS Pathogens* 3, no. 12 (December 7, 2007): e201, https://doi.org/10.1371/journal.ppat.0030201.
[159] Kerry Sheridan, "Invasive species cost the US $21 billion per year, study finds," WUSF.org, WUSF Public Media, January 4, 2022, https://www.wusf.org/local-state/2022-01-04/invasive-species-cost-the-us-21-billion-per-year-study-finds.

are caused by human activity, either accidental or intentional.

Both changes in precipitation patterns and temperature may increase chances of successful invasion of ecosystems by non-native species.

1. Precipitation
    a. Elevated atmospheric CO2 concentrations could reduce the ability of ecosystems to recover from climate shocks; this can create an opportunity for invasive species, which can often rapidly establish themselves following a disturbance, to successfully propagate.
2. Temperature
    a. Climate-driven temperature changes exacerbate the impacts of invasive species by altering ecosystem conditions in ways that enhance their ability to reproduce, spread, and in some cases outcompete native species.
    b. As warmer temperatures place stress on native cold-weather species in the region, invasive species accustomed to higher temperatures are able to more easily fill native species' niches and therefore expand their habitat ranges northward.

Secondary hazard impacts from invasive species include increased temperatures, damage to agricultural crops, and increased wildfire risk; as described in previous sections, all of these hazard impacts have associated potential societal implications through population shifts and changes in land use and development.

VULNERABILITY

Based on the above assessment, Holden has a hazard index rating of "3 – medium risk" from invasive species.

MITIGATION STRATEGIES

The Town of Holden is currently able to effectively respond to invasive species through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to invasive species. The local HMP planning team identified the following strategies that could be used to reduce the threat of invasive species in Holden:

- Assess mosquito, tick, and other pest control options; provide public education and outreach about associated risks, including determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program.
- Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.

4.13 Other Hazards

In addition to the hazards identified in previous sections, the local hazard mitigation planning team reviewed the other hazards listed in the Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP). Hazards from the SHMCAP deemed irrelevant to Holden due to the Town's location are coastal hazards, atmospheric hazards, ice jams, coastal erosion, sea level rise, and tsunamis.

Although landslides have been recognized as affecting communities in Central Massachusetts, the HMP team in Holden did not identify them as affecting the Town; therefore, they were omitted from having a full section in this plan. A brief overview of this hazard is included below.

Landslides

One other hazard discussed in the SHMCAP that can affect Holden is landslides. Landslides occur in all U.S. states and territories. During a landslide, masses of rock, earth, or debris move down a slope. Landslides may be small or large, slow or rapid. They are generally activated by:

- storms,
- earthquakes,
- volcanic eruptions,
- fires,
- alternate freezing or thawing, and/or
- steepening of slopes by natural erosion or by human modification.

Debris and mud flows (landslides) are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." They can flow rapidly, striking with little or no warning at avalanche speeds. They also can travel several miles from their source, growing in size as they pick up trees, boulders, cars, and other materials. Vulnerabilities in the Central Massachusetts region to landslides could include damage to structures, damage to transportation and other infrastructure, and localized road closures. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in the region.

Landslides are therefore considered low frequency events that may occur once in 50 to 100 years (with a 1% to 2% chance of occurring per year) in Central Massachusetts.

There are no documented previous occurrences of significant landslides in Holden. The Town is relatively flat and most of its rivers are slow moving, are frequently dammed, and/or are lined with riprap, which can minimize landslide risk. Roadways in town are not generally built close to river channels; this reduces undercutting risk from stormwater-induced bank erosion. CMRPC's data review and the local HMP planning team both noted no specific concerns relating to landslides in town.

Changes in Groundwater

Another hazard of concern that affects Holden is changes in groundwater. This hazard was identified primarily through the community survey for this plan; common concerns among town residents who responded to the survey included basement flooding from water as well as concerns regarding wells drying up in the future. While the 2023 ResilientMass Plan notes changes in groundwater as a specific hazard, our plan identifies it as being a secondary effect of drought

and flooding.[160] Holden is somewhat vulnerable to changes in groundwater due to much of the town water being from wells both private and public. The details of the Town's specific vulnerabilities to changes in groundwater are included in both the drought and flooding sections of this plan. The town itself is also a downstream customer of Worcester Water Department, in addition to hosting reservoirs that feed into that system. While not explicitly a natural hazard, the town has concerns for pollution to those reservoirs, both from stormwater runoff and macro-pollutants due to a lack of roadway barriers and adequate stormwater infrastructure at Holden Reservoir No 2 along Reservoir Road and Olean Street.

According to the 2023 ResilientMass Plan, climate change is predicted to affect groundwater availability; Sea level rise, extreme temperature events, changes in precipitation patterns, and the increased frequency and duration of drought conditions will all reduce the amount of available groundwater to the Town.[161]

[160] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.
[161] Ibid.

5.0 EXISTING PROTECTION

Sections 5.0 and 5.1 help meet the following FEMA local mitigation plan requirements:

- *A4. "Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information?" (Requirement 44 CFR § 201.6(b)(3));*
- *B2. "Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods?" (Requirement 44 CFR § 201.6(c)(2)(ii));*
- *C1. "Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?" (Requirement 44 CFR § 201.6(c)(3)); and*
- *C2. "Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?" (Requirement 44 CFR § 201.6(c)(3)(ii))*

The Town of Holden currently makes use of most available locally controlled tools, including zoning regulations, planning, and physical improvements, to help mitigate the consequences of natural hazards. The Town does not participate in any federal programs such as StormReady certification nor Firewise community certification. The Town is switching presently from CodeRed to Rave Alert for emergency notifications. The Town plans to research the utility of public awareness and education programs as a result of this planning process.

Holden has most no-cost or low-cost hazard mitigation capabilities in place. These include land use, zoning, and subdivision regulations as well as an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains, tree maintenance, and other practices. Holden also has appropriate staff dedicated to hazard mitigation-related work for a community of its size, including a Town Administrator, an Emergency Management Director/Fire Chief, a Town Planner, a professionally run Department of Public Works, and a Director of Planning and Development. Holden has several plans relevant to hazard mitigation in place, including a Comprehensive Emergency Management Plan (2024), a Water Distribution Plan (___), a Open Space and Recreation Plan (2022), and a Master Plan (2019). Not only does Holden have these capabilities in place, but they are also deployed for hazard mitigation, as appropriate. The Town also has very committed and dedicated volunteers who serve on Boards, Commissions, and Committees as well as in other volunteer positions. The Town collaborates closely with surrounding communities through its South Wachusett Regional Emergency Planning Committee and has opted into fire protection mutual aid agreements through MEMA. Holden is also an active member community of the Central Massachusetts Regional Planning Commission (CMRPC) and can take advantage of no cost local planning assistance provided by the professional planning staff at CMRPC as is needed.

The table below describes existing hazard mitigation protections in Holden. It includes a brief description of each activity, a subjective evaluation of each activity's effectiveness, and a description of any recommendations for improvement for each activity.

5.1 Existing Protection Matrix

Table 38: Existing Protection Matrix

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in National Flood Insurance Program (NFIP)	The NFIP provides flood insurance for structures located in flood- prone areas. Also, communities participating in the NFIP have adopted and enforced ordinances, bylaws, and regulations that meet or exceed FEMA requirements to reduce the risk of flooding.	Holden has participated in the National Flood Insurance Program since December 2nd, 1974. As of July 2nd, 2024, there are approximately 8 policy holders in town with flood insurance policies.[162] There are no repetitive loss properties in Holden. The Town's Building Commissioner is the appointed designee who implements the addressed commitments and requirements of the NFIP in town, and the Town monitors building activity within the flood plain to ensure compliance with provisions of state building code. The Town has adopted the Flood Insurance Rate Map (FIRM) dated from July 2nd , 1981;[163] this information is noted in the Floodplain Overlay District	Effective Holden should seek to further limit development in the 1% flood zone. It should work to score in the Community Rating System (CRS) under NFIP to enable its residents to obtain lower flood insurance rates. Holden should also educate its residents about the NFIP. The Town is working on improving its process for carrying out the substantial improvement/substantial damage (SI/SD) provisions of its floodplain regulations, along with substantial damage claims. In the future, the Town will collaborate with Flood Hazard Management Program staff at the state level to ensure a disaster plan is put in place to employ SI/SD provisions. The Town should also consider adopting the MA Model Floodplain Bylaw when the FEMA FIRM's are updated in the most

[162] "Community Overview: Holden, Town of," NFIP Community Information System.
[163] https://msc.fema.gov/portal/availabilitySearch?addcommunity=250309&communityName=HOLDEN,%20TOWN%20OF#searchresultsanchor

		in chapter 7.1 Section XIII of Holden's Town Bylaw.[164] The Town's Floodplain Overlay District, described in this same section of the Zoning Bylaw, includes all special flood hazard areas (SFHAs) designated as Zone A, A1-30, or AE in town and regulates and permits development within these areas. Holden currently administers the substantial improvement/substantial damage (SI/SD) provisions of its floodplain management regulations in compliance with the NFIP (CFR Title 44, Parts 59 through 65) and the Massachusetts State Building Code (780 CMR).	recent FIS due to be completed within the life of this plan.

[164] https://www.holdenma.gov/sites/g/files/vyhlif4526/f/uploads/chapter_7.1_section_xiii_flood_plan_5.15.23-_website.pdf .

Existing Measure	Description	Action	Effectiveness & Recommendations
Floodplain & Aquifer Protection District Bylaw in Place	Requires all development in District to be in compliance with Aquifer Protection District regulations, and MA DEP Drinking Water Regulations.	Holden has a Flood Plain & Aquifer Protection District (Section XVI) in its Zoning Bylaw. The town is currently in the process of updating its bylaws and may include updates to this bylaw in that process	Very effective The Town should incorporate hazard mitigation principles into their bylaws, updating this bylaw as needed.
Stormwater Management and Erosion Control bylaw in place	Planning Boards or Conservation Commissions review projects for consistency with MA DEP standards. This helps ensure adequate on-site retention and recharge.	Holden has incorporated Stormwater Management and Erosion Control bylaws. Holden also participates in the Central Mass Stormwater Coalition. The Town is also an MS4 Compliant Community	Very effective No changes recommended

Existing Measure	Description	Action	Effectiveness & Recommendations
Local Open Space and Recreation Plan	This local plan identifies significant natural resources to ensure their protection. Following Massachusetts Department of Conservation and Recreation guidance for the development of OSRPs, this document does not focus on specific hazards. Open Space Plans can provide many tools. The Town must commit to making land acquisitions and regulatory changes which are included in this plan's action items. It also must give increased attention to preserving undeveloped flood-prone areas and associated lands.	Holden's Open Space and Recreation Plan was issued in 2012, and updated in 2022	Effective The Towns should incorporate hazard mitigation into open space planning, prioritizing acquisitions of hazard prone land to reduce the risk to residents of Holden.

Existing Measure	Description	Action	Effectiveness & Recommendations
Drainage System Maintenance and Repair Program	This program keeps municipal drainage facilities (storm drains, culverts, etc.) in good order.	Holden performs street sweeping and catch basin cleaning from April to November. Holden provides stormwater public outreach and education in accordance with MS4 requirements.	Effective
Tree Trimming Program	This program consists of the routine maintenance of trees and reduces the likelihood of vegetative debris problems during and after storm events.	Holden conducts roadside mowing from April to November to remove juvenile trees. Tree trimming (take-downs and clearing dead branches) is completed as is needed by the DPW	Very Effective
Battery Storage Facility	Holden Municipal Light Department has recently completed the construction of a battery storage system at the Chaffin Substation.	The Town of Holden is able to buy energy to fill the batteries during dips in price, increasing the towns resilience to energy price shocks as well as provide power to customers during grid down events	Effective Holden should look to increase resiliency by including municipally owned power generation

Existing Measure	Description	Action	Effectiveness & Recommendations
Culvert Maintenance and Replacement Program	This program consists of regular maintenance of existing culverts and (in some cases) beaver controls as well as replacing and expanding culverts where needed to allow for adequate stormwater flow.	The Town has historically maintained and replaced problem culverts when needed and as funding allows. From the last plan the town replaced a problem culvert on Quinapoxet street which successfully mitigated the locally identified flood hazard on that street. Holden has also recently completed a culvert inventory which identifies and prioritizes culverts to be replaced.	Somewhat effective Current efforts in town are limited by available resources. Culvert failures are repaired and replaced as warranted. A townwide culvert inventory completed in 2019 provides the location, size, and condition of the culverts in town. Holden should continue to incorporate hazard mitigation into this process.
Master Plan	The Master Plan serves as a policy guide as well as the Town's future vision of itself. It compiles a comprehensive analysis of all aspects of community development and is designed to be a resource for the Town over the next 10 to 20-year time period.	The Holden Master Plan was adopted in 2019.	Effective In the future, the Town should review the implementation of the Master Plan. The Town should continue to consider hazard mitigation concerns in Master Plan implementation.

Existing Measure	Description	Action	Effectiveness & Recommendations
Municipal Vulnerability Preparedness (MVP) Plan	This plan is a guide for climate resiliency implementation projects in town. It includes a vulnerability assessment and an action-oriented resiliency plan. This plan makes the town eligible for MVP Action Grant funding.	The Holden Municipal Vulnerability Preparedness Plan was adopted in 2018. The Town has acted on some recommendations of this plan through other means, but it has not been successful with MVP Action Grant proposals. The town has not referred to this plan as a roadmap for future plans and actions.	Somewhat effective The Town should incorporate its MVP Plan recommendations into its broader planning goals and objectives. The Town should participate in the MVP 2.0 program if it is eligible to do so.
Compliance with the state building code, AAB codes, and ADA codes	Compliance with the state building code means that buildings in town meet the minimum established requirements for structural strength, sanitation, and efficiency and are safe for regular use as well as during hazard events and other emergency situations. Compliance with the AAB and ADA codes means that buildings and facilities are accessible to and safe for use by people with disabilities.	The Town's Planning Board, Zoning Board of Appeals, and Building Inspector work to implement compliance with these codes. The new update to the state building code (the 10th Edition of the Base Building Code (Massachusetts Amendments)) will become effective on October 11th, 2024, and will be concurrent with the previous edition until January 1st, 2025.	Effective

6.0 Status of Mitigation Measures From 2016 Plan

Section 6.0 helps meet the following FEMA local mitigation plan requirements:

- *E2. "Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?" (Requirement 44 CFR § 201.6(d)(3))*

During this hazard mitigation plan update process, the local HMP team in Holden provided updates on the status of mitigation measures from the Town's 2016 Hazard Mitigation Plan. Certain measures were incomplete as of 2024 and were deemed as still being relevant; These relevant measures were re-incorporated in the 2024 Hazard Mitigation Plan action strategy if they are anticipated to be effective.

Table 39: Status of Mitigation Measures from 2016 Plan

2016 Task	2024 Status	2024 Notes	Include in 2024 Plan?
Structure & Infrastructure Strategies			
Obtain a generator for Town Hall and nearby buildings, including public library and First Congregational Church (shelter). Generators at these critical facilities protect and serve the Town by powering radio transponders and powering shelters for warmth and for refrigerated food storage, among other emergency mitigation and response strategies.	In Progress	The First Congregational Church has obtained a generator, however the Library and town hall buildings which are co-located near each other have not received a generator due to design constraints. The town is currently exploring alternatives and is still interested in seeking design and permitting for a fixed generator for these facilities and subsequently this strategy remains in the 2024 version of the plan, though modified.	YES
Identify / resolve issues causing flooding at Route 31 & Quinapoxet River, including, monitoring and removing beaver dams	Completed	Hazard was mitigated by the town successfully through infrastructure improvements at Quinapoxet street.	NO

Drainage and culvert upgrades at Salisbury St near the pool to reduce repeated flooding incidents.	In Progress	This strategy is being updated to make reference to the Dam itself that has been identified as Dawson Pond Dam. The Town intends to evaluate the structure to identify recommendations to mitigate the issue.	YES
Drainage, culvert upgrades, and flow enhancers at Sterling Road to reduce repeated flooding incidents	Completed	This strategy was in the process of being enacted during the planning of this HMP and will be completed prior to adoption.	NO
Flooding in the Highland Street area partly caused by high water tables and drainage problems. Identify/resolve issues causing basement flooding.	In Progress	The town is in the process of identifying the issues and is including an educational outreach strategy in the current plan to inform residents of how to address basement flooding issues on their private property.	YES
Address structural issues at Town-owned Old Grist Mill Pond Dam (Significant Hazard), in poor condition	No movement on this action yet	There is currently an issue of dam custody, where it is unclear if the dam is owned by the town. Subsequently, this strategy has been modified to include identifying the ownership of the dam to clearly delineate responsibility for maintenance.	YES
Drainage issues need addressing on Main Street near Parker Pond and Friendy's, associated with Talbot's property, and Heather Shop property. Talbots and Heather have begun developing new stormwater systems on their properties. MassDOT has come to an agreement with property owners. Holden needs to become aware of progress.	Completed	Holden is presently upgrading and improving its main street, which will be completed prior to or shortly after plan adoption. Therefore, this hazard has been mitigated.	NO
Obtain Inspection and Evaluation Report for Town-owned, Significant Hazard, Old Grist Mill Pond Dam, and carry out recommended action items to improve structural components of dam.	In Progress	This strategy is being incorporated into a broader mitigation strategy surrounding Grist Mill Pond Dam's inspection, evaluation, and repair/removal.	YES

Maintain access to fire roads to prevent wildfires and brushfires. Also, improve mapping of fire roads and trails and integrate into GIS system.	In Progress	The maintenance of the fire roads is an ongoing endeavor, and the town is interested in updating their paper maps to GIS.	YES
Tree trimming and tree wire installation needed across Town to protect utility wires, especially in south end of Town where flooding is frequent and sump pumps are required. Focus on high-growth areas. Repeat every four years.	Ongoing	This strategy has been successfully implemented and subsequently has been moved to the existing protection measures section of the plan.	NO
Preparedness, Coordination & Response Action Strategies			
Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood hazard planning and management	Ongoing	This strategy has been successfully implemented and subsequently has been moved to the existing protection measures section of the plan.	NO
Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate	In Progress	The town is still considering the value in participating in the community rating system and is periodically reviewing their NFIP policies information to make that determination.	YES
Road information coordination and planning for snow removal	Ongoing	This strategy has been successfully implemented and will be continued as an ongoing effort.	NO
Evacuation Plan updates	In Progress	The Town is still interested in participating in a regional evacuation plan update, which has yet to be funded. The Central Massachusetts Regional Planning Agency is currently identifying funding sources for this update.	YES
Improve vegetation and debris management along P&W Railroad rights-of-way to reduce the chance of brush fires near tracks	In Progress	The town is still interested in improving the coordination with the railroad; however the railroad is difficult to keep in contact with for reasons outside of the town's control. Subsequently, this strategy is being modified to include "Improve Coordination with the P&W RR"	YES
Education & Awareness Strategies			

Provide information to residents and businesses, especially in the Chaffin Pond area, on generator purchase, use, and maintenance, to reduce basement flooding in the event of power outages and the use of sump pumps. Use FEMA/MEMA templates for educational materials.	No movement on this action yet	The town is still interested in implementing this strategy but lacked the capacity to develop educational outreach materials.	YES
Provide information to residents and businesses on water conservation through low-impact landscaping and other measures (to conserve water in times of drought and to conserve water for firefighting)	In Progress	The town has started to disseminate information on water conservation and is evaluating the effectiveness of this effort to determine what additional outreach needs to occur. Subsequently, this strategy will remain in the current edition of the Hazard Mitigation Plan.	YES
Local Plan & Regulation Strategies			
Use MA Drought Management Plan as a template for Town's own drought plan and integrate State's recommendations and actions according to Town's needs.	In Progress	The town still utilizes the state drought management plan and is in the process of developing a town plan.	YES
Follow Worcester's Drought Plan and help enforce water conservation measures	In Progress	The town is interested in incorporating Worcester's drought plan into their own drought planning efforts.	YES
Obtain Inspection and Evaluation Reports for dams in Town and follow through with recommended action items for structural improvements.	Completed	The town has been acquiring inspection reports from applicable dams. This strategy is being reformatted in its entirety to reflect the current dam hazard conditions.	NO

Follow through with Continuity of Operations Planning (COOP) currently being completed by Town Departments. Ensuring, among other mitigation and resiliency strategies, clear roads during snowstorms for emergency vehicle transportation.	Completed	The COOP Plan has been completed.	NO
Investigate and become StormReady certified and provide information to residents around preparedness for weather related issues, especially tornadoes.	No movement on this action yet	The town is still interested in pursuing this strategy but previously lacked the capacity to do so.	YES
Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wild and brush fires.	No movement on this action yet	The town is still interested in pursuing this strategy but previously lacked the capacity to do so.	YES
Review and update local plans and development review processes (planning, zoning, stormwater management, conservation, etc.) to ensure new construction will not be affected by hazards	Completed	The town now takes hazards into account in other planning initiatives, and this has been included in the existing protection measures of this plan.	NO
Establish a Local wetlands protection bylaw to further build upon the states wetland protection act and regulations, which add regulatory oversight provisions for development within the jurisdictional buffer zone, adding increased attention to alteration of wetlands and the opportunity to preserve capacity and quality	Completed	The town has incorporated local wetlands protections into the town bylaws.	NO
Monitor implementation of Hazard Mitigation Plan	In Progress	Going forward from this plan the town will increase the amount of monitoring and implementation of the hazard mitigation plan and is interested in including this strategy in this iteration of the plan.	YES

7.0 Mitigation Strategy

The Holden Hazard Mitigation Planning team developed a list of mitigation strategies (both new and previously identified by local officials) and prioritized them using the criteria described below. This list of factors is broadly derived from FEMA's STAPLE+E feasibility criteria.

7.1 Priority and Impact

Section 7.1 helps meet the following FEMA local mitigation plan requirements:

- C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))

Real world considerations were brought into the analysis to inform the priority ranking process for the different mitigation strategies. Factors considered in this step include costs and cost effectiveness (including eligibility and suitability for outside funding), timing, political and public support, and local administrative burden. Each strategy was ranked as being high, medium, or low priority.

- High priority strategies have obvious mitigation impacts that clearly justify their costs and to a large degree can be funded, can be completed in a timely fashion, can be administered effectively, and are locally supported.
- Medium priority strategies have some clear mitigation impacts that generally justify their costs and generally can be funded, can be completed in a timely fashion, can be administered effectively, and are locally supported.
- Low priority strategies have relatively low mitigation impacts that do not necessarily justify their costs and may have difficulty being funded, being completed in a timely fashion, being administered effectively, and garnering local support.

Costs and cost effectiveness – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of power outages during a winter storm. Strategies that have clear and viable potential funding streams, such as FEMA's Hazard Mitigation Grant Program (HMGP), are also given higher priority.

Time required for completion – Projects that are faster to implement, either due to short work duration, current or near-term availability of funds, and/or ease of permitting or other regulatory procedures, are given higher priority.

Political and public support – Strategies are given higher priority if they have political and/or public support which is shown through public feedback, prioritization in previous regional and local plans, initiatives that were locally initiated or adopted, and/or prioritization in the Municipal Vulnerability Preparedness Program Community Resilience Building workshop process.

Administrative burden – Strategies that are realistically within the administrative capacity of the Town and its available support network (CMRPC, local non-profit organizations, regional collaborative associations etc.) are prioritized. Grant application requirements, grant administrative requirements (including audit requirements), procurement, and staff time to oversee projects are all considered when figuring out the administrative burden of a strategy.

Impact – The HMP Core Team's consideration of each strategy included an analysis of the mitigation impact each can provide, regardless of cost, political support, funding availability, and other constraints. The intent of this step is to separately evaluate the theoretical potential benefit of each

strategy to answer the question: if cost were no object, what strategies have the most benefit? Factors considered in this analysis include the number of hazards each strategy helps mitigate (more hazards equals higher impact), the estimated benefit of the strategy in reducing loss of life and property (more benefit equals higher impact), and the geographic extent of each strategy's benefits (other factors being equal, a larger area equals higher impact).

- High impact actions help mitigate several hazards, substantially reduce loss of life and property (including loss of critical facilities and infrastructure), and/or aid a relatively large portion of the community.
- Medium impact actions help mitigate multiple hazards, somewhat reduce loss of life and property (including loss of critical facilities and infrastructure), and/or aid a sizeable portion of the community.
- Low impact actions help mitigate a single hazard, lead to little or no reduction in loss of life and property (including loss of critical facilities and infrastructure), and/or aid a highly localized area.

7.2 Estimated Cost

Each implementation strategy is provided with a rough cost estimate based on available third party or internal estimates and past experience with similar projects. Each cost estimate includes hard costs (construction and materials), soft costs (engineering design, permitting, etc.), and, where appropriate, Town staff time (valued at appx. $25/hour for grant applications, administration, etc.). Strategies that already have secured funding are noted. Detailed and current cost estimates for strategies were generally not available, so costs are summarized within the following ranges:

- Low – less than $50,000
- Medium – between $50,000 – $100,000
- High – over $100,000

7.3 Timeline

Section 7.3 helps meet the following FEMA local mitigation plan requirements:

- *C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))*

Each strategy is provided with an estimated length of time it will take for implementation. For strategies for which funding has been secured, a specific future timeline is provided for when completion is expected. However, most strategies do not currently have funding, and thus it is difficult to know exactly when they will be completed. For these projects, an estimate is provided for the amount of time it will take to complete the project once funding becomes available. Each strategy has a timeframe of either a specified period of less than 5 years, a 5+ year timeframe, or an ongoing timeframe.

7.4 Strategy Types

Mitigation strategies included in this plan are subdivided into the following four broad categories which can help facilitate local implementation discussions, especially regarding budget considerations and staff roles/responsibilities:

Structure and Infrastructure Projects relate to constructing "brick & mortar" infrastructure and building improvements in order to eliminate or reduce hazard threats or in order to mitigate the impacts of hazards. Examples of this type of project include drainage system improvement, dam repair, and generator installation. Structure and infrastructure improvements tend to have the greatest level of support at the local level but are highly constrained by funding limits.

Preparedness, Coordination and Response Actions ensure that a framework exists to facilitate and coordinate the administration, enforcement and collaboration activities described in this plan. They integrate disaster prevention/mitigation and preparedness into every relevant aspect of town operations, including the operations of the Police Department, Fire Department, EMD, EMS, DPW, Planning Board, Conservation Commission and Board of Selectmen; they also help the Town coordinate with neighboring communities where appropriate. Recommendations in this category often help standardize generally practiced activities.

Education and Awareness Programs help raise awareness of overall or hazard-specific risk and generate support for individual or community-wide efforts to reduce risk. Education and awareness seek to affect broad patterns of behavior. Awareness-building activity tends to have a fairly slow effect, although in the end it can provide extraordinary benefits with relatively little cash outlay.

Local Plans and Regulations propose updates to or formally update or establish local bylaws, ordinances and other regulations to protect vulnerable resources and prevent future natural hazard impacts on these resources. Local plans can also review the effectiveness of past mitigation projects, programs, procedures, and policies so that strategies for making them more effective in the future can be formed. An example of a project which fits under this category is incorporating mitigation planning into master plans, open space plans, capital improvement plans, facility plans, and other town plans.

Planning and regulatory activity tends to provide extraordinary benefits to towns with relatively little cash outlay. However, in smaller communities where planning activities are largely the purview of volunteers, outside assistance from the state or regional levels may be required to maximize the benefits of planning. Political support may be difficult to achieve for some planning and regulatory measures, especially those that place new constraints on land use.

In addition to describing action items in each of these categories, the row for each strategy also identifies what hazard(s) the strategy is intended to address. Each row also identifies the lead organizations who serve as the primary points of contact for coordinating efforts associated with the corresponding strategy and identify potential funding sources for implementing the strategy.

7.5 Strategy Goals

Section 7.5 helps meet the following FEMA local mitigation plan requirements:

• C3. "Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?" (Requirement 44 CFR § 201.6(c)(3)(i))

For each of the strategy types included above, there is an associated mitigation goal. The goals are as follows:

Structure and Infrastructure Projects – Harden and adapt the Town's current infrastructure to withstand hazards in the near-term and the long-term, incorporating nature-based strategies whenever feasible and desirable to build a more resilient municipality.

Preparedness, Coordination and Response Actions – Improve the Town's emergency and municipal service capabilities to effectively respond to and recover from natural disasters, as well as to build and establish relationships with stakeholders to ensure the continuation of essential services in the event of a disaster.

Education and Awareness Programs – Educate and inform the public about the threats of natural hazards and climate change; provide the resources for individual and community preparedness and foster a whole community response to natural hazards and climate change.

Local Plans and Regulations – Adopt and approve plans and legislation that prioritize climate resiliency and hazard mitigation; incorporate principles of resiliency within local and regional planning and legislative actions.

7.6 Town of Holden 2024 Hazard Mitigation Strategies

Section 7.6 helps meet the following FEMA local mitigation plan requirements:

- *C3. "Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?" (Requirement 44 CFR § 201.6(c)(3)(i));*
- *C4. "Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?" (Requirement 44 CFR § 201.6(c)(3)(ii));*
- *C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)); and*
- *D2. "Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)?" (Requirement 44 CFR § 201.6(c)(4)(i))*

OVERALL GOAL: The overall goal of these mitigation strategies is to facilitate activity within the Town of Holden that reduces the loss of people's lives, property in town, and environmental resources in town as well of the risk of these losses in the case of natural hazard occurrences. Please view section 8.4, Potential Federal and State Funding sources, for more information on the funding sources listed below.

Table 40: Town of Holden 2024 Hazard Mitigation Strategies

ID	Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Timeline
Structure & Infrastructure Strategies								
A-1	Obtain a generator or generators for the Town Hall and nearby Public Buildings, including the public Library. Generators at these facilities protect and serve the Town by providing emergency communications infrastructure and shelters for extreme temperatures/ refrigerated food storage, as well as emergency response measures, continuity of government, and allows for other emergency response and mitigation to occur.	All	**Local Emergency Management**	Local (Capital Budget), Federal Grants (BRIC/FMA), State Grants (MVP Action, various)	Low	Medium	High	3-5 Years
A-2	Drainage and Culvert Upgrades at Salisbury Street near Dawson Pond Dam in accordance with recommendations following evaluation of the dam and in accordance with recommendations of the Dam EAP	FL, SS, ST, HU	**DPW**	Local (DPW operating budget), Federal Grants (BRIC/FMA), State Grants (MVP Action, various)	Medium	Medium	High	Greater than 5 years
A-3	Identify and Resolve drainage issues and groundwater intrusion along Highland Street area.	FL, SS, ST, HU	**DPW**, MassDOT	Local (Capital Budget), Federal Grants (BRIC/FMA), State Grants (Ch. 90)	Low	Medium	Medium	3-5 Years

A-4	Determine ownership of Old Grist Mill Pond Dam. Conduct Inspections and Evaluations of Old Grist Mill Pond Dam, following confirmation of town's ownership of the Dam. Carry out recommended repairs and improvements of structural components of the dams.	DF, FL, ST, EQ	**DPW**, Water Department, Conservation Comm., Local Emergency Management	Local (Capital Funds), State Grants (Dam and Seawall), Federal (HHPD, BRIC/FMA)	Low	Medium	High	3-5 Years
A-5	Maintain access points to the DCR and Worcester Watershed to prevent wildfires and brushfires. Improve Mapping of Access Points and trails and integrate into Town's GIS systems	WF	**Fire Department**, DCR, City of Worcester	Local (fire department, DPW, and conservation operating budgets), State Grants (DTLA, EEA, LPA)	Medium	Medium	Medium	1-2 years
A-6	Replace Generator at Steel Street Water tower, currently functioning as the backup repeater system for the town's emergency communications and regional dispatch. Current generator system is unreliable.	All	**DPW**, Holden Regional Dispatch, Light Department	Local (Capital Budget), State (MVP) (Federal (BRIC/FMA)	High	High	High	1-3 years
A-7	Install Generators at town well and interconnection sites to ensure uninterrupted water services in the event of an emergency.	All	DPW	Local (Water Enterprise Funds), State (MVP Action), Federal (BRIC/FMA)	High	High	High	1-3 years
A-8	Reconstruct Causeway on Causeway Street following evaluation of nature-based solutions and improvements at that location, Replace culvert at stand pond for Eagle Lake.	DF, FL	DPW	Local (Capital Fund), State (Ch. 90, Culvert Grant)	Medium	High	High	3-5 years
A-9	Coordinate with the City of Worcester on the repairs of Pine Hill Reservoir Dam and other City of Worcester owned Dams in Holden.	DF, FL, ST, EQ	**City of Worcester**, Town Administration, DPW	Local (City of Worcester, ARPA Funds, Water Funds), State (Various), Federal (BRIC/FMA, HHPD)	High	High	High	3-5 years

A-10	Coordinate with the City of Worcester to address stormwater runoff and roadway pollutants as well as physical water supply protection barriers for the Holden Reservoir No 2 along Reservoir Road and Olean Street to prevent water supply contamination	ST, FL, DF	**City of Worcester,** Town Administration, DPW	Local (City of Worcester, ARPA Funds, Water Funds), State (Various), Federal (BRIC/FMA, HHPD)	High	High	High	3-5 years
A-11	Replace Chaffin Fire Station (Station 2) to improve Fire Service to local neighborhood and Surrounds. Current fire station on 87 Adams Road is a 2-bay station constructed in the 1980's and is inadequate to meet current needs, as well as having significant structural deficiencies such as a collapsing roof and being not up to code for any significant seismic event.	All	Fire Department, DPW	Local (Capital Fund), State (Various), Federal (Assistance to Firefighters Fire Station Improvement Grant, BRIC/FMA)	High	High	High	1-3 years
A-12	Renovate the Roof Structure of the Starboard Building, which currently faces snow load issues and houses many essential government functions in Holden	SS	DPW	Local (Capital Fund), State (various), Federal (BRIC)	High	High	High	1-3 years
A-13	Explore the Feasibility of an expansion of municipal power capabilities, including developing additional redundant energy storage and municipally owned power generation infrastructure to support key locations during outages.	All	Light, DPW, Town Administration	Local (Capital Funds), State (Community One Stop), Federal (BRIC)	High	High	Medium / High	1-3 years

A-14	Assess green infrastructure opportunities for stormwater management to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects. Coordinate with Town departments to incorporate green infrastructure into planned road improvements.	FL	DPW	Local (Capital Funds), State (Ch 90), Federal (FMA)	High	High	Low / Medium	1-2 years
A-15	Determine ownership of Current Meter Pond Dam. Ensure dam owner completes DAM EAP and performs necessary maintenance of Dam as indicated in the inspection report.	DF, FL	EMD	Local (DPW, emergency management, town appropriations), State (DLTA), Federal (HHPD/FMA)	High	High	Low	1 Year
Preparedness, Coordination & Response Action Strategies								
B-1	Investigate Community Rating System (CRS) Benefits and Requirements and Decide Whether to participate.	FL, SS, ST, HU	DPW, Local Emergency Management, **Planning**	Local (DPW, emergency management, town appropriations)	Low	Low	Low	1-2 Years
B-2	Participate in regional evacuation plan updates as they arise.	All	DPW, **Emergency Management**, MassDOT, Mass State Police, CMRPC	Local (LPA, General Operating Budget), State (Various), Federal (BRIC/FMA, EMPG), Private Contracts	High	High	Low	1-2 Years

B-3	Improve Coordination with Genesee and Wyoming to prevent brush fires along G&W owned rail tracks in town with Vegetation and Debris Management	WF	Genesee and Wyoming RR, **Fire Department**	Local (general operating budget), Private (G&W RR)	High	High	Low	1 Year
B-4	Coordinate with Dam owners (Such as the City of Worcester) around High Hazard Dam Planning and Hazard Modeling	DF, FL	Worcester Emergency Management, **Local Emergency Management,** DPW, Town Manager, Consulting Firm, Local Dam Owners	Local (City of Worcester, Water Funds, emergency management)	High	High	Low	1 Year
B-5	Coordinate with Housing Authority on group home response and evacuation planning for vulnerable populations in the event of an emergency	All	Fire, Police, Housing Authority, **Local Emergency Management**	Local (emergency management, fire department, police department, and housing authority operating budgets)	High	High	Low	6 Months
B-6	Distribute an emergency kit list to all citizens to encourage self-preparedness for hazard events.	All	Local Emergency Management	Local (emergency management operating budget)	Low	Medium	Low	6 Months
B-7	Assess mosquito, tick, and other pest control options; provide public education and outreach about associated risks, including determination of future risks due to	IS	Conservation Commission	Local (conservation operating budget), State (MVP), Federal (BRIC)	High	High	Low	1 Year

	increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program.							
B-8	Work with FEMA to correct flood maps at Industrial Park to reflect accurate, current flood risks.	FL	Building Commissioner, Local Emergency Management	Local (emergency management, building department operating budget)	High	High	Low	1-2 Year
Education & Awareness Strategies								
C-1	Provide Information to residents and businesses (especially in the Chaffin Pond area) on generator purchase, Use and Maintenance to reduce basement flooding in the event of power outages and in the use of Sump Pump usage. Use FEMA/MEMA Templates for educational materials	SS, ST, HU, FL	Fire Department, Light Department	Local (fire, light department operating Budget)	High	Medium	Low	1-2 years
C-2	Provide Information to Residents and Businesses on Water Conservation through low-impact landscaping and other measures (to conserve water in times of drought)	DR, WF	DPW, Conservation, Fire, Holden-Worcester Water	Local (DPW, conservation commission Operating Budget), Private (Water Companies)	High	Medium	Low	1 Year
C-3	Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Identify legal authority to enforce established O/M requirements.	FL	Town Government	Local (operating budgets for all town departments)	High	Medium	Medium	1 Year

C-4	Communicate awareness and availability of Preparedness Package and other information about emergency preparedness.	All	Local Emergency Management	Local (emergency management operating budget)	Medium	High	Low	1 year
C-5	Provide education and outreach on fertilizer impacts to inform landowners about the negative water quality impacts of nutrient pollution and how these are linked to algal blooms.	DR, IS	Agricultural Commission, Conservation Commission	Local (capital funding)	High	Medium	Low	1 year
C-6	Provide Education about dam safety and dam personal preparedness.	DF	Local Emergency Management	Local (emergency management operating budget)	Medium	Medium	High	1 Year
C-7	Provide Information to residents and businesses (especially in the Chaffin Pond area) on generator purchase, Use and Maintenance to reduce basement flooding in the event of power outages and in the use of Sump Pump usage. Use FEMA/MEMA Templates for educational materials	SS, ST, HU, FL	Fire Department, Light Department	Local (fire, light department operating Budget)	High	Medium	Low	1-2 years
C-8	Provide Information to Residents and Businesses on Water Conservation through low-impact landscaping and other measures (to conserve water in times of drought)	DR, WF	DPW, Conservation, Fire, Holden-Worcester Water	Local (DPW department, fire department, conservation commission Operating Budgets), Private (Water Companies)	High	Medium	Low	1 Year

C-9	Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Identify legal authority to enforce established O/M requirements.	FL	Town Government	Local (operating budgets for all town departments)	High	Medium	Medium	1 Year
C-10	Communicate awareness and availability of Preparedness Package and other information about emergency preparedness.	All	Local Emergency Management	Local (emergency management operating budget)	Medium	High	Low	1 year
Local Plan & Regulation Strategies								
D-1	Continue to Utilize the MA Drought management Plan as a Template for the Towns own plan and integrate State's recommendations and actions according to town needs.	DR	DPW, Water Department, Conservation Comm, Fire Department	Local (DPW department, water department, conservation commission, fire department Operating Budgets)	High	Low	Low	1-2 Years
D-2	Continue to follow Worcester's Drought Plan and help enforce water conservation measures as a successor water system.	DR, WF	DPW, Water Department, Conservation Comm, Fire Department, Worcester-Holden Wate	Local (DPW department, water department, conservation commission, fire department Operating Budgets)	Medium	Medium	Low	1-2 Years
D-3	Enforce Dam Safety Rules and regulations in coordination with the	DF, FL	Office of Dam Safety, Local	Local (emergency management department	High	Medium	Low	1-2 Years

	Office of Dam Safety to ensure that Inspections and Evaluation reports for privately owned dams in town are being created and followed through with recommended action items for structural improvements. Seek grant funding to address the deficiencies in emergency action planning for hazardous dams.		Emergency Management, DPW	Operating Budget), Federal (HHPD Grant Funding)				
D-4	Investigate and Become Stormready Certified, and provide information to residents around preparedness for weather related issues, especially Tornadoes	All	Fire Department, Emergency Management	Local (fire department, emergency management operating Budgets)	High	High	Low	1-2 Years
D-5	Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wildfires and brushfires.	WF	Fire Department	Local (Fire Department Operating Budget)	High	Medium	Low	1-2 Years
D-6	Review and update local plan and development review processes (planning, zoning, stormwater management, conservation, etc.) to encourage utilizing hazard mitigation measures in all new construction.	All	All Town Departments, Building Commissioner	Local (operating budgets for all town departments)	Medium	High	Low	1-2 Years

D-7	Monitor implementation of Hazard mitigation Planning, reviewing the plan on an annual basis to update as needed and to prioritize strategies for grant seeking.	All	Local Emergency Management, All Town Departments	Local (operating budgets for all town departments, LPA), State (DLTA)	High	High	Low	1 Year then ongoing
D-8	Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.	WF, IS	Fire Department, DCR	Local (Fire department Operating Budget, LPA), State (DLTA)	High	High	Low	1-2 Years

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought
EQ	Earthquakes	FL	Flooding
HU	Hurricanes	IS	Invasive Species
OT	Other	SS	Severe Snowstorms / Ice Storms / Nor'easters
ST	Severe Thunderstorms / Wind / Tornadoes	WF	Wildfire / Brushfire
XT	Extreme Temperatures		

'Agencies Involved' abbreviations:

CMRPC	Central Mass. Regional Planning Commission	CC	Conservation Commission
DPW	Department of Public Works	EMD	Emergency Management Director
PB	Planning Board	LEPC	Local Emergency Planning Committee
ZBA	Zoning Board of Appeals		

8.0 Plan Adoption, Implementation, and Maintenance

8.1 Plan Adoption

A public meeting was held on April 22nd, 2025 as part of the Board of Selectmen's meeting in order to detail the Holden Hazard Mitigation Plan update process to that date and to solicit comments and feedback from the public and the Board of Selectmen on the draft plan which was then being developed. The draft plan was provided to the Town for distribution and posted on the Town's website for three weeks starting on May 6th , 2025 for public review and input. The Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their review. Upon receiving conditional approval of the plan by FEMA, the final plan was adopted by vote of the Holden Board of Selectmen and certified on January 20th, 2026.

8.2 Plan Implementation

Section 8.2 helps meet the following FEMA local mitigation plan requirements:

- *A4. "Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information?" (Requirement 44 CFR § 201.6(b)(3)); and*
- *E2. "Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?" (Requirement 44 CFR § 201.6(d)(3)).*

The Town of Holden has taken steps to implement findings from its 2016 Hazard Mitigation Plan into the following plans: the 2020 Municipal Vulnerability Preparedness Plan, the 2019 Master Plan, and the 2022 Open Space and Recreation Plan.

The implementation of the 2025 plan update began upon its formal adoption by the Board of Selectmen and approval by MEMA and FEMA. Town departments and boards responsible for ensuring the development of policies, ordinance revisions, and programs as described in Sections 6 and 7 of this plan will be notified of their responsibilities immediately following this plan's approval. The local Hazard Mitigation Team in town will oversee the implementation of this plan.

Incorporation with Other Planning Documents

Existing plans, studies, reports, and municipal documents completed by and/or relating to the Town were incorporated throughout this planning process, including the data, ideas, and strategies incorporated into the plan. The following key documents were reviewed as part of the planning process, and information from these documents was incorporated into this plan update:

- ***Holden Comprehensive Emergency Management Plan*** (particularly the critical infrastructure section) – the critical infrastructure section of this plan was used to help identify infrastructure components in town that have been identified as crucial to the function of the Town; this resource was also used to identify potentially vulnerable populations and potential emergency response shortcomings.
- ***Regional Evacuation Plan*** – Funded by United States Department of Homeland Security via the Commonwealth of Massachusetts and the Central Region Homeland Security Advisory Council, this regional evacuation plan prepared by CMRPC was used to identify evacuation routes and emergency shelters. This plan will soon be updated by CMRPC.
- ***Holden Open Space and Recreation Plan*** – This Plan was used to identify the natural context within which mitigation planning takes place; it proved useful for this planning process insofar as it identified water bodies, rivers, streams, infrastructure components (i.e., water

and sewer, or the lack thereof), and population trends. This information was incorporated into this plan to ensure that the Town's mitigation efforts would be sensitive to the surrounding environment.[165]

- ***Holden Zoning Bylaw*** – The Zoning Bylaw was used in this planning process to identify the actions that the Town is already taking (such as implementing and enforcing floodplain regulations) that reduce the potential impacts of a natural hazard and to make sure that this plan's mitigation strategies do not duplicate existing successful efforts.[166]
- ***Holden Master Plan*** – This plan was used to identify the main priorities for the Town so that the Hazard Mitigation Plan's strategies can align with these priorities.[167]
- ***Holden Municipal Vulnerability Preparedness Plan –*** Recommendations from this plan deemed important to hazard mitigation by the planning team in town were incorporated into the Hazard Mitigation Plan's mitigation strategies.[168]
- ***ResilientMass State Hazard Mitigation and Climate Adaptation Plan*** - This plan was used to ensure that the town's HMP data and priorities are consistent with the State's data and priorities.[169]
- ***2022 Massachusetts Climate Change Assessment*** - This plan was used to ensure that the town's HMP data and priorities, especially in the hazards section of the plan, are consistent with the State's data and priorities.[170]
- ***2025 Massachusetts Statewide Comprehensive Housing Plan*** - This plan was used to ensure that the town's HMP data and priorities, especially in the Development Trends section of the plan, are consistent with the State's data and priorities.[171]

After this plan has been approved by both FEMA and the Holden Board of Selectmen, a link to the plan will be emailed to all Town staff, boards, and committees; along with this link, the Town staff, boards, and committees will be sent a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other town planning processes and/or documents. In addition, during annual monitoring meetings for the Hazard Mitigation Plan implementation process, the local Hazard Mitigation Team will review whether any of these plans are in the process of being updated. If so, the Hazard Mitigation Team will remind people working on these plans and/or documents of the Hazard Mitigation Plan and will urge them to incorporate information and strategies from the Hazard Mitigation Plan into their efforts. The Hazard Mitigation Team will also review current town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan. Information from the Hazard Mitigation Plan will also be incorporated into updates of the Town's Comprehensive Emergency Management Plan.

[165] Holden OSRP
[166] Holden Zoning Bylaws
[167] Holden Master Plan
[168] Holden MVP Plan
[169] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[170] "2022 Massachusetts Climate Change Assessment"
[171] HOUSING ADVISORY COUNCIL, Mass.gov (2025). Executive Office of Housing and Livable Communities. Retrieved February 6, 2025, from https://www.mass.gov/doc/a-home-for-everyone/download.

8.3 Plan Monitoring and Evaluation

Section 8.3 helps meet the following FEMA local mitigation plan requirements:

- *D1. "Is there discussion of how each community will continue public participation in the plan maintenance process?" (Requirement 44 CFR § 201.6(c)(4)(iii));*
- *D2. "Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)?" (Requirement 44 CFR § 201.6(c)(4)(i)); and*
- *D3. "Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?" (Requirement 44 CFR § 201.6(c)(4)(ii))*

The Town's Emergency Management Director will call meetings of all responsible parties to review the progress of the Hazard Mitigation Plan on a yearly basis and/or as is needed based on the occurrence of hazard events. Any substantial revisions to the plan will be made open for public comment and/or will be presented on at a Board of Selectmen meeting which is open to the public. Parties identified as responsible for specific mitigation actions will be asked to submit their reports relating to these actions in advance of meetings.

The meetings described above will involve evaluation and assessment of the plan. Responsible parties will review the plan's effectiveness at achieving its goals and stated purpose at these meetings. The following questions will serve as the criteria that are used to evaluate the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?
- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or federal sources relating to the impact of previous hazard events or the probability of future hazard occurrences? If so, this information should be incorporated into the plan.
- How will progressing climate change impact the risk of each natural hazard? What impacts do hotter, wetter, and more variable weather have on each natural hazard?

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effects of any recent hazard events?
- Has there been any damage to property caused by natural hazards since the plan was last reviewed?

- How could the existing mitigation strategies be improved to reduce the impacts of recent occurrences of hazards? If there are improvements which should be made, these should be incorporated into the plan.

Proposed Mitigation Strategies

- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any recently completed mitigation strategies affected the level of impact in town of hazards that have occurred since these strategies were completed?
- Should the criteria for prioritizing the mitigation strategies in the plan be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources and/or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? Could it be improved?
- Are there any town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them?
- How can the current Hazard Mitigation Plan be better integrated with other Town planning tools and operational procedures, including the zoning bylaw, the Comprehensive Emergency Management Plan, and the Capital Improvement Plan?

Plan tracking and monitoring will be accomplished by a group of town stakeholders led by the Town's Emergency Management Director who have similar to if not the same credentials as the local HMP planning team for this plan update. When this team meets, they will review the mitigation strategies table from this plan update, will update it with any progress on the strategies which has been made since the plan update was adopted, and will discuss priorities for mitigation strategies which have not yet been implemented. They will also discuss how the data, ideas, and strategies from this plan update will be incorporated into other planning mechanisms and documents actively being worked on in town, including but not limited to updates to the Town's Master Plan, Open Space and Recreation Plan, Comprehensive Emergency Management Plan, and zoning bylaw as well as Municipal Vulnerability Preparedness program efforts in town. Following these meetings, it is anticipated that the Hazard Mitigation Team may decide to reassign the roles and responsibilities for implementing mitigation strategies in the Plan to different town departments and/or may revise the goals and objectives contained in the Plan. The team will review and update the Hazard Mitigation Plan every five years through forming a HMP planning team and working with a contractor to complete the update.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. Any substantial revisions to the plan will be made open for public comment and/or will be presented on at a Board of Selectmen meeting which is open to the public. Plan implementation will be approved through standard capital planning, Town Meeting, and/or other publicly accessible local approval processes. The public will be notified of any changes to the Plan via the meeting notices board at Town Hall, and copies of the revised Plan will be made available to the public at Town Hall.

8.4 Potential Federal and State Funding Sources

8.4.1 Federal Funding Sources

The following is a summary of the programs which are the primary sources for federal funding of hazard mitigation projects and activities in Massachusetts:

Table 41: Federal Hazard Mitigation Funding Sources

Program	Type of Assistance	Availability	Managing Agency	Funding Source
National Flood Insurance Program (NFIP)	Pre-disaster insurance	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner, FEMA
Community Rating System (CRS) (Part of the NFIP)	Flood insurance discounts	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner
Hazard Mitigation Grant Program (HMGP)	Post-disaster cost-share grants	Post disaster program	MEMA	75% FEMA / 25% non- federal
Building Resilient Infrastructure and Communities (BRIC)	National, competitive cost-share grant program for projects & planning	Annual, pre-disaster mitigation program	MEMA	75% FEMA / 25% non- federal
Flood Mitigation Assistance (FMA) Program	Cost share grants for pre-disaster planning & projects	Annual pre-disaster grant program	MEMA	75% FEMA / 25% non- federal
Public Assistance	Post-disaster aid to state & local governments	Post Disaster	MEMA	FEMA, plus a non-federal share
Small Business Administration (SBA) Mitigation Loans	Pre- & post-disaster loans to qualified applicants	Ongoing	MEMA	Small Business Administration
Emergency Management Performance Grant (EMPG)	Pre- & post-disaster management and implementation grants	Annual	MEMA	50% FEMA / 50% non-federal match
Homeland Security Grant Program (HSGP)	Funding to prevent, respond to, and recover from acts of terrorism	Annual	MEMA	FEMA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Hazard Mitigation Grant Program Post-Fire (HMGP-PF)	Cost-share post-wildfire disaster mitigation measures	Annual, within six months after a Fire Management Assistance Grant declaration	FEMA	75% FEMA / 25% non-federal
Assistance to Firefighters Grants (AFG)	Training & equipment for wildfire-related hazards	Annual	FEMA	FEMA
Fire Prevention & Safety Grant Program (AFG) (FP&S)	Cost-share funding to support projects that protect people from fire-related hazards	Annual	FEMA	95% FEMA / 5% non-federal
Fire Management Assistance Grants (FMAG)	Cost-share funding to mitigate & manage major disasters caused by fire	Any time (pre- & post disaster)	FEMA	75% FEMA / 25% non-federal
National Dam Safety Program (State Assistance Grant Program) (NDSP)	Funding to improve dam safety & state dam safety programs	Annual	FEMA	FEMA, Bipartisan Infrastructure Law
Rehabilitation of High Hazard Potential Dam Program (State Dam Safety Divisions) (HHPD)	Cost-share funding to plan and rehabilitate high hazard potential dams	Annual	FEMA	65% FEMA / 35% non-federal
National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP)	Cost-share funding for pre-earthquake risk management	Annual	FEMA	75% FEMA / 25% non-federal
Emergency Food and Shelter Program (EFSP)	Grant funding for supplemental food & shelter for those experiencing / at risk of experiencing homelessness	Annual	FEMA	FEMA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Public Health Crisis Response Cooperative Agreement (PHCRCA)	Funding to support surge needs of existing public health programs responding to public health emergencies	Annual for approved by unfunded (ABU) roster	CDC	Varies
Army Corp of Engineers Planning Assistance	Water supply, conservation, wetlands, & dam safety funding	Any time (pre & post disaster)	U.S. Army Corps of Engineers	50% Federal / 50% non-federal
Forest Service Community Wildfire Defense Grant (USDA-FSCWDG)	Grant funding to plan for and reduce wildfire risk	Annual	USDA-FS	75% USDA / 25% non-federal
Emergency Watershed Protection Program (EWP)	Technical assistance and funding for helping communities mitigate natural disaster risks which affect watersheds	Ongoing	USDA-NRCS	75% USDA / 25% non-federal (90% USDA / 10% non-federal in limited resource areas)
Agricultural Management Assistance (Drought Mitigation Funding Program) (AMA)	Technical assistance for agricultural producers to manage financial risks	Ongoing	USDA-NRCS	75% USDA / 25% non-federal
USDA Community Facilities Direct Loan & Grant Program (Rural Development) (CFDLGP)	Funding for improving essential community facilities	Annual	USDA-RD	Varies
National Culvert Removal, Replacement, & Restoration Grant (NCRRRG)	Competitive grant funding to replace, remove, and repair culverts or weirs	Annual	US DOT	Varies
Bridge Investment Program (BIP)	Competitive grant program for improving the conditions of existing bridges	Annual	US DOT	80% FHWA / 20% other

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT)	Discretionary program which includes Competitive Resilience Improvement Grants and planning grants	Annual	US DOT	Varies (generally, up to 80% federal share)

This FEMA web page describes several funding opportunities: FEMA Grants | FEMA.gov. The programs listed in the above table are described in more detail below.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) AND COMMUNITY RATING SYSTEM (CRS) (PART OF THE NFIP)

The National Flood Insurance Program (NFIP) provides insurance to communities required to manage and adopt mitigation practices for high flood-risk areas. The Community Rating System (CRS) incentivizes communities to incorporate flood management practices and mitigation strategies through discounted flood insurance rates; Incentives are available on a voluntary and participatory basis to encourage communities to meet the minimum requirements of the NFIP. In encouraging communities to meet NFIP's minimum requirements, CRS can extend the availability of funding to homeowners, businesses, and renters for whom flood insurance may not be accessible. CRS allocates insurance discount rates according to a community's demonstrated efforts to implement the program's three goals:

- Reduce flood damage to insurable properties;
- Strengthen and support NFIP; and
- Incentivize proactive floodplain management.

Communities can earn CRS points based on their implementation of various flood mitigation initiatives, including but not limited to: (1) restricting development on flood prone areas, (2) extending public risk communication with flood warning systems, and (3) enhancing infrastructural resilience to flood damage. Please refer to | The National Flood Insurance Program (floodsmart.gov) and Community Rating System | FEMA.gov for more information.

HAZARD MITIGATION ASSISTANCE (HMA)

The Hazard Mitigation Assistance (HMA) grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of these programs differ, all share the common goal of reducing the risk of loss of life and property from natural hazards. Brief descriptions of the HMA grant programs can be found below. For more information on the individual programs, or to see information related to a specific fiscal year, please click on one of the program links.

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available under this program to implement projects in accordance with state, tribal, and local priorities. Please refer to Hazard Mitigation Assistance Grants | FEMA.gov for additional information.

HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects completed under this program must provide a long-term solution to a problem; for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight a flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. Examples of eligible HMGP projects include, but are not limited to:

- Acquisition of real property from willing sellers and demolition or relocation of buildings to convert this property to open space use;
- Retrofitting structures and facilities to minimize damages from high winds, earthquakes, flooding, wildfires, or other natural hazards;
- Elevation of flood prone structures;
- Development and initial implementation of vegetative management programs;
- Minor flood control projects that do not duplicate the flood prevention activities of other federal agencies;
- Localized flood control projects, such as certain ring levees and floodwall systems, that are designed specifically to protect critical facilities; and
- Post-disaster building code related activities that support building code officials during the reconstruction process.

Hazard Mitigation Grant Program Post-Fire (HMGP-PF)

The Hazard Mitigation Grant Program Post-Fire (HMGP-PF) is a program aimed at providing financial funding to localities to reduce risk of damage from future fires after a given area has experienced a fire. Funds are determined through benefit-cost analysis software. For more information, please refer to: Hazard Mitigation Grant Program Post Fire | FEMA.gov.

Building Resilient Infrastructure and Communities (BRIC)

The Building Resilient Infrastructure and Communities (BRIC) program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. Examples of BRIC projects are projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. For example, an innovative BRIC project may bring multiple funding sources or in-kind resources from a range of private and public sector partners. Or an innovative project may offer multiple benefits to a community in addition to the benefit of risk reduction. The BRIC program has replaced the Pre-Disaster Mitigation (PDM) grant program. More information on the BRIC program can be found here: Building Resilient Infrastructure and Communities | FEMA.gov.

The Massachusetts Emergency Management Agency (MEMA) coordinates BRIC applications for municipalities within the Commonwealth. Links to MEMA resources and BRIC application materials can be found here: Building Resilient Infrastructure and Communities (BRIC) & Flood Mitigation Assistance (FMA) Grant Programs | Mass.gov.

FLOOD MITIGATION ASSISTANCE (FMA)

Flood Mitigation Assistance (FMA) provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program. Please refer to the FMA website: Flood Mitigation Assistance Grant Program | FEMA.gov.

The following types of FMA grants are available to states and communities:

- **Project Scoping Grants** are designed to develop mitigation strategies and obtain data to prioritize, select, and develop complete applications in a timely manner that result in either an improvement in the capability to identify appropriate mitigation projects or in the development of an application-ready mitigation project for FMA or another program.
- **Planning Grants** to prepare flood mitigation plans; Only NFIP-participating communities with approved flood mitigation plans can apply for FMA project grants.
- **Technical Assistance Grants** are awards of up to $50,000 federal cost share for recipients to which FEMA obligated at least $1 million federal share the previous FMA cycle.
- **Project Grants** to implement measures to reduce flood losses, such as the elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties (structures with 2 or more losses each with a claim of at least $1,000 within any ten-year period since 1978).

MEMA coordinates FMA applications for municipalities within the Commonwealth. Links to MEMA resources and FMA application materials can be found here: Building Resilient Infrastructure and Communities (BRIC) & Flood Mitigation Assistance (FMA) Grant Programs | Mass.gov.

DISASTER ASSISTANCE

Disaster Assistance is money or direct assistance to individuals, families, and businesses whose property has been damaged or destroyed and whose losses are not covered by insurance. It is meant to help with critical expenses that cannot be covered in other ways. This assistance is not intended to restore damaged property to its condition before the disaster. While some housing assistance funds are available through FEMA's Individuals and Households Program, most disaster assistance from the Federal government is in the form of loans administered by the Small Business Administration.

Disaster Assistance Available from FEMA

Assistance from FEMA in the event of a disaster declaration is grouped into the following 3 categories:

A. Housing Needs

- **Temporary Housing** (a place to live for a limited period of time): Money is made available to rent a different place to live, or a government-provided housing unit when rental properties are not available.
- **Repair**: Money is available to homeowners to repair damage from the disaster to their primary residence that is not covered by insurance. The goal is to make the damaged home safe, sanitary, and functional.
- **Replacement**: Money is available to homeowners to replace their home destroyed in the disaster that is not covered by insurance. The goal is to help the homeowner with the cost of replacing their destroyed home.
- **Permanent Housing Construction**: Direct assistance or money is made available for the construction of a home. This type of help occurs only in insular areas or remote locations specified by FEMA, where no other type of housing assistance is possible.

B. Other than Housing Needs

- Money is available for necessary expenses and serious needs caused by a disaster, including:
    - Disaster-related medical and dental costs;
    - Disaster-related funeral and burial costs;
    - Clothing;
    - Household items (room furnishings, appliances);
    - Tools (specialized tools or protective clothing and equipment) required for people's jobs;
    - Necessary educational materials (computers, schoolbooks, supplies);
    - Fuels for primary heat source (heating oil, gas);
    - Clean-up items (wet/dry vacuums, dehumidifiers);
    - Expenses relating to disaster-damaged vehicles;
    - Moving and storage expenses related to the disaster (moving and storing property to avoid additional disaster damage while disaster-related repairs are being made to the home);
    - Other necessary expenses or serious needs as determined by FEMA; and
    - Other expenses that are authorized by law.

C. Additional Services

- Crisis Counseling
- Disaster Unemployment Assistance
- Legal Services
- Special Tax Considerations

For additional information, please refer to: Get Assistance After a Disaster | FEMA.gov.

DISASTER LOANS AVAILABLE FROM THE U.S. SMALL BUSINESS ADMINISTRATION

The U.S. Small Business Administration (SBA) can make federally subsidized loans to repair or replace homes, personal property, or businesses that sustained damages not covered by insurance. The Small Business Administration can provide the following three types of disaster loans to qualified homeowners and businesses:

- Physical damage loans: Loans to cover repairs and replacement of physical assets damaged in a declared disaster.
- Mitigation assistance: Funding to cover small business operating expenses after a declared disaster.
- Economic injury disaster loans: Loans which provide economic relief to small businesses and nonprofit organizations that have suffered damage to their home or personal property.
- Military reservist loans: Loans to help eligible small businesses with operating expenses to

make up for employees on active duty leave.

For many individuals, the SBA disaster loan program is the primary form of disaster assistance. Please find more information about this loan program here: Disaster assistance | U.S. Small Business Administration (sba.gov).

DISASTER ASSISTANCE FROM OTHER ORGANIZATIONS AND ENTITIES

Home | disasterassistance.gov is a secure, user-friendly U.S. Government web portal that consolidates disaster assistance information in one place. If individuals need assistance following a Presidentially declared disaster which has been designated for individual assistance, they can now go to DisasterAssistance.gov to register for receiving assistance online. Local resource information to help keep citizens safe during an emergency is also available. Currently, 17 U.S. Government agencies, which sponsor almost 70 forms of assistance, contribute to the portal.

DisasterAssistance.gov speeds up the application process by feeding common data to multiple online applications. Application information is shared only with those agencies individuals identify and is protected by the highest levels of security. DisasterAssistance.gov will continue to expand to include forms of assistance available at federal, state, tribal, regional, and local levels.

EMERGENCY MANAGEMENT PERFORMANCE GRANT (EMPG)

The Emergency Management Performance Grant (EMPG) provides resources for state, local, tribal, and territorial emergency response organizations required for the National Preparedness System. EMPG supports efforts in building and strengthening capabilities in areas related to protection, mitigation, prevention, response and recovery. In fiscal year 2024, this grant had a total available funding of $319.55 million. Please find more information about this grant program at the link here: Emergency Management Performance Grant | FEMA.gov.

HOMELAND SECURITY GRANT PROGRAM (HSGP)

The Homeland Security Grant Program (HSGP) provides a suite of grant opportunities in support of efforts in the mitigation of, prevention of, protection from, and recovery from terrorist and other threats at the state, local, tribal, and territorial levels. As of the 2024 fiscal year, the program, including its three separate grants, had $1.008 billion in funding. The three grants available under this program are:

- The State Homeland Security Program (SHSP);
- The Urban Area Security Initiative (UASI); and
- Operation Stonegarden (OPSG).

Please find more about this program at the link here: Homeland Security Grant Program | FEMA.gov.

ASSISTANCE TO FIREFIGHTERS GRANTS (AFG) AND FIRE PREVENTION & SAFETY GRANT PROGRAM (FP&S)

The FEMA Assistance to Firefighters Grants (AFG) program provides funds to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience. Under AFG, funds may be available for equipment, vehicles, and/or training that can be used to mitigate and/or respond to wildfire-related hazards. AFG also has a Fire Prevention and Safety (FPS) component which funds public outreach programs and prevention activities, which can emphasize wildfire mitigation. More about

these programs can be found at these links: Assistance to Firefighters Grants Program | FEMA.gov, Fire Prevention and Safety (FP&S) | FEMA.gov.

FIRE MANAGEMENT ASSISTANCE GRANTS (F-MAG)

The Fire Management Assistance Grants (F-MAG) Program supports firefighting efforts in cases of fire-related disasters impacting public and private forests as well as grasslands at the state, local and tribal levels. For more information on this program, please refer to: Fire Management Assistance Grants | FEMA.gov.

NATIONAL DAM SAFETY PROGRAM (STATE ASSISTANCE GRANT PROGRAM) (NDSP)

The National Dam Safety Program (NDSP) provides financial assistance to strengthen the individual dam safety programs of states and territories. In the 2024 fiscal year, this program distributed $24.2 million among 49 states and Puerto Rico. For more information on this program, please refer to: Grant Assistance to States | FEMA.gov.

REHABILITATION OF HIGH HAZARD POTENTIAL DAM PROGRAM (STATE DAM SAFTEY DIVISIONS) (HHPD)

The Rehabilitation of High Hazard Potential Dams Program (HHPD) provides technical, planning, design, and construction assistance in the form of grants for the rehabilitation of high hazard potential dams in eligible states and territories. For more information, please refer to: Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program | FEMA.gov.

NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM'S STATE ASSISTANCE PROGRAM (NEHRP)

The National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP) provides funding to localities for the reduction of risk associated with earthquakes. This is done through two grants:

- Individual State Earthquake Assistance (ISEA) and
- Multi-State National Earthquake Assistance (MSNEA).

More information about this program can be found at this link: National Earthquake Hazards Reduction Program's State Assistance Program | FEMA.gov.

EMERGENCY FOOD AND SHELTER PROGRAM (EFSP)

The Emergency Food and Shelter Program (EFSP) assists and expands upon the work of local nonprofit and governmental social service organizations to provide shelter, food, and other services to people experiencing or at risk of hunger and/or homelessness. For more information, please refer to: Emergency Food and Shelter Program | FEMA.gov.

PUBLIC HEALTH CRISIS RESPONSE COOPERATIVE AGREEMENT (PHCRCA)

The Center for Disease Control and Prevention's Public Health Crisis Response Cooperative Agreement (PHCRCA) allows for opportunities for state, local, and tribal government to receive funding in response to public health emergencies. For more information, please refer to: The Centers for Disease Control and Prevention's Public Health Crisis Response Cooperative Agreement Program Awards (hhs.gov).

ARMY CORP OF ENGINEER PLANNING ASSISTANCE

Under the authority provided by Section 22 of the Water Resources Development Act of 1974 (PL 93-251), as amended, the U.S. Army Corps of Engineers can provide states, local governments, other non-federal entities, as well as eligible Native American Indian tribes, assistance in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. Typical studies funded under this program are only at the planning level of detail; they do not include detailed engineering designs intended for project construction. The program can encompass many types of planning studies which address water resources issues. Types of studies conducted in recent years under the program include the following: water supply/demand, water conservation, water quality, environmental/conservation, wetlands evaluation/restoration, dam safety/failure, flood damage reduction, coastal zone protection, and harbor planning. For more information, please refer to: Planning Assistance to States, U.S. Army Corps of Engineers, New England District.

FOREST SERVICE COMMUNITY WILDFIRE DEFENSE GRANT (USDA-FSCWDG)

The Forest Service Community Wildfire Defense Grant Program (USDA-FSCWG) provides funding and assistance to at-risk local communities and tribes to reduce wildfire risk. Funding and assistance under this program are primarily used to revise and develop community wildfire protection plans and to assist in implementing new projects described in said plans. For more information on this program, please refer to: Community Wildfire Defense Grant Program | US Forest Service (usda.gov).

EMERGENCY WATERSHED PROTECTION PROGRAM (EWP)

The Emergency Watershed Protection Program (EWP) provides technical and financial assistance to localities in response to imminent life- and property-threatening natural disasters which negatively impact local watersheds. For more information about this program, please refer to: Emergency Watershed Protection | Natural Resources Conservation Service (usda.gov).

AGRICULTURAL MANAGEMENT ASSISTANCE (DROUGHT MITIGATION FUNDING PROGRAM) (AMA)

Agricultural Management Assistance (AMA) is a program to help farmers build on and diversify their agricultural practices. The program is available in 16 states that have had historically low rates of participation in the Federal Crop Insurance Program. AMA covers up to 75% of funds needed to install conservation practices on farms, with a cap of $50,000 per individual participant in a given fiscal year. For more information, please refer to: Agricultural Management Assistance | Natural Resources Conservation Service (usda.gov).

USDA COMMUNITY FACILITIES DIRECT LOAN & GRANT PROGRAM

The UDSA Community Facilities Direct Loan & Grant program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings. Rural areas including cities, villages, and townships and towns, including Federally Recognized Tribal Lands, with no more than 20,000 residents according to the latest U.S. Census Data are eligible for this program. Program funds can be used to purchase, construct, and / or

improve essential community facilities, purchase equipment, and pay related project expenses. For more information on this program, please refer to: Community Facilities Direct Loan & Grant Program | Rural Development (usda.gov).

NATIONAL CULVERT REMOVAL, REPLACEMENT, & RESTORATION GRANT (NCRRRG)

The National Culvert Removal, Replacement, and Restoration Grant Program (NCRRRG) (Culvert Aquatic Organism Passage (AOP) Program) assists eligible tribes, states and local governments in issues related to culverts and weirs to improve and/or restore passage for anadromous fish in freshwater waterways. Anadromous fish are those that spawn in freshwater but live most of their lives in saltwater. More information about this program can be found at this link: Aquatic Organism Passage - Culvert Hydraulics - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov).

BRIDGE INVESTMENT PROGRAM (BIP)

The Bridge Investment Program (BIP) provides the opportunity for governments at all levels to receive funding to repair and restore aging bridge infrastructure. BIP grant applications have a maximum grant award of 80% of the total eligible bridge project costs. For more information regarding this program, please refer to: BIP - Funding Programs - Management and Preservation - Bridges & Structures - Federal Highway Administration (dot.gov).

PROMOTING RESILIENT OPERATIONS FOR TRANSFORMATIVE, EFFICIENT, AND COST-SAVING TRANSPORTATION PROGRAM (PROTECT)

The Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (Protect) Program is a program established by the Bipartisan Infrastructure Law (BIL) which funds resilience-building activities for surface transportation, such as plans (including evacuation plans) and infrastructure improvements, which increase reliance to natural hazards and climate change. For more information regarding this program, please refer to: Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) | US Department of Transportation and Bipartisan Infrastructure Law - Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program Fact Sheet | Federal Highway Administration (dot.gov).

8.4.2 State Funding Sources

The following is a summary of state funding opportunities for hazard mitigation projects and activities in Massachusetts:

Table 42: State Hazard Mitigation Funding Sources

Program	Type of Assistance	Availability	Managing Agency	Funding Source
604b Water Quality Management Planning Grant Program	Grants focused on nonpoint source pollution assessment and watershed planning	Annual	Mass DEP	State funding (match not required but recommended)
Section 319 Nonpoint Source Competitive Grants Program	Competitive grant program funding projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution	Annual	Mass DEP	State funding
Water Quality Monitoring Grant Program	Reimbursement funding for monitoring and/or data collection efforts that support water quality assessments	Annual	Mass DEP	State funding
Statewide Water Management Act Grant	Reimbursement grant funding for projects to help public water suppliers plan and manage water use	Annual	Mass DEP	Reimbursement grant
Massachusetts Gap Energy Grant Program (Gap III)	Program providing grant assistance (up to $200,000 per community) for implementing energy efficiency and clean energy generation projects at water and wastewater plants	Annual (likely)	Mass DEP	State funding
State Revolving Fund	Low-interest loans	Annual	Mass DEP	Municipal funding with state loan

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Municipal Vulnerability Preparedness (MVP) Action Grants	Competitive climate adaptation grants	Annual	EEA	75% EEA / 25% non-state match
Planning Assistance Grants (EEA PAG)	Competitive grants that support efforts to plan, regulate (zone), and act to conserve and develop land consistent with the Massachusetts Sustainable Development Principles	Annual	EEA	75% EEA / 25% non-state match
Dam and Seawall Repair or Removal Program	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding
Massachusetts Land & Water Conservation Fund Grant Program (LWCF)	Federal grant program to help improve access to and protection for public lands and waters	Annual	DCS	Federal program that funds up to 50% of total costs for acquisition, development, and renovation
Local Acquisitions for Natural Diversity (LAND)	Financial assistance to municipalities for the acquisition of conservation land	Annual	DCS	Reimbursement grant, the reimbursement rate varies per town
Drinking Water Supply Protection Grant (DWSP)	Competitive grants for protection of drinking water supplies	Annual	DCS	State funding
Land and Recreation Grants and Loans	Varies, though primarily grant funding for conservation and recreation projects	Varies, generally annually	DCS	Varies

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Land Conservation Assistance Grant Program	Financial assistance for permanently protecting land	Annual (Likely)	DCS	90% state reimbursement / 10% other
Forest Legacy Grant Program (USDA-FS) (FLGP)	Grant funding to protect environmentally important forestland from conversion	Annual	DCR	75% USDA FS / 25% non-federal
Culvert Replacement Municipal Assistance Grant Program	Competitive grants for replacing an undersized, perched, and/or degraded culvert located in an area of high ecological value	Annual	DER	State funding
Division of Ecological Restoration Priority Project Program	State competitive grant program that funds projects that restore and protect the state's rivers, wetlands, and watersheds (priority projects may differ each year)	Annual	DER	State funding
Mass Wildlife Habitat Management Grant Program (MWHMGP)	Reimbursement grant funding to assist municipalities in enhancing wildlife habitat and increasing recreational opportunities on protected lands	Annual	DFW	USDA NRCS
Agricultural Climate Resiliency and Efficiencies Program (ACRE)	Competitive reimbursement grant funding that supports practices that mitigate the agricultural sector's vulnerability to climate change	Annually through Climate Smart Agriculture Program (CSAP)	MDAR	MDAR

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Agricultural Preservation Restriction Program (APR)	Financial assistance in exchange for permanent deed restriction to protect lands' agricultural viability	Any time for owners of at least 5 acres of farmland	MDAR	MDAR
Hazard Mitigation Grant Program (State) (HMGP)	Sub-grant programs for the Hazard Mitigation Grant Program	Annual	MEMA	State funding
Community Development Block Grants (CDBG)	Competitive community development grants	Annual	EOHLC	US Department of Housing and Urban Development
Emergency Solutions Grant (ESG)	Competitive grant funding designed to support services that assist those experiencing / at risk of experiencing homelessness	Annual	EOHLC	MA EOHLC
Mass Works	Competitive infrastructure grants	Annual	EOED	State funding
Community Preservation Act (CPA)	Establishes a local community preservation fund through tax surcharge to support a variety of project related to conservation and housing	Ongoing	Department of Revenue (DOR)	Statewide Community Preservation Trust Fund / Local Community Preservation Fund
Special appropriations and legislative earmarks	Varies	Infrequent, after natural disasters or legislature vote	Massachusetts General Legislature	State funding
District Local Technical Assistance (DLTA)	Funding to support planning and technical assistance for housing, economic growth, and regional projects	Varies, generally annually	Massachusetts General Legislature, CMRPC	State funding

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Local Planning Assistance (LPA)	Planning and technical assistance	Annual	CMRPC	Planning assistance hours
Support and Incentive Grant	Reimbursement grant funding designed to assist in providing enhanced 911 service	Annual	MA EOPSS	MA EOPSS
Municipal Small Bridge Program	Competitive grants for small bridge replacement, preservation, and rehabilitation projects	Annual	MassDOT	State funding
Chapter 90 Program (Transportation Capital Improvement Projects) (Chpt. 90)	Reimbursable grants to support capital improvements on local public ways	Ongoing	MassDOT	State funding
State Transportation Improvement Program (STIP)	Competitive funding opportunity for transportation projects along federal-aid roadways	Annually updated five-year programming document	MassDOT	MassDOT
Complete Streets (CS)	Reimbursement grant funding to provide safe and accessible options for all travel modes	Annually available to municipalities that adopt a Complete Streets Policy	MassDOT	State funding

The Community Grant Funder web page includes the municipal grant programs listed above, as well as other funding opportunities: Community Grant Finder | Mass.gov. The programs listed in the above table are described in more detail below.

604B WATER QUALITY MANAGEMENT PLANNING GRANT PROGRAM

The 604B Water Quality Management Planning Grant Program provides funding opportunities to regional planning agencies, councils of governments, conservation districts, counties, cities and towns, federally and state recognized tribes, and other substate public planning agencies and interstate agencies to determine and correct water quality issues in Massachusetts. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

SECTION 319 NONPOINT SOURCE COMPETITIVE GRANTS PROGRAM

Section 319 of the Clean Water Act provides funding opportunities for the prevention, control, and

abatement of nonpoint source (NPS) pollution. These grants are available to eligible Massachusetts public or private organizations, including: state and federally recognized tribes, regional planning agencies, councils of governments, counties, conservation districts, cities and towns, other substate public planning agencies, and interstate agencies. To be eligible for this program, these entities' projects must: include measures that address the prevention, control, and abatement of NPS pollution, target major sources of NPS pollution within a watershed, contain an appropriate method for evaluating the project results, and address activities in the current Massachusetts NPS Management Program Plan. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

WATER QUALITY MONITORING GRANT PROGRAM

The Water Quality Monitoring Grant Program provides funding opportunities to eligible entities and organizations to increase the amount of data on water quality in Massachusetts. For more information, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

STATEWIDE WATER MANAGEMENT ACT GRANT

The Statewide Water Management Act Grant provides grant funding for projects which improve the ecological conditions of specific watersheds and projects aimed at reducing water demand. Specifically, projects funded under this program must: improve or increase instream flow, keep wastewater local, relate to stormwater management, reduce impervious cover and/or improve water quality, relate to water supply operational improvements, improve habitat, reduce wastewater inflow and infiltration, and/or be another type of project which can be demonstrated to mitigate the impacts of water withdrawals. This program awards approximately 10 grants a year and has a reimbursement rate of 80%. Grants are awarded to eligible public water suppliers and municipalities with Water Management Act permits. For more information, please refer to: Water Management Act Grant Programs for Public Water Suppliers | Mass.gov.

MASSACHUSETTS GAP ENERGY GRANT PROGRAM (GAP III)

Through a partnership between the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Clean Energy Center (MassCEC), the Massachusetts Gap Energy Grant Program (Gap III) provides funding to fill the last financial "gap" needed for clean energy projects spearheaded by a variety of organizations to promote clean and efficient energy projects. In 2022, the GAP III program awarded a total of $8.1 million in grants. For more information about this program, please refer to: Massachusetts' Gap Energy Grant Program | Mass.gov.

PLANNING ASSISTANCE GRANTS (EEA PAG)

Executive Office of Energy and Environmental Affairs Planning Assistance Grant (EEA PAG) program grants are available to municipalities and regional planning agencies acting on their behalf to financially support efforts to conserve and develop land consistent with the Massachusetts Sustainable Development Principles. Top priorities of the program include: zoning for sustainable housing production, mitigation of climate change through zoning and other regulatory actions, and zoning that results in permanent land conservation. For more information about these grants, please refer to: Planning Assistance Grants | Mass.gov.

STATE REVOLVING FUND

This statewide loan program through the Massachusetts Department of Environmental Protection assists communities in funding local drinking water, wastewater, and stormwater infrastructure

improvements.

MUNICIPAL VULNERABILITY PREPAREDNESS ACTION GRANT PROGRAM

The Municipal Vulnerability Preparedness (MVP) Action Grant program offers financial resources to municipalities that are seeking to advance priority climate adaptation actions to address impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate change-related events. Towns are eligible for this competitive grant program after successfully completing an MVP planning grant. A variety of project types are eligible for funding under this program, but projects must address local vulnerabilities to climate change and incorporate MVP Core Principles. Grant application information can be found here: MVP Action Grant | Mass.gov. The MVP Core Principles can be found here: https://www.mass.gov/doc/mvp-core-principles/download.

DAM AND SEAWALL REPAIR OR REMOVAL PROGRAM

The EEA funds projects for the repair and removal of dams, levees, seawalls, and other forms of inland and coastal flood control under the Dam and Seawall Repair or Removal Program. For additional information, please refer to Dam and Seawall Repair or Removal Program Grants and Funds | Mass.gov.

LAND & WATER CONSERVATION FUND GRANT PROGRAM (LWCF)

The Land & Water Conservation Fund Grant Program (LCWF) provides up to 50% of total project funding to eligible municipalities, tribes, and state agencies for park, trail and conservation area related projects. For more information, please refer to: Massachusetts Land and Water Conservation Fund Grant Program | Mass.gov.

LOCAL ACQUISITIONS FOR NATURAL DIVERSITY (LAND)

The Local Acquisitions for Natural Diversity (LAND) grant program assists cities and towns in acquiring new lands for conservation and passive recreation purposes. Grants are awarded at a maximum of $500,000 with reimbursement rates ranging from 52% to 70%. For more information, please refer to: Local Acquisitions for Natural Diversity (LAND) Grant Program | Mass.gov.

DRINKING WATER SUPPLY PROTECTION GRANT (DWSP)

The Drinking Water Supply Grant (DWSP) program provides financial assistance to public water systems and municipal water departments for the purchase of land or interests in land for the following purposes: 1) protection of existing DEP-approved public drinking water supplies; 2) protection of planned future public drinking water supplies; or 3) groundwater recharge. This is a reimbursement program. For more information, please refer to Drinking Water Supply Protection Grant Program | Mass.gov.

LAND AND RECREATION GRANTS AND LOANS

The Massachusetts Division of Conservation Services (DCS) manages several grant and loan programs that enable land preservation, natural resources conservation, and public recreation. Municipalities with an active Open Space and Recreation Plan are generally eligible to apply for these programs. Preserving natural open space can buffer natural systems from development impacts, protect open spaces from future development, and maintain ecosystem services like natural flood mitigation. The full list of DCS grant programs can be found here: Land and Recreation Grants & Loans | Mass.gov.

LAND CONSERVATION ASSISTANCE GRANT PROGRAM

The Land Conservation Assistance Grant Program from the Massachusetts Division of Conservation Services (DCS) provides reimbursement funding to municipalities, qualified 501(c)(3) land trusts, tribal governments, and other public entities for the permanent protection of land as well as to Regional Planning Agencies (RPAs) and qualified 501(c)(3) land trusts which assist these entities in this goal. Eligible activities under this program include preparing grant applications for permanently protecting land, completing other tasks which progress transactions which permanently protect land, developing or updating municipal Open Space and Recreation Plans, and planning for developing and/or renovating a park to help with a grant application to DCS. For more information on this program, please refer to: Apply to the Land Conservation Assistance Grant Program | Mass.gov.

FOREST LEGACY GRANT PROGRAM (USDA-FS) (FLGP)

The Forest Legacy Grant Program (FLGP) is a voluntary grant funding opportunity for private landowners to either sell their land outright or to sell a conservation restriction on their land. A conservation restriction is a legally binding agreement which limits the types of land use on a property, in this case restricting land to forestry, recreation, or another conservation-related use. For more information about this program, please refer to: Forest Legacy Program | Mass.gov.

CULVERT REPLACEMENT MUNICIPAL ASSISTANCE GRANT PROGRAM

The Culvert Replacement Municipal Assistance Grant program provides a funding opportunity for local governments to replace undersized, perched, and/or degraded culverts in areas of high ecological value. For more information on this program, please refer to: Culvert Replacement Municipal Assistance Grant Program | Mass.gov.

DER PRIORITY PROJECTS

The Priority Project Program is an opportunity under the Division of Ecological Restoration (DER) for organizations to receive technical assistance, consulting, and/or direct grant funding for wetland and river restoration projects through a state-wide, competitive process. DER chooses high-priority projects that bring significant ecological and community benefits to the Commonwealth. DER's most recent call for applications solicited projects that focus on cranberry bog wetland restoration, dam removal and river restoration, coastal wetland restoration projects, or a combination of these topics. More information on the Priority Projects program can be found here: Become a DER Priority Project | Mass.gov. This program can be used to remove significant or high hazard dams that communities no longer want to maintain; the removal of these dams may improve the health and resilience of aquatic systems.

MASS WILDLIFE HABITAT MANAGEMENT GRANT PROGRAM (MWHMGP)

The Mass Wildlife Habitat Management Grant Program (MWHMGP) is a program dedicated to the protection and restoration of wildlife habitat. MWHMGP awards grants ranging from $10,000 to $75,000 to private landowners for habitat restoration projects. The program places emphasis on the protection of endangered species, the expansion of outdoor recreation opportunities, and the enhancement of ecological communities disproportionally susceptible to climate change. For more information about this program, please refer to: MassWildlife Habitat Management Grant Program | Mass.gov.

AGRICULTURAL CLIMATE RESILIENCY AND EFFICIENCIES PROGRAM (ACRE)

The Agricultural Climate Resiliency and Efficiencies Program (ACRE) is a competitive grant program available to eligible farmers that funds materials and labor to improve climate and economic resilience and forwards the goals of the Massachusetts Local Food Action Plan. For more about this program, please refer to: Agricultural Climate Resiliency & Efficiencies (ACRE) Program | Mass.gov.

AGRICULTURAL PRESERVATION RESTRICTION PROGRAM (APR)

The Agricultural Preservation Restriction (APR) program is a voluntary program that allows farmers to be paid the difference between the "fair market value" and the "agricultural value" of their farms in exchange for a permanent deed restriction by the state. This restriction is meant to prevent any use of the property that will negatively impact the land's future agricultural viability. To qualify for this program, a farm must be at least 5 acres in size, must have been actively devoted to agriculture for at least the past 2 tax years, and must produce at least $500 in gross sales per year for the first five acres plus $5 for each additional acre or 50 cents per each additional acre of woodland and/or wetland; there are various other considered criteria which farms must meet to qualify for this program. For more information on this program, please refer to: Agricultural Preservation Restriction (APR) Program Details | Mass.gov.

HAZARD MITIGATION GRANT PROGRAM (STATE) (HMGP)

The Hazard Mitigation Grant Program (HMGP) provides funds to areas after a natural disaster with the purpose of lowering the risk of damage and loss of life from future natural disasters. This grant program seeks to reduce the reliance on taxpayer-funded federal assistance for disaster recovery. For more information about this program, please refer to: Hazard Mitigation Grant Program (HMGP) | Mass.gov.

COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG)

The Community Development Block Grant (CDBG) program remains the principal source of revenue for many communities to use in identifying solutions to address physical, economic, and social deterioration in lower-income neighborhoods and communities. CDBG is primarily a housing and community development program administered through the Executive Office of Housing and Livable Communities (EOHLC). The program can fund certain critical infrastructure projects, and necessary housing improvements that benefit populations who may be more vulnerable to certain natural hazards. The program can also fund the rehabilitation of municipal buildings serving low- and moderate-income populations, which in many cases also serve as Emergency Operations Centers for their communities. For more information, please refer to: Community Development Block Grant (CDBG) | Mass.gov.

EMERGENCY SOLUTIONS GRANT (EFG)

The Emergency Solutions Grant (EFG) program funds necessary services to help house/rehouse those who are homeless or at risk of homelessness and to provide shelter for those in need of emergency shelter. For more information on this program, please refer to: Emergency Solutions Grant Program (ESG) | Mass.gov.

MASSWORKS INFRASTRUCTURE PROGRAM

The MassWorks Infrastructure Program provides a one-stop shop for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation. Although this program is not specific to natural hazards per se, infrastructure enhancements under MassWorks can address identified hazard mitigation needs. The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic

Development, in cooperation with the Department of Transportation and Executive Office for Administration & Finance. For additional information on this program, please refer to MassWorks Infrastructure Program | Mass.gov.

COMMUNITY PRESERVATION ACT (CPA)

The Community Preservation Act (CPA) is a smart growth tool that helps communities preserve open space and historic sites, create affordable housing, and develop outdoor recreational facilities. CPA also helps strengthen the state and local economies by expanding housing opportunities and construction jobs for the commonwealth's workforce and by supporting the tourism industry through preservation of the commonwealth's historic and natural resources. All communities in Massachusetts pay into statewide Community Preservation Trust fund through a real estate excise tax. However, communities must set up a local Community Preservation Fund and governing committee to utilize the trust fund. CPA projects can build local resilience by protecting open spaces and/or creating affordable housing; these types of projects can benefit residents who may be the most vulnerable to natural hazards. More information on the CPA program can be found here: CPA: An Overview | Community Preservation Coalition.

SPECIAL APPROPRIATIONS AND LEGISLATIVE EARMARKS

Although there is no separate state disaster relief fund in Massachusetts, the state legislature may enact special appropriations for those communities sustaining damages following a natural disaster that are not large enough for a Presidential disaster declaration. Since 2011, Massachusetts has issued 12 state of emergency declarations. Additionally, individual legislators may seek specific project funding for projects through the legislative budgeting and appropriations process.

DISTRICT LOCAL TECHNICAL ASSISTANCE

District Local Technical Assistance (DLTA) is funding allocated by the Massachusetts General Assembly (Legislature) to the Central Massachusetts Regional Planning Commission (CMRPC) to provide technical assistance to member communities on eligible projects. DLTA planning dollars help cities and towns take on necessary projects that they don't have the staff capacity to address on their own and partner with neighboring communities to tackle shared projects with reduced administrative burden.

According to the most recent guidelines of the Commonwealth's DLTA program, a proposed project must fall into one of the following four (4) general priority categories to be considered eligible for technical assistance:

1. Planning Ahead for Housing;
2. Planning Ahead for Growth;
3. Technical Assistance to support Community Compact Cabinet Activities including Regionalization; and
4. Supporting the Housing Choice Initiative

The goal of the DLTA Fund is to direct funds to projects and activities that result in change in the municipality/municipalities receiving DLTA Fund services, whether in law, regulation, program management, or practice, that serve to further the objectives listed above. Community Compact Cabinet (CCC) best practices should include both those that the Commonwealth of Massachusetts is seeking to fund as part of the CCC program as a first priority and best practices that explicitly align with CCC best practices but are not best practices identified in a signed CCC agreement. COVID-19 relief / recovery activities that fall under the above priority categories are eligible. For

more information, please refer to 2024 District Local Technical Assistance (DLTA) Call for Concepts - CMRPC.

LOCAL PLANNING ASSISTANCE

The Local Planning Assistance (LPA) program was initiated to improve the direct services of CMRPC to its member communities. Under the LPA program, each CMRPC community annually receives a set number of hours of technical assistance to be used in any reasonable planning project authorized by the community's CMRPC commissioner.

SUPPORT AND INCENTIVE GRANT

The Support and Incentive Grant provides opportunity funding to public safety answering points (PSAPs) and regional emergency communication centers (RECCs) in providing enhanced 9-1-1 service. Entities eligible for the Support Grant include: primary or regional public safety answering points, regional secondary public safety answering points, and regional emergency communication centers. To be eligible for the Incentive Grant, a regional public safety answering point or regional emergency communication center must be expanding. For more on this program, please refer to: Apply for the Support & Incentive Grant | Mass.gov.

MUNICIPAL SMALL BRIDGE PROGRAM

The Municipal Small Bridge Program offers funding opportunities to Massachusetts municipalities for small bridge replacement, preservation, and rehabilitation projects. For more information about this program, please refer to: Municipal Small Bridge Program | Mass.gov.

CHAPTER 90 FUNDS

The statewide Chapter 90 program reimburses communities for roadway improvement projects, such as projects relating to resurfacing and related work, preliminary engineering (including State Aid/Consultant Design Agreements), right-of-way acquisition, shoulders, side road approaches, landscaping and tree planting, roadside drainage, structures (including bridges), sidewalks, traffic control and service facilities, and street lighting (excluding operating costs), as well as for such other purposes specifically authorized. Maintaining and upgrading critical infrastructure and evacuation routes is an important component of hazard mitigation. For more information, please refer to Chapter 90 Program | Mass.gov.

STATE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

The State Transportation Improvement Program (STIP) is an annual list of transportation infrastructure projects funded and planned through the combined effort of MassDOT and other state agencies. For more information on this program, please refer to: State Transportation Improvement Program (STIP) | Mass.gov.

COMPLETE STREETS (CS)

The Complete Streets (CS) Funding Program provides grants to municipalities in Massachusetts for projects that improve safety and accessibility for all modes of transportation. To qualify for the program, municipalities must pass a Complete Streets Policy and develop a Prioritization Plan. After these requirements have been met, municipalities can apply for up to $500,000 in construction funding. For more information about this program, please refer to: Complete Streets Public Overview (site.com).

APPENDIX A

Maps

Name	Hazard/ Critical Infrastructure	ID	Hazard Type	In Hazard?	Notes
Rte 31 at Quinapoxet River Flooding	H	FL-1	FL	NA	
Generator for Town Hall and nearby buildings	H	SS-1	SS	NA	
Unionville Dam Repair	H	DF-1	DF	NA	
Wachusett St Dam Repair	H	DF-2	DF	NA	
Wachusett St Dam Repair	H	DF-3	DF	NA	
Chaffin Water tank	CI	1		N	
Chapin Water Tank 2MM	CI/H	2	WF	Y	
Avery Heights Water Tank 1MM	CI	3		N	
Highland Street Water Tank 2MM and Booster Station	CI	4	FL	Y	
Jefferson Water Tank 0.75MM Metering House	CI	5		N	
Spring St Wellfield/PS	CI/H	6	FL	Y	
Quinapoxet Wellfield	CI/H	7	FL	Y	
Mill St Wellfield	CI	8		N	
Mason St Wellfield	CI	9	FL	Y	
Brattle St Water Interconnection	CI	10		N	
Chapin Tank Water Booster Pump	CI/H	12	WF	Y	
Avery Heights Morgan Water Booster Pump	CI	13		N	
Lincoln Ave Sewer PS	CI	15		N	
Gail Dr. Sewer PS	CI	16	FL	Y	
Industrial Dr. Sewer PS	CI	17	FL	Y	
Sycamore Sewer PS	CI/H	18	WF	Y	
Alden Sewer PS	CI	19		N	
ECC Sewer PS	CI	20		N	
Jefferson Sewer PS	CI	21	FL	Y	
Flagler Dr Sewer PS	CI	22	HS	Y	
Avery / Morningside Sewer PS	CI	23		N	
Heather Circle Sewer PS	CI	24		N	
Dorothy Ave Sewer PS	CI	25		N	
Sunnyside Ave Sewer PS	CI	26		N	
Winthrop Ln Sewer PS	CI	27		N	
River St Sewer PS	CI	28		N	
Wachusett St Sewer PS	CI	29		N	
Quinapoxet Large Sewer PS	CI	30		N	
Quinapoxet Small Sewer PS	CI	31		N	
Heritage Ln Sewer PS	CI	14		N	
Mark Bradford Dr Sewer PS	CI	32		N	
Quaker Rd Sewer PS	CI	33		N	
Malden St Sewer PS	CI	34		N	
Twinbrook Sewer PS	CI	36		N	
Bailey Rd Sewer PS	CI	37		N	
Nelson St Sewer PS	CI	38		N	
Avery Heights Radio Antennae	CI	39		N	
Chaffin Radio Antennae	CI	40		N	
Municipal Light Dept sub-station	CI	42		Y	
Municipal Light Dept.	CI	43		N	
Salisbury St Water Interconnection	CI	11	DF	Y	
Municipal Light Dept Substation	CI	41		N	
Claires Sewer PS	CI	35		N	
Railroad Bridge Flooding at Main Street	CI/H	FL-8	FL	Y	At the railroad
Starbard Building snow load concern	CI/H	SS-2	SS	N	
High School	CI/H	SS-3	SS	N	
Jefferson Garage on Main Street and Railroad Bridge	CI/H	FL-9	FL	N	
Venture Community Services	CI	43		N	
Open Sky	CI	44		N	Group Home
Aspire	CI	45		N	Group home
Bamsi	CI	46		N	Group home
Venture Community Services	CI	47		N	Group Home
Open Sky	CI	48		N	Group home
CIL	CI	49		N	Group home
Advocates	CI	50		N	Group home
Bamsi	CI	51		N	Group home
Seven Hills	CI	52		N	Group home
Fire Headquarters	CI	53		N	
Main St Radio Tower	CI	54		N	
DPW Headquarters	CI	55		N	
Transformer	CI	56		N	
Gale Free Library	CI/H	57	EQ	Y	Stone building, EQ hazard
Holden Housing Authority	CI	58		N	
Holden Recreation Dept.	CI	59		N	
Town Pool (Dawson Rec Facility)	CI	60	DF	Y	
Trout Brook Recreation Area	CI	61	FL	Y	
Little Learning Adventures	CI	62		N	

Steele St Elevated Tank	CI	63		N	Inactive
Brattle St Vault Interconnection	CI	64		N	
Adams Road Pump Station	CI	65	FL	Y	inactive
Salisbury St Interconnection	CI	66		N	
Sycamore Large Booster Station	CI	67	WF	Y	
Sycamoe Small Booster Station	CI	68	WF	Y	
Sycamore Booster Station Control Vault	CI	69	WF	Y	inactive
Reservoir St Booster Vault	CI	70		N	inactive
Avery Heights Water Tank and Booster Station	CI	71		N	
Morgan Booster Station	CI	72		N	access between 10 & 18 Morgan Circle
Quinapoxet Wells and Wachusett St Treatment Facility	CI	73		N	
Mason Street Wellfield	CI	74		N	
Spring Street Well and Treatment Facility	CI	75		N	
Muschopauge Reservoir Metering House	CI	76		N	Inactive, building demolished
Muschopauge Reservoir Dam	CI/H	77		N	not maintained by Holden Water & Sewer
Parker Avenue Metering Manhole	CI	78		N	
Lincoln Avenue Sewer PS	CI	79		N	Forcemain lined 2018, New Generator 2019
Main St (Clairs) PS	CI	80		N	
Shady Lane Sewer PS	CI	81		N	
Wagner Sewer PS	CI	82		N	
Tea Party Circle Sewer PS	CI	83		N	Developer owned
Stoneybrook Sewer PS	CI	84		N	
Liberty Circle Sewer PS	CI	85		N	
Jordan Road Sewer PS	CI	86		N	
Chaffin Area Flooding	H	FL-4	FL	NA	
2010 Wildfire Area	H	WF-1	WF		
2022 Brushfire	H	WF-2	WF		
Highland St Flooding	H	FL-6	FL		
Main St Flooding	H	FL-7	FL		
Salisbury St Flooding	H	FL-2	FL		
Chaffins Area Flooding with fallen tree limbs	H	FL-5	FL		
P&W Railroad	CI	44	WF	Y	
Route 122A	CI	45	FL	Y	
I-190 #1	CI	46	WF	Y	
I-190 #2	CI	46	FL	Y	
Main St Flooding	H	FL-8	NA		
Main St Flooding at Rail Road Bridge	H	FL-9	NA		

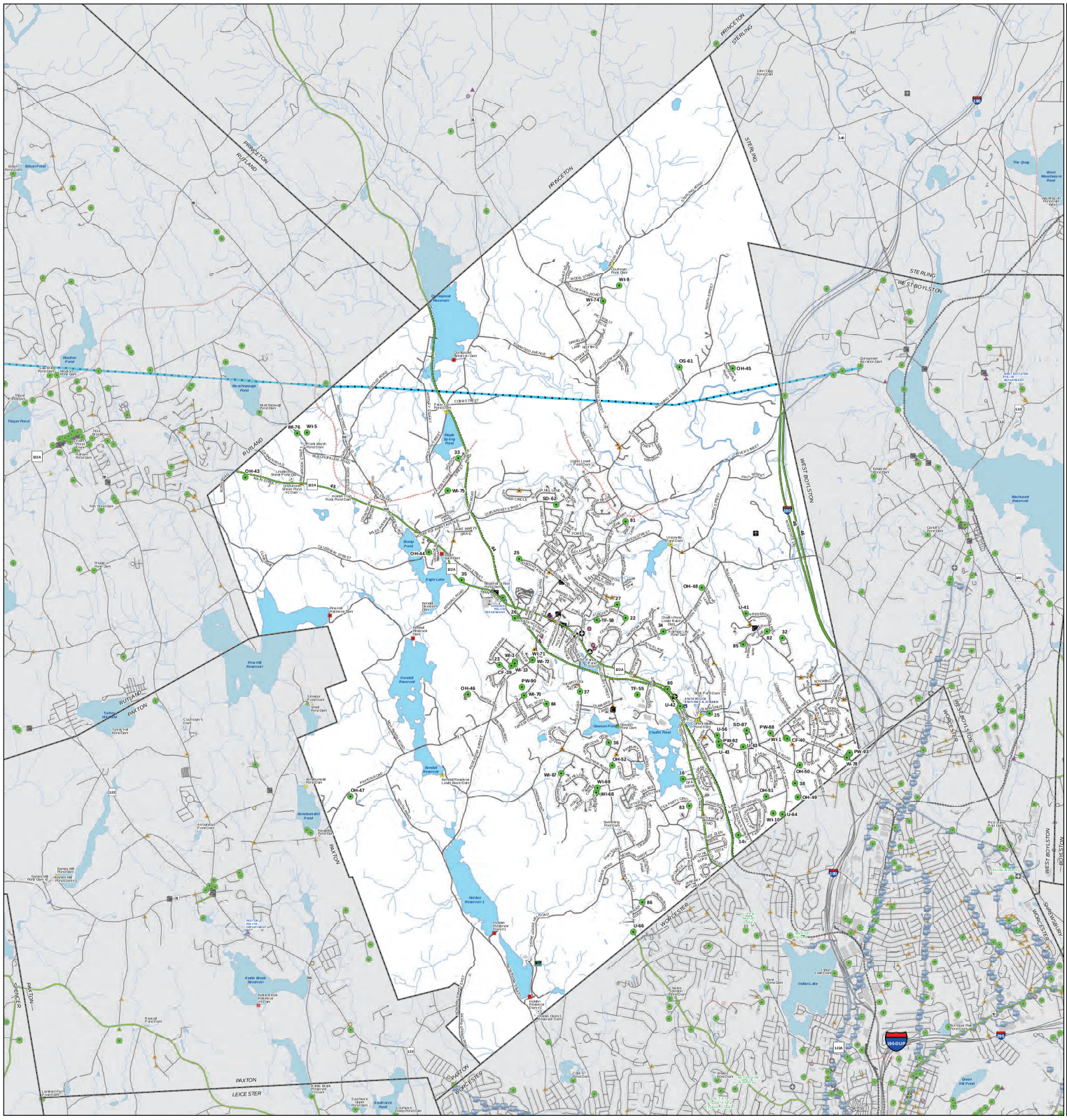
Name	PDM_ID	PDM_Type
Chaffin Area Flooding	FL-4	PFZ
		PFZ
		PFZ
		PFZ
		PFZ
		PFZ
Rte 31 Flooding at Quinapoxet River		PFZ
		PFZ
2010 Wildfire Area	WF-1	H
2022 Brushfire	WF-2	H
		PFZ
Main St Flooding		PFZ
Main St Flooding at Rail Road Bridge		PFZ

Name	PDM_ID	PDM_Type	In_Hazard
Highland St Flooding	FL-6	H	NA
Main St Flooding	FL-7	H	NA
Salisbury St Flooding	FL-2	H	NA
Chaffins Area Flooding with fallen tree limbs	FL-5	H	NA
P&W Railroad	44	CI	Y
Route 122A	45	CI	Y
I-190 #1	46	CI	Y
I-190 #2	46	CI	Y
Main St Flooding	FL-8	H	NA
Main St Flooding at Rail Road Bridge	FL-9	H	NA

Hazard Mitigation Plan

Map 1
Critical Infrastructure and Facilities
Town of Holden, Massachusetts

July 2025



Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Other Government Buildings
- Water Treatment Plant
- Airports

Dams

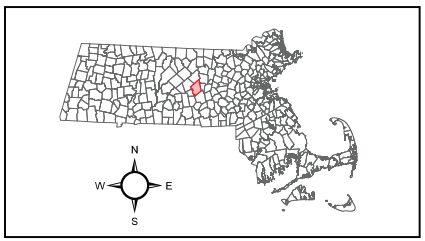
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail LIne

- Town Boundaries
- Water Bodies
- Roads
- Structures
- Streams

Locally Defined

- Critical Infrastructure (Points)
- Critical Infrastructure (Arcs)
- Critical Infrastructure (Polygons)



0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massDOT and MassGIS.

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

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CMRPC
Central Massachusetts Regional Planning Commission

Date: 7/25/2025 Document Path: H:\Projects\DM\PDM_01_Local_Cri_36x44.mxd

Hazard Mitigation Plan

Map 2
Hazards
Town of Holden, Massachusetts

July 2025



Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Other Government Buildings
- Water Treatment Plant
- Airports
- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail LIne

Town Boundaries | Water Bodies | Roads
Structures | Streams

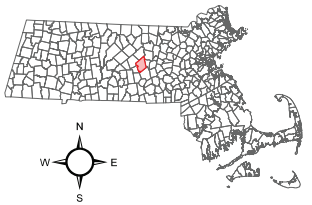
Hazards

Dams
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

100-year Flood Area*
500-year Flood Area
High Slope (15% and above)
Repetitive Loss Property Areas
FEMA DFIRM Flood Zones / FEMA Q3 Flood Zones

Locally Defined

Hazards (Points) | Hazard (Polygon) | Possible Flood Area
Hazards (Arcs)



0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massDOT and MassGIS.

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Hazard Mitigation Plan

Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Holden, Massachusetts

July 2025

Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Other Government Buildings
- Water Treatment Plant
- Airports
- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail LIne
- EJ/Vulnerable Population (Mobility 2040)

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

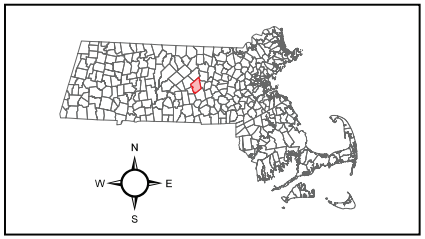
Hazards

Dams
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

- 100-year Flood Area*
- 500-year Flood Area
- FEMA DFIRM Flood Zones / FEMA Q3 Flood Zones
- High Slope (15% and above)
- Repetitive Loss Property Areas

Locally Defined

- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure
- Hazard
- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure
- Hazard
- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure
- Hazard
- Possible Flood Area



0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massDOT and MassGIS.

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APPENDIX B

Public Survey



Survey Responses Needed!

The Town of Holden is currently working with The Central MA Regional Planning Commission on the town's Hazard Mitigation Plan and we need your input!

We want to hear from you about:

- How you have been affected by natural hazards in and around Town
- What natural hazards are you most concerned about
- How you think climate change and natural hazards will affect Holden
- Your suggestions for mitigating the effects of climate change and natural hazards to Holden

Answer the survey by November 31st, 2024 using the QR code below:

TIP: Open your phone camera, point at QR code, and click on pop-up link to take the survey, OR type the link below into your web browser:

https://www.surveymonkey.com/r/HCP6LGX

CMRPC
Central Massachusetts Regional Planning Commission

TOWN OF HOLDEN, MASS. INCORPORATED 1741

Holden Hazard Mitigation Plan Community Survey

Holden Hazard Mitigation Plan

In January 2024, the Town of Holden started the planning process to update its Hazard Mitigation Plan (HMP). An updated HMP will help the town identify strategies to reduce its vulnerability to hazards like flooding, winter storms, and drought. Climate change may shift the extent and severity of certain natural hazards, including those that already impact Holden.

By participating in this survey, you will help the Town of Holden understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until August 31st, 2024.

1. Check all that apply.

- [ ] I live in Holden.
- [ ] I work in Holden.
- [ ] I frequently visit Holden.

2. Has your family, household, or property in Holden been impacted by any of the following natural hazards? Select all that apply:

- [ ] I have not been impacted by natural hazards in Holden
- [ ] Winter Storms / Ice
- [ ] Thunderstorms, Microbursts, and/or Extreme Wind
- [ ] Tornadoes
- [ ] Flooding
- [ ] Extreme Heat / Extreme Cold
- [ ] Drought
- [ ] Wildfire / Brushfire
- [ ] Hurricanes
- [ ] Earthquakes
- [ ] Poor Air Quality
- [ ] Invasive Species
- [ ] Other (please specify)

3. Where have you observed hazard impacts in Holden, and what were those impacts?

Examples: flooding on specific roads, drought/effects on water supply, extended power outages, trees down on roads, beaver dams affecting property and septic systems due to flooding from dams.

4. How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

- ◯ I think natural hazards and climate change will negatively impact my life.
- ◯ I'm not sure how natural hazards and climate change will impact my life.
- ◯ I don't think that I personally will be impacted by natural hazards and climate change.

5. If you are concerned about impacts to your life from natural hazards and/or climate change, what impacts are you most concerned about?

Examples: basement flooding, wells drying out / contamination of wells, ability to grow food

6. How concerned are you about the impacts that natural hazards and climate change will have on the Town of Holden (the local infrastructure, economy, environment, and/or town residents)?

- ◯ Very concerned
- ◯ Somewhat concerned
- ◯ Unsure
- ◯ Somewhat unconcerned
- ◯ Not concerned at all

7. What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Holden? Rank the responses below in order from most concerned (1) to least concerned (5).

- ≡ ☐ Local natural resources and environments
- ≡ ☐ Resident health, safety, and property
- ≡ ☐ Local infrastructure
- ≡ ☐ Local business and the town economy
- ≡ ☐ Local government resources

8. Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

- [ ] Impacts on well water quantity / quality
- [ ] Future flood risks
- [ ] Impacts on infrastructure
- [ ] Sustainability initiatives
- [ ] Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)
- [ ] Impacts on town budget and finances
- [ ] Impacts on wildlife
- [ ] Impacts on the health of local forests
- [ ] Impacts on future development
- [ ] Other (please specify)

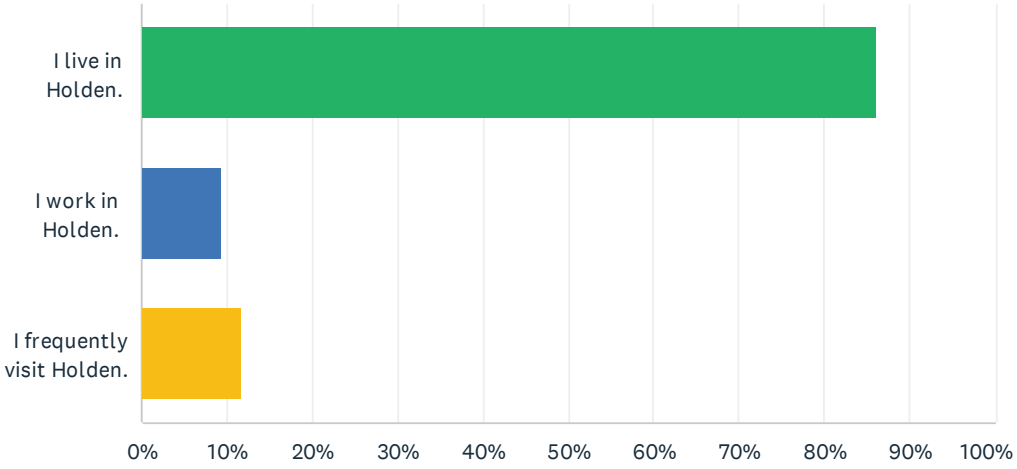
9. What actions should the Town of Holden take to cultivate local resilience to natural hazards?

Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; encourage cutting/trimming dead trees beside/hanging over roads; etc.

10. If you would like to stay informed about other opportunities to participate in Holden's Hazard Mitigation planning process, please enter your E-mail address below.

Q1 Check all that apply.

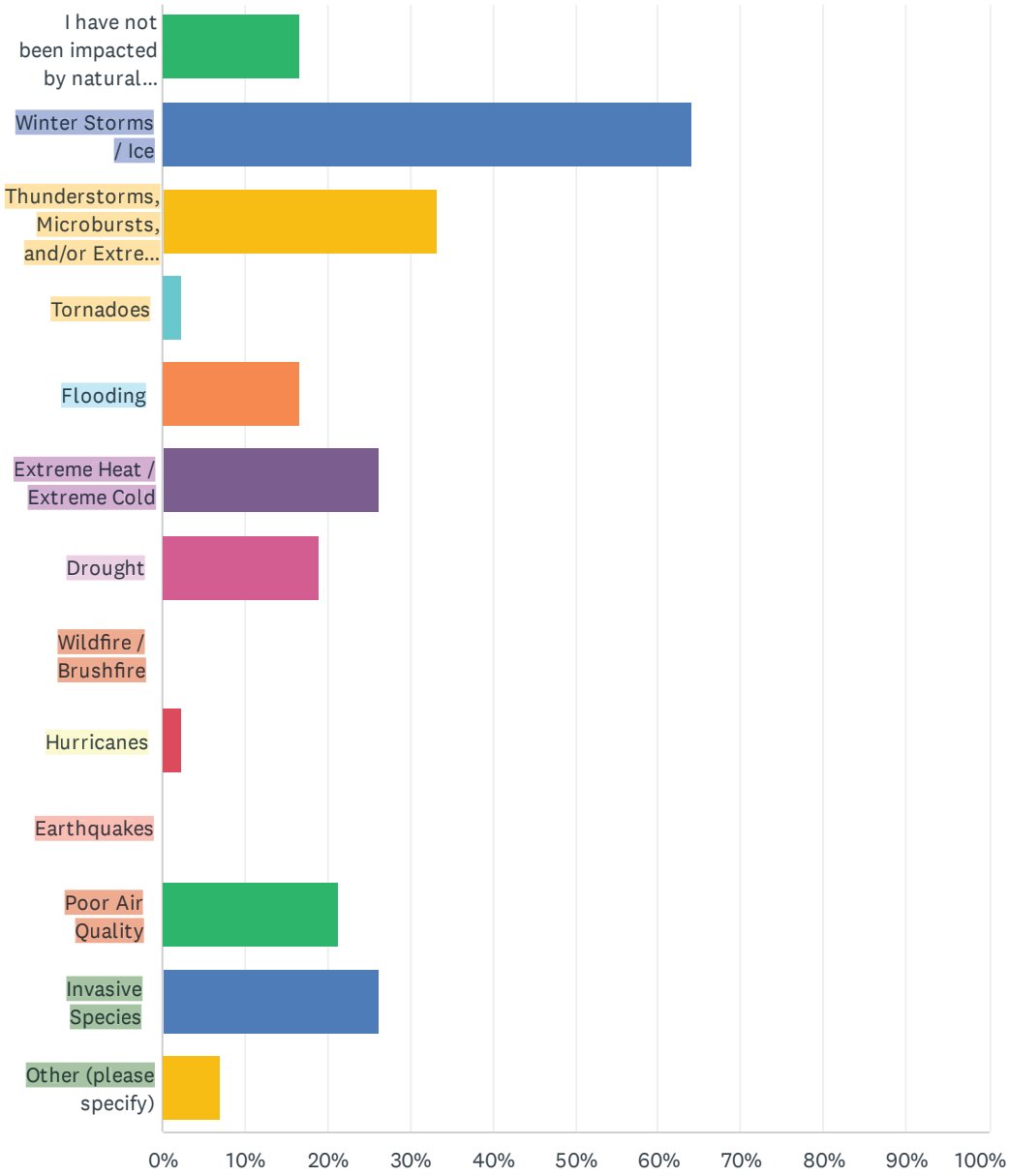
Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
I live in Holden.	86.05%	37
I work in Holden.	9.30%	4
I frequently visit Holden.	11.63%	5
Total Respondents: 43		

Q2 Has your family, household, or property in Holden been impacted by any of the following natural hazards? Select all that apply:

Answered: 42 Skipped: 1



ANSWER CHOICES	RESPONSES	
I have not been impacted by natural hazards in Holden	16.67%	7
Winter Storms / Ice	64.29%	27
Thunderstorms, Microbursts, and/or Extreme Wind	33.33%	14
Tornadoes	2.38%	1
Flooding	16.67%	7
Extreme Heat / Extreme Cold	26.19%	11
Drought	19.05%	8
Wildfire / Brushfire	0.00%	0
Hurricanes	2.38%	1
Earthquakes	0.00%	0
Poor Air Quality	21.43%	9
Invasive Species	26.19%	11
Other (please specify)	7.14%	3
Total Respondents: 42		

#	OTHER (PLEASE SPECIFY)	DATE
1	NA	9/4/2024 2:47 PM
2	climate change	7/8/2024 2:47 PM
3	PCB s in town water	7/1/2024 8:13 PM

Q3 Where have you observed hazard impacts in Holden, and what were those impacts?Examples: flooding on specific roads, drought/effects on water supply, extended power outages, trees down on roads, beaver dams affecting property and septic systems due to flooding from dams.

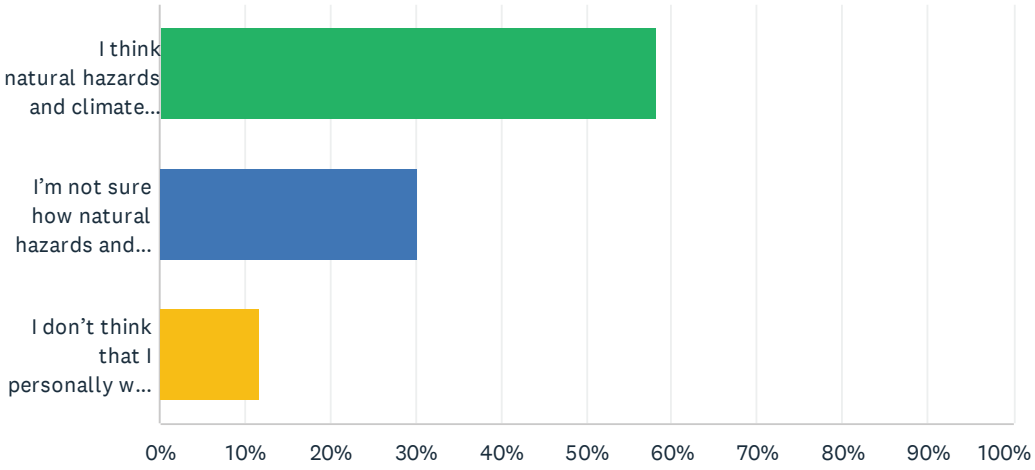
Answered: 33 Skipped: 10

#	RESPONSES	DATE
1	Thunderstorms	9/4/2024 2:53 PM
2	Power outages on dead ends	9/4/2024 2:51 PM
3	[Flooding on specific roads is circled on the form]	9/4/2024 2:49 PM
4	NA	9/4/2024 2:47 PM
5	["flooding from dams" is crossed out on the form]	9/4/2024 2:46 PM
6	Reservoir Road Floods in heavy rain or snow	9/4/2024 2:43 PM
7	Flooding on Quinapoxet street, downed limbs/ impact damage, ice/snow on side streets (chestnut hill), water penetration from extreme storms (through window and door seals).	8/24/2024 4:08 PM
8	Downed trees, power outages	8/24/2024 9:34 AM
9	Flooding on Main street and Quinapoxet St Sink hole on main street.	7/19/2024 6:18 PM
10	During the ice storm in 2008 we had a tree fall on our deck - we also lost power for 3 days - we observed downed trees across town.	7/8/2024 6:13 PM
11	My property. See answers to Q2	7/8/2024 2:47 PM
12	Damage to homes and power lines from winter storms, such as in 2015 and 2010	7/7/2024 10:05 AM
13	Flooding on Quinapoxit St	7/6/2024 8:37 PM
14	Tree damage, flooding of roads	7/6/2024 9:25 AM
15	2008 ice storm, 1956? Hurricane Carol, & 1953 tornado: extended power outages. Increase traffic on main roads: air pollution. Excessive heat, pollution, & drought, affecting health	7/5/2024 8:47 PM
16	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
17	Much more frequent basement flooding; heat waves have gotten more intense and frequent	7/3/2024 3:43 PM
18	Power outages from trees down on Newell Road.	7/2/2024 6:14 PM
19	Flooding on main St near Shrewsbury St under the railroad bridge. Flooding on side streets I don't know the names of. Air quality from wildfires from far away. Drought/heat stress on the property	7/2/2024 3:57 PM
20	Twinbrooke Drive	7/2/2024 9:21 AM
21	basement flooding damaging property, invasive species require ongoing mitigation to preserve native plants/garden	7/2/2024 7:39 AM
22	extended power outages, trees down on roads	7/2/2024 7:32 AM
23	Nope haven't really been affected by anything. Even when there's been power outages due to storms the town DPW is top tier and getting us back online. And none of this has anything to do with climate change. All's in us to do with is that we're in a northern cold climate nothing special about it.	7/1/2024 8:46 PM
24	Ice storm damage throughout the town	7/1/2024 8:13 PM

25	High water levels in wet land on property	7/1/2024 6:57 PM
26	none	7/1/2024 6:01 PM
27	Drought effecting water supply, poor air quality from Canadian fires, winter ice knocking down trees	7/1/2024 5:55 PM
28	Trees down, extended power outages, home damage from trees hitting home	7/1/2024 4:44 PM
29	Trees damaging power lines. Power lines need to be moved underground so we can have beautiful tree-lined streets. Over development, we're loosing way to much green space, impacts wildlife, wildlife moving into neighborhoods, runoff. We need to seriously hault development for a few years and then move forward strategically.	7/1/2024 3:49 PM
30	branches falling on power lines causing outages	7/1/2024 3:29 PM
31	Invasive plants and aquatics, species and waterways, lakes and streams. Forest, pests and forest health concerns. Tree damage, power failure due to down wires after windstorms trees, falling on homes and cars	7/1/2024 3:15 PM
32	Flooding on roads,extended power outages,trees down on roads, beaver dams affecting property	7/1/2024 11:35 AM
33	Many of the ponds and in swampy areas, From Chapins all the way down to 68- seem to be very dry this year.	7/1/2024 11:31 AM

Q4 How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
I think natural hazards and climate change will negatively impact my life.	58.14%	25
I'm not sure how natural hazards and climate change will impact my life.	30.23%	13
I don't think that I personally will be impacted by natural hazards and climate change.	11.63%	5
TOTAL		43

Q5 If you are concerned about impacts to your life from natural hazards and/or climate change, what impacts are you most concerned about? Examples: basement flooding, wells drying out / contamination of wells, ability to grow food

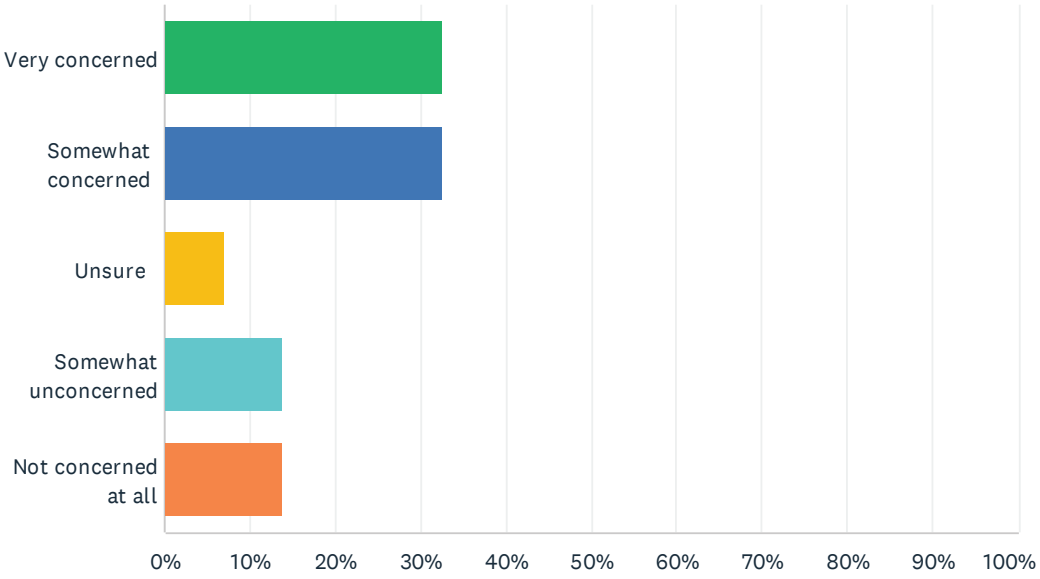
Answered: 38 Skipped: 5

#	RESPONSES	DATE
1	Thunderstorms by the road	9/4/2024 2:53 PM
2	natural resources	9/4/2024 2:51 PM
3	[contamination of wells and ability to grow food is circled on the form]	9/4/2024 2:49 PM
4	No idea	9/4/2024 2:46 PM
5	garage flooding with heavy rain	9/4/2024 2:43 PM
6	Extreme heat and cold, with associated cooling/ heating costs. Power loss and home damage from downed limbs and ice storms. Localized flooding from extreme storms.	8/24/2024 4:08 PM
7	Basement flooding, power outages that won't allow my home to be cool/warm	8/24/2024 9:34 AM
8	Flooding of fields which would ruin our ability to grow food, contamination of wells (fertilizers), personal property becoming damaged.	7/19/2024 6:18 PM
9	Climate change will create disasters that require remediation. The government will pay for these. My taxes will go up.	7/13/2024 10:38 AM
10	extinction of my species!	7/8/2024 9:34 PM
11	Water quality/availability, invasive tick borne illnesses	7/8/2024 7:09 PM
12	extreme & unpredictable weather (drought, more ice storms vs. snow storms, more flooding), public health impacts ie increase in vector borne disease	7/8/2024 6:13 PM
13	Excessive heat/loss of power; crop failures/food supply; water quality; impacts of excessive precipitation	7/8/2024 2:47 PM
14	Damage to home and cars, damage to the power grid, localized flooding	7/7/2024 10:05 AM
15	rising temps, more/stronger storms,	7/6/2024 9:25 AM
16	I have developed COPD from air pollution. I can't use my front windows.	7/5/2024 8:47 PM
17	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
18	Basement flooding, ability to grow food, excessive heat and the need for air conditioning, effects on plant and animal wildlife	7/3/2024 3:43 PM
19	Damage to siding roofing due to high wind, loss of power from same.	7/2/2024 6:14 PM
20	Basement flooding. Low water. Food not growing due to changes.	7/2/2024 3:57 PM
21	Food prices	7/2/2024 9:21 AM
22	basement flooding, inability to grow food, health consequences of unsafe outdoor temperatures, insect-borne disease (from ticks, mosquitoes)	7/2/2024 7:39 AM
23	severe weather	7/2/2024 7:32 AM
24	Basement flooding	7/2/2024 7:02 AM
25	Climate change is a scam. The only thing that the town needs to worry about is that our water system and our sewer system are properly maintained and our electric system works well. So	7/1/2024 8:46 PM

	if our pipes are aging they need to be replaced if our sewers are aging, they need to be replaced. It's just a matter of keeping up to date with aging infrastructure. And I don't want to hear in the least that holden is going to not support natural gas anymore. Our electric grid Nationwide cannot handle putting everything onto electric. And it is way more expensive to heat with electric and everything with electric than it is with natural gas.	
26	Basement flooding, reduced water resources for vegetable gardens, extreme storms could take down ours trees and roof in the process. All aspects of life will eventually be affected by climate change.	7/1/2024 8:24 PM
27	More ice storms Hotter summers	7/1/2024 8:13 PM
28	Erosion of land due to water levels during weather events	7/1/2024 6:57 PM
29	Air quality when I have breathing issues	7/1/2024 6:06 PM
30	no	7/1/2024 6:01 PM
31	Ocean warming and Rising sea levels effecting ocean current/quality and will effect us all. Migration north due to Intense heat. Drought effecting our food supply. More extreme storms causing propert damage.	7/1/2024 5:55 PM
32	Extensive flooding as seen in Leominster last year, roof / window/ siding damage due to high winds.	7/1/2024 4:44 PM
33	Power lines down (move them underground), mold from fluctuating temperatures	7/1/2024 3:49 PM
34	water shortages, heat, severe storms	7/1/2024 3:29 PM
35	Extreme temperatures and electric grid reliability.	7/1/2024 3:15 PM
36	Excess heat and humidity. Construction material/ infrastructure failures due to natural hazards.	7/1/2024 2:57 PM
37	Flooding, ice damage, brush/wildfire,extreme heat, warmer winters resulting in decreased water levels for reservoirs	7/1/2024 11:35 AM
38	People complain more and more about the cost of groceries And food. As a community, we should be working to help each other be more conscious of space. If we all had small home gardens and worked with each other to can, Share bounties, etc. we could have a pretty pretty good thing going.	7/1/2024 11:31 AM

Q6 How concerned are you about the impacts that natural hazards and climate change will have on the Town of Holden (the local infrastructure, economy, environment, and/or town residents)?

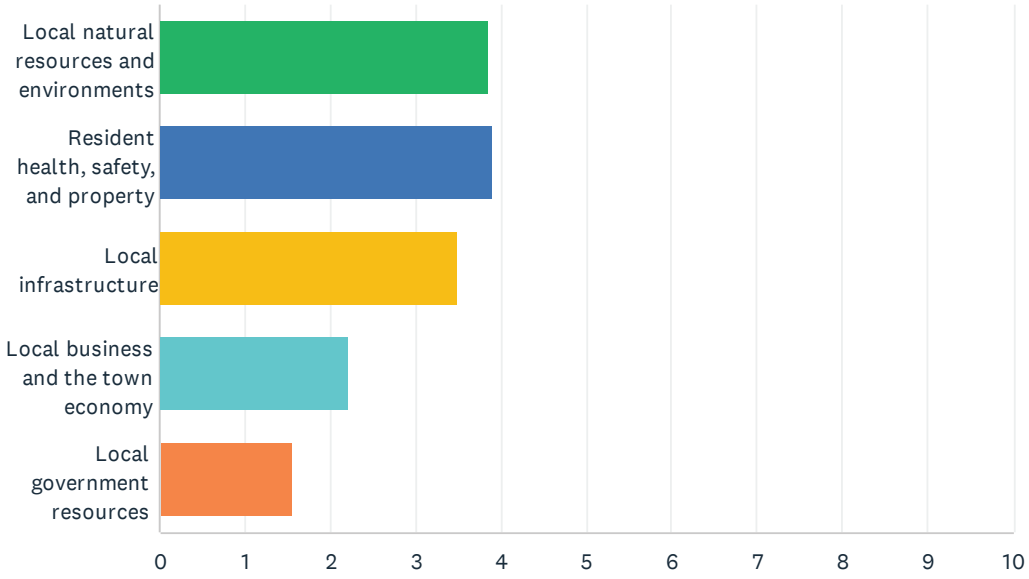
Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very concerned	32.56%	14
Somewhat concerned	32.56%	14
Unsure	6.98%	3
Somewhat unconcerned	13.95%	6
Not concerned at all	13.95%	6
TOTAL		43

Q7 What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Holden? Rank the responses below in order from most concerned (1) to least concerned (5).

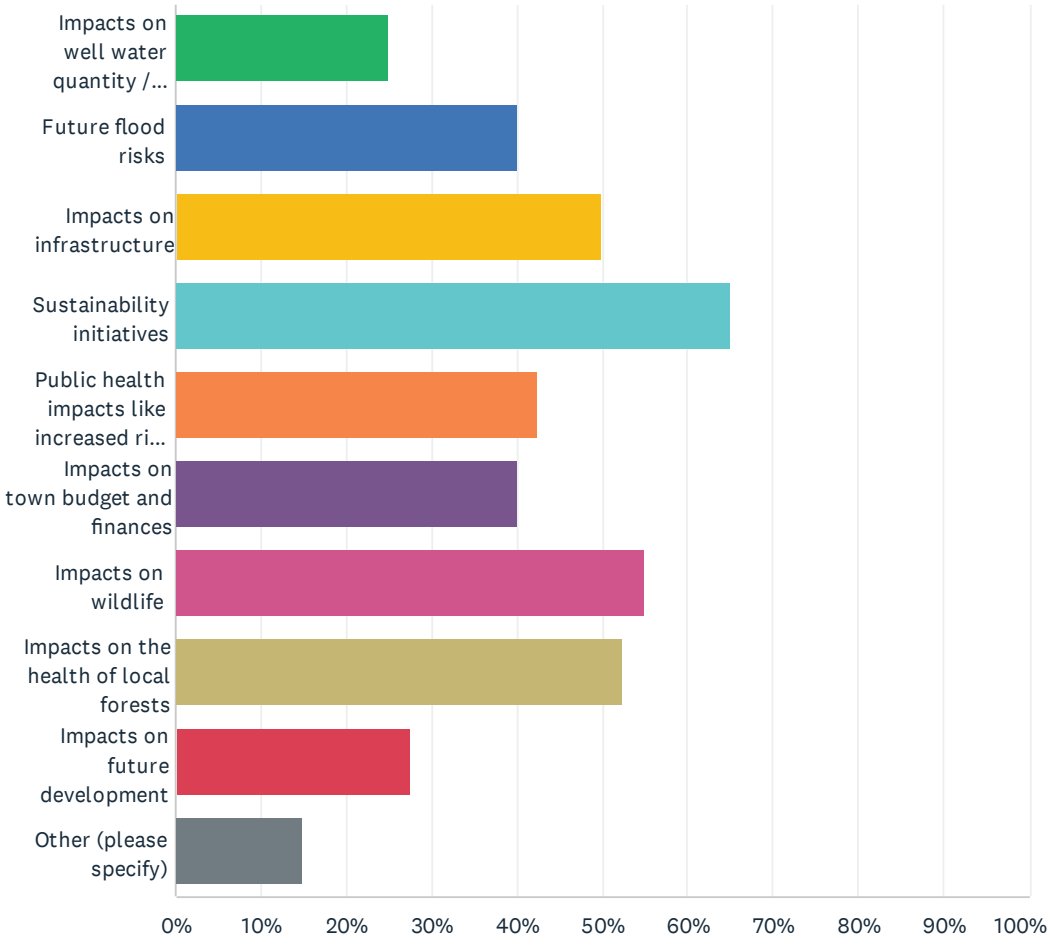
Answered: 39 Skipped: 4



	1	2	3	4	5	TOTAL	SCORE
Local natural resources and environments	41.03% 16	25.64% 10	17.95% 7	7.69% 3	7.69% 3	39	3.85
Resident health, safety, and property	33.33% 13	38.46% 15	17.95% 7	5.13% 2	5.13% 2	39	3.90
Local infrastructure	17.95% 7	28.21% 11	43.59% 17	5.13% 2	5.13% 2	39	3.49
Local business and the town economy	7.69% 3	2.56% 1	15.38% 6	51.28% 20	23.08% 9	39	2.21
Local government resources	0.00% 0	5.13% 2	5.13% 2	30.77% 12	58.97% 23	39	1.56

Q8 Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

Answered: 40 Skipped: 3



ANSWER CHOICES	RESPONSES	
Impacts on well water quantity / quality	25.00%	10
Future flood risks	40.00%	16
Impacts on infrastructure	50.00%	20
Sustainability initiatives	65.00%	26
Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)	42.50%	17
Impacts on town budget and finances	40.00%	16
Impacts on wildlife	55.00%	22
Impacts on the health of local forests	52.50%	21
Impacts on future development	27.50%	11
Other (please specify)	15.00%	6
Total Respondents: 40		

#	OTHER (PLEASE SPECIFY)	DATE
1	I have seen fertilizer phosphates pollute ponds and lakes over my own long lifetime.	7/5/2024 8:47 PM
2	The climate changes naturally.. fnd something useful to do and stop wasting my money.	7/4/2024 9:59 AM
3	Climate change isn’t real	7/1/2024 11:41 PM
4	Stop building all these extra little communities in Holden. The meal project was not needed and is causing problems for residents and so were all these extra new places that you're allowing to be built that the residents don't want.	7/1/2024 8:46 PM
5	the fact that Holden's agreement with Worcester ceded many water rights	7/1/2024 6:01 PM
6	Impact of future development- continuous drain on existing budgets and community resources	7/1/2024 3:15 PM

Q9 What actions should the Town of Holden take to cultivate local resilience to natural hazards?Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; encourage cutting/trimming dead trees beside/hanging over roads; etc.

Answered: 32 Skipped: 11

#	RESPONSES	DATE
1	plant natural species by road side to soak up salt water runoff	9/4/2024 2:51 PM
2	[Trimming Dead trees is circled on the form]	9/4/2024 2:47 PM
3	All of the Above. Pursue Green Communities.	9/4/2024 2:43 PM
4	Improve storm water management, tree management near infrastructure, more funds for ecosystem management in managed areas, incentives for home efficiency improvements.	8/24/2024 4:08 PM
5	Increase capacity to apply For hazard mitigation grants, improve storm water management.	8/24/2024 9:34 AM
6	The integration of hazard mitigation projects and education on how these projects would effect the infrastructure of the town.	7/19/2024 6:18 PM
7	Apply for state grant money that is available.	7/13/2024 10:38 AM
8	Planting native and reducing lawns (decreasing CO2 emissions), solar panels and ev charging.	7/8/2024 9:34 PM
9	Cutting trees, acquiring water resources, investing in alternative energy (solar grids, etc)	7/8/2024 7:09 PM
10	improve storm water management, encourage cutting/trimming dead trees, increase local capacity to apply for hazard mitigation funding, planting climate resiliant plant species	7/8/2024 6:13 PM
11	yeah, that sounds good	7/8/2024 2:47 PM
12	increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species;	7/7/2024 10:05 AM
13	SAVE EAGLE LAKE, education on climate change	7/6/2024 9:25 AM
14	Education and outreach about the issues Seek hazard mitigation grant funding; implement new projects. Compliments to the HDP for a great job of tree-trimming!	7/5/2024 8:47 PM
15	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
16	Please incentivize/subsidize/support solar panel installation! We want to pursue this (and know others in town who do, too) but it's cost prohibitive right now.	7/3/2024 3:43 PM
17	More tree trimming over wires, roadways.	7/2/2024 6:14 PM
18	All of the examples.provided in the prompt and allowing all town residents regardless of zone to have more ability to provide for themselves for example, having chickens allows a natural way to manage pests like ticks which carry Lyme and provides eggs. Also more info on solar programs to lessen carbon footprint	7/2/2024 3:57 PM
19	promoting renewable energy via HMLD incentives for solar, building infrastructure for electric vehicles, managing invasive species, planting climate-resilient trees, educating residents,	7/2/2024 7:39 AM

20	provide more education and outreach about how climate change could impact my life	7/2/2024 7:32 AM
21	We need to do composting / food pick up	7/2/2024 7:02 AM
22	Climate change is a scam Stop it with the bullshit. I would agree with encouraging cutting and trimming dead trees that are beside and hanging over roads and power lines That's the number one reason that power goes out because a dead tree or an tree that was overpower lines gets iced up in a northern climate that has the potential for ice without having anything to do with climate change to take down a line. And as I said above HMLD is great them partnering with the DPW get us going fast They are top tier.	7/1/2024 8:46 PM
23	More native plant species / fewer lawns that require absurd amounts of resources without benefiting the ecosystem the way biodiversity will.	7/1/2024 8:24 PM
24	Storm water management, dead tree removal	7/1/2024 6:57 PM
25	Avoid building in flood prone areas.	7/1/2024 6:01 PM
26	Secure drinking water for the future growth of the town	7/1/2024 5:55 PM
27	Removal of tree branches near wires and storm water management	7/1/2024 4:44 PM
28	Slow development to protect green space, improve sidewalks to encourage walking, move powerlines underground	7/1/2024 3:49 PM
29	improve water management, encourage growth of native plants/trees, promote environmentally friendly switches (solar, energy efficient appliances, etc.) among residents through better discounts, rebates and tax advantages.	7/1/2024 3:29 PM
30	Reimagined zoning and development to ensure that building and redevelopment occurs in the most sustainable and resilient fashion, we need to stop approving ANR lots all over town.	7/1/2024 3:15 PM
31	Slow down or stop the allowable destruction of forested areas for the purpose of new construction. Regulate the water usage for the purposes of a lush green lawn. Drinking water should not be allowed to be used or it should be severely restricted. Regulate the type of pesticides used on lawns for the purpose of a weed free lawn. Impose and enforce pool drainage into the sewer drains	7/1/2024 11:35 AM
32	Replacing trees in native species that have been removed due to blight, Aging, And overzealous developments would be a great way To protect the area.	7/1/2024 11:31 AM

Town of Holden
6 days ago

The town has partnered with Central Mass Regional Planning Commission to update our hazard mitigation plan and we need your help. This plan is updated every five years and plays an important role in ensuring the town remains safe and resilient during hazardous events. Your feedback is invaluable in shaping this plan to best meet our community's needs. By participating in this survey, you're contributing directly to the safety of the town.
https://www.surveymonkey.com/r/HCP6LGX



We want to hear from you about:

- How you have been affected by natural hazards in and around Town
- What natural hazards are you most concerned about
- How you think climate change and natural hazards will affect Holden
- Your suggestions for mitigating the effects of climate change and natural hazards to Holden

Answer the survey by August 31st, 2024 using the QR code below:

TIP: Open your phone camera, point at QR code, and click on pop-up link to take the survey, OR type the link below into your web browser:

https://www.surveymonkey.com/r/HCP6LGX

5 1 2

Like Comment

APPENDIX C:

Meetings

Meeting Name:
Holden Hazard Mitigation Plan Meeting #1

Community: Holden

Location: Public Safety Building, 1370 Main Street, Holden, MA

Date: January 4, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Mark Gronato	CMRPC	Emergency Prep Planner	mgronato@cmrpc.org
Russ Hall	Holden Fire	Fire Chief/EM	rhall@holdenma.gov
John Woodsmall	DPW	Director of Public Works	jwoodsmall@holdenma.gov
Chris DeMoranville	DPW	Supervisor of Operations	cdemoranville@holdenma.gov
Peter Lukes	Town Manager	Town Manager	PLukes@holdenma.gov
Francis Dagle	Health Dept	Health Agent	dagle@leicesterma.org
Jocelyn LaPlante	WRECC	Director	jlaplante@holdenma.gov
Andrew Loew	CMRPC	Director	aloew@cmrpc.org

Meeting Name:
Holden Hazard Mitigation Plan Meeting #1

Community: Holden

Location: Public Safety Building, 1370 Main Street, Holden, MA

Date: January 4, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Christopher Montiverdi	Holden Fire	Asst. Chief	CMontiverdi@holdenma.gov
Bryan Parkhurst	Holden Fire	EM Coordinator	Bparkhurst@holdenma.gov
Brad Stone	Holden DPW	Civil Engineer II	BStone@HoldenMA.Gov
Joseph Kenney	Holden DPW	Water and Sewer Superintendent	JKenney@HoldenMA.Gov
Tim Sherblom	Holden PD	Chief of Police	tsherblom@holdenma.gov
Chris Noyes	Holden PD	Dep. Chief of Police	cnoyes@holdenma.gov

Meeting Name:
Holden Hazard Mitigation Plan Meeting #2

Community: Holden

Location: Public Safety Building, 1370 Main Street, Holden, MA

Date: March 7th, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Chris Noyes	Holden PD	Deputy Chief	cnoyes@holden.ma.gov
Tim Sherblom	Holdn PD	Chief of Police	tsherblom@holdenma.gov
Mark Wilde	WRSD	Fac. Director	mark_wilde@WRSD.net
Peter Lukes	Holden Admin	Town Manager	PLukes@holdenma.gov
John Woodsmall	Holden DPW	Director of Public Works	jwoodsmall@holdenma.gov
Chris Montiverdi	Holden F.D.	Asst. Chief	cmontiverdi@holdenma.gov
Joseph Kenney	Holden DPW	Superintendent W+S	JKenney@HoldenMa.Gov
Bryan Barth	Holden Fire	EM Coordinator	Bbarth@holden.ma.gov
Chris DeMoranville	Holden DPW	Supervisor of Operations	cdemoranville@holdenma.gov
Jocelyn Laplante	Wachusett Regional Emergency Communications	Director	jlaplante@holdenma.gov
Will Talbot	CMRPC	Assistant Planner	Wtalbot@cmrpc.org
Lily Rosa	CMRPC	Intern	lrosa@cmrpc.org
Mark Granato	CMRPC	Emergency Prep. Planner	mgranato@cmrpc.org

Meeting Name:
Holden Hazard Mitigation Plan Meeting #3

Community: Holden

Location: Public Safety Building, 1370 Main Street, Holden, MA

Date: May 9th, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Chris DeMoranville	DPW	Supervisor of Operations	cdemoranville@holdenma.gov
Michael Viano	HMLD	Superintendent	mviano@holdenma.gov
Glenda Williamson	Conservation	Cons. Agent	gwilliamson@holdenma.gov
DAVID LINDBERG	BLDG DEPT	BLDG COMMISSIONER	DLINDBERG@HOLDENMA.GOV
David L. George	Planning	Town Planner	dgeorge@holdenmagov.
Andrew Loew	CMRPC	Dir Comm, Dev and Resiliency	aloew@cmrpc.org
Mark Grondin	CMRPC	Emergency Prep. Planner	

Meeting Name:
Holden Hazard Mitigation Plan Meeting #3

Community: Holden

Location: Public Safety Building, 1370 Main Street, Holden, MA

Date: May 9th, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Christopher Montiverdi	Holden Fire	Asst. Chief	cmontiverdi@holdenma.gov
Russ Hall	Holden Fire	CHIEF	rhall@holdenma.gov
Bryan Patch	Holden Fire EM	Coordinator	bpatch@holdenma.gov
Joseph Kenney	Holden DPW W+S	Superintendent	JKenney@Holdenma.Gov
Bernadette DeBlander	DCR DWSP	Reg. Planner	Bernadette.DeBlander2@mass.gov

Meeting Name:
Holden Hazard Mitigation Plan Meeting #4

Community: Holden

Location: Gale Free Library
23 Highland St, Holden, MA 01520

Date: June 25, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Jocelyn LaPlante	Worcester REC	Director	jlaplante@holdenma.gov
John Woodsmall	Holden DPW	Director	jwoodsmall@holdenma.gov
Bryce Patch	Holden Fire	Em Coordinator	Bpatch@holdenma.gov
Andrew Loew	CMRPC	Director of D,RP	aloew@cmrpc.org
Marc Gaudreau	CMRPC	Emergency Preparedness Planner	mgaudreau@cmrpc.org

Meeting Name:
Holden Hazard Mitigation Plan Meeting #4

Community: Holden

Location: Gale Free Library
23 Highland St, Holden, MA 01520

Date: June 25, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Rob Connolly	Worcester EM	EMD	ConnollyR@worcesterma.gov
Austin Gatlin	Holden PD	Intern	austingatlin24@gmail.com
Chris Noyes	Holden PD	Dep. Chief	cnoyes@holdenma.gov
Chris Montiverdi	Holden F.D.	Asst. Chief	cmontiverdi@holdenma.gov
Jim Kempton	Holden DPW	Town Eng	jkempton@holdenma.gov
Chris DeMoranville	Holden DPW	Super. of Operations	cdemoranville@holdenma.gov
MARK Wilde	WRSD	FACILITIES DIRECTOR	mark_wilde@WRSD.NET
DAVID LANDERS	BLDG DEPT	COMMISSIONER	DLANDERS@HOLDENMA.GOV
Glenda Williamson	Holden Conservation	Agent	gwilliamson@holdenma.gov
Dave George	Holden Planning	Town Planner	dgeorge@holdenma.gov
Alexa Owen	Wachusett Regional Dispatch	Dep. Director	aowen@holdenma.gov

Meeting Name: Holden Hazard Mitigation Plan Meeting #5	Community: Holden	Location: Holden Police Department, 1370 Main St, Holden, MA 01520
Date: September 10th, 2024		Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Bryan Patch	Holden Fire	EM Coordinator	BPatch@holdenma.gov
Dave George	Holden Planning	Town Planner	dgeorge@holdenmagov.
Will Talbot	CMRPC	Assistant Planner	Wtalbot@cmrpc.org
Chris DeMaranville	DPW	Supervisor of Operations	cdemaranville@holdenma.gov
Sean Smith	Holden Fire	Deputy Chief	SSmith@holdenma.gov
Chris Montiverdi	Holden Fire	Asst. Chief	cmontiverdi@holdenma.gov

Meeting Name: **Holden Hazard Mitigation Plan Meeting #5**	**Community: Holden**	**Location: Holden Police Department, 1370 Main St, Holden, MA 01520**
	Date: September 10th, 2024	**Meeting Time: 10:00 AM**

Participant Name	Organization	Title	E-mail

C M R P C
Central Massachusetts Regional Planning Commission

Holden Hazard Mitigation Plan Update
Local Planning Team Kickoff Meeting

Date/Time: Thursday January 4th, 2024, 10:00am
Location: Public Safety Building, 1370 Main Street Holden MA, First Floor Training Room

AGENDA

I. Introductions

II. Plan Background
- o Review Contract
- o Roles and Responsibilities
- o Estimated Timeline

III. Project Phases & Preliminary Schedule

Phase	Completion (proposed)
o Assembly of local planning team, kickoff	Jan 04
o Information gathering	
o Natural hazards	
o Critical infrastructure and facilities	
o Mitigation strategy development	
o Stakeholder and public involvement	
o Plan narrative development	
o Plan submission (initial)	
o Plan adoption	

IV. Local Planning Team Meetings/Council Presentations
- o Meeting #1 (kickoff)
- o Meeting #2 (hazards and critical infrastructure/facilities) (*can be two meetings*)
- o Meeting #3 (mitigation strategies)
- o Presentation #1 (summary of draft plan – setting is flexible)
- o Presentation #2 (final plan and request for adoption @ BOS) (optional)

V. **Review of Mitigation Strategies**

- 2017 HMP Mitigation Strategies

VI. **Next Meeting – Natural Hazards and/or Infrastructure**

- Date/location
- What to prepare

State and Local Mitigation Planning Policy Guides: Summary of Changes

The State and Local Mitigation Planning Policy Guides (policies) are the official interpretation of the requirements in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended and other federal statutes as well as in federal regulations, specifically Title 44 Code of Federal Regulations (CFR) Section 201-Mitigation Planning. This summary presents the key changes to the two policies released in April 2022.

Update Highlights

The 2022 policies clarify what FEMA requires for state and local mitigation planning, respectively. The updated policies become effective for all mitigation plan approvals one year from the official release date, April 2022.

State Mitigation Planning Policy Guide

The state policy applies to state governments that update, maintain and implement state mitigation plans. The primary users are state staff that oversee mitigation plan updates and the FEMA officials that review and approve those plans. There are two kinds of state plans: standard and enhanced. All states must meet the standard plan requirements. Enhanced states must meet the standard and enhanced state requirements.

STANDARD STATE UPDATES

The state policy:

- Requires that state plans consider equity and climate change impacts.
- Outlines participants in the state planning process. The process involves a broad range of state and other partners. This includes community lifelines and climate change experts. It also includes state agencies and others that support underserved communities.
- Requires states to describe building code adoption and enforcement, land use, National Flood Insurance Program (NFIP) administration and flood risk mapping in the capability assessment.
- Includes existing mitigation plan requirements for the High Hazard Potential Dams (HHPD) grant program to include all dam risks. Removes the optional Repetitive Loss Strategy.

FEMA

- Includes existing mitigation plan requirements for the Fire Management Assistance Grants program.

ENHANCED STATE UPDATES

The state policy:

- Introduces more advanced lead times and pre-submission coordination for new enhanced states. Provides a more detailed plan submission and review process.
- Requires states that wish to become enhanced to first show they can meet Hazard Mitigation Assistance (HMA) grant performance requirements.
- Requires that states demonstrate local jurisdictions have approved mitigation plans as part of the state's commitment to mitigation. The state must show how it supports the update and adoption of these plans before expiration.
- Strongly encourages enhanced states to adopt and enforce building codes that advance mitigation and resilience.

Local Mitigation Planning Policy Guide

The local policy applies to local governments that develop, update, maintain and implement their own mitigation plans. The primary users of this guide are local staff that oversee mitigation plans and the federal and state officials who review and approve those plans. The local policy includes the following changes:

- Defines who local governments must include in the planning process. This includes representatives from a broad range of sectors, community lifelines, the public and community-based organizations that support underserved communities.
- Requires local governments to include the effects of climate change and other future conditions in the risk assessment.
- Recognizes the important role of adopting and enforcing building codes and land use and development ordinances in the local government's ability to improve mitigation capabilities.
- Facilitates stronger alignment with other FEMA mitigation programs such as the National Flood Insurance Program (NFIP), Community Rating System and flood risk mapping program.
- Explains the need to right-size the scope of a plan update, consider both current and future risks, and complete the planning process with plan adoption.
- Includes existing mitigation plan requirements for the High Hazard Potential Dams (HHPD) grant program to include all dam risks. Removes the optional Repetitive Loss Strategy.
- Reorganized requirements for ease of use.

Other Updates

Both policies reflect program and administrative changes to other FEMA programs. This includes programs for which a mitigation plan is a condition of eligibility. For example, references to the Pre-Disaster Mitigation program have been deleted and new grant programs including Building Resilient Infrastructure and Communities have been added.

Both policies connect mitigation planning with community resilience. They also align with FEMA's 2022-2026 Strategic Plan. These priorities include promoting climate change and equity.

For More Information

Download the State Mitigation Planning Policy Guide on FEMA's state mitigation planning resources page.

Download the Local Mitigation Planning Policy Guide on FEMA's local mitigation planning resources page.

This fact sheet summarizes important changes to the State and Local Mitigation Planning Policy Guides. Users should read each guide, including the narrative and the requirements tables.

Questions? Contact the lead Community Planner in the Mitigation Division of your FEMA regional office.

4.1. Element A: Planning Process

Overall Intent. The planning process section of the mitigation plan documents how the plan was developed, who was involved and what data and information were used to build or update the plan. A successful planning effort includes active participation and buy-in from community leaders, stakeholders and the public. The National Mitigation Framework emphasizes the valuable role of collaboration among various sectors to ensure that mitigation capabilities continue to grow and that comprehensive mitigation includes strategies for all community sectors. Examples of sectors with mitigation capabilities are those agencies and stakeholders responsible for:

- Emergency management.
- Economic development.
- Land use and development.
- Housing.
- Health and social services.
- Infrastructure (including transportation and other community lifelines).
- Natural and cultural resources.

In addition, FEMA's National Response Framework, 4th Edition identifies critical community lifelines, which are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Community lifelines include the following:

- Safety and Security.
- Food, Water, Shelter.
- Health and Medical.
- Energy.
- Communications.
- Transportation.
- Hazardous Material.

Efforts to mitigate potential impacts to community lifelines are key to building resilience. These community lifelines connect to the sectors in the National Mitigation Framework and the Recovery Support Functions under the National Disaster Recovery Framework; the same agencies and departments that support these sectors also often support community lifelines and the recovery mission.

Involving members from these key sectors in the planning process will result in a shared understanding of risks. It will also help build widespread support for directing financial, technical and human resources toward natural hazard risk reduction.

Documenting the planning process is a crucial step for future plan updates. By building on the work that has already been done, the community can incorporate best practices and insights learned from previous processes while avoiding past challenges.

Element A Requirements
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))
A1-a. The plan must describe the current planning process. Documentation requirements typically are met with a narrative description, but may also include other records such as copies of meeting minutes, sign-in sheets or newspaper articles. When a narrative description is provided, supporting documentation such as meeting minutes, sign-in sheets, etc., does not need to be included in the plan itself. Planners are encouraged to retain supporting documentation in a Plan Appendix as a record of how decisions were made and who was involved. **Document** means to provide factual evidence for how the participants developed/updated the plan. **Involvement** means being engaged and actively participating in the development of the plan; providing input and directly providing, affecting or editing plan content as the representative of the participating jurisdiction(s) or organization. *If applicable, ensure that participating Community Rating System (CRS) jurisdictions maximize points throughout the planning process.*
A1-b. The plan must list the representatives from each of the participants in the current plan that will seek approval, and how they participated in the planning process. The plan must identify who participated, by agency and title. **Participant** means any local government or entity developing or updating a local mitigation plan. **Participation** means being engaged and having the chance to provide input on the plan. It can be defined and met in a variety of ways (such as attendance at meetings, reviewing and commenting on drafts, etc.).

Element A Requirements

A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))

A2-a. The plan must provide documentation of an opportunity for stakeholders to be involved in the current planning process. Documentation of this opportunity must identify how ***each*** of the following types of stakeholders were presented with this opportunity, as applicable.

1. Local and regional agencies involved in hazard mitigation activities:
   - Examples include public works, emergency management, local floodplain administration and Geographic Information Systems (GIS) departments.
2. Agencies that have the authority to regulate development:
   - Examples include: zoning, planning, community and economic development departments; building officials; planning commissions; or other elected officials.
3. Neighboring communities:
   - Examples include adjacent local governments, including special districts, such as those that are affected by similar hazard events or may share a mitigation action or project that crosses boundaries. Neighboring communities may be partners in hazard mitigation and response activities, or may be where critical assets, such as dams, are located.
4. Representatives of businesses, academia, and other private organizations:
   - Examples include private utilities or major employers that sustain community lifelines.
5. Representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations, among others:
   - Examples include housing, healthcare or social service agencies.

An **opportunity to be involved** in the planning process means that these stakeholders are invited to be engaged or are asked to provide information or input to inform the plan's content. Different communities may necessitate more targeted outreach and engagement, especially underserved communities.

Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. The integrated network of assets, services and capabilities that provide community lifeline services are used day to day to support recurring needs. Lifelines enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security, as described in the National Response Framework, 4th Edition.

The specific entities may be defined by each jurisdiction based on the unique characteristics of the local government, including special districts. The purpose of inviting input is to integrate natural hazard risk reduction across all community systems, as well as encourage implementation of mitigation actions.

Element A Requirements
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))
A3-a. The plan must document how the public had an opportunity to be involved in the current planning process, and what that participation entailed, including how underserved communities and vulnerable populations within the planning area were provided an opportunity to be involved. The opportunity must occur during the plan's development, which means prior to the plan's submission for formal review. In addition, the plan must document how public feedback was included throughout the planning process. *Examples of documentation include, but are not limited to, narratives, materials from open meetings, screenshots of social media postings and/or interactive websites with drafts for public review and comment, questionnaires or surveys through utility bills, etc.*
A4. Does the plan describe the review and incorporation of existing plans, studies, reports and technical information? (Requirement 44 CFR § 201.6(b)(3))
A4-a. The plan must document what existing plans, studies, reports and technical information were reviewed and how they were incorporated, if appropriate, into the development/update of the plan. For jurisdictions with structures for which National Flood Insurance Program (NFIP) coverage is available, regulatory flood mapping products [13] are required to be incorporated, if appropriate. *Participants may use other jurisdiction-specific materials, including non-regulatory flood mapping products, that improve upon NFIP regulatory flood mapping products.* *Gaps and limitations may be addressed as actions in the mitigation strategy, in particular for items that require additional assistance.* **Incorporate** means to reference or include information from other existing sources to form the content of the mitigation plan. *The documentation requirement may be met with narrative or citations (i.e., footnotes, in-text citations or a bibliography). Examples of the types of existing sources include, but are not limited to: the state hazard mitigation plan; local plans (such as comprehensive/master/general land use, economic development, capital improvement, affordable housing, resource management, resilience, climate, etc.); and hazard-specific reports and plans (such as Community Wildfire Protection Plans).*

[13] **Regulatory flood mapping products** are intended to be used as the basis for official actions required by the NFIP (https://www.fema.gov/flood-maps/products-tools/products). These can be found via the FEMA Map Service Center (https://msc.fema.gov/portal/home).

Town of Holden
Mitigation Strategies

OVERALL GOAL: Facilitate activity within the Town of Holden that reduces the loss, and risk of loss, to persons and property

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	A. Structure & Infrastructure Strategies							
1.	Obtain a generator for Town Hall and nearby buildings, including public library and First Congregational Church (shelter). Generators at these critical facilities protect and serve the Town by powering emergency communications and shelters for warmth and for refrigerated food storage, among other emergency mitigation and response strategies.	All	Local Emergency Management	Local, Federal Grants (HMGP/PDM), State Grants (Various)	Low	Medium	High	3-5 years
2.	Identify / resolve issues causing flooding at Route 31 & Quinapoxet River, including, monitoring and removing beaver dams	FL, SS, ST, HU	DPW, Conservation, Board of Health	Local	Medium	Medium	Low	Ongoing
3.	Drainage and culvert upgrades at Salisbury St near the pool to reduce repeated flooding incidents	FL, SS, ST, HU	DPW	Local, Federal Grants (HMGP/PDM), State Grants (Various)	Medium	Medium	High	Greater than 5 years
4.	Drainage, culvert upgrades, and flow enhancers at Sterling Road to reduce repeated flooding incidents	FL, SS, ST, HU	DPW	Local, Federal Grants (HMGP/PDM, TIP), State Grants (Various)	Medium	Medium	Low	1-2 Years
5.	Flooding in the Highland Street area partly caused by high water table and drainage problems. Identify/resolve issues causing basement flooding.	FL, SS, ST, HU	DPW, MassDOT	State (MassDOT)	Low	Low	More information required	Greater than 5 years

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
6	Address structural issues at Town-owned Old Grist Mill Pond Dam (Significant Hazard), in poor condition	DF	DPW	Local, State Grants (Dam & Seawall)	High	High	High	3-5 Years
7	Drainage issues need addressing on Main Street near Parker Pond and Friendly's, associated with Talbot's property, and Heather Shop property. Talbots and Heather have begun developing new stormwater systems on their properties. MassDOT has come to an agreement with property owners. Holden should monitor progress.	FL, SS, ST, HU	DPW, MassDOT	Local, Federal Grants (HMGP/PDM), State Grants (Various)	High	Medium	More information required	1-2 Years
8	Conduct Inspection and Evaluation Reports for Town-owned, Significant Hazard, ~~Old Grist Mill Pond Dam,~~ and carry out recommended action items to improve structural components of dam.	DF, FL, ST, EQ	Highway Dept, Water Dept, Conservation, Local Emergency Management	Local, State Grants (Various)	Medium	Medium	Low	1-2 years
	Maintain access points to the DCR and Worcester watershed to prevent wildfires and brushfires. Also, improve mapping of access points and trails and integrate into GIS system.	WF	Fire Dept, DCR, City of Worcester	Local, State Grants (Various)	High	Medium	Low	1-2 years
	Tree trimming and tree wire installation needed across Town to protect utility wires, especially in south end of Town where flooding is frequent and sump pumps are required. Focus on high-growth areas. Repeat every four years.	SS, ST, HU	Holden Municipal Light Dept., Town, Private property owners	Utility (National Grid), Local, Private (property owners)	High	Medium	High	1-2 years
	B. Preparedness, Coordination & Response Action Strategies							
	Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood	FL, SS, ST, HU	DPW, Local Emergency Management, Planning	Local	High	High	Low	Ongoing

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	hazard planning and management							
	Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate	FL, SS, ST, HU	DPW, Local Emergency Management, Planning	Local	Low	Low	Low	1-2 Years
	Road information coordination and planning for snow removal	SS	DPW; MassDOT; Mass State Police; CMRPC	Local, Federal Grants (HMGP/PDM), State Grants (Various), Private Contracts	High	High	Low	Ongoing
	Evacuation Plan updates	All	Local Emergency Management, DPW, CMRPC, MassDOT	Local, Federal Grants (Homeland Security via MEMA and CRHSAC)	High	High	Low	1-2 Years (update every 5 Years)
	Improve vegetation and debris management along P&W Railroad rights-of-way to reduce the chance of brush fires near tracks	DR, WF	P&W Railroad, Fire, DPW	Private (P&W Railroad)	High	High	Low	Ongoing
	C. Education & Awareness Strategies							
	Provide information to residents and businesses, especially in the Chaffin Pond area, on generator purchase, use, and maintenance, to reduce basement flooding in the event of power outages and the use of sump pumps. Use FEMA/MEMA templates for educational materials.	SS, ST, HU, FL	Fire Dept, Light Dept	Local	High	Medium	Low	1-2 years
	Provide information to residents and businesses on water conservation through low-impact landscaping and other measures (to conserve water in times of drought and to conserve water for firefighting)	DR, WF	DPW, Conservation, Fire, Holden-Worcester Water	Local, Private (water companies)	High	Medium	Low	Ongoing
	D. Local Plan & Regulation Strategies							
	Use MA Drought Management Plan as a template for Town's own drought plan, and integrate State's	DR	Highway Dept, Water Dept, Conservation	Local	Medium	Low	Low	1-2 years

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	recommendations and actions according to Town's needs.							
	Follow Worcester's Drought Plan and help enforce water conservation measures	DR, WF	DPW, Conservation, Fire, Holden-Worcester water	Local, Private (water companies)	High	Medium	Low	Ongoing
	Obtain Inspection and Evaluation Reports for dams in Town, and follow through with recommended action items for structural improvements.	DF, FL, ST, EQ	Highway Dept, Water Dept, Conservation, Local Emergency Management	Local, State Grants (Various)	Medium	Medium	Low	1-2 years
	Follow through with Continuity of Operations Planning (COOP) currently being completed by Town Departments. Ensuring, among other mitigation and resiliency strategies, clear roads during snow storms for emergency vehicle transportation.	All	All Town Departments	Local	Medium	High	Low	Ongoing
	Investigate and become StormReady certified, and provide information to residents around preparedness for weather related issues, especially tornadoes.	All	All Town Departments	Local, Federal Grants (HMGP/PDM), State Grants (Various)	High	High	Low	1-2 years
	Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wild and brush fires.	WF	Fire Dept	Local	High	Medium	Low	1-2 years
	Establish a Local wetlands protection bylaw to further build upon the State's Wetlands Protection Act and Regulations, which add regulatory oversight provisions for development within the jurisdictional buffer zone, adding increased attention to alteration of wetlands and the	DR, WF	Conservation Commission	Local	Medium	Medium	Low	1-2 years

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	opportunity to preserve capacity and quality.							
	Review and update local plans and development review processes (planning, zoning, stormwater management, conservation, etc.) to ensure new construction will not be affected by hazards	All	All Town Departments	Local	Medium	High	Low	Ongoing
	Monitor implementation of Hazard Mitigation Plan	All	All Town Departments	Local	High	High	Low	Ongoing

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought
EQ	Earthquake	FL	Flooding
HU	Hurricane	OT	Other
SS	Severe Snowstorm/Ice storm/Nor'easter	ST	Severe Thunderstorm/Wind/Tornado
WF	Wildfire/Brushfire	XT	Extreme Temperatures

Holden Hazard Mitigation Plan Update
Local Planning Team Meeting 2: Natural Hazards

Date/Time: Thursday March 7th, 2024, 10:00am
Location: Public Safety Building, 1370 Main Street Holden MA, First Floor Training Room

AGENDA

I. Introductions

II. Meeting #1 Recap

III. Community Lifelines

IV. Reference Documents

V. Natural Hazards Review

a. Flooding
b. Severe Snowstorms, Ice Storms, and Nor'easters
c. Hurricanes
d. Severe Thunderstorms, Wind, and Tornadoes
e. Wildfires and Brushfires
f. Earthquakes
g. Dam Failure
h. Drought
i. Extreme Temperatures
j. Landslides
k. Invasive Species
l. Other Hazards

V Plant survey study for next week, due Ins note

VI. Next Meeting – Critical Infrastructure Review and Update

- Date/location, May 9th, 10am, here
- What to prepare

Community lifelines list

Boro lines in maybe

Community Lifelines

A "lifeline" enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security.

Why Lifelines?

FEMA developed the community lifelines construct to increase effectiveness in disaster operations and better position the Agency to respond to catastrophic incidents.

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society. When disrupted, decisive intervention (e.g., rapid service re-establishment or employment of contingency response solutions) is required.

During initial response, priority efforts focus on understanding and addressing community impacts.

Lifelines provide an outcome-based, survivor- centric frame of reference that assists responders with:

- Root Cause Analysis
- Interdependencies
- Prioritization
- Ease of Communication

How Lifelines Were Developed

FEMA released initial guidance *(Lifelines Toolkit)* introducing the lifelines construct in February 2019, followed by significant stakeholder outreach and feedback including:

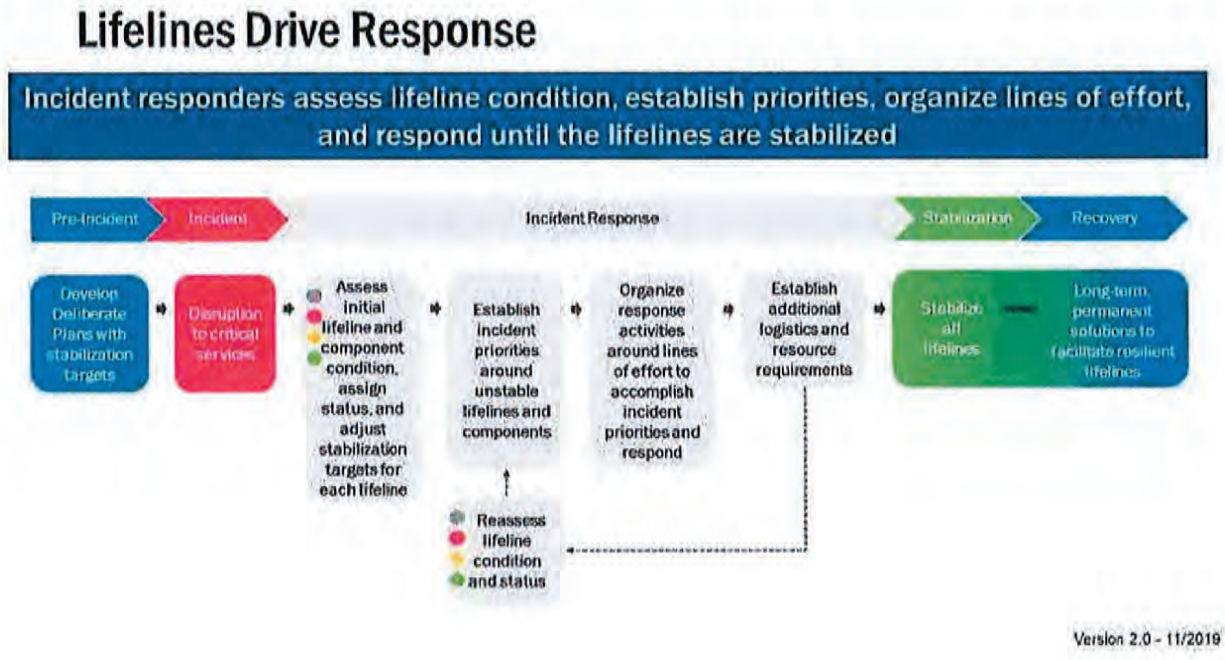
- State and Local Emergency Managers

- Interagency Partners
- Private and Non-Profit Stakeholders

Construct was validated during responses to Hurricanes Michael, Florence, and Dorian, Super Typhoon Yutu, Alaska Earthquake, and during Shaken Fury full-scale exercise.

Lessons learned from exercises, operations, and stakeholder feedback resulted in refinement and improvement to the construct.

National Response Framework (NRF) 4th Edition formalized lifelines in national response policy, and enhanced Lifelines guidance *(Lifelines Toolkit 2.0)* released to support NRF publication.



View the Community Lifelines Implementation Toolkit.

If you have any questions or feedback, please email them to:
Lifelines@fema.dhs.gov

Community Lifeline Components



Multiple components and subcomponents establish the parameters of the lifeline; component-level assessment is required to determine the condition of each lifeline.

1. Safety and Security
- Law Enforcement/Security
- Fire Service
- Search and Rescue
- Government Service
- Community Safety

2. Food, Hydration, Shelter
- Food
- Hydration
- Shelter
- Agriculture

3. Health and Medical
- Medical Care
- Public Health
- Patient Movement
- Medical Supply Chain
- Fatality Management

4. Energy
- Power Grid
- Fuel

5. Communications
- Infrastructure
- Responder Communications
- Alerts, Warnings, and Messages
- Finance
- 911 and Dispatch

6. Transportation
- Highway/Roadway/Motor Vehicle
- Mass Transit
- Railway
- Aviation
- Maritime

7. Hazardous Material
- Facilities
- HAZMAT, Pollutants, Contaminants

8. Water Systems
- Potable Water Infrastructure
- Wastewater Management

ASSESSMENT	
Status	***"What?"***
Impact	***"So What?"***
Actions	***"Now What?"***
Limiting Factors	***"What's the Gap?"***
ETA to Green	***"When?"***

Hazards Since (or Soon Before) Last Plan Update in 2018

Flooding

- 8/15/2015 – Flood: A weak cold front moving through southern New England brought showers and thunderstorms to the region. These storms produced hail and damaging winds as well as some poor drainage street flooding.
- 9/30/2015 – Flood: A cold front moved across southern New England bringing heavy rain, strong winds, and periods of coastal flooding along the south coast.
- 10/30/17 – Flood: The remnants of Tropical Storm Phillipe merged with a mid-latitude system approaching the U.S. East Coast. Tropical moisture flowing north ahead of the cold front contributed to heavy downpours with one to five inches of rain reported.
- 11/3/2018 – Flood: Heavy rain occurred in the early morning hours, with generally 1.50 to 2.50 inches in eastern sections of southern New England and up to 3.66 inches in the slopes of the Berkshires.
- 7/6/19 – Flood: A cold front advanced into a very moist, almost tropical air mass in place across southern New England. This produced a line of thunderstorms, some with torrential downpours that caused flooding.
- 7/9/21 – Flood: Tropical Storm Elsa made landfall in Rhode Island on Friday morning before moving into the Gulf of Maine. It interacted with a stalled frontal boundary and brought widespread heavy rainfall of 2 to 3.5 inches.
- 11/12/21 – Flood: Strong southerly wind flow out ahead of an advancing cold front produced strong to damaging wind gusts and some heavy rain that caused some street and basement flooding.
- 07/14/2023 – Flood: A cluster of thunderstorms moved northward into Connecticut during the morning ahead of a short-wave trough southwest of southern New England. The showers and thunderstorms spread northeastward into the early afternoon. One storm produced a lightning strike that started a house fire in northeast Massachusetts. Several roads were flooded in Worcester County. In Holden, Main St and several side streets were flooded in spots up to one ft.
- 09/11/2023 – Flash Flood: A deamplifying mid level shortwave with dewpoints in the 70s and decent instability brought scattered thunderstorms and widespread flash flooding to Massachusetts and Rhode Island. There were many streets closed, many cars stranded in flood waters, and several houses with flooded basements or first floors. In Leominster, flash flooding caused widespread damage to residences and municipal properties.

Sources:
Hopedale 2023 HMP
https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Flash+Flood&eventType=%28Z%29+Flood&eventType=%28C%29+Heavy+Rain&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=2000&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS

Severe Snowstorms / Ice Storms / Nor'easters

While the Fujita and Saffir-Simpson Scales characterize tornadoes and hurricanes respectively, there is no widely used scale to classify snowstorms. The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin 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. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

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 Storm events listed below occurred throughout the Northeast region.

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Rank	Start	End	NESIS	Category	Description	Map
2	2022-12-21	2022-12-26	2.66	2	Significant	December 21-26, 2022Dec 21-26, 2022
4	2022-12-13	2022-12-20	8.52	4	Crippling	December 13-20, 2022Dec 13-20, 2022
67	2022-01-28	2022-01-30	1.73	1	Notable	January 28-30, 2022Jan 28-30, 2022
72	2022-01-04	2022-01-07	1.60	1	Notable	January 4-7, 2022Jan 4-7, 2022
88	2022-01-01	2022-01-03	1.06	1	Notable	January 1-3, 2022Jan 1-3, 2022
25	2021-01-30	2021-02-03	4.93	3	Major	January 30 - February 3, 2021Jan 30 - Feb 3, 2021
46	2020-12-14	2020-12-18	3.21	2	Significant	December 14-18, 2020Dec 14-18, 2020
83	2019-03-03	2019-03-04	1.29	1	Notable	March 3-4, 2019Mar 3-4, 2019

https://www.ncei.noaa.gov/access/monitoring/rsi/nesis

Previous Instances of Declared Winter Storm Disasters in Massachussetts

- Severe Winter Storm, Snowstorm, and Flooding /FEMA-4214-DR-MA, April 2015
- Severe Winter Storm and Snowstorm/FEMA-4379-DR, March 2018

Sources:

2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan Appendix B, Historical Disaster Occurrences, https://www.mass.gov/doc/2018-statewide-hazard-mitigation-and-climate-adaptation-plan-appendix-b/download.

https://www.ncei.noaa.gov/access/monitoring/rsi/nesis

https://www.ncei.noaa.gov/monitoring-content/snow-and-ice/rsi/docs/kocin-and-uccellini-2004.pdf

Hurricanes

Holden's location in central Massachusetts approximately 45 miles inland reduces the risk of extremely high winds that are associated with hurricanes, although it can still experience some high wind events.

Storm Name	Year	Saffir/Simpson Category (when reached MA)
Andrea	2013	Extratropical Storm
Florence	2018	Extratropical Storm
Elsa	2021	Tropical Storm
Fred	2021	Extratropical Storm
Henri	2021	Tropical Storm/Depression

super storm sandy, sporadic power outages + trees down

Sources:

NOAA Historical Hurricane Tracks Map, https://coast.noaa.gov/hurricanes/#map=6.06/42.065/-71.688&search=eyJzZWFyY2hTdHJpbmciOiJNYXNzYWNodXNldHRzLCBVU0EiLCJzZWFyY2hUeXBlIjoiZ2VvY29kZWQiLCJvc21JRCI6IjYxMzE1IiwiY2F0ZWdvcmllcyI6WyJINSIsIkg0IiwiSDMiLCJIMiIsIkgxIiwiVFMiLCJURCIsIkVUIl0sInllYXJzIjpbXSwibW9udGhzIjpbXSwiZW5zbyI6W10sInByZXNzdXJlIjp7InJhbmdlIjpbMCwxMDMwXSwiaW5jbHVkZVVua25vd25QcmVzc3VyZSI6dHJ1ZX0sImJ1ZmZlciI6NjAsImJ1ZmZlclVuaXQiOlsiTmF1dGljYWwgTWlsZXMiXSwic29ydFNlbGVjdGlvbiI6eyJ2YWx1ZSI6InllYXJzX25ld2VzdCIsImxhYmVsIjoiWWVhciAoTmV3ZXN0KSJ9LCJhcHBseVRvQU9JIjp0cnVlLCJpc1N0b3JtTGFiZWxzVmlzaWJsZSI6dHJ1ZX0=.

Holden HMP 2017, Page 18

Tornadoes, Thunderstorms, and High Wind Events

several & small instances,

- July 19, 2007 Tornado (New Braintree), EF-0, light damage, no fatalities, no injuries
- August 31, 2014 Tornado (Worcester), EF-0, light damage, no fatalities, no injuries
- August 16, 2016 Thunderstorm Wind (Holden) A warm front brought widespread rainfall and an isolated

Worcester tornado

Overall more significant thunderstorms + wind

thunderstorm or two to southern New England. A tree on Malden Street was downed by thunderstorm winds.

- July 26, 2018 Tornadoes (East Douglas, Uxbridge, Whitinsville and Upton), both EF-1, moderate damage, no fatalities, no injuries
- October 23, 2018 Tornado (Hardwick), EF-1, moderate damage, no fatalities, no injuries
- August 19, 2021 Tornado (Webster), EF-0, light damage, no fatalities, no injuries
- August 23, 2021 Tornado (Marlborough, Southborough), light damage, EF-0, no fatalities, no Injuries
- August 27th, 2021 Thunderstorm Wind (Holden) A cold front entered a marginally unstable, but highly sheared environment during the late afternoon and evening hours. A broken line of severe thunderstorms moved acros most of Massachusetts and a portion of northern Connecticut and northern Rhode Island. In Holden, a gust to 60 mph was reported by a trained spotter.

- lightning strike on HS / lightning rods ✓ more for Holden town Buildings

Source: ArcGIS Tornado Tracks Data, data from Texas Parks & Wildlife, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS,

https://www.arcgis.com/apps/View/index.html?appid=01672085b139432e8fe1296a743f67d7.

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Hail&eventType=%28Z%29+High+Wind&eventType=%28Z%29+Strong+Wind&eventType=%28C%29+Thunderstorm+Wind&eventType=%28C%29+Tornado&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=2014&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Hail&eventType=%28Z%29+High+Wind&eventType=%28Z%29+Strong+Wind&eventType=%28C%29+Thunderstorm+Wind&eventType=%28C%29+Tornado&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=2014&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS

Wildfires / Bush Fires

Department	# of Incidents	Fire Service Injuries	Civilian Injuries	Fire Service Deaths	Civilian Deaths	Dollar Loss	# of Acres Burned (Fire Module)	# of Acres Burned (Wildland Module)	Total Reported Acres Burned
HOLDEN	78	0	0	0	0	$3,000	30	18.61	48.61

Department	Total # of Fires	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
HOLDEN	78	6	8	14	6	12	9	4	3	7	9

Source: Massachusetts Fire Incident Reporting System Natural Vegetation Fires Data, 2011-2020

Fires along RR tracks

2021	2022	2023
8	11	7

2010 Fire east of Chapin Rd (30 - 40 acres) → mitigation strategy needed?

Earthquakes

Events listed by Weston Observatory in Boston College were reviewed for all towns in Massachusetts. from 2015 to the present. Listed earthquakes above magnitude 2.0 include:

- 6/1/16 – 51 km ENE of Rockport, 2.4/2.7 [Mn*/Mc**]
- 9/6/17 – 2 km ESE of Athol, 1.5/2.0
- 8/18/18 – 83 km E of Nantucket, 2.5/2.9
- 12/21/18 – 3 km WSW of Gardner, 2.1/2.1
- 12/23/18 – 4 km SW of Gardner, 2.1/2.3
- 1/28/19 – 4 km WSW of Gardner, 1.0/2.0
- 4/27/19 – 24 km NE of Rockport, 1.8/2.1
- 8/21/19 – 2 km SSE of Wareham, 1.7/2.4
- 11/2/19 – 230 km ENE of Orleans, 2.2/2.9
- 12/3/19 – 4 km SSE of Plymouth, 1.6/2.2
- 7/24/20 – 20 km ESE of Woods Hole, 1.8/2.6
- 11/8/20 – 11 km SW of New Bedford, 3.8/3.4
- 11/22/20 – 12 km WSW of New Bedford, 1.7/2.6
- 7/25/21 – 5 km W of Peabody, 1.4/2.5
- 1/1/22 – 13 km N of Rockport, 2.3/3.0
- 3/4/22 – 5 km WSW of Orange, 2.2/2.7
- 3/19/22 – 36 km ENE of Rockport, 1.4/2.2
- 9/24/22 – 6 km S of Litleton, 1.9/2.5
- 11/10/22 – 12 km NW of Nantucket, 2.6/3

  *Mn is the Nutli Magnitude (see below)

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

The Weston Observatory utilizes two scales to track the magnitude of earthquakes. These include the Nutli magnitude (Mn) for North America east of the Rocky Mountains. Weston Observatory also utilizes the Coda Duration magnitude (Mc), which is based on the duration of shaking at a particular station. Coda Duration magnitude can quickly estimate the magnitude before the exact location of the earthquake is known.

Source: Weston Observatory at Boston College New England Seismic Network (NESN) Recent Earthquakes Data, http://aki.bc.edu/cgi-bin/NESN/recent_events.pl

Dam Failure

According to the Massachusetts Office of Dam Safety, there are 29 dams in Holden, of which 6 are High Hazards, 7 are Significant Hazards, and 2 are Low Hazards. The remaining 14 are rated Not Applicable (N/A).

National ID	Dam Name	Owner Type	Hazard Potential	Notes
MA00619	Holden Reservoir Dam #2	City of Worcester	High Hazard	
MA00620	Unionville Pond Dam	DCR	Significant Hazard	Local team notes repairs needed
MA00621	Chaffin Pond Dam	Private	Significant Hazard	
MA00622	Kendall Reservoir Dam	City of Worcester	High Hazard	
MA00623	Pine Hill Reservoir Dam	City of Worcester	High Hazard	
MA00929	Quinapoxet Reservoir Dam	City of Worcester	High Hazard	
MA00960	Holden Reservoir Dam #1	City of Worcester	High Hazard	
MA00979	Eagle Lake Dam	Private Assoc.	High Hazard	
MA01303	Dawson Pond Dam	DCR	Low Hazard	
MA01247	Peter Carr Pond Dam	City of Worcester	Significant Hazard	
MA01635	Cournoyer Pond Dam	Private	Significant Hazard	
MA01636	Frank Marsh Pond Dam	Private	N/A	
MA01637	Bock Pond Dam	Private	N/A	
MA01638	Holden Trap Rock Pond Dam	Private	N/A	
MA01639	Koenigs Lilly Pond Dam	Private	N/A	
MA01640	Current Meter Pond Dam	Private	Significant Hazard	Local team notes repairs needed
MA01641	Lindstroms Shiner Pond Dam	Private	N/A	
MA01642	Swimming Pool Dam	Private	N/A	

MA01643	Parsons Pond Dam	Private	N/A	
MA01644	S.H.S. Pond Dam	Private	N/A	
MA01645	Lindstroms Shiner Pond #2 Dam	Private	N/A	
MA01646	Regional School Pond Dam	Wachusett Reg. HS	N/A	
MA02325	Old Grist Mill Pond Dam	Town of Holden	Significant Hazard	Local team notes repairs needed
MA02326	Kendall Diversion Dam	City of Worcester	N/A	
MA02328	Kendall Reservoir Lower Basin Dam	City of Worcester	Significant Hazard	
MA02573	Chaffin Pond Lower Basin Dam	DCR	N/A	
MA02575	Parker Pond Dam	DCR	Low Hazard	
MA02576	Upper Lovell Pond Dam	DCR	N/A	
MA02789	Holden District Reservoir Dam	City of Worcester	N/A	

Inundation areas for these dams cover less than 10% of the town, or a "small" portion of its area.

The Massachusetts State Hazard Mitigation and Climate Adaptation Plan does not report any dam failures having recently occurred in the CMRPC Region.

Sources:

Massachusetts State Hazard Mitigation and Climate Adaptation Plan

MassGIS Data: Dams

Holden HMP 2016

Source: 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan Appendix B, Historical Disaster Occurrences: https://www.mass.gov/doc/2018-statewide-hazard-mitigation-and-climate- adaptation-plan-appendix-b/download.

Drought

Year	Maximum Severity
2018	D1 conditions in 36% of the state
2019	D0 conditions in 85% of the state

2020	D3 conditions in 36% of the state
2021	D2 conditions in 1% of the state
2022	D3 conditions in 70% of the state
2023 (to August)	D1 conditions in 0.2% of the state

Source: US Drought Monitor, National Drought Mitigation Center, University of Nebraska-Lincoln, https://droughtmonitor.unl.edu/DmData/DataDownload/StatisticsbyThreshold.aspx

Water conservation by them, whatever water use they do, town supplies well water,

Extreme Temperatures

- 02/15/2015: Low pressure off the Delmarva peninsula intensified rapidly as it moved northeastward. Its path just southeast of Nantucket brought heavy snow to all of southern New England and blizzard conditions and coastal flooding to coastal areas. Near blizzard conditions occurred across much of eastern Massachusetts. The large amount of snow, combined with wintry, frigid temperatures resulted in snow piling up on roofs and numerous (250) roof collapses were reported to emergency management and to the National Weather Service in the days after this snowstorm. Fortunately no injuries to humans were reported. However, a large amount of snow fell off a Boston-area ice rink roof, burying a man and knocking down four others. No one was seriously hurt, but two of the people were taken to the hospital for evaluation. In barn collapses in Stoughton and Andover, a total of 40 horses were trapped and rescued. In another barn collapse in Westford, two horses died. In another who would have guessed scenario, a falling icicle ruptured a gas line causing an explosion at the Duxbury House, an Alzheimer's care facility in Duxbury. No one was injured. There were several indirect fatalities related to the snow. These include: a 57 year old man who died shoveling snow, a 57 year old woman hit by a snow plow, and a 60 year old man hit by a snow plow. The Automated Surface Observing System at Fitchburg Municipal Airport (KFIT) recorded wind chills as low as 31 below zero.

Lucky in a sense for An Alzheimer's (unrelated) warming + holiday crowds

- 02/20/2015: High pressure to the west and low pressure to the east funneled winds through southern New England overnight. Coupled with strong cold advection into the region, this resulted in wind chills well below zero overnight. The Automated Surface Observing System at Fitchburg Municipal Airport recorded wind chills below 25 degrees below zero for six hours.

Some pipes on water issues significantly

- 02/13/2016: Arctic high pressure brought strong northwest winds and extremely cold wind chills to southern New England. Many locations reported wind chills between 25 and 35 degrees below zero. Wind chills as low as 37 below zero were reported at Fitchburg Airport.

According to the SHMCAP43 warm weather events have occurred across Massachusetts between 1995 and 2018. **The NOAA Storm Events database does not have Record Warmth/Heat or Excessive Heat events listed in the last decade for Northern Worcester County.** However, it should be noted that, in 2012, Massachusetts temperatures broke 27 heat records. Most of these records were broken between June 20 and June 22, 2012, during the first major heat wave of the summer to hit Massachusetts and the East Coast. In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the Heat Index reached 100°F (NOAA Storm Events Database)

Source: Hopedale 2023 HMP

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Cold%2FWind+Chill&eventType=%28Z%29+Excessive+Heat&eventType=%28Z%29+Extreme+Cold%2FWind+Chill&beginDate_mm=11&beginDate_dd=0

1&beginDate_yyyy=2014&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS

- 1/7/2015 - Extreme Cold/Wind Chill
- 1/30- 2/2/2015 - Cold/Wind Chill
- 2/5/2015 - Cold/Wind Chill
- 2/13/2015 - Cold/Wind Chill
- 2/15- 2/16/2015 - Extreme Cold/Wind Chill
- 2/19-2/20/2015 - Extreme Cold/Wind Chill
- 2/23/2015 - Cold/Wind Chill
- 2/13-2/14/16 - Extreme Cold/Wind Chill
- 12/15/2016 - Cold/Wind Chill
- 3/11/2017 - Cold/Wind Chill

Source: 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan Appendix B, Historical Disaster Occurrences, https://www.mass.gov/doc/2018-statewide-hazard-mitigation-and-climate- adaptation-plan-appendix-b/download.

Landslides

Although Holden has no documented previous occurrences of significant landslides, there are more high-sloped areas in Town than other Worcester County towns. Also, there are some roadways that border high sloped areas, rivers, and/or 100-yr flood zones, which can increase stormwater-induced bank erosion and contribute to the occurrence of landslides. High slope terrain (defined as 15 to 25% grade) cover 2,038 acres, or only 8.7% of the town; very high slopes (higher than 25% grade) cover 248 acres, or 1% of the town's area.

The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan does not report any landslides/mudslides having recently occurred in Worcester County.

Source:

Holden 2016 HMP

Appendix B, Historical Disaster Occurrences, https://www.mass.gov/doc/2018-statewide-hazard- mitigation-and-climate-adaptation-plan-appendix-b/download.

Invasive Species

According to the MDAR Invasive Pest Dashboard Holden hosts at least 3 invasive species: Asian Longhorn Beetle, Emerald Ash Borer and Mile-A-Minute Vine. Beech leaf Disease was also confirmed to have been found in Holden in 2023 and Holden borders communities with Spotted Lanternfly. According to the Forest Ecosystem Monitoring Cooperative's Northeastern Forest Health Atlas Holden has historically been host to Spongy Moth (commonly known as Gypsy Moth) in 1981, and again in 2018 experiencing defoliation events in both instances.

As for water born invasives nearby Wachusett reservoir is host to Eurasian Water-milfoil, Fanwort and Variable Water-milfoil, with other Aquatic Invasive Species having the potential to take hold in the ponds and streams of Holden. According to DCR's Aquatic Invasive Species Assessment and Management Plan "Aquatic invasive species are an escalating problem because global trade and commerce continue to homogenize the world's flora and fauna. Secondary spread of existing infestations in North America will result in chronic delivery of AIS into Massachusetts." This secondary spread is most often caused by human activities.

Source:

MDAR Invasive Pest Dashboard (arcgis.com)

Forest Health Atlas (uvm.edu)

Microsoft Word - AIS_Plan_2010.doc (mass.gov)

Nonindigenous Aquatic Species (usgs.gov)

Other Hazards

In addition to the hazards identified in previous sections, the Hazard Mitigation Team for the 2016 HMP reviewed the other hazards listed in the Massachusetts Hazard Mitigation Plan: coastal hazards, atmospheric hazards, ice jams, coastal erosion, sea level rise, nor'easters, and tsunamis. It was determined that these hazards are either irrelevant to Holden due to the town's location, or in the case of nor'easters, that the hazard is already included within another hazard described above (severe winter storms).

Sources:

Holden 2016 HMP

Key to Locally Identified Hazards and Critical Infrastructure and Facilities in Appendix A Maps

Facility/Infrastructure/Hazard	Type	Map ID
Chaffin Water tank	CI	1
Chapin Water Tank 2MM	CI	2
Avery Heights Water Tank 1MM	CI	3
Highland Street Water Tank 2MM and Booster Station	CI	4
Jefferson Water Tank 0.75MM Metering House	CI	5
Spring St Wellfield/PS	CI	6
Quinapoxet Wellfield	CI	7
Mill St Wellfield	CI	8
Mason St Wellfield	CI	9
Brattle St Water Interconnection	CI	10
Salisbury St Water Interconnection	CI	11
Chapin Tank Water Booster Pump	CI	12
Avery Heights Morgan Water Booster Pump	CI	13
Heritage Ln Sewer PS	CI	14
Lincoln Ave Sewer PS	CI	15
Gail Dr. Sewer PS	CI	16
Industrial Dr. Sewer PS	CI	17
Sycamore Sewer PS	CI	18
Alden Sewer PS	CI	19
ECC Sewer PS	CI	20
Jefferson Sewer PS	CI	21
Flagler Dr Sewer PS	CI	22
Avery / Morningside Sewer PS	CI	23
Heather Circle Sewer PS	CI	24
Dorothy Ave Sewer PS	CI	25
Sunnyside Ave Sewer PS	CI	26
Winthrop Ln Sewer PS	CI	27
River St Sewer PS	CI	28
Wachusett St Sewer PS	CI	29
Quinapoxet Large Sewer PS	CI	30
Quinapoxet Small Sewer PS	CI	31
Mark Bradford Dr Sewer PS	CI	32
Quaker Rd Sewer PS	CI	33
Malden St Sewer PS	CI	34
Claires Sewer PS	CI	35
Twinbrook Sewer PS	CI	36
Bailey Rd Sewer PS	CI	37
Nelson St Sewer PS	CI	38
Avery Heights Radio Antennae	CI	39
Chaffin Radio Antennae	CI	40
Municipal Light Dept Substation	CI	41
Municipal Light Dept sub-station	CI	42
Municipal Light Dept.	CI	43

P&W Railroad	CI	44
Route 122A	CI	45
I-190 #1	CI	46
I-190 #2	CI	46
Rte 31 at Quinapoxet River Flooding	H	FL-1
Salisbury St Flooding	H	FL-2
Sterling Road Culvert Flooding	H	FL-3
Chaffin Area Flooding	H	FL-4
Chaffins Area Flooding with fallen tree limbs	H	FL-5
Highland St Flooding	H	FL-6
Main St Flooding	H	FL-7
Unionville Dam Repair	H	DF-1
Wachusett St Dam Repair	H	DF-2
Wachusett St Dam Repair	H	DF-3
Generator for Town Hall and nearby buildings	H	SS-1

Flooding

9/12/23- Heavy rainfall of nearly 10 inches over just six hours in Leominster, MA causing structural damage to homes, roadways, dams and bridges resulting in a State of Emergency being declared by Gov. Healy. To date there are still no total estimates listed for IA/ PA dollar amounts. This would be the only declaration made in Central Massachusetts in the 5 year span of 2017-2023.

Severe snow/ ice storms/nor'easters

1.) ***On March 29, 2022,*** Governor Charles D. Baker requested a major disaster declaration (FEMA-4651-DR) due to a severe winter storm and snowstorm during the period of January 28-29, 2022. The Governor requested a declaration for Public Assistance, including snow assistance, for four counties and one tribe and Hazard Mitigation for the entire commonwealth. During the period of February 17 to March 24, 2022, joint federal, commonwealth, and local government Preliminary Damage Assessments (PDAs) were conducted in the requested areas and are summarized below. PDAs estimate damages immediately after an event and are considered, along with several other factors, in determining whether a disaster is of such severity and magnitude that effective response is beyond the capabilities of the commonwealth and the affected local governments,=and that Federal assistance is necessary

2.) ***On April 18, 2022***, the Commonwealth of Massachusetts received a Major Disaster Declaration (FEMA-4651-DR-MA) for Bristol, Norfolk, Plymouth and Suffolk counties, and the Mashpee Wampanoag Tribe for the January 28-29, 2022 Severe Winter Storm and Snowstorm. This Declaration has activated the Federal Emergency Management Agency (FEMA)'s Public Assistance (PA) Program, including Snow Assistance for these counties, making federal funding available to local governments, state agencies, and eligible private non-profit organizations for eligible disaster-related costs such as emergency work and permanent repair and replacement of facilities damaged as a direct result of the storm, as well as Snow Assistance for a 48-hour period

3.) ***On April 30, 2018***, Governor Charles D. Baker requested a major disaster declaration due to a severe winter storm and flooding during the period on March 2-3, 2018. The Governor requested a declaration for Public Assistance for six counties and Hazard Mitigation for the entire commonwealth. During the period of March 15 to April 13, 2018, joint federal, commonwealth, and local government Preliminary Damage Assessments (PDAs) were conducted in the requested areas and are summarized below. PDAs estimate damages immediately after an event and are considered, along with several other factors, in determining whether a disaster is of such severity and magnitude that effective response is beyond the capabilities of the state and the affected local governments, and that Federal assistance is necessary.

4.) ***On June 25, 2018***, the Commonwealth of Massachusetts received a Major Disaster Declaration (FEMA-4372-DR-MA) for the counties of Barnstable, Bristol, Essex, Nantucket, Norfolk, and Plymouth for the March 2-3, 2018 Nor'easter. This Declaration has activated the Federal Emergency Management Agency (FEMA)'s Public Assistance (PA) Program for these counties, making federal funding available to local governments, state agencies, and eligible private non-profit organizations for eligible disaster-related costs such as emergency work and permanent repair and replacement of facilities damaged as a direct result of the storm.

5.) ***On June 12, 2018,*** Governor Charles D. Baker requested a major disaster declaration (FEMA-4379-DR) due to a severe winter storm and snowstorm during the period on March 13-14,

2018. The Governor requested a declaration for Public Assistance, including snow assistance for five counties and Hazard Mitigation for the entire commonwealth. During the period of April 24 to May 24, 2018, joint federal, commonwealth, and local government Preliminary Damage Assessments (PDAs) were conducted in the requested areas and are summarized below. PDAs estimate damages immediately after an event and are considered, along with several other factors, in determining whether a disaster is of such severity and magnitude that effective response is beyond the capabilities of the state and the affected local governments, and that Federal assistance is necessary

Farm roads have equal risk for Tree fall from Snow

2008 Ice storm, mostly central mass, All roads Impassable, power out for 2 weeks, Shelters up and Running

2015 Snow blitz

- Flat roofs,
- Holden garage roof collapse
- School has a lot of Snow
- ~~Bob's~~ dollar store by G.Y.

2014 Regional Snow storms

- Auburn building collapse

2011 - ~~H~~Halloween Snow storm

- Similar to ice storm impacts

Severe Thunder storms/ Winds/ Tornadoes

August 23, 2021- FEMA announced that federal emergency aid has been made available to the Mashpee Wampanoag Tribe of Massachusetts' response efforts to the emergency conditions in the area affected by Tropical Storm Henri (**Disaster 3566**), beginning on Aug. 20 and continuing.

The President's action authorizes FEMA to coordinate all disaster relief efforts which have the purpose of alleviating the hardship and suffering caused by the emergency on the local population, and to provide appropriate assistance for required emergency measures, authorized under Title V of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, to save lives, protect property, public health and safety, and to lessen or avert the threat of a catastrophe for the Mashpee Wampanoag Tribe.

Specifically, FEMA is authorized to identify, mobilize and provide at its discretion, equipment and resources necessary to alleviate the impacts of the emergency. Emergency protective measures, including direct federal assistance and reimbursement for mass care including evacuation and shelter support, will be provided at 75% federal funding. This assistance is for the Mashpee Wampanoag Tribe.

James R. McPherson has been named as the Federal Coordinating Officer for federal response operations in the affected area.

Hurricanes

On September 15, 2023, **the Commonwealth of Massachusetts received an Emergency Disaster Declaration (FEMA-3599-EM-MA) for all counties, the Mashpee Wampanoag Tribe, and the Wampanoag Tribe of Gay Head Aquinnah for Hurricane Lee. This Declaration has activated the Federal Emergency Management Agency (FEMA)'s Public Assistance (PA) Program with limited Category B costs for pre-landfall activities for these counties, making federal funding available to local governments, state agencies, and eligible private non-profit organizations for eligible disaster-related costs such as Mass Care (evacuation and sheltering) and EOC operations.**

Wildfires/ Brushfires

The Bureau of Forest Fire Control and Forestry's Fire Control program actively participates with all municipal fire departments as well as county and local forest warden committees, town and city foresters, state and local law enforcement agencies, and the Commonwealth's county and statewide civil defense and mutual assistance organizations to prevent, detect and suppress wildfires throughout our Commonwealth.
Since 1911, the average size burn has been reduced from more than 34 acres to 1.17 acres on average. This generous reduction has occurred while the state has tripled the area of its wooded lands, more people have built homes within forested environments, and recreational opportunities in the Commonwealth's many forests and parks have grown enormously.

The peak brushfire season in Massachusetts typically occurs from March until June1. During this time, changing weather conditions and increased fire danger can lead to many days when open burning is not allowed. In particular, April is usually the worst month for brush fires. When snow recedes but before new growth emerges, last year's dead grass, leaves, and wood become dangerous tinder. It's essential to follow safety guidelines and obtain proper permits if you plan to burn materials in your yard during this season.

Please find the attached excel worksheet listing the brushfires from 2017-2023 in Central Ma.

EARTHQUAKES

Since 2017 Massachusetts has had several earthquakes of varying magnitude, both on and off shore. Although there have been several Magnitude 2 earthquakes reported there has been no significant damage reported to major infrastructure or personal property.

Buildings built according to building code at time of construction

DAM FAILURE

Please find the attached excel spreadsheet for the current list of Dams in Holden and the associated hazard rating.

DROUGHT

Please find the attached excel spreadsheet with rainfall amounts for Central Ma from 2017-2023

EXTREME TEMPERATURES

Please find the attached excel spreadsheet with the average monthly temperatures from 2017-2023 in Central MA

NATID	Dam Name	Regulatory Authority	Hazard Potential Classification	Dam Ownership Type 1
MA00619	Holden Reservoir Dam No. 2	Office of Dam Safety	High	Public Sector
MA00620	Unionville Pond Dam	Office of Dam Safety	Significant	Public Sector
MA00621	Chaffin Pond Dam	Office of Dam Safety	Significant	Private Sector
MA00622	Kendall Reservoir Dam	Office of Dam Safety	High	Public Sector
MA00623	Pine Hill Reservoir Dam	Office of Dam Safety	High	Public Sector
MA00929	Quinapoxet Reservoir Dam	Office of Dam Safety	High	Public Sector
MA00960	Holden Reservoir Dam No. 1	Office of Dam Safety	High	Public Sector
MA00979	Eagle Lake Dam	Office of Dam Safety	High	Private Sector
MA01247	Maple Spring Pond Dam	Office of Dam Safety	Significant	Public Sector
MA01303	Dawson Pond Dam	Office of Dam Safety	Significant	Public Sector
MA01635	Cournoyer Pond Dam	Office of Dam Safety	Low	Private Sector
MA01636	Frank Marsh Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01637	Bock Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01638	Holden Trap Rock Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01639	Koenigs Lilly Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01640	Current Meter Pond Dam	Office of Dam Safety	Significant	Private Sector
MA01641	Lindstroms Shiner Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01642	Swimming Pool Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01643	Lupa Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01644	S.H.S. Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01645	Lindstroms Shiner Pond No. 2 Dam	Non-Jurisdictional	Non-Jurisdictional	Private Sector
MA01646	Regional School Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Public Sector
MA02325	Old Grist Mill Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Public Sector
MA02326	Kendall Diversion Dam	Office of Dam Safety	Low	Public Sector
MA02328	Kendall Reservoir Lower Basin Dam	Office of Dam Safety	Significant	Public Sector
MA02573	Breached - Chaffin Pond Lower Basin Dam	Non-Jurisdictional	Non-Jurisdictional	Public Sector
MA02575	Parker Pond Dam	Office of Dam Safety	Low	Private Sector
MA02576	Upper Lovell Pond Dam	Non-Jurisdictional	Non-Jurisdictional	Public Sector
MA02789	Holden District Reservoir Dam	Non-Jurisdictional	Non-Jurisdictional	Public Sector

Dam Ownership Type 3
City of Worcester
DCR - Dept of Conservation & Recreation
Not Applicable
City of Worcester
City of Worcester
City of Worcester
City of Worcester
Not Applicable
City of Worcester
Town of Holden
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Not Applicable
Wachusett Regional School
Town of Holden
City of Worcester
City of Worcester
DCR - Dept of Conservation & Recreation
Not Applicable
DCR - Dept of Conservation & Recreation
City of Worcester

Owner(s)
City of Worcester, DPW & Parks
DCR - Dept of Conservation & Recreation
DOT - Dept of Transportation; Chaffin Realty Co., LLC; ~~Town of Holden~~; Andrew E. & Kristen M. Charbonneau; TNC Realty, LLC
City of Worcester, DPW & Parks
City of Worcester, DPW & Parks
City of Worcester, DPW & Parks
City of Worcester, DPW & Parks
White Oak Land Conservation Society, Inc.; CB Sundin Rentals, LLC; Jefferson Mills, LLC
City of Worcester, DPW & Parks
Town of Holden
Leonard Cournoyer
Gail Hanny
Richard Jr. Sheils and Mary Sheils
Holden Trap Rock Co.
Walter A. Koenig
Chaffin Realty Co., LLC; Town of Holden; Andrew E. & Kristen M. Charbonneau; TNC Realty, LLC
William Lindstrom
Richard Nugent
Unknown
S.H.S. Inc.
William Lindstrom
Wachusett Regional School
Town of Holden, DPW
City of Worcester, DPW & Parks
City of Worcester, DPW & Parks
DCR - Dept of Conservation & Recreation
Sunnyside Motor Real Estate, LLC
DCR - Dept of Conservation & Recreation
City of Worcester, DPW & Parks

Dam Type	Hazard Potential Classification	Date of most Recent EAP	EAP Status	EAP Due Date
Earth	High	2019/12/01	Reminder Notice	2020/12/31
Earthen Embankment	Significant	2023/06/01	Received Not Reviewed	2024/06/01
Earthen Embankment	Significant	2018/05/01	Reminder Notice	2019/05/31
Earthen	High	2019/12/01	Reminder Notice	2020/12/31
Concrete Gravity/Earthen	High	2019/12/01	Reminder Notice	2020/12/31
Earth Embankment	High	2019/12/01	Reminder Notice	2020/12/31
Earthen Embankment	High	2019/12/01	Reminder Notice	2020/12/31
Earth/masonry walls	High	2018/09/28	Reminder Notice	2019/09/28
Earth/Concrete Gravity	Significant	2019/12/10	Reminder Notice	2020/12/31
Earthen embankment	Significant			
Earthen Embankment	Low	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
Earthen Embankment	Significant		Reminder Notice	
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
REPG	Non-Jurisdictional	Not required	Not required	Not required
Earth Embankment	Low	Not required	Not required	Not required
Earth embankment	Significant	2019/12/05	Reminder Notice	2020/12/31
	Non-Jurisdictional	Not required	Not required	Not required
Earthen	Low	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required
	Non-Jurisdictional	Not required	Not required	Not required

Latest Emergency Inspection Date	Latest Emergency Inspection Condition	Last Phase I Inspection Date
2005/10/27	Good	2020/06/22
		2022/06/02
		2020/05/08
2005/10/27	Fair	2019/01/17
2005/10/27	Fair	2022/06/15
		2018/05/14
		2020/06/22
		2021/12/06
		2016/06/06
		2023/10/05
		2006/11/20
		2021/05/04
		2006/11/17
		2012/04/12
		2015/10/29
		2016/09/29
		2006/05/24

Last Phase I Inspection Condition	Latest Follow-Up Inspection Date	Latest Follow-Up Inspection Condition	Road Over Dam
SATISFACTORY			True
FAIR			True
POOR	2018/06/21	Poor	True
FAIR			False
FAIR			False
SATISFACTORY			False
FAIR			False
FAIR	2012/06/15	Fair	False
FAIR			True
FAIR			True
SATISFACTORY			False
			False
			True
			True
			False
POOR	2013/06/12	Poor	True
			False
			False
			False
			False
			True
POOR	2010/04/13	Poor	True
FAIR			False
SATISFACTORY			False
BREACHED			False
FAIR			True
POOR			

Road Name
Stone House Hill Road
Wachusett Street
Main Street
Princeton Street
Salisbury Street
Wachusett Street
Shrewsbury Street
Main Street MA 122A
Lincoln Avenue
Main Street MA 122A

Holden Hazard Mitigation Plan Update
Local Planning Team Meeting 3: Critical Infrastructure

Date/Time: Thursday May 9th, 2024, 10:00am
Location: Public Safety Building, 1370 Main Street Holden MA, First Floor Training Room

AGENDA

I. Introductions

II. Meeting #2 Recap
- Dam Hazard EAPs

III. Community Lifelines Review

IV. Reference Documents

V. Critical Infrastructure Review

Review previous CI/F/P lists and update as necessary
- Category 1 – Emergency Response Facilities
- Category 2 – Non-Emergency Response Facilities
- Category 3 – Dams
- Category 4 – Populations and Facilities to Protect

VI. Community Survey

VI. Next Meeting – Mitigation Strategies Review
- Date/location
- What to prepare

Community Lifeline	Entity	Point of Contact	Phone	Email
1. Safety and Security	Local Planning Team	Chris Montiverdi	508-210-5653	cmontiverdi@holdenma.gov
1. Safety and Security	Holden Fire Department			
1. Safety and Security	Holden Police Department			
1. Safety and Security	Holden Emergency Managemnt	Chris Montiverdi	508-210-5653	cmontiverdi@holdenma.gov
1. Safety and Security				
2. Food, Hydration, Shelter	Mountview Middle School			
2. Food, Hydration, Shelter	Regional High School			
2. Food, Hydration, Shelter	Senior Center			
2. Food, Hydration, Shelter	Big Y			
2. Food, Hydration, Shelter	St. Marks Food pantry?			
2. Food, Hydration, Shelter	Wachusett Food Bank			
2. Food, Hydration, Shelter	Holden Grange			
2. Food, Hydration, Shelter				
3. Health and Medical	St. Vincents			
3. Health and Medical	Umass Medical			
3. Health and Medical	Holden Health Agent			
3. Health and Medical	Holden Urgent Care 1			
3. Health and Medical	Holden Urgent Care 2			
3. Health and Medical	Nursing Home			
3. Health and Medical	Holden Funeral Directors			
3. Health and Medical				
4. Energy	Municipal Light Department			
4. Energy	Natural Gas			
4. Energy	Eversource			
4. Energy				
5. Communications	Cell Towers			
5. Communications	Holden Regional Dispatch Center			
5. Communications	CodeRED			
5. Communications	Reverse 911			
5. Communications	Town Planning			
5. Communications				
6. Transportation	MassDOT			
6. Transportation	Senior Center Busses			
6. Transportation	WRTA			
6. Transportation	AA transportation (School Busses)			
6. Transportation	Genessee and Wyoming			
6. Transportation	Sterling Regional Airport			
6. Transportation	Worcester Regional Airport			
6. Transportation				
7. Hazardous Material	Tier II Facilities			
7. Hazardous Material	MassDEP			
7. Hazardous Material				
8. Water Systems	DPW			
8. Water Systems	Upper Blackstone Clean Water			
8. Water Systems				

5.0 CRITICAL FACILITIES & VULNERABLE POPULATIONS

A Critical Facility is defined as a building, structure, or location which:

- Is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

5.1 Critical Facilities within Holden

The Critical Facilities List for the Town of Holden has been identified utilizing several sources, and the knowledge and expertise of the team:

- Holden's Comprehensive Emergency Management Plan
- MassGIS data
- Critical infrastructure mapping undertaken by CMRPC under contract with the Central Region Homeland Security Advisory Council, which is charged by the Executive Office of Public Safety and Security to administer and coordinate the State Homeland Security Grant for central Massachusetts.

Holden's Hazard Mitigation Team has broken up this list of facilities into four categories:

- Emergency Response Facilities needed in the event of a disaster
- Non-Emergency Response Facilities that have been identified by the Team as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Holden
- Dams
- Facilities/Populations that the Team wishes to protect in the event of a disaster

Critical infrastructure and facilities are mapped in Appendix A.

Category 1 – Emergency Response Facilities

The Town has identified the Emergency Response Facilities and Services as the highest priority in regards to protection from natural and man-made hazards.

1. **Emergency Operations Center/Public Safety**
   Holden Public Safety Complex/EOC 1370 Main Street

2. **Fire Stations**

Fire Headquarters	1384 Main Street
Chaffins Fire Station	87 Adams Road

3. **Communications Facilities**

Avery Heights Radio Antenna	14 Morgan Circle
Chaffin Radio Antenna	Steele St

4. **~~Highway~~ Department**

DPW Headquarters	~~87 Adams Rd~~

5. **Light Department**

Municipal Light Dept	1 Holden St
Municipal Light Dept. Sub-station	Bullard St
Municipal Light Dept Sub-station	Adams Rd

The Holden Public Safety Complex, DPW, Municipal Light Dept., Light Dept. sub-station, and both Radio Antenna have generators. The facilities that have experienced damage from past hazards are the Light Dept. and Light Dept. sub-station, which were knocked out during the 2008 December ice storm, and the two radio antennas, which experienced lightning strikes in December 2008 and October 2011.

6. **Primary Evacuation Routes**

Route 122A
I-190
Manning St
Route 31
Shrewsbury St
Doyle Rd

The Holden Hazard Planning team made note of flooding on Primary Evacuation Routes 122A and 31. The flooding on Route 122A is known to be caused in part by poor drainage, and directly associated with the Talbot's property and with the Heather's Shop property. These property owners are devising new stormwater systems, and MassDOT is in communication with these property owners about solutions. The Town of Holden needs to stay informed about this problem's solutions and estimated timelines for completion. Flooding along Route 31 is known to be caused in part by a high water table. Future roadway projects need to be mindful of drainage impacts and investigate drainage capacity further.

7. Secondary Evacuation Routes

Holden St
Salisbury St – Bridge replacement on Salisbury Street
Rt 68 –

The Hazard Planning team also identified flooding on Salisbury Street near the pool. This problem is known to be associated with ~~undersized culverts~~. Clogged pipes or beavers

8. Tertiary Evacuation Routes

Reservoir St
Quinapoxet St – culvert replace

Other major evacuation routes that could be vulnerable to severe snowstorms, severe thunderstorms, high winds, and other weather events that create road blockages, either through snow, flooding, fallen limbs, or the like, include: Reservoir Street, which is right up against the Holden Reservoirs and 100-year flood plains around its borders, and Manning Street, which passes through a 100-year flood plain. Travel on these roads can be ensured by finishing Continuity of Operations (COOP) planning between Town Departments and Local Emergency Management Officials. COOP plan in place, Revising Secondary

Category 2 – Non Emergency Response Facilities

The Town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Holden.

1. Town Facilities

Town Hall	1196 Main St
Town Hall (Starboard Bldg.)	1204 Main St
Public library	23 Highland Street

The Town Hall is in need of a generator for its own usage, as well as to power the surrounding buildings, including the Public Library, and First Congregational Church which is used as an emergency shelter.

2. Water Supply

~~Chaffin Elevated Water Tank~~	Steel Street – empty tank / Rehab Maintenance
Chapin Water Tank	190 Sycamore Drive
Avery Heights Water Tank	14 Morgan Circle
Generator – Highland St Water Tank and Booster Station	281 Highland St
Jefferson Water Tank	235 Muschopauge Road
Spring St Wellfield/PS	69 Spring St
Quinapoxet Wellfield	1195 Quinapoxet St

Subject to flooding

Mill St Wellfield	80 Mill St
Mason St Wellfield	200 Mason Rd
Brattle St Water Interconnection	280 Brattle St
Salisbury St Water Inerconnection	Salisbury St
Chapin Water Tank Booster Pump	308 Sycamore Rd
Avery Heights Morgan Water Booster Pump	14 Morgan Circle

3. Sewer

Heritage Ln Sewer PS	101 Paugus Rd
Lincoln Ave Sewer PS	15 Lincoln Ave
Gail Dr Sewer PS	33 Gail Dr
Industrial Drive Sewer PS	106 Industrial Dr
Sycamore Sewer PS	265 Sycamore Dr
Alden Sewer PS	126 Wachusett St
ECC Sewer PS	150 Princeton St
Jefferson Sewer PS	1678 Main St
Flagler Dr Sewer PS	254 Flagler Dr
Avery / Morningside Sewer PS	178 Jennifer Dr
Heather Circle Sewer PS	50A Heather Cir.
Dorothy Ave Sewer PS	99 Dorothy Ave
Sunnyside Ave Sewer PS	28 Sunnyside Ave
Winthrop Ln Sewer PS	165 Winthrop Ln
River St Sewer PS	50 River St
Wachusett St Sewer PS	1039 Wachusett St
Quinapoxet Large Sewer PS	268 Quinapoxet St
Quinapoxet Small Sewer PS	228 Quinapoxet St
Mark Bradford Dr Sewer PS	90 Mark Bradford St
Quaker Rd Sewer PS	6 Quaker Rd
Malden St Sewer PS	218 Malden St
Claires Sewer PS	Main St
Twinbrook Sewer PS	31 Twinbrook Dr
Bailey Rd Sewer PS	93 Bailey Rd
Nelson St Sewer PS	114 Nelson St

4. Utilities

P & W Railroad (runs Northwest-Southeast near center of town)

Category 3 – Dams

The third category is a listing of dams in Holden.

Notes From the Last Meeting:

According to the Massachusetts Office of Dam Safety, there are 29 dams in Holden, of which 6 are High Hazards, 7 are Significant Hazards, and 2 are Low Hazards. The remaining 14 are rated Not Applicable (N/A).

- Unionville Pond Dam repairs may still be needed, reach out to DCR and invite to next meeting on critical infrastructure
- Chaffin Pond Dam - town of Holden is not an owner, it is privately owned and last EAP in 2018 (on reminder notice)
    - Failure would shut down Main Street which is owned by the state, would have significant impact on the community
- Kendall Reservoir Dam - last inspection in 2019
- Current Meter Pond Dam - never had an EPA done (on reminder notice)
- Old Grist Mill Pond Dam - town of Holden is not an owner, does not require an EAP
    - Failure would impact small side street Lincoln Ave
- Will delve into more at the Critical Infrastructure meeting
- Upload dam management plans to help identify highest hazards

Table 1

National ID	Dam Name	Owner Type	Hazard Potential	Notes
MA0061	Holden Reservoir Dam #2	City of Worcester	High Hazard	
MA0062	Unionville Pond Dam	DCR	Significant Hazard	Local team notes repairs needed
MA0062	Chaffin Pond Dam	Private	Significant Hazard	
MA0062	Kendall Reservoir Dam	City of Worcester	High Hazard	
MA0062	Pine Hill Reservoir Dam	City of Worcester	High Hazard	
MA0092	Quinapoxet Reservoir Dam	City of Worcester	High Hazard	
MA0096	Holden Reservoir Dam #1	City of Worcester	High Hazard	
MA0097	Eagle Lake Dam	Private Assoc.	High Hazard	
MA0130	Dawson Pond Dam	DCR	Low Hazard	
MA0124	Peter Carr Pond Dam	City of Worcester	Significant Hazard	
MA0163	Cournoyer Pond Dam	Private	Significant Hazard	

National ID	Dam Name	Owner Type	Hazard Potential	Notes
MA0163	Frank Marsh Pond Dam	Private	N/A	
MA0163	Bock Pond Dam	Private	N/A	
MA0163	Holden Trap Rock Pond Dam	Private	N/A	
MA0163	Koenigs Lilly Pond Dam	Private	N/A	
MA0164	Current Meter Pond Dam	Private	Significant Hazard	Local team notes repairs needed
MA0164	Lindstroms Shiner Pond Dam	Private	N/A	
MA0164	Swimming Pool Dam	Private	N/A	
MA0164	Parsons Pond Dam	Private	N/A	
MA0164	S.H.S. Pond Dam	Private	N/A	
MA0164	Lindstroms Shiner Pond #2 Dam	Private	N/A	
MA0164	Regional School Pond Dam	Wachusett Reg. HS	N/A	
MA0232	Old Grist Mill Pond Dam	Town of Holden	Significant Hazard	Local team notes repairs needed
MA0232	Kendall Diversion Dam	City of Worcester	N/A	
MA0232	Kendall Reservoir Lower Basin Dam	City of Worcester	Significant Hazard	
MA0257	Chaffin Pond Lower Basin Dam	DCR	N/A	
MA0257	Parker Pond Dam	DCR	Low Hazard	
MA0257	Upper Lovell Pond Dam	DCR	N/A	
MA0278	Holden District Reservoir Dam	City of Worcester	N/A	

The Holden Hazard Planning Team made note of repairs being needed for at least a few dams: Old Grist Mill Pond Dam (Significant Hazard); Unionville Pond Dam (High Hazard); and Current Meter Pond Dam (Significant Hazard).

For additional information on dams and the dam failure hazard in Holden, also see Chapter 4.

Category 4 – Facilities/Populations to Protect

1. **Special Needs Population/Elderly Housing/Assisted Living**

Holden Rehab and Skilled Nursing Center	32 Mayo Dr
~~Wachusett Extended Care Facility~~	~~54 Boyden Rd~~
Colony Retirement Homes	Reservoir St
Oriol Health Care	Mayo Dr

2. **Public Buildings/Areas**

Holden Senior Center/Council on Aging	1130 Main St

3. **Schools/Daycare**

(Please note: The EMD has a list of current daycare facilities but these can change locations and addresses frequently, so this list should be revisited periodically.)

Wachusett Regional High School	1401 Main St
Mayo Elementary School	351 Bullard St
Davis Hill Elementary School	80 Jamieson Rd
Mountview Middle School	270 Shrewsbury St
Dawson Elementary School	155 Salisbury St
Holden Christian Academy	279B Reservoir St
Early Childhood Center	1745 Main St
Montessori Country Day School	800-13 Main St
First Congregational Church of Holden Nursery	1180 Main St
Immanuel Lutheran Nursery School	346 Shrewsbury St
Kidoodles Learning Center Inc	659 Shrewsbury St
Town of Holden-Mayo Before/After School Programs	Bullard St
Town of Holden-Davis Hill School Before/After School Programs	Jamieson Rd
Town of Holden-Dawson School Before/After School Programs	155 Salisbury St

Benoit, Christina	300 Chapel St
Bourget, Gale	28 Sandy Glen Dr
Martelli, Cynthia	206 South Main St
McCarthy, Deborah	770 Salisbury St
Dolan, Linette	13 Thorny Lea
Tawczynski, Ellen	7 Avery Rd
Bishop, Yvonne	27 Wyoming Dr
Driscoll, Diane	16 Sheffield Way
Pagan, Lisandra	104 Highland Avenue
Carlson-Reno, Kristen	76 Steele St
Person, Allison M.	35 Oregon Trail
Bratkon, Patricia	358 Bullard St
Hackett, Laurie J.	21 Longmeadow Ave
Caissie, Catherine	29 Homestead Rd
DeNorscia, Justine M.	93 Arizona Ave
Haley, Brenda	89 Stoneleigh Rd
O'Brien, Kelly	90 Highland Ave
Cardwell, Carmella	28 Homestead Rd
Dombrowski, Cynthia	324 Salisbury St
Colton, Catherine	363 Bailey Rd

NO Home daycares

Most of the schools in Holden have generators, including Wachusett Regional HS, Mayo Elementary, Davis Hill Elementary, Mountview Middle, and Dawson Elementary. The Wachusett Regional HS was adversely affected by the December 2008 Ice Storm.

4. Historic Buildings/Sites

According to the Massachusetts Cultural Resources Information System (MACRIS) online database accessed in November 2016, there are 10 Areas, 367 Buildings, 4 Burial

Grounds, 8 Objects, and 21 Structures listed for Holden. The Local Team did not specifically identify any of these sites as Critical Facilities or Infrastructure.

5. Employment Centers

Based on data obtained from the Massachusetts Executive Office of Labor and Workforce Development (EOLWD), the following table shows the largest employers in Holden:

Table 2

Largest Employers in Holden - May 2024

Company	Location	No. of Employees
Advanced Business Concepts	Main St # 4	100-249
Alden Research Laboratory Inc	Shrewsbury St	100-249
Big Y	Reservoir St Route 31 # 31	100-249
Oriol Health Care	Boyden Rd	100-249
Pepsi Cola of Worcester	Industrial Dr	100-249
Wachusett Regional High School	Main St	100-249
Worcester Men of Song	Mixter Rd	100-249
Alden	Shrewsbury St	50-99
Cves Ma State Police	Main St	50-99
Davis Hill Elementary School	Main St	50-99

Source: EOLWD website:
http://lmi2.detma.org/lmi/Top_employer_list.asp?gstfips=25&areatype=05&gCountyCode=000507

6. Environmental Justice and Vulnerable Populations

The US Environmental Protection Agency defines Environmental Justice (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Within the context of natural hazards and their mitigation, potential EJ concerns may arise from income-related factors, discrimination (overt or institutional), cultural

isolation and barriers, language isolation, lack of transportation access, and disability (especially among the elderly).

In Massachusetts, an environmental justice population is a neighborhood where one or more of the following criteria are true:

1. the annual median household income is 65 percent or less of the statewide annual median household income
2. minorities make up 40 percent or more of the population
3. 25 percent or more of households identify as speaking English less than "very well"
4. minorities make up 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income.

The Executive Office of Energy and Environmental Affairs (EEA) uses data from the 2019 American Community Survey to identify environmental justice population areas in Massachusetts. Policy makers and state agencies can then use this information to communicate more effectively with communities affected by their work.

Holden as of the 2020 census does not have an EJ population, however in the previous plan they did have one in a block group located in the center of town, because of its high concentration of households with older individuals (18.8%+ of households with people ages 75+).

More information regarding the identification of Environmental Justice and Vulnerable populations in the Central Massachusetts region can be found online at www.cmrpc.org/mobility2040.

- Lack of multi-plan GU

Updates to GIS

Key to Locally Identified Hazards and Critical Infrastructure and Facilities in Appendix A Maps

Facility/Infrastructure/Hazard	Type	Map ID
Chaffin Water tank	CI	1
Chapin Water Tank 2MM	CI	2
Avery Heights Water Tank 1MM	CI	3
Highland Street Water Tank 2MM and Booster Station	CI	4
Jefferson Water Tank 0.75MM Metering House	CI	5
Spring St Wellfield/PS	CI	6
Quinapoxet Wellfield	CI	7
Mill St Wellfield	CI	8
Mason St Wellfield	CI	9
Brattle St Water Interconnection	CI	10
Salisbury St Water Interconnection	CI	11
Chapin Tank Water Booster Pump	CI	12
Avery Heights Morgan Water Booster Pump	CI	13
Heritage Ln Sewer PS	CI	14
Lincoln Ave Sewer PS	CI	15
Gail Dr. Sewer PS	CI	16
Industrial Dr. Sewer PS	CI	17
Sycamore Sewer PS	CI	18
Alden Sewer PS	CI	19
ECC Sewer PS	CI	20
Jefferson Sewer PS	CI	21
Flagler Dr Sewer PS	CI	22
Avery / Morningside Sewer PS	CI	23
Heather Circle Sewer PS	CI	24
Dorothy Ave Sewer PS	CI	25
Sunnyside Ave Sewer PS	CI	26
Winthrop Ln Sewer PS	CI	27
River St Sewer PS	CI	28
Wachusett St Sewer PS	CI	29
Quinapoxet Large Sewer PS	CI	30
Quinapoxet Small Sewer PS	CI	31
Mark Bradford Dr Sewer PS	CI	32
Quaker Rd Sewer PS	CI	33
Malden St Sewer PS	CI	34
Claires Sewer PS	CI	35
Twinbrook Sewer PS	CI	36
Bailey Rd Sewer PS	CI	37
Nelson St Sewer PS	CI	38
Avery Heights Radio Antennae	CI	39
Chaffin Radio Antennae	CI	40
Municipal Light Dept Substation	CI	41
Municipal Light Dept sub-station	CI	42
Municipal Light Dept.	CI	43

P&W Railroad	CI	44
Route 122A	CI	45
I-190 #1	CI	46
I-190 #2	CI	46
Rte 31 at Quinapoxet River Flooding	H	FL-1
Salisbury St Flooding	H	FL-2
Sterling Road Culvert Flooding	H	FL-3
Chaffin Area Flooding	H	FL-4
Chaffins Area Flooding with fallen tree limbs	H	FL-5
Highland St Flooding	H	FL-6
Main St Flooding	H	FL-7
Unionville Dam Repair	H	DF-1
Wachusett St Dam Repair	H	DF-2
Wachusett St Dam Repair	H	DF-3
Generator for Town Hall and nearby buildings	H	SS-1

Blackstone Hazard Mitigation Plan

Survey Responses Needed

The Town of Blackstone is in the process of updating its Hazard Mitigation Plan and is requesting input from residents to inform this plan. An updated HMP will help the Town assess and reduce community risk from natural hazards.

You are invited to submit your thoughts on natural hazards, such as flooding, snowstorms, or thunderstorms, in the Blackstone Hazard Mitigation Plan Community Survey.

Take our survey using the QR code below.

Tip: Open your phone camera, point at the QR code, and click the pop-up link to take the survey.

Link to the survey: https://www.surveymonkey.com/r/YSTHFQM

CENTRAL MASSACHUSETTS
Regional Planning Commission

Holden Hazard Mitigation Plan Community Survey

Holden Hazard Mitigation Plan

In January 2024, the Town of Holden started the planning process to update its Hazard Mitigation Plan (HMP). An updated HMP will help the town identify strategies to reduce its vulnerability to hazards like flooding, winter storms, and drought. Climate change may shift the extent and severity of certain natural hazards, including those that already impact Holden.

By participating in this survey, you will help the Town of Holden understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until ~~June 31st~~, 2024.

1. Check all that apply.

- [ ] I live in Holden.
- [ ] I work in Holden.
- [ ] I frequently visit Holden.

2. Has your family or property, in Holden, been impacted by any of the following natural hazards? Select all that apply:

- [ ] I have not been impacted by natural hazards in Holden
- [ ] Winter Storms / Ice
- [ ] Thunderstorms, Microbursts, and/or Extreme Wind
- [ ] Tornadoes
- [ ] Flooding
- [ ] Extreme Heat / Extreme Cold
- [ ] Drought
- [ ] Wildfire / Brushfire
- [ ] Hurricanes
- [ ] Earthquakes
- [ ] Poor Air Quality
- [ ] Other (please specify)

3. Where have you observed hazard impacts in Holden, and what were those impacts?

Examples: flooding on specific roads, drought/effects on water supply, extended power outages, trees down on roads, beaver dams affecting property and septic systems due to flooding from dams.

4. How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

- I think natural hazards and climate change will negatively impact my life.
- I'm not sure how natural hazards and climate change will impact my life.
- I don't think that I personally will be impacted by natural hazards and climate change.

5. If you are concerned about impacts to your life from natural hazards and/or climate change, what impacts are you most concerned about?

Examples: basement flooding, wells drying out / contamination of wells, ability to grow food

6. How concerned are you about the impacts that natural hazards and climate change will have on the Town of Holden (the local infrastructure, economy, environment, and/or town residents)?

- Very concerned
- Somewhat concerned
- Unsure
- Somewhat unconcerned
- Not concerned at all

7. What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Holden? Rank the responses below in order from most concerned (1) to least concerned (5).

- Local natural resources and environments
- Resident health, safety, and property
- Local infrastructure
- Local business and the town economy
- Local government resources

8. Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

- [ ] Impacts on well water quantity / quality
- [ ] Future flood risks
- [ ] Impacts on infrastructure
- [ ] Sustainability initiatives
- [ ] Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)
- [ ] Impacts on town budget and finances
- [ ] Impacts on wildlife
- [ ] Impacts on the health of local forests
- [ ] Impacts on future development
- [ ] Other (please specify)

9. What actions should the Town of Holden take to cultivate local resilience to natural hazards?

Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; encourage cutting/trimming dead trees beside/hanging over roads; etc.

10. If you would like to stay informed about other opportunities to participate in Holden's Hazard Mitigation planning process, please enter your E-mail address below.

- Cert tlcm
- CMRPC social media

Holden Hazard Mitigation Plan Update
Local Planning Team Meeting 4: Mitigation Strategies

Date/Time: Tuesday June 25th, 2024, 10:00am
Location: Gale Free Library, 23 Highland St, Holden, MA 01520

AGENDA

I. Introductions

II. Meeting #3 Recap

III. FEMA Spring Dam Safety State Assistance Grant Application Period is Now Open from June 24th – July 26

- Factsheet Included at the end of the packet

IV. Reference Documents

V. Mitigation Strategies Review

- Review of last plan's mitigation strategies
- Development of new mitigation strategies
- Discussion of vulnerable populations and facilities

VI. Next Meeting – Existing Protection Measures and Community Survey Review

- Date/location
- What to prepare

Draft Plan following that Environmental Plan

Sept 10, 10 am Recreation Public Safety building

- Follow up
- Community survey
  - mailers
  - local paper Date
  - Press release Thursday
- Holden Says 27th or August
- Send NFIP Questions to Building Commissioner
- Draft mitigation strategies
  - Irving Gow MVP actions

all capital Budget

Town of Holden
Mitigation Strategies

OVERALL GOAL: Facilitate activity within the Town of Holden that reduces the loss, and risk of loss, to persons and property

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	A. Structure & Infrastructure Strategies							
	Obtain a generator for Town Hall and nearby buildings, including public library ~~and First Congregational Church (shelter).~~ Generators at these critical facilities protect and serve the Town by powering emergency communications and shelters for warmth and for refrigerated food storage, among other emergency mitigation and response strategies.	All	Local Emergency Management,	Local, Federal Grants (HMGP/PDM), State Grants (Various)	Low	Medium	High	3-5 years
	Identify / resolve issues causing ~~flooding at Route 31 & Quinapoxet~~ River, including, monitoring and removing beaver dams	FL, SS, ST, HU	DPW, ~~Conservation,~~ Board of Health	Local	Medium	Medium	Low	Ongoing
	Drainage and culvert upgrades at Salisbury St near the pool to reduce repeated flooding incidents - significant Hazard Dam	FL, SS, ST, HU evaluations by EA P [Dawson Pond Dam]	DPW more information	Local, Federal Grants (HMGP/PDM), State Grants (Various)	~~Medium~~ local general funds	Medium	High	Greater than 5 years
	Drainage, culvert upgrades, and flow enhancers at Sterling Road to reduce repeated flooding incidents - construction OF Final Design	FL, SS, ST, HU	DPW	Local, Federal Grants ~~(HMGP/PDM, TIP)~~, State Grants (Various)	Medium	Medium	Low	1-2 Years
	Flooding in the Highland Street area partly caused by high water table and drainage problems. Identify/resolve issues causing basement flooding.	FL, SS, ST, HU	DPW, MassDOT	State (MassDOT) local (capital)/ State (Ch 90)	Low	Low	More information required	Greater than 5 years
	Steel St Generator	All	DPW, Dispatch	Local (capital ~~plan~~ Funding	High	High	High	1-3 yrs
	Replacement ~~Cell~~ tower; Installation OF Backup at four water sites (5 wells/interconnection)	all	DPW	water enterprise, Bio Grant, Farm grant	High	High	high	3-5 yrs

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	Address structural issues at Town-owned Old Grist Mill Pond Dam (Significant Hazard), in poor condition Need ownership research, structural	DF	DPW	Local, State Grants (Dam & Seawall) local/state	~~High~~ Low	~~High~~ med	High	3-5 Years
	Drainage issues need addressing on Main Street near Parker Pond and Friendly's, associated with Talbot's property, and Heather Shop property. ~~Talbots~~ and Heather have begun developing new stormwater systems on their properties. MassDOT has come to an agreement with property owners. Holden should monitor progress.	FL, SS, ST, HU	DPW, MassDOT	Local, Federal Grants (HMGP/PDM), State Grants (Various)	High	Medium	More information required	1-2 Years
	Conduct Inspection and Evaluation Reports for Town-owned, Significant Hazard, Old Grist Mill Pond Dam, and carry out recommended action items to improve structural components of dam.	DF, FL, ST, EQ	Highway Dept, Water Dept, Conservation, Local Emergency Management	Local, State Grants (Various)	Medium	Medium	Low	1-2 years
	Maintain access points to the DCR and Worcester watershed to prevent wildfires and brushfires. Also, improve mapping of access points and trails and integrate into GIS system.	WF	Fire Dept, DCR, City of Worcester,	Local, State Grants (Various) operational DHA, EEA	~~High~~ med	Medium	Low	1-2 years
	Tree trimming and tree wire installation needed across Town to protect utility wires, especially in south end of Town where flooding is frequent and sump pumps are required. Focus on high-growth areas. Repeat every four years.	SS, ST, HU	Holden Municipal Light Dept., Town, Private property owners	Utility (National Grid), Local, Private (property owners)	High	Medium	High	1-2 years
	B. Preparedness, Coordination & Response Action Strategies							
	Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood	FL, SS, ST, HU	DPW, Local Emergency Management, Planning	Local	High Utility Comms NFIP Coordinator	High	Low	Ongoing
	Coordinate w/ Dam owners such as City of Worcester	DF, FL	City of Wor, Dam owners, ESRI	Local operating, Comms	High	High	Low	
	On High hazard Planning Dams		DPW, Town manager					Ongoing
	Inundation modeling for High Significance Hazard modeling,	DF, FL	Worcester EM Holden EM Consulting Firm	City or Worcester, FEMA Grant Funds, Water Company	High	High	Med	Ongoing

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	hazard planning and management							
	Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate	FL, SS, ST, HU	DPW, Local Emergency Management, Planning	Local	Low	Low	Low	1-2 Years
	Road information coordination and planning for snow removal	SS	DPW; MassDOT; Mass State Police; CMRPC	Local, Federal Grants (HMGP/PDM), State Grants (Various), Private Contracts	High	High	Low	Ongoing
	Evacuation Plan updates .	All	Local Emergency Management, DPW, CMRPC, MassDOT	Local, Federal Grants (Homeland Security via MEMA and CRHSAC)	High	High	Low	1-2 Years (update every 5 Years)
	Improve vegetation and debris management along ~~P&W~~ Railroad rights-of-way to reduce the chance of brush fires near tracks	DR, WF	~~P&W~~ Railroad, Fire, ~~DPW~~ G&W	Private (P&W Railroad)	High	High	Low	Ongoing
	C. Education & Awareness Strategies							
	Provide information to residents and businesses, especially in the Chaffin Pond area, on generator purchase, use, and maintenance, to reduce basement flooding in the event of power outages and the use of sump pumps. Use FEMA/MEMA templates for educational materials.	SS, ST, HU, FL	Fire Dept, Light Dept	Local	High	Medium	Low	~~1-2 years~~ ongoing
	Provide information to residents and businesses on water conservation through low-impact landscaping and other measures (to conserve water in times of drought and to conserve water for firefighting)	DR, WF	DPW, Conservation, Fire, Holden-Worcester Water	Local, Private (water companies)	High	Medium	Low	Ongoing
	D. Local Plan & Regulation Strategies							
	Use MA Drought Management Plan as a template for Town's own drought plan, and integrate State's	DR	~~Highway Dept, Water Dept,~~ Conservation DPW	Local	Medium	Low	Low	1-2 years

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	recommendations and actions according to Town's needs.							
	Follow Worcester's Drought Plan and help enforce water conservation measures	DR, WF	DPW, Conservation, Fire, Holden-Worcester water	Local, Private (water companies)	High	Medium	Low	Ongoing
	Obtain Inspection and Evaluation Reports for dams in Town, and follow through with recommended action items for structural improvements.	DF, FL, ST, EQ	Highway Dept, Water Dept, Conservation, Local Emergency Management	Local, State Grants (Various)	Medium	Medium	Low	1-2 years
	Follow through with Continuity of Operations Planning (COOP) currently being completed by Town Departments. Ensuring, among other mitigation and resiliency strategies, clear roads during snow storms for emergency vehicle transportation.	All	All Town Departments	Local	Medium	High	Low	Ongoing
	Investigate and become StormReady certified, and provide information to residents around preparedness for weather related issues, especially tornadoes.	All	~~All Town Departments~~	Local, Federal Grants (HMGP/PDM), State Grants (Various)	High	High	Low	1-2 years
	Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wild and brush fires.	WF	Fire Dept	Local	High	Medium	Low	1-2 years
	Establish a Local wetlands protection bylaw to further build upon the State's Wetlands Protection Act and Regulations, which add regulatory oversight provisions for development within the jurisdictional buffer zone, adding increased attention to alteration of wetlands and the	DR, WF	Conservation Commission	Local	Medium	Medium	Low	1-2 years

	Action Plan/Descriptions	Hazards Addressed	Who -agencies involved	Potential Funding Sources	Priority Political and economic viability: High/Med/Low	Impact Mitigation impact: High/Med/Low	Estimated Cost High/Med/Low	Timeline
	opportunity to preserve capacity and quality.							
	Review and update local plans and development review processes (planning, zoning, stormwater management, conservation, etc.) to ensure new construction will not be affected by hazards	All	All Town Departments / Building Comm.	Local	Medium	High	Low	Ongoing
	Monitor implementation of Hazard Mitigation Plan	All	All Town Departments	Local	High	High	Low	Ongoing

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought
EQ	Earthquake	FL	Flooding
HU	Hurricane	OT	Other
SS	Severe Snowstorm/Ice storm/Nor'easter	ST	Severe Thunderstorm/Wind/Tornado
WF	Wildfire/Brushfire	XT	Extreme Temperatures

master plan, OSRP
↳ recommendations to incorporate Hm concerns into next update,

| Create Debris management Plan | All | DPW | Local, State, Federal | High | High | low - med | ongoing |

Integrate MVP Planning into

Stormwater management Plan = existing protection measure

Fiscal Year 2024 Fall State Assistance Funding Opportunity

Background and applicant requirements for the funding opportunity for the fiscal year (FY) 24 fall State Assistance grant program. The Bipartisan Infrastructure Law is funding an estimated $26.3 million for this grant.

Background about the State Assistance Grant Program

The National Dam Safety Program (NDSP) State Assistance grant program encourages the establishment and maintenance of effective state programs intended to ensure dam safety, to protect human life and property and to improve state dam safety programs. The grant program's goals are to reduce risks to life and property associated with dams, increase awareness of the benefits and risks associated with dam infrastructure, and advance the state of practice of dam safety and dam risk management.

The State Assistance grant is used by state dam safety programs for the following activities:

- Dam safety training for state personnel
- Increase in the number of dam inspections
- Increase in the submittal and testing of Emergency Action Plans
- More timely review and issuance of permits
- Improved coordination with state emergency preparedness officials
- Identification of dams to be repaired or removed
- Conduct dam safety awareness workshops and creation of dam safety videos and other outreach materials
- Risk identification analysis and risk prioritization to inform decision-making in dam rehabilitation or removal projects of high hazard potential dams

In a state or territory with an enacted dam safety program, the state administrative agency or an equivalent state agency is eligible to apply.

Funding

The Infrastructure Investment and Jobs Act (IIJA) was passed by the 117th Congress and signed into law by President Joseph R. Biden as the Bipartisan Infrastructure Law (BIL) on Nov. 15, 2021. The Bipartisan Infrastructure Law increased funding for FEMA dam safety with $148 million for the State Assistance grant.

Prior to this law, State Assistance funding originated from annual appropriations. In Fiscal Year 2022, FEMA allocated nearly $10.9 million in grant funding, of which $4 million came from the Bipartisan Infrastructure Law.

FEMA

In Spring 2023, the National Dam Safety Program worked with stakeholders via a series of listening sessions to determine how to disburse the Bipartisan Infrastructure Law funding. As a result, the program decided that BIL-funded State Assistance grants will consist of five equal disbursements of an estimated $26 million a year with the first disbursement in the fall of FY 2024.

The State Assistance FY 2024 fall funding opportunity application period will be open from Nov. 6, 2023 – Feb. 29, 2024. The funding amount available is $26.3 million. The funding opportunity can be found on Grants.gov by clicking here.

Eligibility Requirements

This is a basic summary of considerations and documentation required for the subrecipient grant planning for FY 2024. To be considered for a grant:

- The applicant must be eligible:
  - This funding opportunity is restricted to the state dam safety program for eligible states and territories. For the purposes of this grant program, in FY 2024, this includes 49 states and Puerto Rico. Alabama and the remaining territories are not currently eligible for funding under National Dam Safety Program grants.
- The applicant must meet the Maintenance of Effort requirement to demonstrate their financial investment in dam safety efforts within their state. Maintenance of Effort is determined by averaging the amount of funding spent on dam safety by the state for the previous two fiscal years. This average is the maximum grant amount the state or territory may receive from the State Assistance grant program.
- The application must be complete, to include procurement documentation, and submitted by the deadline on Feb. 29, 2024.

For a state to be eligible for assistance under this program, a state dam safety program must be authorized by state legislation and working toward meeting specific criteria and budgeting requirements. The summarized list of eligibility requirements for state dam safety programs is below. For exact eligibility requirements, please refer to the statute language contained in Title 33 United States Code Section 467f(e)(2)(a).

- Safety evaluations of existing dams
- Review of plans and specifications for dam construction and major repair work
- Periodic inspections of dams and construction work on new and existing dams
- Reviews and approval of Emergency Action Plans (EAPs) required for certain dams
- Engagement with local officials and dam owners on emergency preparedness activities[1]

[1] Congressional Research Report: Federal Assistance for Nonfederal Dam Safety (January 2023)

Updates and additional information can be found on the State Assistance webpage on FEMA's website and in the funding opportunity scheduled for release Nov. 6, 2023 on Grants.gov.

Eligible Activities Examples

The following are examples of the kinds of activities that are eligible for the State Assistance grant. This is not an all-inclusive list.

- Perform targeted safety inspections of High Hazard (HH) dams/dams of highest consequence.
- Perform targeted condition assessment and evaluations of reservoirs and HH dams/dams of highest consequence.
- Development of new or updated Emergency Action Plan (EAP) of HH dams/dams of highest consequence.
- Perform regulatory enforcement actions to compel the dam owner of an unsafe high hazard potential dam to take action to reduce the risk associated with the dam. Regulatory enforcement actions may include, but not limited to, official notice of violation, civil or criminal penalties, reservoir restrictions, or safe breaching of the dam.
- Execution of targeted outreach and messaging strategies to inform the public and stakeholders of dam risks and actions that individuals/organizations/communities need to take.
- Establish and maintain assessment tool for gauging effectiveness of targeted public outreach about hazards and risks associated with dams.
- Identification of and applied best practices that advance operations of state dam safety programs (includes software programs that assess, monitor, model, and analyze potential and real risk).
- Risk identification analysis and risk prioritization methodologies to inform decision-making in dam rehabilitation or removal projects of High Hazard Potential Dams (HHPD). All High Hazard Potential Dams pose a risk to lives and/or property, but all risks are not equal. Risk prioritization methodology is an objective means to prioritize the dams that pose the greatest risks.
- Implementation of a state dam sector cybersecurity framework consistent with the National Institute of Standards and Technology (NIST) Framework for Improving Critical Infrastructure Cybersecurity and guidance from the Cybersecurity and Infrastructure Security Agency (CISA).
- Professional education, workshops, and training on content such as dam operations and safety standards, industry best practices, risk assessment methodologies, and risk communication strategies for dam owners, local officials and emergency management, and state dam safety staff. Best practices are procedures or activities that are accepted or prescribed as being correct or most effective.

Application Requirements

Steps and information required prior to submission

The following list will be content or actions needed to successfully submit a grant application.

- Unique Entity Identifier EUI Number Registration To find or request a Unique Entity Identifier (SAM), please visit www.sam.gov.
- Grants.gov profile https://www.grants.gov/applicants/registration/add-profile.html
- State Designation for Dam Safety Program Authority Information. (Who will be your Pass-Through application Point of Contact?)
- Eligibility of a High Hazard Potential Dam by State Authority
- State Designation of State Authorization Authority
- Recognition or listing of US Corps of Engineer listing
- State Approved Mitigation Plan
- Environmental Assessment Plan (if required)
- Statement of Work Planning Information
- Construction Planning documentation
- Dam Removal Planning documentation
- Budget Planning & Funding
- Cost Match and Planning information
- Terms & Conditions for High Hazard Potential Dam funding
- Application designation Point of Contact(s) with Name, email, and phone number. (Preference submission with Primary and secondary contacts)

Procurement Documentation

Per Title 2 Codes of Federal Regulation Section 200.318(i), non-federal entities other than states and territories are required to maintain and retain records sufficient to detail the history of procurement covering at least the rationale for the procurement method, selection of contract type, contractor selection or rejection, and the basis for the contract price.

States and territories are encouraged to maintain and retain this information as well and are reminded that for any cost to be allowable, it must be adequately documented per Title 2 Code of Federal Regulations Section 200.403(g).

Examples of the types of documents that would cover this information include but are not limited to:

- Solicitation documentation, such as requests for quotes, invitations for bids, or requests for proposals.
- Responses to solicitations, such as quotes, bids, or proposals.
- Pre-solicitation independent cost estimates and post-solicitation cost/price analyses on file for review by federal personnel, if applicable.
- Contract documents and amendments, including required contract provisions; and
- Other documents required by federal regulations applicable at the time a grant is awarded to a recipient.
- Additional information on required procurement records can be found on pages 24-26 of the Procurement Disaster Assistance Team (PDAT) Field Manual

All documentation will be submitted in the close out package upon completion/termination of the grant. This package will be submitted to the State pass-through agency and the respective state National Dam Safety Program Regional Office for retention. This is separate from the financial grant close out documentation.

Additional Information

Applicants can learn more about the State Assistance program, application requirements and process in several ways:

- Contacting their National Dam Safety Program grants officer at their respective regions
- Visiting the FEMA State Assistance webpage, which contains resources and webinars
- Emailing the National Dam Safety Program grants team with comments or questions at: FEMA-NDSP@fema.dhs.gov

Holden Group Homes

Venture Community Services-

2417 Main St, Jefferson MA 01522

House Manager- Alphonso Daniels

House phone- 508-829-4027

Cell- 774-253-6787

Email- Adaniels@venturecs.org

Residents- 4

Open Sky-

20 Hilltop Ave Jefferson MA 01522

House Manager- Sabbatina Konadu

House phone- 508-829-5683

Cell- 508-612-5883

Email- Sabbatine.konadu@openskycs.org

Residents- 8

Aspire-

511 Manning St

House Manager- Samuel Meliara

House Phone- 508-829-2012

Cell- 774-502-5316

Email-

Residents- 5

AJJ as VVI Wheelchair Facilities (CI)

AJJ housing authority as well

Erin Parish will send a list

Bamsi-

140 Mixter Rd Holden MA 01520

House Manager-Lindsey Ryder

House phone-508-829-2104

Cell-774-517-7334

Email- lindseyryder@bamsi.org

Residents- 5 (2 trached)

Venture Community Service-

148 Paxton Rd Holden MA 01520

House Manager- Greg Golden

House phone- 508-829-3000

Cell- 774-289-1572

Email- ggolden@venturecs.org

Residents- 5

Open Sky-

422 Malden St Holden MA 01520

House Manager- Kwadwo Ossei

House Phone- 508-829-0139

Cell- N/A

Email- Charles.beck@openskycs.org

Residents- 5

CIL-

109 Nelson St Holden MA 01520

House Manager- Denise Young

House Phone- 508-595-9126

Cell- 413-813-5131

Email- denise.young2@mass.gov

Residents- 5

Advocates-

160 Doyle Rd Holden MA 01520

House Manager- Jessica Lange

House phone- 508-975-6464

Cell- N/A

Email- Jlange@advocates.org

Residents- 5

Bamsi-

7 West Fairhill Rd Holden MA 01520

House Manager- Shalianna Humphrey

House Phone- 508-926-8903

Cell- 508-930-2705

Email- Shaliannahumphrey@bamsi.org

Residents- 5

Seven Hills-

350 Salisbury St Holden MA 01520

House Manager- Ebenezer Acheampong

House phone- 508-829-9575

Cell- 508-808-0908

Email- Eacheampong@sevenhills.org

Residents- 4

ADD Reconstruction of causeway at causeway St, in for slope and culvert at stump part of eagle lake, Culvert for inclusion of Nature based solutions

Hazard - Flooding, access rate
Agencies - DPW,
Funding - capital (local), State grants, Chapter, environmental
Priority - medium
Cost - high
Impact - High
Time line - 3-5 years

Pine hill Reservoir dam repairs
Hazard: Dam failure, funding -> City of worcester ARPA, water fund

~~Eagle~~ Eagle lake - Dam - ODR
evaluate dam owners to plan regular monitoring and maintenance visibility of Breezeway / maintenance on Holden street / ~~front street~~ (A) Rte

Hazard flooding
agencies: DPW
Funding: town capital / Grants
Priority: High
Cost: High
impact: High
Timeline: 3-5 years

Chapin substation (2 story structure) needs Replacement
- Roof Collapsing, seismic events,
agencies: Fire, DPW,

Storage building (Renovation, Replacement) 12 Oct main,
- Pipe gas Rooms compromised, snow load
- Public works

Holden Hazard Mitigation Plan Update
Local Planning Team Meeting 5: Existing Protection Measures and Community Survey Review

Date/Time: Tuesday September 10th, 2024, 10:00am
Location: Holden Police Department (1370 Main St, Holden, MA 01520)

AGENDA

I. Introductions

II. Meeting #4 Recap

III. Municipal Vulnerability Preparedness Action Grant Expression of Interest Period open until Friday, November 1, 2024.

- Opened September 9th
- Factsheet Included at the end of the packet

IV. Reference Documents

- GIS

V. High Hazard Potential Dam Appendix Inclusion

- Communication

VI. Existing Protection Measures and Community Survey Review

VI. Next Meeting – Public Presentation

- Date/location – ~~[illegible]~~ 2nd and 4th Mondays
- What to prepare

E

2nd week of November Part Time 15 - 20 min Presentation

community cable Windy or Abby Lamont ! Boulette

Municipal Vulnerability Preparedness (MVP) Program Core Principles

The MVP program has 10 core principles that should be incorporated into MVP Action Grant Applications. Communities should also consider these principles when completing the Planning Grant process. They are:

1. **Furthering a community identified priority action to address climate change impacts:** Projects funded under this program must address one (or more) priority implementation action(s) identified by the community and documented within the municipality's MVP plan or similar EEA-approved plan.
2. **Increasing equitable outcomes for Environmental Justice (EJ) and other priority populations and addressing the root causes of social vulnerability:** Projects funded under this program that increase climate resiliency for Environmental Justice (EJ) and other priority populations and take steps to address the root causes of inequity will be prioritized. Environmental Justice (EJ) Populations are defined in the 2021 EJ Policy. Other priority populations are people or communities in addition to mapped EJ populations who may be disproportionately impacted by climate change due to life circumstances that systematically increase their exposure to climate hazards or make it harder to respond. In addition to factors that contribute to EJ status (i.e., income, race, and language), other factors like physical ability, access to transportation, health status and age shape whether someone or their community will be disproportionately affected by climate change. Learn more in the MVP EJ & Equity toolkit.
3. **Building community capacity for climate resilience:** Projects funded under this program should, where appropriate, include capacity building activities like fostering social and institutional relationships, integrating climate resilience thinking into other planning or policy projects, training community members on climate resilience and equity, or engaging students via new climate resilience curricula.
4. **Conducting robust community engagement and supporting strong partnerships with EJ and other priority populations:** All Action Grant projects are required to submit a Public Involvement and Community Engagement Plan as part of the application. The community liaison model or other partnership building activities with EJ and other priority populations are strongly encouraged. Learn more in the MVP EJ & Equity toolkit. Tips for conducting virtual and remote engagement can be found here.
5. **Utilizing climate change data for a proactive solution:** Projects funded under this program should incorporate climate change projections and data (where available). Climate projections should not only be considered for projects with physical assets, but also in planning or policy review, identifying sites for potential land acquisition, training community members in climate resilience and equity, etc. Quantitative climate data can be found on the Resilient MA Climate Change Clearinghouse resilientma.mass.gov, (which includes the Resilient MA Maps and Data Center and the Climate Resilience Design Standards Tool), and/or local-level climate change studies. MVP's definition of data also includes Traditional Ecological Knowledge (TEK) or other qualitative forms of data like storytelling, interviews, or audio-visual documentation.

6. **Employing Nature-Based Solutions (NBS):** NBS are adaptation measures focused on the protection, restoration, and/or management of ecological systems to safeguard public health, provide clean air and water, increase natural hazard resilience, and sequester carbon. Projects focused on NBS do not have to be strictly infrastructure or implementation-focused. NBS can be incorporated into policy review, regulatory processes, developing community trainings or school curricula, etc. More information on nature-based solutions can be found in the MVP NBS toolkit.
7. **Achieving broad and multiple community benefits:** Projects that maximize climate resilience and provide other co-benefits (e.g., public health, environmental, social, economic, etc.) for many people will receive priority.
8. **Committing to monitoring project success and maintaining the project into the future:** Projects that proactively set in place mechanisms to (1) measure success over time and (2) maintain the installation or process beyond the life of the grant will receive priority.
9. **Utilizing regional solutions for regional benefit:** Projects that provide regional climate resilience benefits are prioritized. Regional partnerships of multiple municipalities are eligible and encouraged under the program, provided that the lead applicant is MVP-designated.
10. **Pursuing innovative, transferable approaches:** Innovative projects that seek to address critical climate related issues with widespread relevance for many communities are encouraged. See MVP Transferable Tools information page for examples from other MVP action grants.

Get clarity on mvp 2.0 - submit or a.

More information regarding the identification of Environmental Justice and Vulnerable populations in the Central Massachusetts region can be found online at www.cmrpc.org/mobility2040.

6.0 EXISTING PROTECTION

The Town of Holden currently makes use of most available locally-controlled tools to mitigate the consequences of natural hazards: zoning regulations, planning, and physical improvements. The Town does not participate in any federal programs such as StormReady certification or Firewise community certification, but Holden does use ~~CodeRed~~, and plan to research the utility of public awareness and education programs as a result of this planning process.

Holden has most of the no-cost or low-cost hazard mitigation capabilities in place. Land use zoning, subdivision regulations and an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains, stormwater management, tree maintenance, etc.... Holden also has appropriate staff dedicated to hazard mitigation-related work for a community of its size, including a Town Manager, an Emergency Management Coordinator, a professionally run Department of Public Works, and a Director of Planning and Development. Holden has several relevant plans in place, including a Comprehensive Emergency Management Plan, Water Distribution System Master Plan, Open Space and Recreation Plan, and Master Plan. Not only does Holden have these capabilities in place, but they are also deployed for hazard mitigation, as appropriate. The Town also has very committed and dedicated volunteers who serve on Boards, Commissions and Committees and in other volunteer positions. The Town collaborates closely with surrounding communities through its South Wachusett Regional Emergency Planning Committee and has opted in to fire protection mutual aid agreements through MEMA. Holden is also an active member community of the Central Massachusetts Regional Planning Commission (CMRPC) and can take advantage of no cost local technical assistance as needed provided by the professional planning staff at CMRPC.

The table below describes existing mitigation protections in Holden. It includes a brief description of each activity as well as a subjective evaluation of its effectiveness and of any need for modifications.

6.1 Existing Protection Matrix

Table 29

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in National Flood Insurance Program (NFIP)	Provides flood insurance for structures located in flood-prone areas. Also, communities participating in the NFIP have adopted and enforce ordinances, bylaws and regulations that meet or exceed FEMA requirements to reduce the risk of flooding.	Holden monitors building activity within the flood plain to ensure compliance with provisions of state building code.	Effective There are no repetitive loss properties in Holden. Holden should seek to further limit development in the 100-year flood zones. It should work to score in the Community Rating System (CRS) under NFIP to enable its residents to obtain lower flood insurance rates. Holden should educate its residents about NFIP.
Floodplain & Aquifer Protection District bylaw in place	Requires all development in District to be in compliance with Aquifer Protection District regulations, and MA DEP Drinking Water Regulations.	Holden has a Flood Plain & Aquifer Protection District (Section XVI) in its Zoning Bylaw. incorporate into current Bylaw update process	Very effective ~~No changes recommended~~ Update bylaws as needed
Stormwater Management and Erosion Control bylaw in place	Planning Boards or Conservation Commissions review projects for consistency with MA DEP standards. This helps ensure adequate on site retention and recharge.	Holden has incorporated a Stormwater Management and Erosion Control bylaw. Holden also participates in the Central Mass Stormwater Coalition. town is an MS4 community	Very effective No changes recommended

in zoning bylaw, will align w/ Soil model Flood Plain Overlay to Map team

Existing Measure	Description	Action	Effectiveness & Recommendations
Local Open Space and Recreation Plan	Local plan identifying significant natural resources and identifying mechanisms to ensure their protection. Following Mass. Department of Conservation and Recreation guidance for development of OSRPs, this document does not focus on specific hazards. Open Space Plans can provide many tools. Towns must commit to making the land acquisitions and regulatory changes, giving increased attention to preserving undeveloped flood-prone areas and associated lands	Holden's Open Space and Recreation Plan was issued in 2012. Update in ~~2014-2016~~ Update in 2022	~~Somewhat~~ effective Plan expires end of this year; 2016. Holden should prepare plan update as per Mass. DCR guidance. Where allowable, Holden should use the update to integrate hazard mitigation activities and recommendations.
Drainage system maintenance and repair program	Plan to keep municipal drainage facilities (storm drains, culverts, etc.) in good order	Holden performs street sweeping and catch basin cleaning from April to November. Holden does public outreach a-2 Conservation and DPW annual town	Effective Holden should examine a public education program for residents on storm drain clearance and other best practices

Existing Measure	Description	Action	Effectiveness & Recommendations
Tree Trimming	Plan to ensure routine maintenance of trees to reduce likelihood of vegetative debris in response to storm events.	Holden conducts roadside mowing from April-November to remove juvenile trees. Tree trimming (take-downs and clearing dead branches) takes place with a full-time crew, whose primary goal is to keep power lines clear.	Very Effective
Culvert Maintenance and Replacement	Maintain existing culverts through regular maintenance and (in some cases) beaver controls; replace/expand culverts where needed to allow for adequate stormwater flow.	The Town has historically maintained and replaced other problem culverts when needed and as funding allows. The most recent culvert improvement being ~~in 2014, when Holden replaced a culvert at Reservoir St and Bailey Rd.~~ Quinapoxet Street, Replaced frozen culvert, Mitigating a locally Identified flood hazard area in town, Culvert inventory has been Created,	Somewhat effective Current efforts are piecemeal and are limited by lack of resources and systematic approach. ~~Holden should develop a prioritized inventory of problem culverts for use in seeking external financial support.~~ Planning must comply with 2014 Mass. Wetlands Protection Act update; culverts may not be replaced in-kind.

Culvert assessment ?

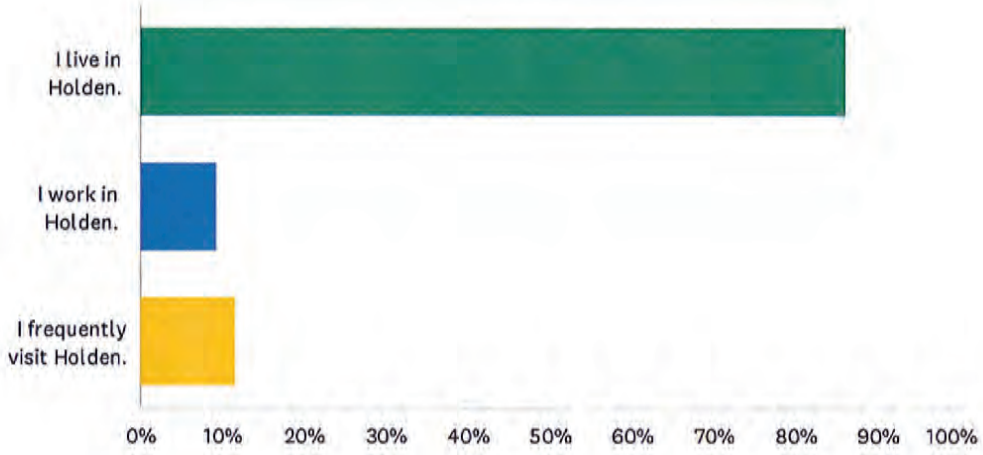
Add

Add : Debris management planning ?, Stat

Check with counsel about ADA

Q1 Check all that apply.

Answered: 43 Skipped: 0

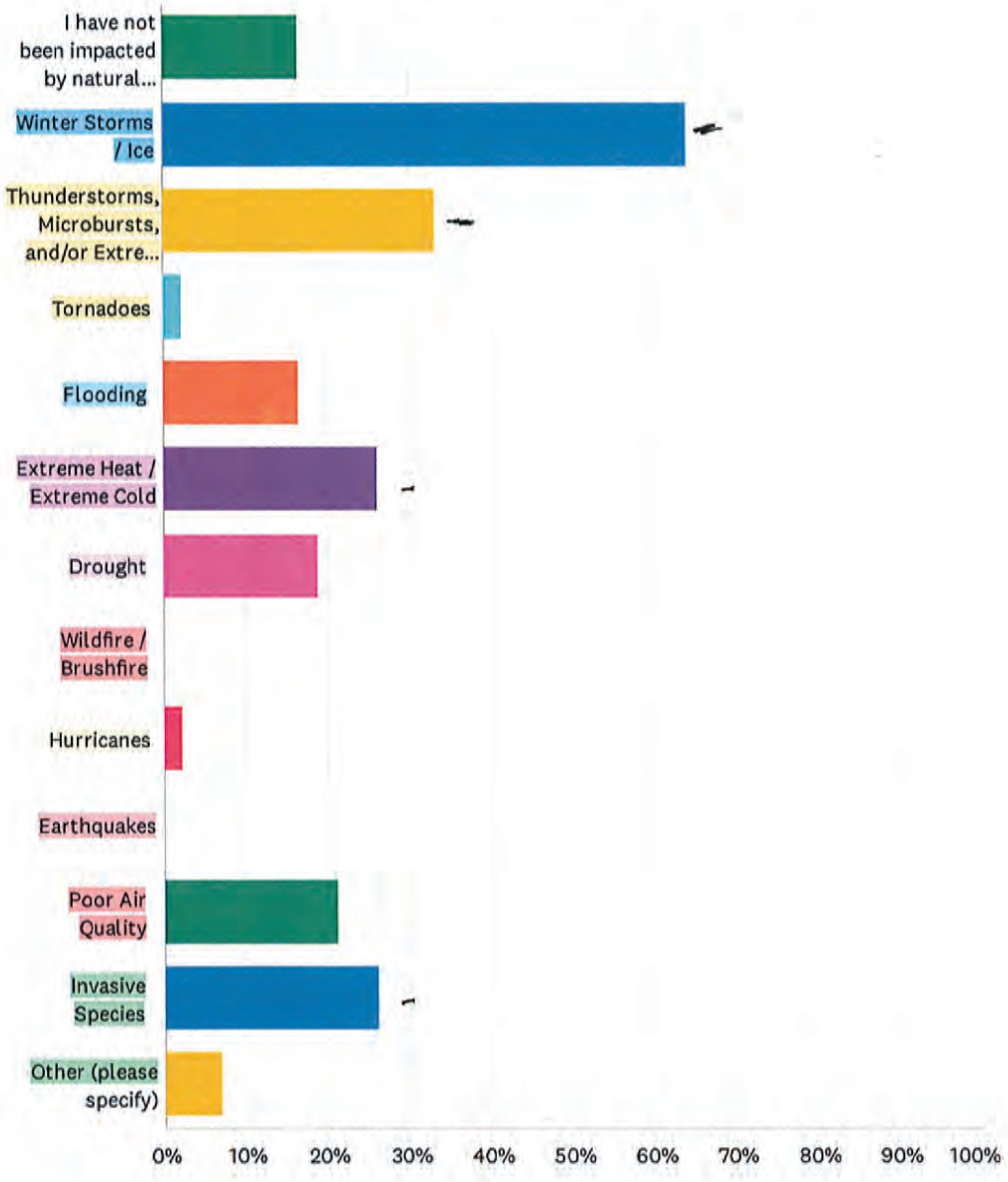


ANSWER CHOICES	RESPONSES	
I live in Holden.	86.05%	37
I work in Holden.	9.30%	4
I frequently visit Holden.	11.63%	5

Total Respondents: 43

Q2 Has your family, household, or property in Holden been impacted by any of the following natural hazards? Select all that apply:

Answered: 42 Skipped: 1



ANSWER CHOICES	RESPONSES	
I have not been impacted by natural hazards in Holden	16.67%	7
Winter Storms / Ice	64.29%	27
Thunderstorms, Microbursts, and/or Extreme Wind	33.33%	14
Tornadoes	2.38%	1
Flooding	16.67%	7
Extreme Heat / Extreme Cold	26.19%	11
Drought	19.05%	8
Wildfire / Brushfire	0.00%	0
Hurricanes	2.38%	1
Earthquakes	0.00%	0
Poor Air Quality	21.43%	9
Invasive Species	26.19%	11
Other (please specify)	7.14%	3

Total Respondents: 42

#	OTHER (PLEASE SPECIFY)	DATE
1	NA	9/4/2024 2:47 PM
2	climate change	7/8/2024 2:47 PM
3	PCB s in town water	7/1/2024 8:13 PM

Q3 Where have you observed hazard impacts in Holden, and what were those impacts?Examples: flooding on specific roads, drought/effects on water supply, extended power outages, trees down on roads, beaver dams affecting property and septic systems due to flooding from dams.

Answered: 33 Skipped: 10

#	RESPONSES	DATE
1	Thunderstorms	9/4/2024 2:53 PM
2	Power outages on dead ends	9/4/2024 2:51 PM
3	[Flooding on specific roads is circled on the form]	9/4/2024 2:49 PM
4	NA	9/4/2024 2:47 PM
5	["flooding from dams" is crossed out on the form]	9/4/2024 2:46 PM
6	Reservoir Road Floods in heavy rain or snow	9/4/2024 2:43 PM
7	Flooding on Quinapoxet street, downed limbs/ impact damage, ice/snow on side streets (chestnut hill), water penetration from extreme storms (through window and door seals).	8/24/2024 4:08 PM
8	Downed trees, power outages	8/24/2024 9:34 AM
9	Flooding on Main street and Quinapoxet St Sink hole on main street.	7/19/2024 6:18 PM
10	During the ice storm in 2008 we had a tree fall on our deck - we also lost power for 3 days - we observed downed trees across town.	7/8/2024 6:13 PM
11	My property. See answers to Q2	7/8/2024 2:47 PM
12	Damage to homes and power lines from winter storms, such as in 2015 and 2010	7/7/2024 10:05 AM
13	Flooding on Quinapoxit St	7/6/2024 8:37 PM
14	Tree damage, flooding of roads	7/6/2024 9:25 AM
15	2008 ice storm, 1956? Hurricane Carol, & 1953 tornado: extended power outages. Increase traffic on main roads: air pollution. Excessive heat, pollution, & drought, affecting health	7/5/2024 8:47 PM
16	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
17	Much more frequent basement flooding; heat waves have gotten more intense and frequent	7/3/2024 3:43 PM
18	Power outages from trees down on Newell Road.	7/2/2024 6:14 PM
19	Flooding on main St near Shrewsbury St under the railroad bridge. Flooding on side streets I don't know the names of. Air quality from wildfires from far away. Drought/heat stress on the property	7/2/2024 3:57 PM
20	Twinbrooke Drive	7/2/2024 9:21 AM
21	basement flooding damaging property, invasive species require ongoing mitigation to preserve native plants/garden	7/2/2024 7:39 AM
22	extended power outages, trees down on roads	7/2/2024 7:32 AM
23	Nope haven't really been affected by anything. Even when there's been power outages due to storms the town DPW is top tier and getting us back online. And none of this has anything to do with climate change. All's in us to do with is that we're in a northern cold climate nothing special about it.	7/1/2024 8:46 PM
24	Ice storm damage throughout the town	7/1/2024 8:13 PM

1 documented ditches below state levels

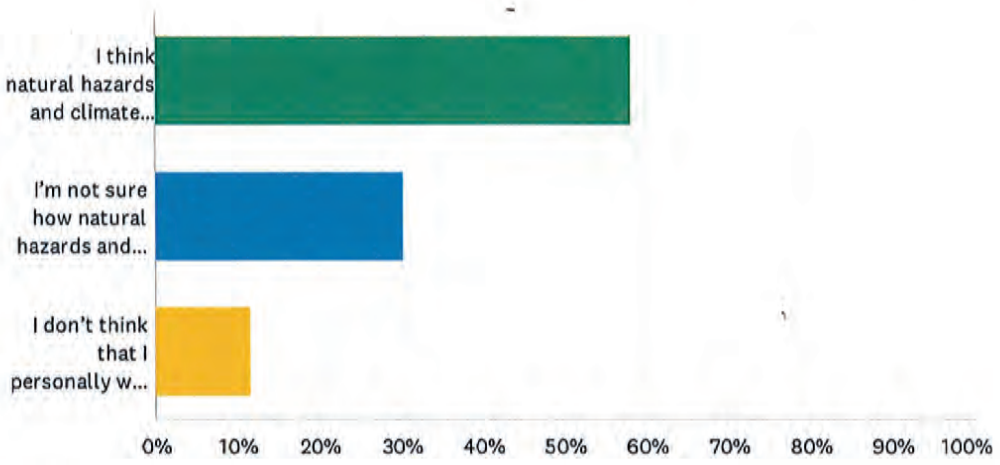
25	High water levels in wet land on property	7/1/2024 6:57 PM
26	none	7/1/2024 6:01 PM
27	Drought effecting water supply, poor air quality from Canadian fires, winter ice knocking down trees	7/1/2024 5:55 PM
28	Trees down, extended power outages, home damage from trees hitting home	7/1/2024 4:44 PM
29	Trees damaging power lines. Power lines need to be moved underground so we can have beautiful tree-lined streets. Over development, we're loosing way to much green space, impacts wildlife, wildlife moving into neighborhoods, runoff. We need to seriously hault development for a few years and then move forward strategically.	7/1/2024 3:49 PM
30	branches falling on power lines causing outages	7/1/2024 3:29 PM
31	Invasive plants and aquatics, species and waterways, lakes and streams. Forest, pests and forest health concerns. Tree damage, power failure due to down wires after windstorms trees, falling on homes and cars	7/1/2024 3:15 PM
32	Flooding on roads,extended power outages,trees down on roads, beaver dams affecting property	7/1/2024 11:35 AM
33	Many of the ponds and in swampy areas, From Chapins all the way down to 68- seem to be very dry this year.	7/1/2024 11:31 AM

New Subdivision Bylaws

→ light Infrastructure, reach out to Barry to check if there is plans in place to carry Power infrastructure as it gets older

Q4 How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
I think natural hazards and climate change will negatively impact my life.	58.14%	25
I'm not sure how natural hazards and climate change will impact my life.	30.23%	13
I don't think that I personally will be impacted by natural hazards and climate change.	11.63%	5
TOTAL		43

Q5 If you are concerned about impacts to your life from natural hazards and/or climate change, what impacts are you most concerned about? Examples: basement flooding, wells drying out / contamination of wells, ability to grow food

Answered: 38 Skipped: 5

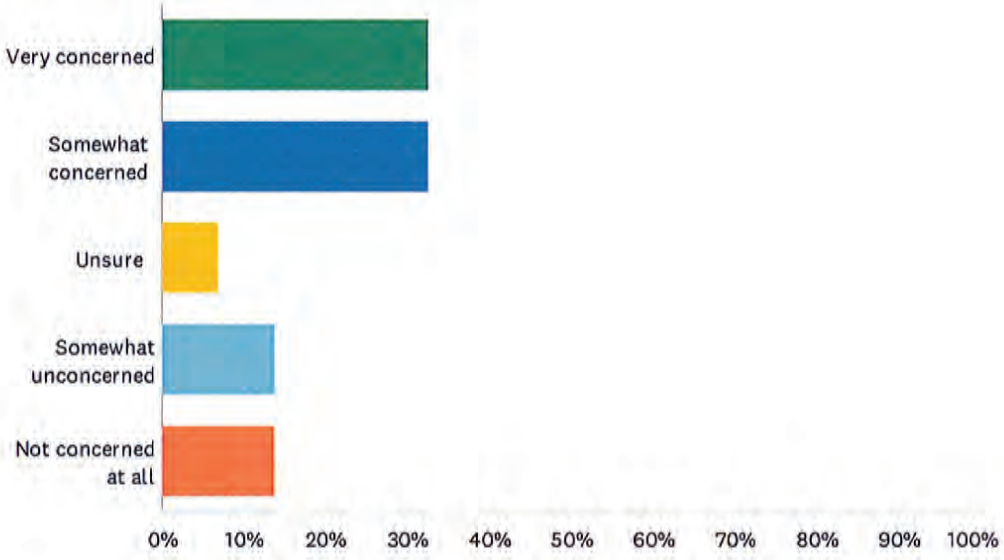
#	RESPONSES	DATE
1	Thunderstorms by the road	9/4/2024 2:53 PM
2	natural resources	9/4/2024 2:51 PM
3	[contamination of wells and ability to grow food is circled on the form]	9/4/2024 2:49 PM
4	No idea	9/4/2024 2:46 PM
5	garage flooding with heavy rain	9/4/2024 2:43 PM
6	Extreme heat and cold, with associated cooling/ heating costs. Power loss and home damage from downed limbs and ice storms. Localized flooding from extreme storms.	8/24/2024 4:08 PM
7	Basement flooding, power outages that won't allow my home to be cool/warm	8/24/2024 9:34 AM
8	Flooding of fields which would ruin our ability to grow food, contamination of wells (fertilizers), personal property becoming damaged.	7/19/2024 6:18 PM
9	Climate change will create disasters that require remediation. The government will pay for these. My taxes will go up.	7/13/2024 10:38 AM
10	extinction of my species!	7/8/2024 9:34 PM
11	Water quality/availability, invasive tick borne illnesses	7/8/2024 7:09 PM
12	extreme & unpredictable weather (drought, more ice storms vs. snow storms, more flooding), public health impacts ie increase in vector borne disease	7/8/2024 6:13 PM
13	Excessive heat/loss of power; crop failures/food supply; water quality; impacts of excessive precipitation	7/8/2024 2:47 PM
14	Damage to home and cars, damage to the power grid, localized flooding	7/7/2024 10:05 AM
15	rising temps, more/stronger storms,	7/6/2024 9:25 AM
16	I have developed COPD from air pollution. I can't use my front windows.	7/5/2024 8:47 PM
17	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
18	Basement flooding, ability to grow food, excessive heat and the need for air conditioning, effects on plant and animal wildlife	7/3/2024 3:43 PM
19	Damage to siding roofing due to high wind, loss of power from same.	7/2/2024 6:14 PM
20	Basement flooding. Low water. Food not growing due to changes.	7/2/2024 3:57 PM
21	Food prices	7/2/2024 9:21 AM
22	basement flooding, inability to grow food, health consequences of unsafe outdoor temperatures, insect-borne disease (from ticks, mosquitoes)	7/2/2024 7:39 AM
23	severe weather	7/2/2024 7:32 AM
24	Basement flooding	7/2/2024 7:02 AM
25	Climate change is a scam. The only thing that the town needs to worry about is that our water system and our sewer system are properly maintained and our electric system works well. So	7/1/2024 8:46 PM

	if our pipes are aging they need to be replaced if our sewers are aging, they need to be replaced. It's just a matter of keeping up to date with aging infrastructure. And I don't want to hear in the least that holden is going to not support natural gas anymore. Our electric grid Nationwide cannot handle putting everything onto electric. And it is way more expensive to heat with electric and everything with electric than it is with natural gas.	
26	Basement flooding, reduced water resources for vegetable gardens, extreme storms could take down ours trees and roof in the process. All aspects of life will eventually be affected by climate change.	7/1/2024 8:24 PM
27	More ice storms Hotter summers	7/1/2024 8:13 PM
28	Erosion of land due to water levels during weather events	7/1/2024 6:57 PM
29	Air quality when I have breathing issues	7/1/2024 6:06 PM
30	no	7/1/2024 6:01 PM
31	Ocean warming and Rising sea levels effecting ocean current/quality and will effect us all. Migration north due to Intense heat. Drought effecting our food supply. More extreme storms causing propert damage.	7/1/2024 5:55 PM
32	Extensive flooding as seen in Leominster last year, roof / window/ siding damage due to high winds.	7/1/2024 4:44 PM
33	Power lines down (move them underground), mold from fluctuating temperatures	7/1/2024 3:49 PM
34	water shortages, heat, severe storms	7/1/2024 3:29 PM
35	Extreme temperatures and electric grid reliability.	7/1/2024 3:15 PM
36	Excess heat and humidity. Construction material/ infrastructure failures due to natural hazards.	7/1/2024 2:57 PM
37	Flooding, ice damage, brush/wildfire,extreme heat, warmer winters resulting in decreased water levels for reservoirs	7/1/2024 11:35 AM
38	People complain more and more about the cost of groceries And food. As a community, we should be working to help each other be more conscious of space. If we all had small home gardens and worked with each other to can, Share bounties, etc. we could have a pretty pretty good thing going.	7/1/2024 11:31 AM

→ community Garden Coop

Q6 How concerned are you about the impacts that natural hazards and climate change will have on the Town of Holden (the local infrastructure, economy, environment, and/or town residents)?

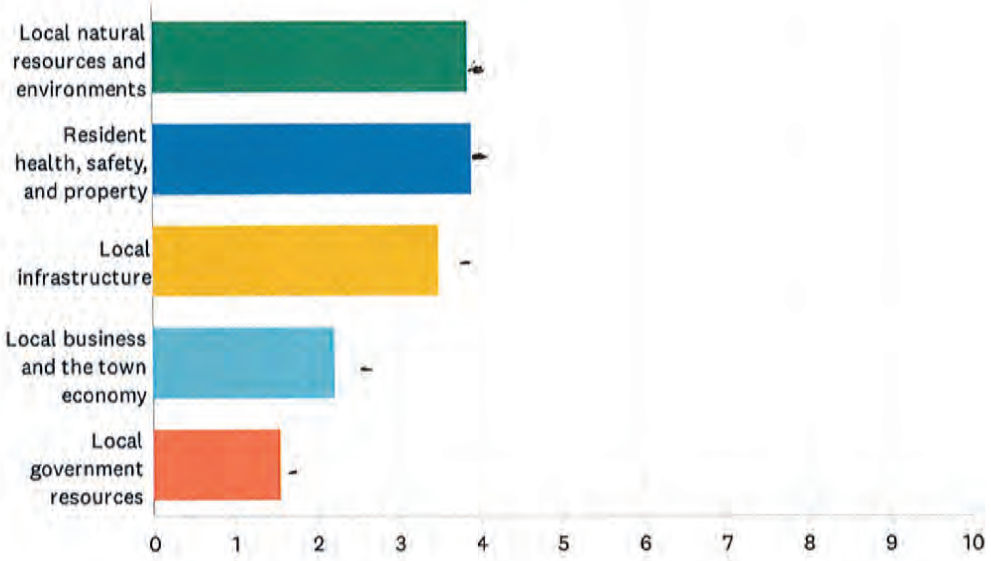
Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very concerned	32.56%	14
Somewhat concerned	32.56%	14
Unsure	6.98%	3
Somewhat unconcerned	13.95%	6
Not concerned at all	13.95%	6
TOTAL		43

Q7 What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Holden? Rank the responses below in order from most concerned (1) to least concerned (5).

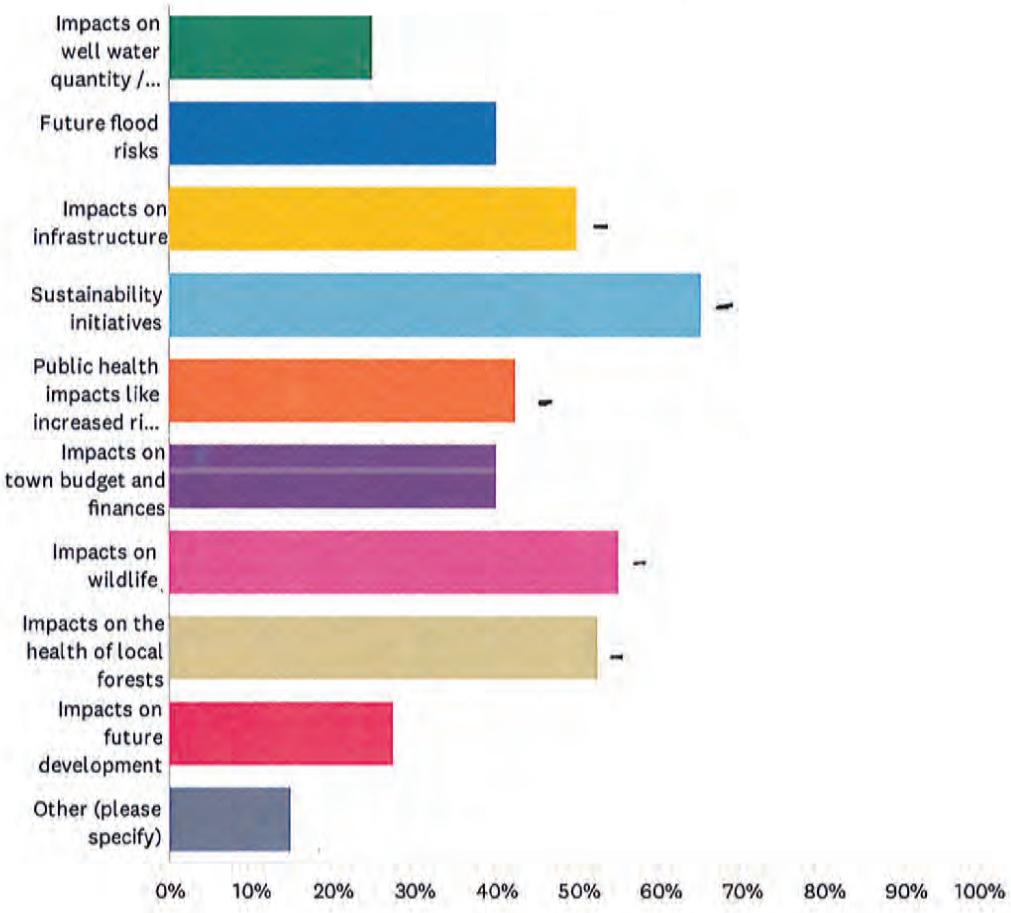
Answered: 39 Skipped: 4



	1	2	3	4	5	TOTAL	SCORE
Local natural resources and environments	41.03% 16	25.64% 10	17.95% 7	7.69% 3	7.69% 3	39	3.85
Resident health, safety, and property	33.33% 13	38.46% 15	17.95% 7	5.13% 2	5.13% 2	39	3.90
Local infrastructure	17.95% 7	28.21% 11	43.59% 17	5.13% 2	5.13% 2	39	3.49
Local business and the town economy	7.69% 3	2.56% 1	15.38% 6	51.28% 20	23.08% 9	39	2.21
Local government resources	0.00% 0	5.13% 2	5.13% 2	30.77% 12	58.97% 23	39	1.56

Q8 Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

Answered: 40 Skipped: 3



ANSWER CHOICES	RESPONSES	
Impacts on well water quantity / quality	25.00%	10
Future flood risks	40.00%	16
Impacts on infrastructure	50.00%	20
Sustainability initiatives	65.00%	26
Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)	42.50%	17
Impacts on town budget and finances	40.00%	16
Impacts on wildlife	55.00%	22
Impacts on the health of local forests	52.50%	21
Impacts on future development	27.50%	11
Other (please specify)	15.00%	6

Total Respondents: 40

#	OTHER (PLEASE SPECIFY)	DATE
1	I have seen fertilizer phosphates pollute ponds and lakes over my own long lifetime.	7/5/2024 8:47 PM
2	The climate changes naturally.. fnd something useful to do and stop wasting my money.	7/4/2024 9:59 AM
3	Climate change isn't real	7/1/2024 11:41 PM
4	Stop building all these extra little communities in Holden. The meal project was not needed and is causing problems for residents and so were all these extra new places that you're allowing to be built that the residents don't want.	7/1/2024 8:46 PM
5	the fact that Holden's agreement with Worcester ceded many water rights	7/1/2024 6:01 PM
6	Impact of future development- continuous drain on existing budgets and community resources	7/1/2024 3:15 PM

add mitigation strategy around public outreach for strengthening ability in events

Q9 What actions should the Town of Holden take to cultivate local resilience to natural hazards?Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; encourage cutting/trimming dead trees beside/hanging over roads; etc.

Answered: 32 Skipped: 11

#	RESPONSES	DATE
1	plant natural species by road side to soak up salt water runoff	9/4/2024 2:51 PM
2	[Trimming Dead trees is circled on the form]	9/4/2024 2:47 PM
3	All of the Above. Pursue Green Communities.	9/4/2024 2:43 PM
4	Improve storm water management, tree management near infrastructure, more funds for ecosystem management in managed areas, incentives for home efficiency improvements.	8/24/2024 4:08 PM
5	Increase capacity to apply For hazard mitigation grants, improve storm water management.	8/24/2024 9:34 AM
6	The integration of hazard mitigation projects and education on how these projects would effect the infrastructure of the town.	7/19/2024 6:18 PM
7	Apply for state grant money that is available.	7/13/2024 10:38 AM
8	Planting native and reducing lawns (decreasing CO2 emissions), solar panels and ev charging.	7/8/2024 9:34 PM
9	Cutting trees, acquiring water resources, investing in alternative energy (solar grids, etc)	7/8/2024 7:09 PM
10	improve storm water management, encourage cutting/trimming dead trees, increase local capacity to apply for hazard mitigation funding, planting climate resiliant plant species	7/8/2024 6:13 PM
11	yeah, that sounds good	7/8/2024 2:47 PM
12	increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species;	7/7/2024 10:05 AM
13	SAVE EAGLE LAKE, education on climate change	7/6/2024 9:25 AM
14	Education and outreach about the issues Seek hazard mitigation grant funding; implement new projects. Compliments to the HDP for a great job of tree-trimming!	7/5/2024 8:47 PM
15	The climate changes naturally.. find something useful to do and stop wasting my money.	7/4/2024 9:59 AM
16	Please incentivize/subsidize/support solar panel installation! We want to pursue this (and know others in town who do, too) but it's cost prohibitive right now.	7/3/2024 3:43 PM
17	More tree trimming over wires, roadways.	7/2/2024 6:14 PM
18	All of the examples.provided in the prompt and allowing all town residents regardless of zone to have more ability to provide for themselves for example, having chickens allows a natural way to manage pests like ticks which carry Lyme and provides eggs. Also more info on solar programs to lessen carbon footprint	7/2/2024 3:57 PM
19	promoting renewable energy via HMLD incentives for solar, building infrastructure for electric vehicles, managing invasive species, planting climate-resilient trees, educating residents,	7/2/2024 7:39 AM

Add mi... stormy To ... Add Ag Commission ...
... Lane

20	provide more education and outreach about how climate change could impact my life	7/2/2024 7:32 AM
21	We need to do composting / food pick up	7/2/2024 7:02 AM
22	Climate change is a scam Stop it with the bullshit. I would agree with encouraging cutting and trimming dead trees that are beside and hanging over roads and power lines That's the number one reason that power goes out because a dead tree or an tree that was overpower lines gets iced up in a northern climate that has the potential for ice without having anything to do with climate change to take down a line. And as I said above HMLD is great them partnering with the DPW get us going fast They are top tier.	7/1/2024 8:46 PM
23	More native plant species / fewer lawns that require absurd amounts of resources without benefiting the ecosystem the way biodiversity will.	7/1/2024 8:24 PM
24	Storm water management, dead tree removal	7/1/2024 6:57 PM
25	Avoid building in flood prone areas.	7/1/2024 6:01 PM
26	Secure drinking water for the future growth of the town	7/1/2024 5:55 PM
27	Removal of tree branches near wires and storm water management	7/1/2024 4:44 PM
28	Slow development to protect green space, improve sidewalks to encourage walking, move powerlines underground	7/1/2024 3:49 PM
29	improve water management, encourage growth of native plants/trees, promote environmentally friendly switches (solar, energy efficient appliances, etc.) among residents through better discounts, rebates and tax advantages.	7/1/2024 3:29 PM
30	Reimagined zoning and development to ensure that building and redevelopment occurs in the most sustainable and resilient fashion, we need to stop approving ANR lots all over town.	7/1/2024 3:15 PM
31	Slow down or stop the allowable destruction of forested areas for the purpose of new construction. Regulate the water usage for the purposes of a lush green lawn. Drinking water should not be allowed to be used or it should be severely restricted. Regulate the type of pesticides used on lawns for the purpose of a weed free lawn. Impose and enforce pool drainage into the sewer drains	7/1/2024 11:35 AM
32	Replacing trees in native species that have been removed due to blight, Aging, And overzealous developments would be a great way To protect the area.	7/1/2024 11:31 AM

Push out through schools, Senior center presentation
- Tying it into septa preparedness, eat at Ter

Select hours next in

Talk to Sherry about postcards

APPENDIX D:

Public Presentation at

Select Board Meeting

Materials

Town of Holden, Natural Hazard Mitigation Plan
Public Presentation: April 22, 2025

What is hazard mitigation? What is a mitigation plan?

- Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of natural disasters.
- Mitigation is not disaster response; its goal is to reduce hazard impacts before a disaster occurs.
- A mitigation plan identifies natural hazards and the risks they pose to residents, infrastructure, property, and natural resources. It prioritizes projects, policies, education, and procedures for reducing these risks, now and in the future.
- Mitigation helps break the cycle of disaster damage, reconstruction, and repeated damage.

Why should Holden complete and adopt this kind of plan?

- Natural hazard mitigation planning establishes a road map for achievable actions that can substantially reduce risks.
- The Federal Emergency Management Agency (FEMA) requires that cities and towns adopt and update a natural Hazard Mitigation Plan to be eligible for various FEMA pre-disaster and post-fire hazard mitigation grants.
- This plan is primarily funded by a grant from FEMA through MEMA (with a local in-kind match).
- FEMA and Holden's Board of Selectmen adopted the Town's last natural hazard mitigation plan in March 2017, and this plan expired in March 2022.

What natural hazards pose the greatest risks to Holden?

- Largest risks: dam failure, severe thunderstorms / wind
- Moderate risks: flooding, winter storms, tornadoes, wildfires, invasive species
- Lower risks: hurricanes, drought, extreme temperatures, earthquakes

Local partners

Local knowledge is essential to the mitigation planning process. Partners in Holden to date include:

Chief and Emergency Management Director Russ Hall, Assistant Chief Christopher Monteverdi, Deputy Chief Sean Smith, and Emergency Management Coordinator Bryan Patch, Fire Department; Town Manager Peter Lukes and Town Planner David George, Town Administration; Director John Woodsmall, Supervisor of Operations Chris DeMoranville, Water and Sewer Superintendent Joeseph Kennedy, and Civil Engineer II Brad Stone, Department of Public Works; Chief Tim Sherblum, Deputy Chief Chris Noyes, and Intern Austin Gatlin, Police Department; Superintendent Dano Landberg, Building Department; Health Agent Francis Dagle, Health Department; Conservation Agent Glenda Williamson, Conservation Commission; Superintendent Michael Viano, Holden Municipal Light Department; Facilities Director Mark Wilde, Wachusett Regional School District; Director Jocelyn LaPlante and Deputy Director Alexa Owen, Wachusett Regional Emergency Communications Center.

Planning timeline

- Information gathering via mapping, research, and local input — January 2024 to the present
- Draft plan development — September 2024 – March 2025
    - Public comments/questions are requested within two weeks of the draft plan being posted on the town website following this presentation.
- Public presentation — April 22 2025

- MEMA review — Anticipated Spring/Summer 2025
- FEMA approval and local adoption — Anticipated Fall 2025
- 5-year update — 2030

Recent/ongoing mitigation activities include:

- Street sweeping and catch basin cleaning
- Maintaining and replacing problem culverts and maintaining and repairing problem roadways when needed and as funding allows
- Participation in the National Flood Insurance Program (NFIP)
- Compliance with the state building code
- Dam monitoring
- Tree trimming program
- Snow removal
- Hazard warning systems and notifications
- Education and outreach
- Plans, regulations, and studies

Recommended high priority mitigation strategies in the DRAFT plan

Structure and Infrastructure Strategies

- Coordinate with the City of Worcester on the repairs of Pine Hill Reservoir Dam and other City of Worcester owned dams in Holden.
- Replace generator at Steel Street Water Tower, currently functioning as the backup repeater system for the town's emergency communications and regional dispatch. Current generator system is unreliable.
- Install generators at town well and interconnection sites to ensure uninterrupted water services in the event of an emergency.
- Replace Chaffin Fire Station (Station 2) to improve Fire Service to local neighborhood and Surrounds. Current fire station on 87 Adams Road is a 2 bay station constructed in the 1980's and is inadequate to meet current needs, as well as having significant structural deficiencies such as a collapsing roof and being not up to code for any significant seismic event.
- Renovate the roof structure of the Starboard Building, which currently faces snow load issues and houses many essential government functions in Holden
- Assess green infrastructure opportunities for stormwater management to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects. Coordinate with Town departments to incorporate green infrastructure into planned road improvements.

Preparedness, Coordination, and Response Strategies

- Participate in regional evacuation plan updates as they arise.
- Improve Coordination with Genesee and Wyoming to prevent brush fires along G&W owned rail tracks in town with Vegetative and Debris Management
- Coordinate with dam owners (Such as the City of Worcester) around High Hazard Dam Planning and Hazard Modeling
- Coordinate with the Housing Authority on group home response and evacuation planning for vulnerable populations in the event of an emergency.
- Assess mosquito, tick, and other pest control options; provide public education and outreach about associated risks, including determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program.
- Work with FEMA to correct flood maps at Industrial Park to reflect accurate, current flood risks.

Education and Awareness Strategies

- Provide information to residents and businesses (especially in the Chaffin Pond area) on generator purchase, use and maintenance to reduce basement flooding in the event of power outages and in the use of sump pump usage. Use FEMA/MEMA Templates for educational materials
- Provide information to residents and businesses on water conservation through low-impact landscaping and other measures (to conserve water in times of drought)
- Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Identify legal authority to enforce established O/M requirements.
- Provide education and outreach on fertilizer impacts to inform landowners about the negative water quality impacts of nutrient pollution and how these are linked to algal blooms.

Local Plan and Regulation Strategies

- Continue to utilize the MA Drought Management Plan as a template for the Town's own plan, and integrate State's recommendations and actions according to town needs.
- Enforce dam safety rules and regulations in coordination with the Office of Dam Safety to ensure that inspections and evaluation reports for privately owned dams in town are being created and followed through with recommended action items for structural improvements
- Investigate and become Stormready Certified, and provide information to residents around preparedness for weather related issues, especially tornadoes
- Investigate and become Firewise certified through the National Fire Protection Association (NFPA). Distribute educational materials to residents and businesses about reducing risks for wildfires and brushfires.
- Monitor implementation of Hazard mitigation Planning, reviewing the plan on an annual basis to update as needed and to prioritize strategies for grant seeking.

- Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.

The draft plan with the full list of mitigation strategies will be available shortly on Holden's town website.

Comments and questions should be directed to Marc Granato (mgranato@cmrpc.org) at CMRPC within two weeks of the draft plan being posted on the town website.

This natural hazard mitigation planning activity is funded by an FY23 Hazard Mitigation grant from the Federal Emergency Management Agency through the Massachusetts Emergency Management Agency

TOWN OF HOLDEN
HAZARD MITIGATION PLAN

Holden Board of Selectmen

April 22 , 2025

Marc Granato, Emergency Preparedness Planner

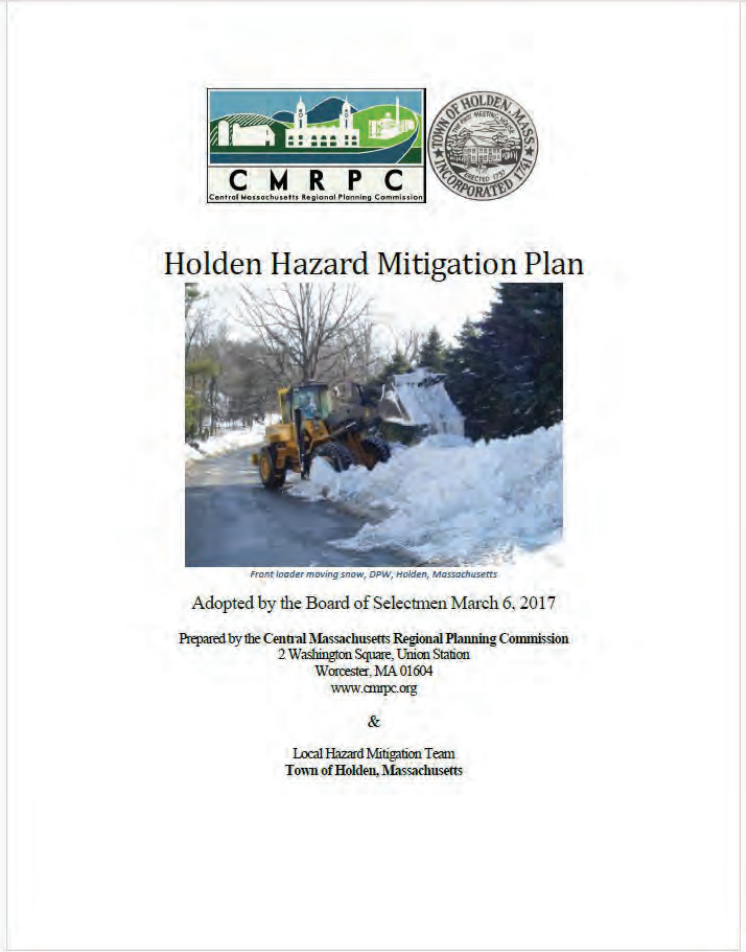
Will Talbot, Assistant Planner

Central Massachusetts Regional Planning Commission

WHY IS HOLDEN COMPLETING THIS PLAN?

- The Federal Emergency Management Agency (FEMA) requires that cities and towns adopt and update a natural Hazard Mitigation Plan to be eligible for various FEMA pre-disaster and post-fire hazard mitigation grants.

- This plan will meet FEMA's requirements and help the town make good use of its resources.
- Holden's last HMP update was approved in March 2017 and expired in March 2022.



PLAN FOR MITIGATING DAMAGES FROM NATURAL HAZARDS

- Flooding
- Severe Snowstorms / Ice Storms / Nor'easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires / Brush Fires
- Earthquakes
- Dam Failure
- Drought
- Extreme Temperatures
- Invasive Species
- Other Hazards (Landslides, Groundwater Intrusion)

Not an Emergency Response Plan

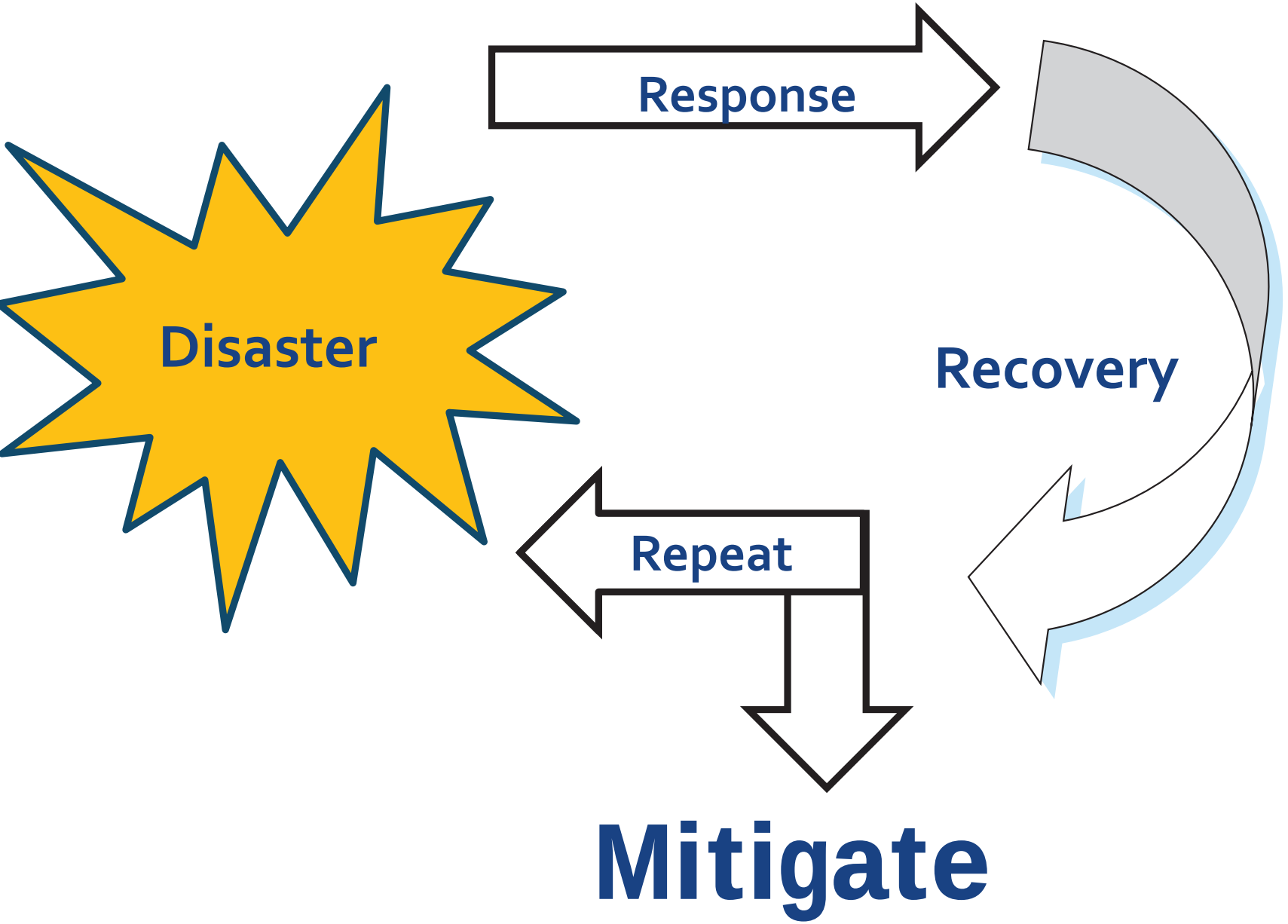
WHAT IS HAZARD MITIGATION?

- *To permanently reduce or prevent losses of life, injuries and property damage by using long-term strategies*
- *What preventive actions are being taken NOW to reduce future risks and damages?*
- *What additional actions can be taken in the FUTURE?*
- *According to the National Institute of Building Sciences Natural Hazard Mitigation Saves: 2019 Report, on average between 4 to 6 dollars is saved for every dollar spent on hazard mitigation*

THE BENEFITS OF MITIGATION

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	**$4:1**	**$6:1**
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

Breaking the Cycle of Risk



Four Tools & Techniques for Hazard Mitigation

1. Structure & Infrastructure Projects
2. Preparedness, Coordination & Response Actions
3. Education & Awareness Programs
4. Local Plans & Regulations

STRUCTURE AND INFRASTRUCTURE PROJECTS

- Prevent floodwaters from reaching properties
- Man-made structures to control water flows
- Culverts, dams, storm drainage facilities, pumping facilities

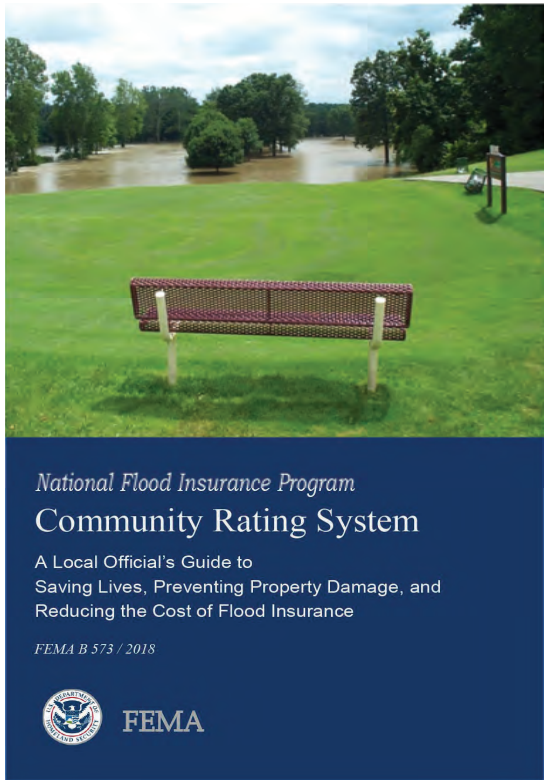


the Pine Hill Reservoir Dam

PREPAREDNESS AND RESPONSE

- National Flood Insurance Program
- Evacuation Planning
- Community Rating System
- Facilitate and coordinate the administration, enforcement and collaboration

NATIONAL FLOOD INSURANCE PROGRAM



EDUCATION AND AWARENESS

- Natural hazard awareness websites
- Hazard information at libraries, schools, and public buildings
- Information brochures mailed to residents (e.g., safe operation of home generators)
- Public outreach at community events



LOCAL PLANS & REGULATIONS

- Planning & Zoning
- Subdivision and Site Plans
- Floodplain regulations
- Wetlands bylaws
- Storm water regulations
- Building Code
- Master Plans
- MVP Plans



PLANNING PROCESS

- CMRPC provides technical assistance to the Town for plan development
- The Town coordinates through its Local Hazard Mitigation Team
- Public Survey
- Public presentation (tonight), during plan development and review of the draft plan
- Submittal of Draft Plan to MEMA and FEMA for review, revision, and approval
- Plan adoption by the Board of Selectmen

DEVELOPMENT OF THE PLAN

CMRPC assisted the Holden Local Hazard Mitigation Planning Team to:

- Identify & Map Critical Facilities
- Identify & Map Locally Identified Hazard Areas
- Identify & Review Existing Mitigation Measures
- Identify and Prioritize New Mitigation Strategies
- Gather Feedback & Input from the Public



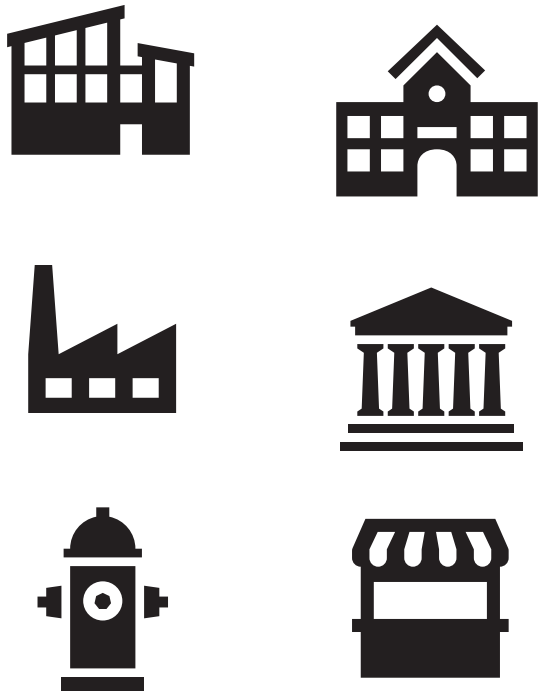



IDENTIFY CRITICAL FACILITIES

Database & GIS maps of critical facilities, infrastructure

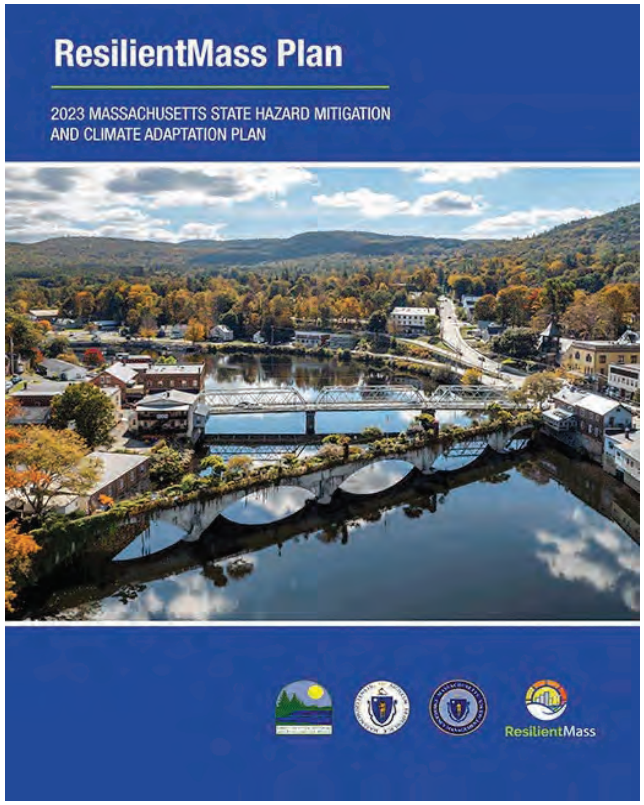
Sites identified include:

- Emergency Response Facilities
- Water Supply and Sewer Facilities, Town Facilities, and Utilities
- Dams
- Facilities and populations to protect



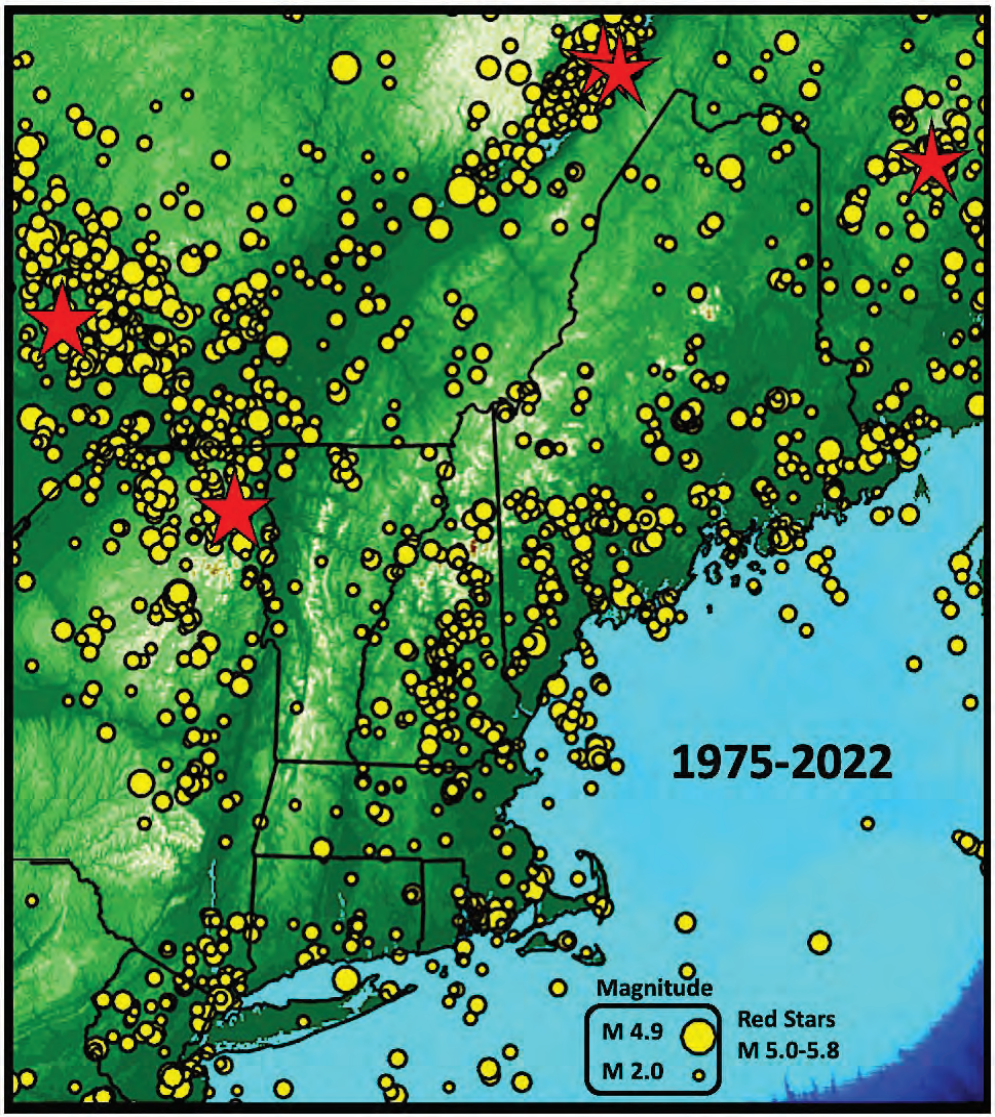
HAZARD IDENTIFICATION & MAPPING

- State & Federal data on floodplains, snowfall, wind speeds, hurricanes, earthquake risk, etc.
- Review Mass. State Hazard Mitigation Plan
- Coordinate with Local Team to get local information on hazard areas and potential future developments



OTHER HAZARDS – GEOLOGIC, WIND, & SNOW

Earthquakes from 1975 to 2022 2+ Magnitude



Recent Declared Hurricanes & Snow Disasters

Disaster	Declaration Date	Incident Period	FEMA ID
Hurricane Lee	09/15/23	09/15/23 - 09/17/23	EM-3599-MA
Mashpee Wampanoag Tribe Tropical Storm Henri	08/22/21	8/20/21 -	3566-EM-Mashpee Wampanoag Tribe

Disaster	Declaration Date	Incident Period	FEMA ID
Massachusetts Severe Winter Storm and Snowstorm	04/18/22	01/28/22 - 01/29/22	DR-4651-MA
Massachusetts Severe Winter Storm and Snowstorm	07/19/18	03/13/18 - 03/14/18	DR-4379-MA

SELECT LOCALLY-IDENTIFIED HAZARD AREAS

- Flooding
  - Main Street, Highland Street, Salisbury Street, and Chaffins area



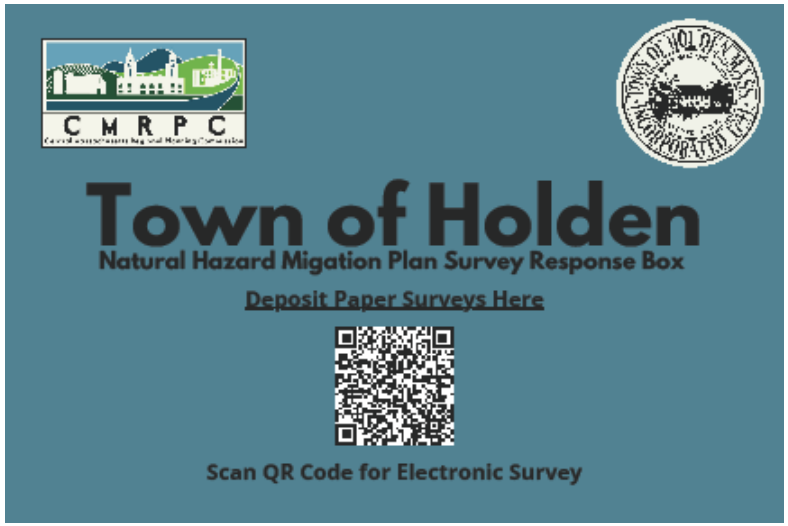
- Wildfire / Brushfire
  - Fox Hill Drive / Sycamore Drive / Hickory Circle area
  - Along Malden Street west of I-190

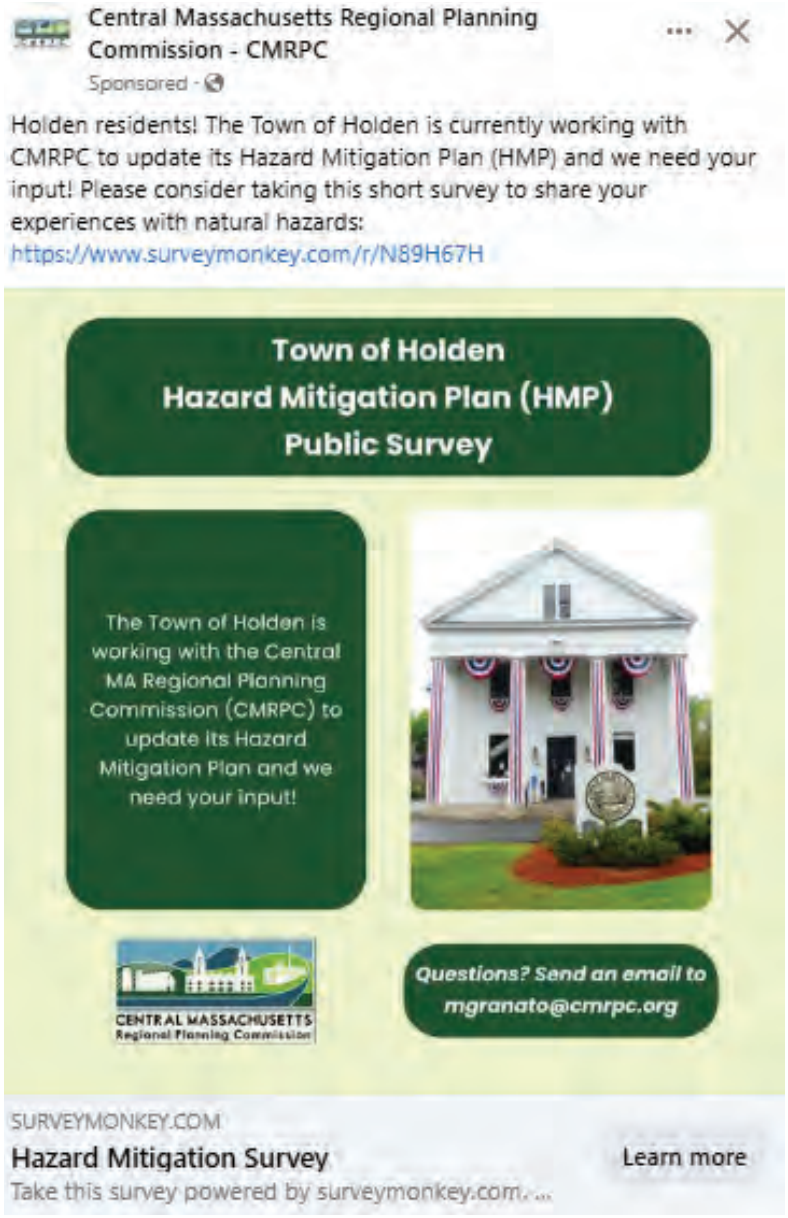
- Potential Dam Failure
  - Unionville Dam
  - Wachusett Street Dam
  - Wellfields, a water system connection, sewer pump stations, communications and public facilities, and the fire headquarters
    - All located in potential dam failure inundation zones.



PUBLIC SURVEY – Summer / Fall 2024

- 98 total responses
- Hazards of greatest concern: winter storms / ice, thunderstorms / microbursts / extreme wind, invasive species, and drought
- The survey was promoted through town social media and a geographically targeted Facebook ad buy.
    - Survey flyers and paper copies were also posted at several high traffic locations in town.





EXISTING MITIGATION MEASURES

MULITIHAZARD

- Comprehensive Emergency Management Plan (CEMP)
- Compliance with the state building code
- Education and outreach
- Hazard warning systems and notifications
- Plans, regulations, and studies

FLOOD RELATED HAZARDS

- National Flood Insurance Program
- Street sweeping
- Catch basin cleaning
- Roadway treatments
- Drainage preventive practices to reduce clogging
- Subdivision Rules and Regulations
- Zoning Regulations

DAM FAILURES

- DCR dam safety regulations
- Dam monitoring

WIND-RELATED HAZARDS

- Tree trimming program

WINTER-RELATED HAZARDS

- Salting and sanding of roads and plowing for snow removal

HOLDEN MITIGATION STRATEGIES

- Where are the GAPS?
- What actions will further reduce vulnerability?
- Where are the PRIORITIES?



DRAFT PLAN SELECT HIGH-PRIORITY MITIGATION MEASURES

- Coordinate with the City of Worcester on the repairs of Pine Hill Reservoir Dam and other City of Worcester owned dams in Holden.
- Coordinate with the Housing Authority on group home response and evacuation planning for vulnerable populations in the event of an emergency.
- Provide education and outreach on fertilizer impacts to inform landowners about the negative water quality impacts of nutrient pollution and how these are linked to algal blooms.
- Enforce dam safety rules and regulations in coordination with the Office of Dam Safety to ensure that inspections and evaluation reports for privately owned dams in town are being created and followed through with recommended action items for structural improvements.

PLAN APPROVAL AND ADOPTION

- The Draft plan will be reviewed by MEMA.
- FEMA will review the plan and is the agency that issues conditional approval.
- A Board of Selectmen resolution to adopt the plan can occur after FEMA conditional approval.
- FEMA issues final plan approval.
- The plan will be in effect for 5 years.



IMPLEMENTING THE PLAN
WHAT HAPPENS AFTER THE PLAN IS APPROVED?

- Establish a local implementation group.
- Prepare a timeline for implementation.
- Integrate the plan's recommendations with other local plans and policies.
- Seek FEMA and other funding sources and other resolutions for plan mitigation measures.
- Meet at least yearly to review progress of plan implementation.
- Update the plan every 5 years.

DRAFT PLAN

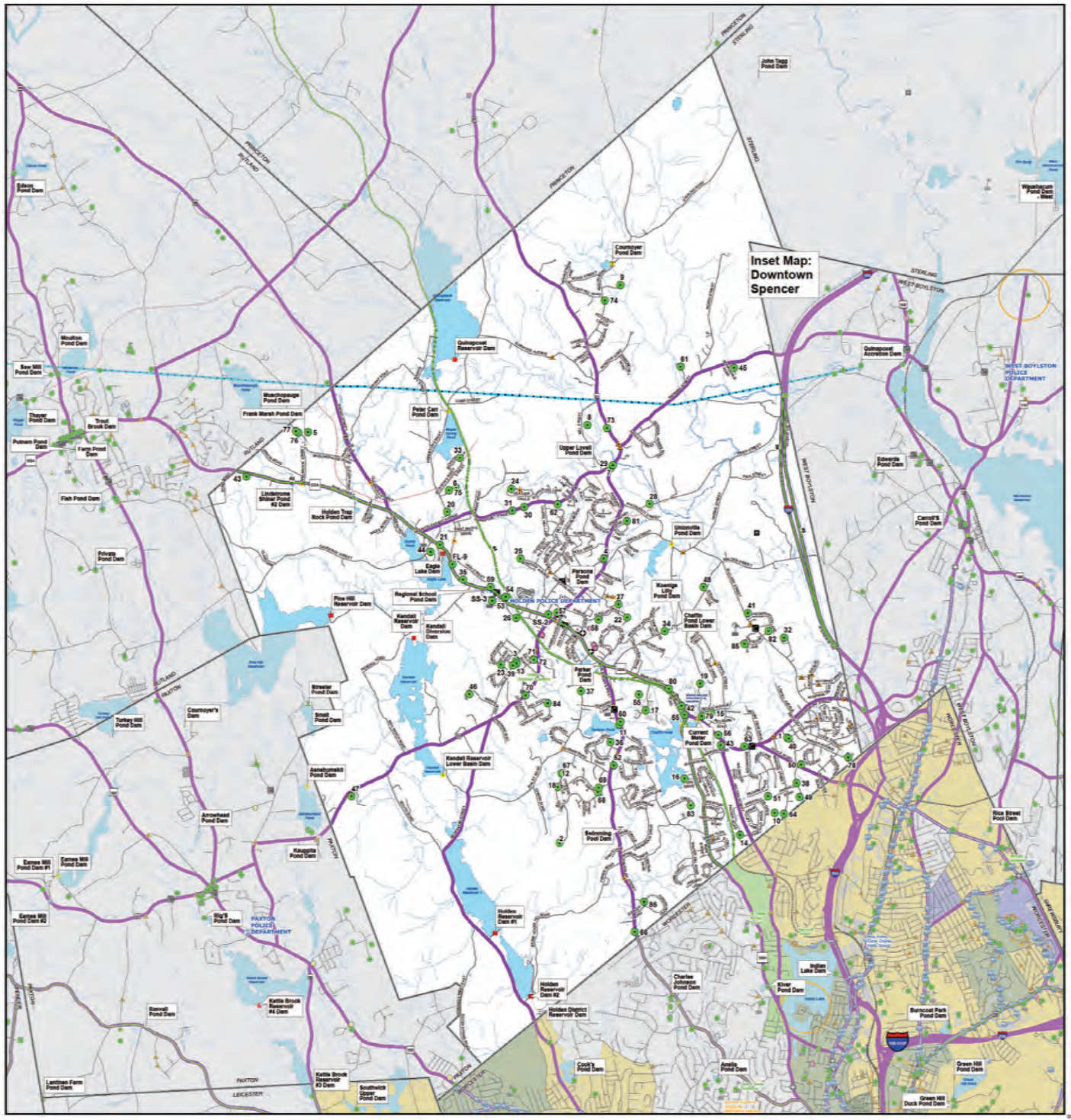
The full draft plan will be available on the Holden town website.

Please send any comments on or questions about the plan to mgranato@cmrpc.org within two weeks of the draft plan being posted on the town website.

Hazard Mitigation Plan

Map 1
Critical Infrastructure and Facilities
Town of Holden, Massachusetts

September 2024



Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Airports
- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail Line

MA Environmental Justice Populations 2020

- Minority
- Income
- Minority and Income

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Dams (2/2012)

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Locally Defined

- Critical Infrastructure
- Critical Infrastructure
- Critical Infrastructure



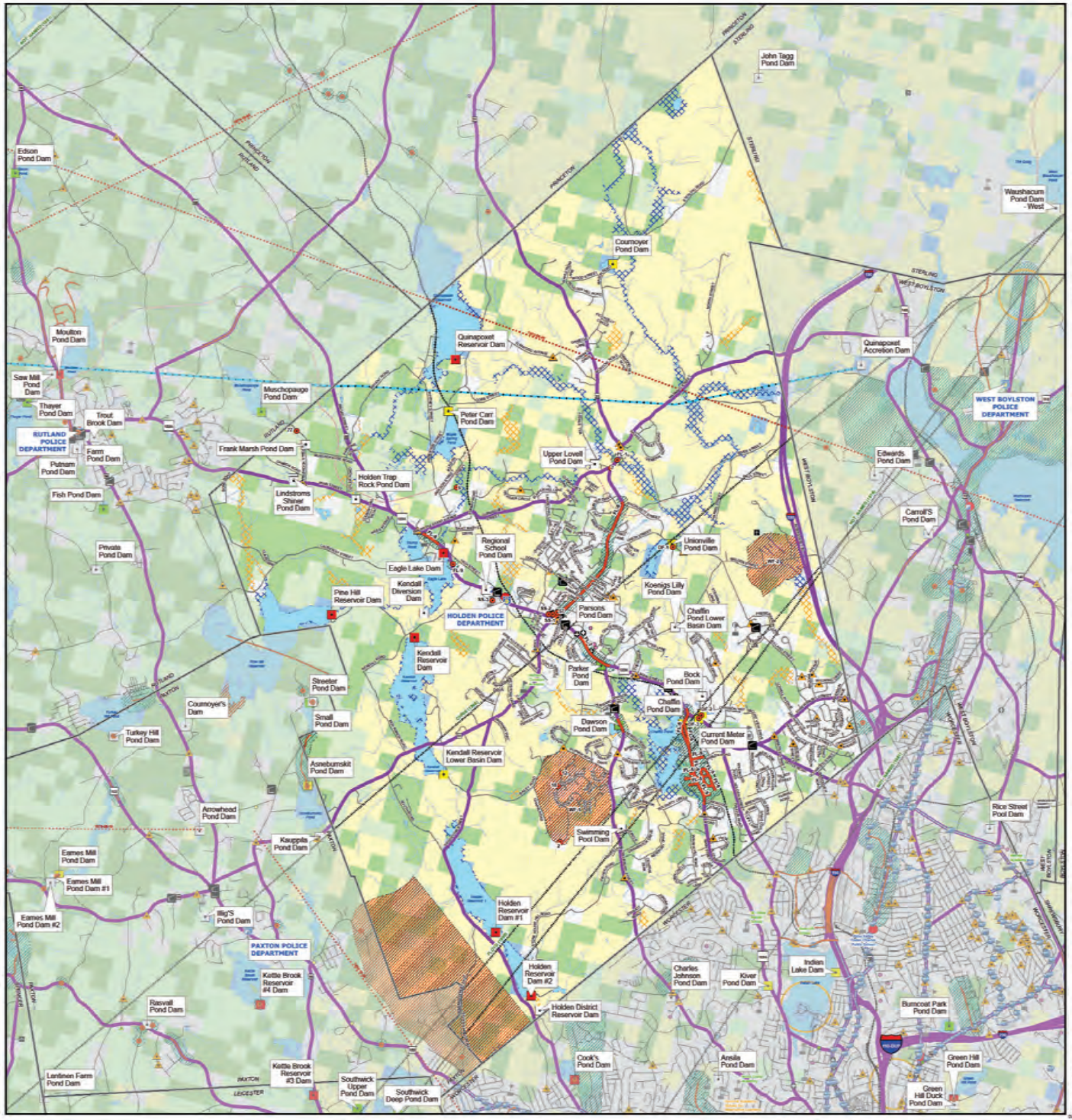
0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

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CMRPC



Hazard Mitigation Plan

Map 2
Hazards
Town of Holden, Massachusetts

August 2024

Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Water Treatment Plant
- Airports
- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail Line
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

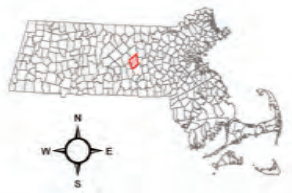
Hazards

Dams (2/2012)
- High Hazard
- N/A

FEMA DFIRM Flood Zones
- 100-year Flood Area*
- 500-year Flood Area
- Repetitive Loss Property Areas
- NOAA Historic Hurricane Tracks (1842-2022)

USDA Wildfire Hazard Potential, Version 2023
- 1: Very Low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very High
- 6: Non-burnable
- 7: Water

Locally Defined Hazards
- Hazard
- Hazard
- Possible Flood Area
- Hazard



0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massGIS, MassDOT, FEMA and NOAA.
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CMRPC
Central Massachusetts Regional Planning Commission



Hazard Mitigation Plan

Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Holden, Massachusetts

September 2024

Legend

- Assisted Living
- Clinics
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Airports
- Town Halls
- Local Police
- State Police
- Fire Station
- Schools (Pre-K through High School)
- WRTA Bus Stop
- WRTA Bus Routes (IN/OUT)
- Aqueducts
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Unknown Status Rail LIne

MA Environmental Justice Populations 2020

- Minority
- Income
- Minority and Income

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

Dams (2/2012)

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

FEMA DFIRM Flood Zones

- 1% Annual Chance Flood Hazard or Regulatory Floodway
- 0.2% Annual Chance Flood Hazard
- FEMA Q3 Flood Zones

- High Slope (15% and above)
- Repetitive Loss Property Areas
- NOAA Tornado Tracks (as of 9/2021)
- IBTrACS Historical Hurricane Tracks (1842-2020)

Locally Defined

- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure/ Hazard
- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Possible Flood Area
- Hazard
- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure



0.75 0.375 0 0.75 1.5 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
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CMRPC
Central Massachusetts Regional Planning Commission

APPENDIX E:

Public Comment

Period Outreach

Materials

Community Lifeline	Entity	Point of Contact	Phone	Email
1. Safety and Security	Local Planning Team	Chris Montiverdi	508-210-5653	cmontiverdi@holdenma.gov
1. Safety and Security	Holden Fire Department	Russ Hall	508-210-5651	rhall@holdenma.gov
1. Safety and Security	Holden Police Department	Tim Sherblom	508-210-5601	tsherblom@holdenma.gov
1. Safety and Security	Holden Emergency Managemnt	Bryan Patch	508-210-5663	bpatch@holdenma.gov
1. Safety and Security				
2. Food, Hydration, Shelter	Mountview Middle School	Erik Githmark	508-829-5577	erik_githmark@wrsd.net
2. Food, Hydration, Shelter	WRSD Central Office	Jon Krol	508-829-1670	j_krol@wrsd.net
2. Food, Hydration, Shelter	Wachusett Regional High School	Michael Pratt	508-829-6771	m_pratt@wrsd.net
2. Food, Hydration, Shelter	Senior Center	Karen Phillips	508-210-5571	kphillips@holdenma.gov
2. Food, Hydration, Shelter	Big Y	Scott Novinger	508-829-9614	wecare@bigy.com
2. Food, Hydration, Shelter	Wachusett Food Bank		978-563-1064	wfp@wachusettfoodpantry.org
2. Food, Hydration, Shelter	Holden Grange	Randy Jordan	508-886-2595	mjordan713@verizon.net
2. Food, Hydration, Shelter	American Red Cross	Nia Rennix	413- 233-1024	nia.rennix@redcross.org
2. Food, Hydration, Shelter	Worcester County Food Bank		508-342-3663	jmcmurray@secondharvest.org
3. Health and Medical	St. Vincents	Adam Darnobid, MD	508-363-5000	adam_darnobid@tenenthealth.com
3. Health and Medical	Umass Medical	Norm Soucie	508-421-5705	nsoucie@ummhc.org
3. Health and Medical	Holden Health Agent			healthagent@holdenma.gov
3. Health and Medical	Holden Urgent Care 1	Jay Adams	508-954-5204	info@urgentcareofholden.com
3. Health and Medical	Holden Nursing Home	Harry Quick	508-829-1205	HQuick@oriolhealthcare.com
3. Health and Medical	Miles Funeral Home	Richard Mansfield	508-829-4434	Bruce@milesfuneralhome.com
3. Health and Medical				
4. Energy	Municipal Light Department	Barry Tupper	508-210-5404	btupper@holdenma.gov
4. Energy	Eversource	Nathan Audette	800-592-2000	nathan.audette@eversource.com
4. Energy	National Grid	Deborah Blanch	800-867-5222	deborah.blanch@nationalgrid.com
5. Communications	Cell Towers - Verizon	John Starck		b.irwin@verizon.com; john.starck@veri
5. Communications	Holden Regional Dispatch Center	Jocelyn Laplante	508-210-5612	jlaplante@holdenma.gov
5. Communications	CodeRED			
5. Communications	Town Planning	David George	508-210-5541	dgeorge@holdenma.gov
6. Transportation	MassDOT	Barry Lorion	857- 368-3000	blorion@dot.state.ma.us
6. Transportation	Senior Center Busses	Mary Sloan	508-210-5573	msloan@holdenma.gov
6. Transportation	WRTA	David Trabucco	508-791-9782	dtrabucco@therta.com
6. Transportation	AA transportation (School Busses)	Patricia Collier	774-234-0678	patc@aatransportation.com
6. Transportation	Genessee and Wyoming		866-527-3499	corporatecommunications@gwrr.com
6. Transportation	Sterling Regional Airport	THOMAS DUFFY	978-422-8860	
6. Transportation	Worcester Regional Airport	Jusin Foster	508-849-5519	lAviation@massport.com
6. Transportation	Central Mass EMS AMBU Bus	Dave Pederzani	508-854-0111	dpederzani@cmemsc.org
7. Hazardous Material	Tier II Facilities			
7. Hazardous Material	MassDEP	Mary Jude Pigsley	508-792-7650	MaryJude.Pigsley@mass.gov
7. Hazardous Material	State Haz Mat Team	Timothy Gallagher	978-567-3151	timothy.gallagher@mass.gov

8. Water Systems	DPW	John Woodsmall	508-210-5554	jwoodsmall@holdenma.gov
8. Water Systems	Upper Blackstone Clean Water	Liz Mailhot	508-755-1286 x 32	nfo@ubcleanwater.org

From: Bryan Patch
To: Marc Granato | CMRPC
Subject: Fwd: hazard mit report
Date: Friday, May 2, 2025 3:05:57 PM

CAUTION: This email originated from **outside of the organization**. DO NOT click links or open attachments unless you recognize the sender and know the content is safe. Thanks.

From our Town Assessor. Not sure if you can look into this?

Bryan Patch FF/NREMT-P
Emergency Management Coordinator
Holden Fire Department
1370 Main St Holden, MA 01520
Office: 508-210-5663
Bpatch@holdenma.gov

Begin forwarded message:

From: Christopher Montiverdi <cmontiverdi@holdenma.gov>
Date: May 2, 2025 at 11:28:37 AM EDT
To: bpatch@holdenma.gov
Subject: Fwd: hazard mit report
Reply-To: cmontiverdi@holdenma.gov

fyi

-------- Forwarded Message --------
Subject:hazard mit report
Date: Fri, 2 May 2025 09:38:41 -0400
From: Rosemary Scully <rscully@holdenma.gov>
Reply-To:rscully@holdenma.gov
Organization: Town of Holden
To: Chris Montiverdi <cmontiverdi@holdenma.gov>

chris...looking over the report i noticed a couple of issues might need correction:

page 16 - Sunshine Ridge and Fisher Rd construction of new single family homes is still under construction, not completed

page 17 - total permits for single family homes states 55169. thinking that is alittle high? :)

i didn't have time to read the entire report, but noticed these in the holden section and hoped to pass the information along before the final document is complete.

rose

--
Rosemary Scully, MAA
Principal Assessor
Board of Assessors
Town of Holden

--
Christopher Montiverdi, MPH
Assistant Chief
Holden Fire Department
Community Risk Reduction
1370 Main Street
Holden, Ma 01520
(O) 508-210-5653
(C) 774-479-1801
cmontiverdi@holdenma.gov

From: Bryan Patch
To: Marc Granato | CMRPC
Subject: Re: Holden Public Comment Period
Date: Thursday, May 1, 2025 4:56:04 PM
Attachments: favicon.ico
Holden Meetings 1-5 Sign In Sheets.pdf

CAUTION: This email originated from **outside of the organization**. DO NOT click links or open attachments unless you recognize the sender and know the content is safe. Thanks.

This is what was posted on the Town website. Hope that works.

Hazard Mitigation Plan Public Review and Commenting, Now - 5/16
holdenma.gov

Bryan Patch FF/NREMT-P
Emergency Management Coordinator
Holden Fire Department
1370 Main St Holden, MA 01520
Office: 508-210-5663
Bpatch@holdenma.gov

> On May 1, 2025, at 3:53 PM, Bryan Patch <bpatch@holdenma.gov> wrote:
>
> Thank you! And the plan is posted!
> Bryan Patch FF/NREMT-P
> Emergency Management Coordinator
> Holden Fire Department
> 1370 Main St Holden, MA 01520
> Office: 508-210-5663
> Bpatch@holdenma.gov
>
> > On May 1, 2025, at 3:50 PM, Marc Granato | CMRPC <mgranato@cmrpc.org> wrote:
> >
> > Bryan,
> >
> > As Promised here is the main meeting sign in sheets.

APPENDIX
F: Glossary

APPENDIX F

GLOSSARY OF TERMS

As used in this plan, these terms are defined as follows:

Blizzard – Issued for sustained or frequent gusts to 35 mph or more for an hour or greater and considerable falling and/or blowing snow. These conditions frequently occur alongside reduced to or below one-quarter mile. These conditions must be the predominant condition over a 3-hour period.

Blizzard warning - Sustained winds or frequent gusts of 35 mph or higher, occurring in combination with considerable falling and/or blowing snow. When proclaimed, these conditions are expected to prevail for a period of at least three (3) hours. Visibilities will frequently be reduced to less than one-quarter mile.

Blowing snow - Wind driven snow that reduces visibility to six (6) miles or less causing significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Community Lifelines - The most fundamental services in the community that, when stabilized, enable all other aspects of society to function (definition from FEMA)

Conflagration - A large destructive fire; which attains such intensity that it creates and sustains its own wind system. It is most commonly a natural phenomenon, created during some of the largest bushfires, forest fires, and wildfires.

Drifting snow - Uneven distribution of snowfall caused by strong surface winds. Drifting snow is usually associated with blowing snow.

Flurries – Intermittent light snow with no measurable accumulation; a light dusting is all that is expected.

Exposure - The people, property, systems, or functions that could be lost to a hazard. Generally, exposure includes what lies in the area that the hazard could affect.

Freeze - Occurs when the surface air temperature is 32 degrees Fahrenheit or below over a widespread area for a climatologically significant period of time. The term “freeze” is usually restrictive to advective situations or occasions when wind or other conditions prevent frost.

Freezing rain or drizzle – Rain that falls as a liquid but freezes into an icy glaze when it hits the ground or other surfaces such as trees, cars, and roads=.

Frost - The formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops when the temperature of the earth's surface falls below 32 degrees Fahrenheit, but because frost is primarily an event that occurs as the result of radiation cooling, it frequently occurs with air temperatures in the middle 30s.

Graupel - Small pellets of ice created when super-cooled water droplets coat or rime, a snowflake. The pellets are cloudy or white, not clear like sleet, and are often mistaken for hail. Same as snow pellets or small hail.

Gustnado - A whirlwind of dust or debris at or near the ground with no condensation funnel. Typically forms as an eddy in thunderstorm outflows.

Hail - A form of showery precipitation in the form of irregular pellets or balls of thin ice that occur when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Heavy snow - This definition depends on the region of the USA. In Massachusetts, heavy snow means that six (6) or more inches of snow have fallen in 12 hours, or eight (8) inches in 24 hours. Heavy snow is also observed when snow is falling at a rate of one (1) inch per hour.

Heavy Snow Warning - Snow accumulations are expected to approach or exceed six (6) inches in 12 hours or eight (8) inches or more in 24 hours but will not be accompanied by significant wind. During a heavy snow warning, freezing rain and sleet are not expected.

Hurricane - An intense tropical cyclone in the Atlantic, Caribbean Sea, Gulf of Mexico, or eastern Pacific, which the maximum 1-minute sustained surface wind is 74 mph or greater.

Ice Storm - An ice storm is used to describe occasions when damaging accumulation of ice are expected during freezing rain situations. Significant accumulations of ice are recognized to pull down trees and utility lines, resulting in power loss; they are defined as one-quarter inch or greater.

Ice Storm Warning – Predicted significant coating of freezing rain; one-quarter inch or more is expected to accumulate in an area.

Invasive Species - A species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (definition from the Invasive Species Advisory Committee of the U.S. Department of the Interior).

Mitigation - The process of reducing the severity of the impact of natural hazards through planning. Each hazard requires a specific type of mitigation. In some cases, we can use engineering solutions (such as an earthquake-resistant building) to at least temporarily reduce the impact of a natural hazard. In other cases, the only form of mitigation that is guaranteed to be successful is to limit or not allow human activities where the hazard occurs (such as in floodplains).

Natural Disaster - A hazard event caused by nature or the natural process of the earth, such as a flood or tornado. Natural disasters result in widespread destruction or death to the lives of individuals, damaging their property, causing economic loss and/or the inability for a population to rebuild.

Natural Hazard - An act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing.

Risk - Depends on all three factors: hazard, vulnerability, and exposure. Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

Sleet – Pellets of ice composed of frozen or mostly frozen rain drops or refrozen partially melted snowflakes. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists. Heavy sleet occurs when a half of an inch of sleet accumulates

Snow Showers - Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Snow Squalls - Intense, but of limited duration, periods of moderate to heavy snowfall, accompanied by strong, gusty surface winds and possible lightning.

Storm Surge – An abnormal rise in sea level, accompanying a hurricane or other intense storm, whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic tide from the observed storm tide. Storm surges can reach 25' high and 50-100 miles wide. This can cause severe erosion, major flooding and extensive damage to coastal areas.

Sustained Wind - Two-minute average wind measured at about 33' above the surface. BB.

Technological Disaster - A disaster that results from a technological or man-made hazard event.

Technological Hazard - A hazard that originates in accidental or intentional human activity (oil spill, chemical spill, building fires, terrorism, etc.)

Tropical Depression - A tropical cyclone in which the maximum 1-minute sustained surface wind is 38 mph or less.

Tropical Storm - A tropical cyclone in which the maximum 1-minute sustained surface wind ranges from 39-73 mph.

Vulnerability - Susceptibility to physical injury, harm, damage, or economic loss. It depends on an asset's construction, contents, and economic value of its functions. Vulnerability assessment provides the extent of injury and damages that may result from a hazard event of a given intensity in a given area.

Wind Chill Warning - Life-threatening wind chills reaching minus 50 degrees Fahrenheit or lower. Criteria varies by state.

Watch (Storm) - A watch is used when the risk of a hazardous weather event has increased significantly, but the occurrence, location and timing are still uncertain.

Warning/Advisory (Storm) - These products are issued when a hazardous weather event is occurring, is imminent, or has a very high probability of occurrence. A warning is used for conditions posing a threat to life or property. Advisories are for less serious conditions that cause significant inconvenience and, if caution is not exercised, could lead to situations that may threaten life and property.

Whiteout - A condition caused by falling and/or blowing snow that reduces visibility to nothing or zero miles; typically, only a few feet. Whiteouts can rapidly occur, blinding motorists and creating chain-reaction crashes involving multiple vehicles. Whiteouts are most frequent during blizzards.

Wind Chill - The wind chill is based on the rate of heat loss from exposed skin caused by the combined effects of wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. This temperature is the reading the body "feels" given the combination of wind and air temperature. At wind speeds of four (4) mph or less, the wind chill temperature is the same as the actual air temperature. The threshold for potentially dangerous wind chill conditions is about negative 20 degrees Fahrenheit.

APPENDIX
G: High Hazard Potential Dams Appendix

HIGH HAZARD POTENTIAL DAMS APPENDIX

This appendix to the Holden hazard mitigation plan specifically looks at the risks posed by hazardous dams and expands upon section *4.9 Dam Failure* of the Hazard Profiles section.

SECTION 1: DEFINITIONS, CLASSIFICATIONS, AND REGULATIONS

High Hazard Potential Dams (HHPDs) are dams where failure of the dam will likely cause loss of life and serious damage to homes, industries, commercial facilities, public utilities main highways or railroad infrastructure. These dams are classified as such by the Massachusetts Office of Dam Safey (ODS), the chief regulatory body for dams in Massachusetts. The ODS classifies the hazard potential of Dams under 3 categories: High, Significant and Low.

Table 1: Hazard Potential Classification Table

Classification	Definition
High Hazard Potential (Class I)	Dams located where failure 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 Potential (Class II)	Dams located where failure may cause loss of life and damage to 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 Potential (Class III)	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

Table 1: Dam Hazard Classification table from Office Of Dam Safety 302 CMR 10.06(3)[1]

The ODS takes into account the size of the dam, the number of dams in series, and the potential damage caused by dam failure into its classification. For purposes of this appendix, we will be focusing primarily on high and significant hazard dams.

In addition to hazard potential classification, dams are also rated by condition. This is a qualitative assessment that is based on the overall condition of the dam structure and areas surrounding the dam structure or structures that could affect the dam's ability to function.

[1] 302 CMR 10.00: DAM SAFETY (2017).

Table 2: Dam Condition Rating

Dam Condition	Definition	Typical Circumstances
Satisfactory	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the minimum applicable state or federal regulatory criteria or tolerable risk guidelines.	No existing deficiencies or potentially unsafe conditions are recognized, with the exception of minor operational and maintenance items that require attention. Safe performance is expected under all loading conditions including the design earthquake and design flood. Permanent risk reduction measures (reservoir restrictions, spillway modifications, operating procedures, etc) have been implemented to eliminate identified deficiencies.
Fair	No existing dam safety deficiencies are recognized for normal operating conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action. Note: Rare or extreme event is defined by the regulatory agency based on their minimum applicable state or federal criteria.	Lack of maintenance requires attention to prevent developing safety concerns. Maintenance conditions may exist that require remedial action greater than routine work and/or secondary studies or investigations. Interim or permanent risk reduction measures may be under consideration.
Poor	A dam safety deficiency is recognized for normal operating conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Investigations and studies are necessary.	Dam has multiple deficiencies or a significant deficiency that requires remedial work. Lack of maintenance (erosion, sinkholes, settlement, cracking, unwanted vegetation, animal burrows, inoperable outlet gates) has affected the integrity or the operation of the dam under normal operational conditions and requires remedial action to resolve. Critical design information is needed to evaluate the potential performance of the dam. For example, a field observation or a review of the dam's performance history has identified a question that can only be answered by review of the design and construction history for the dam. Uncertainty arises when there is no design and/or construction documentation available for review and additional analysis is needed to better understand the risk associated with operation under normal operational conditions. Interim or permanent risk reduction measures may be under consideration.
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.	A critical component of the dam has deteriorated to unacceptable condition or failed. A safety inspection indicates major structural distress (excessive uncontrolled seepage, cracks, slides, sinkholes, severe deterioration, etc.), advanced

		deterioration, or operational deficiencies which could lead to failure of the dam or its appurtenant structures under normal operating conditions. Reservoir restrictions or other interim risk reduction measures are required. A partial or complete reservoir drawdown may be mandated by the state or federal regulatory agency.
Not Rated	The dam has not been inspected, is not under state or federal jurisdiction, or has been inspected but, for whatever reason, has not been rated.	
Not Available	Dams for which the condition assessment is not provided.	

Table 2: Dam Condition Assessment Table Based off of National Inventory of Dam's Data Dictionary[2]

Both the hazard classification and condition of the dam are important to know to evaluate the risk posed by hazardous dams.

REGULATORY REQUIREMENTS IN MASSACHUSETTS

Massachusetts Office of Dam Safety requires the following from the owners of hazardous dams:
Condition

- Owners of dams are required to hire a qualified engineer to inspect and report results every 2 years for High Hazard Potential dams, every 5 years for Significant Hazard Potential dams and every 10 years for Low Hazard Potential dams
- High and Significant Hazard potential dams whose condition have been determined to be poor or unsafe by inspection must be inspected and reported at least every three months by a registered professional engineer employed by the owner until the dam safety repairs are completed and the dam is found to be in satisfactory condition, unless otherwise ordered by the Commissioner. Such inspections shall be termed Follow-up Inspections and shall be submitted to the Office of Dam Safety.

Emergency Action Planning:

- All dams classified as High Hazard Potential and Significant Hazard Potential shall have an Emergency Action Plan (EAP) submitted to the Commissioner and the Massachusetts Emergency Management Agency. All EAPs shall be updated annually, and their format shall be in accordance with guidelines established by ODS which will be posted and updated on the ODS website.

These requirements included here are not comprehensive and only serve to provide context to the regulations surrounding hazardous dams in Massachusetts, and how they pertain to the hazardous dams in Holden.

[2] USACE. (n.d.). Condition Assessment . *National Inventory of Dams Data Dictionary August 2024* (pp. 11–12). Retrieved October 10, 2024, from https://usace-cwbi-prod-il2-nld2-docs.s3.us-gov-west-1.amazonaws.com/46b33023-6872-4096-bd4c-f1651fa91c45/NID%20Data%20Dictionary%20August%202024.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIALJKNXPVPLAZKRFNA%2F20241010%2Fus-gov-west-1%2Fs3%2Faws4_request&X-Amz-Date=20241010T231203Z&X-Amz-Expires=60&X-Amz-Signature=be422d22d9e94dcc612d796b67a4f4782dc8aced5fc1c70ec66ca0b6d9582fa2&X-Amz-SignedHeaders=host.

SECTION 2: PLANNING PROCESS

Section 2 helps meet the following FEMA local mitigation plan requirements:

- *HHPD1-a: How the local government coordinated with local dam owners and/or the state dam safety agency.*
- *HHPD1-b: Information shared by the state and/or local dam owners.*

HAZARDOUS DAMS THAT AFFECT HOLDEN

According to the Massachusetts Office of Dam Safety, there are 29 dams in Holden, of which 6 are High Hazards, 7 are Significant Hazards, and 2 are Low Hazards. The remaining 14 are rated Not Applicable (N/A).

Holden's dams exist under a variety of ownership structures ranging from private to public and in a variety of conditions from poor to satisfactory. A complete listing of the hazardous dams is included below in table 2.

Table 3: High, Significant, and Low Hazard Class Dams in Holden

ID	Dam Name	Dam Type	Owner	Regulatory Authority	Hazard Code	EAP Date	Inspected Condition
MA00619	Holden Reservoir Dam #2	Earth	City of Worcester	Office of Dam Safety	High Hazard	2019/12/01	Satisfactory
MA00620	Unionville Pond Dam	Earthen Embankment	DCR	Office of Dam Safety	Significant Hazard	2023/06/01	Fair
MA00621	Chaffin Pond Dam	Earthen Embankment	DOT - Dept of Transportation; Chaffin Realty Co., LLC; Town of Holden; Private Owners; TNC Realty, LLC	Office of Dam Safety	Significant Hazard	2018/05/01	Poor
MA00622	Kendall Reservoir Dam	Earthen	City of Worcester	Office of Dam Safety	High Hazard	2019/12/01	Fair

MA00623	Pine Hill Reservoir Dam	Concrete Gravity / Earthen	City of Worcester	Office of Dam Safety	High Hazard	2019/12/01	Fair
MA00929	Quinapoxet Reservoir Dam	Earthen Embankment	City of Worcester	Office of Dam Safety	High Hazard	2019/12/01	Satisfactory
MA00960	Holden Reservoir Dam #1	Earthen Embankment	City of Worcester	Office of Dam Safety	High Hazard	2019/12/01	Fair
MA00979	Eagle Lake Dam	Earth/ Masonry walls	White Oak Land Conservation Society, Inc.; CB Sundin Rentals, LLC; Jefferson Mills, LLC	Office of Dam Safety	High Hazard	2018/09/28	Fair
MA01303	Dawson Pond Dam	Earthen Embankment	DCR	Office of Dam Safety	Low Hazard	N/A	Fair
MA01247	Peter Carr Pond Dam	Earthen Embankment	City of Worcester	Office of Dam Safety	Significant Hazard	2019/12/10	Fair
MA01635	Cournoyer Pond Dam	Earthen Embankment	Private	Office of Dam Safety	Significant Hazard	None	Satisfactory
MA01640	Current Meter Pond Dam	Earthen Embankment	Unknown[3]	Office of Dam Safety	Significant Hazard	None	Fair

[3] According to a dam inspection report provided by ODS dated May 4,2021, the dam owner is unknown at this time, and the dam itself is currently being maintained by the Town of Holden's DPW. The dam is operated by Alden Labs, which reportedly has the rights to water usage. Since the owner is unknown, there is currently no plan for maintenance

MA02325	Old Grist Mill Pond Dam		Town of Holden	Non-Jurisdictional	Significant Hazard[4]	None	Poor[5]
MA02328	Kendall Reservoir Lower Basin Dam	Earthen Embankment	City of Worcester	Office of Dam Safety	Significant Hazard	2019/12/05	Satisfactory
MA02575	Parker Pond Dam	Earthen	DCR	Office of Dam Safety	Low Hazard	N/A	Fair

These dams can be found in section 4.9 of the hazard mitigation plan as well but have been identified during the local hazard mitigation team meetings for additional analysis based on the risk that these dams pose.

PLANNING PROCESS

The Town of Holden sought feedback from the owners of dams in the Town as part of the hazard mitigation planning process, and this was met with some success. The owners of publicly owned dams in town, namely the City of Worcester and the Department of Conservation, responded to requests for information, and both sent representatives to Holden to attend at least one of the planning meetings. During the public comment period the Office of Dam Safety was also sent a draft of the plan, as were the private dam owners in town.

SECTION 3: RISK ASSESSMENT

Section 3 helps meet the following FEMA local mitigation plan requirements:

- *HHPD2-a: Describe the risks and vulnerabilities to and from HHPDs*
- *HHPD2-b: Document the limitations and describe the approach for addressing deficiencies*

This risk assessment was put together as part of Holden's 2023 hazard mitigation plan update. In this section we will review the risks and vulnerabilities to Holden from HHPDs as well as the limitations and approach of the town's emergency management to address deficiencies in preparedness and mitigation

(beyond the seasonal mowing and limited debris clearance from the spillway by its caretakers) and no required EAP in place.

[4] This Dam was reclassified in 2012 to be non-jurisdictional due to its size falling below 6-acre feet of impoundment. The report detailing the dam's condition and hazard potential was unable to be found.

[5] Correspondence was provided by ODS that indicated the dam was in poor condition in 2012.

EXPOSURE

Holden is particularly exposed to risk from dams due to the high number of HHPDs in the town. Below is a table of exposures for each HHPD based on the existing Emergency Action Plans for those dams:

Table 3: HHPD Impacts and Exposures in Holden[6]

ID	Dam Name	Hazard Code	EAP Date	Inspected Condition	Dam Specs (Size, Normal Storage in Acre-Feet)	Summary Impacts[7]
MA00619	Holden Reservoir Dam #2	High Hazard	2019/12/01	Satisfactory	Large – 1900 AF[8]	Holden – 6 Properties Worcester – 1,025 Properties Roadways in Worcester and Holden, 3 Churches/ Community Oriented locations in Worcester, residential properties in Holden and Worcester
MA00620	Unionville Pond Dam	Significant Hazard	2023/06/01	Fair	Intermediate – 100 AF	Holden – 25 Properties 5 Roadways and the Central Mass Rail Trail West Boylston – 3 Properties 2 Roadways and the Central Mass Rail Trail Residential and Municipal Properties as well as DCR owned facilities in Holden and West Boylston, as well as Interstate 190

[6] Wherever possible, data was gathered from previous engineering inspections located in the dam EAPs. When this was not possible, data was sourced from the USACE National Inventory of Dams
[7] Where EAP's were unable to be provided, the Impacts were listed as 'Unknown"
[8] AF – Acre Feet

MA00621	Chaffin Pond Dam	Significant Hazard	2018 /05/0 1	Poor	Intermediat e – 170 AF	Holden -13 properties Residential, Commercial and State properties, 9 Roadway bridges, 1 railroad, and 1 Dam (Unionville Pond Dam), Main Street
MA00622	Kendall Reservoir Dam	High Hazard	2019 /12/0 1	Fair	Large – 2,850 AF	Holden -249 Properties and portions of roadways in Holden and West Boylston Residential, Commercial, Holden Police Department, Holden Post Office, Wachusett School District Properties and 1 Church. Eagle Lake Dam
MA00623	Pine Hill Reservoir Dam	High Hazard	2019 /12/0 1	Fair	Large – 9,398 AF	Holden – 331 Properties and portions of roadways West Boylston – 1 portion of a roadway Residential, Commercial, Holden Town Hall/DPW, Wachusett Regional Highschool and other school properties, Holden Police Department, Holden recreation Department, and 1 Church, Eagle Lake Dam
MA00929	Quinapox et Reservoir Dam	High Hazard	2019 /12/0 1	Satisfactory	Large – 3,376 AF	Holden – 125 properties and roadways West Boylston – 1 roadway Residential and Commercial

MA00960	Holden Reservoir Dam #1	High Hazard	2019/12/01	Fair	Large – 2,250 AF	Holden – 7 properties and Roadways Municipal and Residential, Worcester Water Filtration Plant
MA00979	Eagle Lake Dam	High Hazard	2018/09/28	Fair	Intermediate – 800 AF	Holden – 79 properties Residential and Commercial, 3 Road bridges, 2 Railroad Bridges,
MA01303	Dawson Pond Dam	Low Hazard	N/A	Fair	Small – 38 AF	Unknown
MA01247	Peter Carr Pond Dam	Significant Hazard	2019/12/10	Fair	Intermediate – 126 AF	Holden – 2 properties Residential, Quinapoxet Reservoir Dam, Roadway and Railroad Infrastructure
MA01635	Cournoyer Pond Dam	Significant Hazard[9]	None [10]	Satisfactory	Small – 25 AF	Mason Road
MA01640	Current Meter Pond Dam	Significant Hazard	None	Fair	Small – 14.4 AF	Shrewsbury Street, Lincoln Ave, Wachusett Street, Downstream Residential and Commercial, Chaffin Pond Dam, Dawson Pond Dam and Parker Pond Dam
MA02325	Old Grist Mill Pond Dam	Significant Hazard	None	Unknown	Unknown	Unknown

[9] ODS Provided a Dam inspection report dated November 20, 2006 that conversely refers to the hazard classification as both a significant hazard and a low hazard classification. ODS currently has the dam listed as a significant hazard classification.

[10] Dam inspection report indicated that the Dam was in satisfactory condition. No EAP has been prepared at this time.

MA02328	Kendall Reservoir Lower Basin Dam	Significant Hazard	2019/12/05	Satisfactory	Large – 2,850	Holden - 1 Road Roadways
MA02575	Parker Pond Dam	Low Hazard	N/A	Fair		Unknown
Total **Holden - 813** **Worcester - 1025** **West Boylston - 3** **Residential, Commercial, Municipal, Essential Government Services, Schools, Community Centers and Road and Rail Infrastructure**						

Holden, and the downstream city of Worcester as well as the town West Boylston are all exposed to significant risk from dam failures of HHPDs. Much of Holden's critical infrastructure lies within the inundation zones of multiple high hazard dams.

Probability of Future Events

The probability of future dam failure events in Holden is difficult to quantify, as dam failures are rare occurrences. According to the 2023 ResilientMass Plan, the frequency of 1% or 0.25% annual chance river flow events at High or Significant hazard dams is likely to increase in both the near and mid-term in Worcester County[11]. Presently, we estimate the likelihood of a dam failure event in Holden to be approximately 1.3%, or "low" in the next year.

Additionally, many of the high hazard dams in Holden are in Fair to Poor condition, indicating that there are significant structural, operational and maintenance deficiencies in 9 of the 14 HHPDs, and have a greater likelihood of failure.

Impacts

The Town faces the potential for a "catastrophic impact" from the failure of high hazard potential dams, with multiple deaths and injuries possible. While each impact is very dependent on the specific dam in question, broadly speaking a loss of any one of the dams would have serious consequences.

Economic Impact:

Residential properties, commercial properties, municipal properties and essential government services, schools, community centers and road and rail Infrastructure are all located within the inundation zones of these high and significant hazard dams. Beyond the cost of cleanup and restoration to these facilities and the dams themselves, there would also be the loss of useful service life for the roads and rails affected by the flooding, causing disruptions in commerce and supply chains.

[11] 2023 ResilientMass Plan, Appendix 5.8, Pgs 39-40

Environmental Damage:

Dam failure can cause significant environmental damage. The sudden release of water can alter landscapes, erode soil, destroy habitats and lead to the loss of wildlife. This flooding event caused by any of the dam failures could create secondary hazards of potentially contaminated waters, and the loss of drinking water service to the City of Worcester and its water customers.

Societal Impact:

Dam failure can also have significant societal impacts, such as displacement of people and disruption of communities. Particularly in the areas within or near the inundation zones.

VULNERABILITY

Based on a mostly qualitative assessment, Holden has a hazard index rating of "1 – Highest risk" from dam failure as identified in the dam failure section of the plan. The combination of a high percentage of high and significant hazard dams in varying states of disrepair and with unclear ownership in some cases, and in other cases lacking the foundational safety of an up-to-date Emergency Action Plan (and in some cases, lacking an EAP entirely) and a catastrophic impact to the town infrastructure and potentially to the region should any one of these dams fail. Additionally, there are numerous dams with potential cascade failure potential, where one dam failure can lead to subsequent downstream dam failures compounding the damages caused. There are several of these dam chains in town with the upstream dam being in Fair to Poor Condition.

APPROACHES AND LIMITATIONS

The Town of Holden is currently in an ad hoc/emerging resilience maturity model as it pertains to High Hazard Potential Dams[12]: The risks that these dams pose are well understood, however the ability to mitigate from and respond this hampered by a number of factors. There are 3 major limitations identified during the planning process: coordination with dam owners, complex dam ownership structures, and a lack of enforcement capability for local stakeholders.

Limitation 1 – Coordination with Dam Owners and Stakeholders

The first major hurdle is a lack of coordination with dam owners and local emergency management. Local emergency management does reach out to dam owners and stakeholders on a semi regular basis to receive updates on EAPs, request compliance with codes and statutes, and to coordinate dam response activities. However, there is a lack of interest or ability on the dam owners and stakeholders part to perform these necessary planning activities, which leads to a reorientation on local emergency management's part to focus on other hazards that are seen as more pressing and more able to be addressed by local emergency management. More must be done to encourage coordination between dam owners and stakeholders and local emergency management, and we are seeing some improvements on this as part of the hazard mitigation plan update. Additionally, there is a renewed interest in dam safety in the region following the Leominster flooding event in September of 2023.

[12] FEMA National Resilience Guidance (August 2024), page 34.

Limitation 2 – Complex Dam Ownership Structures

When it comes to who is responsible for updating emergency action plans and maintaining regulatory compliance and structural stability of the dams within Holden, ownership structures is a problem for a number of reasons. For at least 2 of the HHPDs in Holden, the ownership is split among separate interested parties. Both of these dams are in fair to poor condition, and this complex ownership structure for these dams has led to controversy at one of the dams in particular, Eagle Lake Dam, with competing interests among the owners in conflict over the ultimate fate of the dam itself. Similarly, it is unclear who the owner or owners of Chaffin Pond Dam (MA00621) are, as indicated by the Emergency Action Plan[13]. Finally, for Current Meter Pond Dam (MA01640) the owners are entirely unknown, meaning that no one is maintaining the dam (beyond seasonal mowing and minor maintenance tasks performed by dam stakeholders) and preventing its further deterioration.

Limitation 3 – Lack of Regulatory Authority

Due to the sole power of regulatory authority residing with the Massachusetts Office of Dam Safety, the town's local efforts to increase compliance with regulations relies on the willingness of dam owners to comply with the town's requests. As is indicated in table 2 above this approach has many shortcomings. All but one of the HHPDs Dams listed is on reminder notice for completing an emergency action plan (not including the low hazard dams, where one is not required). More must be done on the part of the Office of Dam Safety to enforce compliance to ensure that the dams are being maintained and that emergency action plans are in place and kept up to date.

Should these limitations be addressed the town would be able to take a more proactive approach to dam safety.

SECTION 4 MITIGATION STRATEGIES

Section 4 helps meet the following FEMA local mitigation plan requirements:

- *HHPD3-a: Address a reduction in vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies. The plan does not need to include a goal specific to HHPDs alone.*
- *HHPD3-b: Link proposed actions to reducing long-term vulnerabilities consistent with the goals*
- *HHPD4-a: Describe a range of specific actions, such as:*
    - *Rehabilitating/removing dams.*
    - *Adopting and enforcing land use ordinances in inundation zones.*
    - *Elevating structures in inundation zones.*
    - *Adding flood protection, such as berms, floodwalls or floodproofing, in inundation zones.*
- *HHPD4-b: Describe the criteria used for prioritizing actions related to HHPDs.*
- *HHPD4-c: Identify the position, office, department or agency responsible for implementing and administering the action related to mitigating hazards to or from HHPDs.*

This section will address the reduction in vulnerabilities from HHPD by establishing a Mitigation overall goal, reference specific mitigation actions the town intends to take to address HHPDs to reduce vulnerabilities, and describe how these actions will be prioritized:

[13] Emergency Action Plan for Chaffin Pond Dam, (2018)

GOAL FOR MITIGATING HHPD

The goal for the Town of Holden is as follows:

Reduce the potential impacts of high hazard potential dams on the lives, property and safety of residents of Holden and those down-stream through planning and infrastructural mitigation.

The strategies that follow are in alignment with this goal as identified by Holden's Emergency Management Department.

MITIGATION STRATEGIES

This section of the appendix can be found in the main body of the plan, and is reproduced here to address specifically high and significant hazard dams:

- Determine ownership of Old Grist Mill Pond Dam. Conduct Inspections and Evaluations of Old Grist Mill Pond Dam, following confirmation of town's ownership of the Dam. Carry out recommended repairs and improvements of structural components of the dams. Seek HHPD grant funding to address dam deficiencies in Town
- Determine ownership of Current Meter Pond Dam. Ensure dam owner completes DAM EAP and performs necessary maintenance of Dam as indicated in the inspection report.
- Reconstruct Causeway on Causeway Street following evaluation of nature-based solutions and improvements at that location
- Replace culvert at stand pond for Eagle Lake.
- Coordinate with Dam owners (Such as the City of Worcester) around High Hazard Dam Planning and Hazard Modeling
- Provide Education about dam safety and dam personal preparedness.
- Enforce Dam Safety Rules and regulations in coordination with the Office of Dam Safety to ensure that Inspections and Evaluation reports for privately owned dams in town are being created and followed through with recommended action items for structural improvements. Seek grant funding to address the deficiencies in emergency action planning for hazardous dams.

Further details on mitigating dam failures of high hazard potential dams can be found in the main body of the plan.

MITIGATION PRIORITIZATION

The town intends on prioritizing high hazard potential dam mitigation strategies during the normal course of hazard mitigation plan monitoring and implementation as described in section 8 of the plan. During this process the town will stand up an emergency management planning committee comprised similarly to the local hazard mitigation planning committee if possible. The emergency management planning committee will meet on an annual basis or as needed based on disaster events. These meetings will address all hazards in the plan, and specifically in relation to HHPDs they will meet to establish consensus of the highest potential impacts from dam failure and determining what mitigation actions can be taken to address those impacts. Following that HHPD mitigation actions will be tracked and monitored just like the other natural hazard mitigations presented in this plan.

SECTION 5 FUNDING OPPORTUNITIES

Outside of town meeting apportionment and other local funding sources that could be used, a complete list of funding sources exclusively for High and Significant Hazard Potential Dams is Included below. This takes selections from section 8.

FUNDING SOURCE MATRIX

Program	Type of Assistance	Availability	Managing Agency	Funding Source
National Flood Insurance Program (NFIP)	Pre-disaster insurance	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner, FEMA
Community Rating System (CRS) (Part of the NFIP)	Flood insurance discounts	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner
Hazard Mitigation Grant Program (HMGP)	Post-disaster cost-share grants	Post disaster program	MEMA	75% FEMA / 25% non- federal
Building Resilient Infrastructure and Communities (BRIC)	National, competitive cost-share grant program for projects & planning	Annual, pre-disaster mitigation program	MEMA	75% FEMA / 25% non- federal
Flood Mitigation Assistance (FMA) Program	Cost share grants for pre-disaster planning & projects	Annual pre-disaster grant program	MEMA	75% FEMA / 25% non- federal
Public Assistance	Post-disaster aid to state & local governments	Post Disaster	MEMA	FEMA, plus a non-federal share
Small Business Administration (SBA) Mitigation Loans	Pre- & post-disaster loans to qualified applicants	Ongoing	MEMA	Small Business Administration
Emergency Management Performance Grant (EMPG)	Pre- & post-disaster management and implementation grants	Annual	MEMA	50% FEMA / 50% non-federal match
National Dam Safety Program (State Assistance Grant Program) (NDSP)	Funding to improve dam safety & state dam safety programs	Annual	FEMA	FEMA, Bipartisan Infrastructure Law

Rehabilitation of High Hazard Potential Dam Program (State Dam Safety Divisions) (HHPD)	Cost-share funding to plan and rehabilitate high hazard potential dams	Annual	FEMA	65% FEMA / 35% non-federal
Army Corp of Engineers Planning Assistance	Water supply, conservation, wetlands, & dam safety funding	Any time (pre & post disaster)	U.S. Army Corps of Engineers	50% Federal / 50% non-federal
National Culvert Removal, Replacement, & Restoration Grant (NCRRRG)	Competitive grant funding to replace, remove, and repair culverts or weirs	Annual	US DOT	Varies
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT)	Discretionary program which includes Competitive Resilience Improvement Grants and planning grants	Annual	US DOT	Varies (generally, up to 80% federal share)
Dam and Seawall Repair or Removal Program	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding
Drinking Water Supply Protection Grant (DWSP)	Competitive grants for protection of drinking water supplies	Annual	DCS	State funding
Hazard Mitigation Grant Program (State) (HMGP)	Sub-grant programs for the Hazard Mitigation Grant Program	Annual	MEMA	State funding

Special appropriations and legislative earmarks	Varies	Infrequent, after natural disasters or legislature vote	Massachusetts General Legislature	State funding
District Local Technical Assistance (DLTA)	Funding to support planning and technical assistance for housing, economic growth, and regional projects	Varies, generally annually	Massachusetts General Legislature, CMRPC	State funding
Local Planning Assistance (LPA)	Planning and technical assistance	Annual	CMRPC	Planning assistance hours

Details on these funding sources can be found in section 8.4 of the plan.