Tighe&Bond
Engineers | Environmental Specialists

COMMUNITY RESILENCE BUILDING WORKSHOPS- SUMMARY OF FINDINGS

TOWN OF BILLERICA
MUNICIPAL VULNERABILITY PREPAREDNESS (MVP) PROGRAM

Source: *https://www.town.billerica.ma.us/*

SUBMITTED TO

Town of Billerica

JUNE 30, 2020

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Section 1
Community Resilience Building Workshops

1.1 Overview

The Town of Billerica, like other communities in the Commonwealth of Massachusetts, is already feeling the impacts of climate change. In particular, the community has experienced severe weather related to inland flooding and extreme winter weather events. Billerica has experienced 20 natural hazard incidents that triggered federal or state disaster declarations since 1991. Most events involved severe storms and flooding, most recently Winter Storms Skyler, Riley, and Juno as well as "Snowtober". These extreme weather events have tested Billerica's ability to prepare for and respond to emergencies.

FIGURE 1: Significant Flooding in Billerica
(Billerica Minuteman)

In 2017, the Commonwealth of Massachusetts inaugurated the Municipal Vulnerability Preparedness (MVP)[1] program to assist municipalities in planning for and implementing strategies to adapt to predicted changes in our warming climate. The Executive Office of Energy and Environmental Affairs (EEA) oversees and implements the MVP program. Funds are awarded to municipalities under two categories of work: planning grants and action grants.

To prepare for climate resiliency and begin to consider adaptation strategies, the Town was awarded a planning grant to complete the MVP planning process. This summary describes the planning process and findings suggested by the community for building a more resilient Billerica.

1.1.1 How does the MVP Planning Process Augment the HMP?

The Federal Disaster Mitigation Act, adopted in 2000, requires that after November 1, 2004, all municipalities that wish to continue to be eligible to receive Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant funding for hazard mitigation activities adopt a local Hazard Mitigation Plan (HMP)[2] and update the plan every 5-years. Note that this planning requirement does not affect federally authorized disaster assistance funding which is exempt from the HMP requirement.

Currently, Billerica is included in the "Hazard Mitigation Plan for the Northern Middlesex Region", which was approved by FEMA in August 2015. This plan covers Billerica, Chelmsford, Dracut, Dunstable, Lowell, Pepperell, Tewksbury, Tyngsborough, and

[1] More information on the MVP Program is available at: https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program
[2] More information on HMP is available at: https://www.fema.gov/hazard-mitigation-planning

Westford and was prepared under the overall direction of the Northern Middlesex Council of Governments (NMCOG)[3]. This plan will expire in August 2020.

The MVP effort supplements the HMP process by providing a statewide and major basin-specific climate change data to use in the natural hazard risk assessment and a consistent methodology for public engagement through the Community Resilience Building (CRB) process. Figure 2 demonstrates the overlap between the MVP and HMP development.

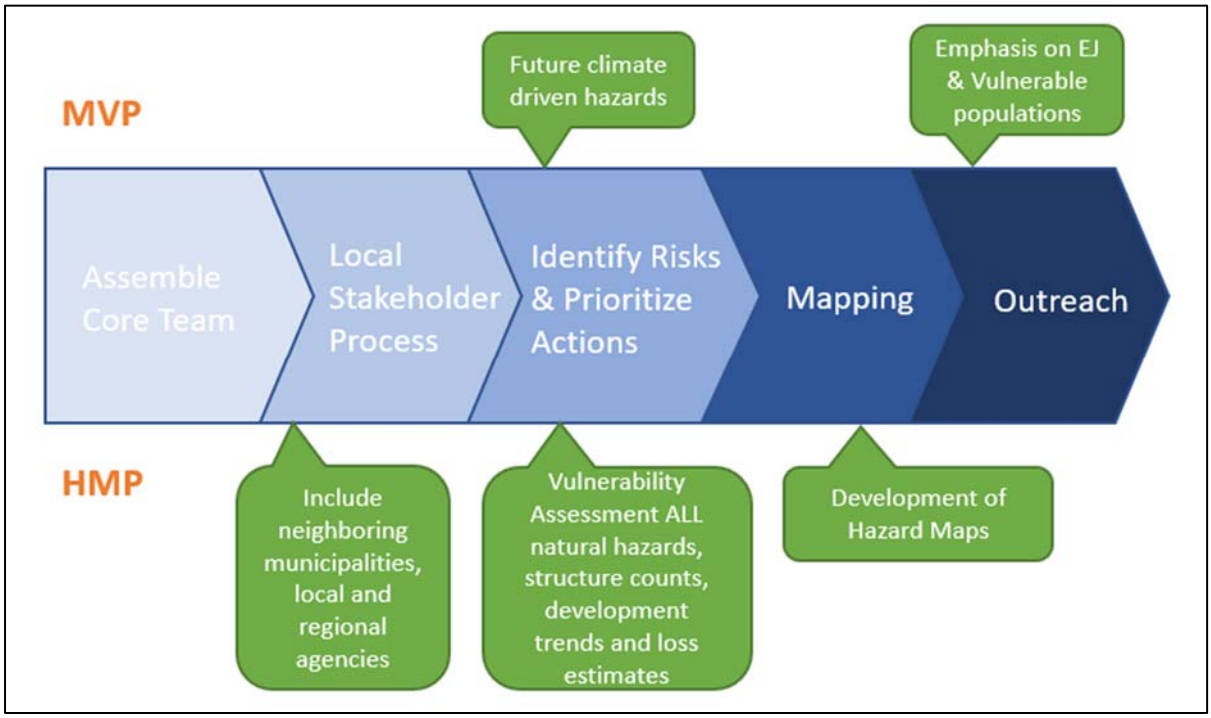


FIGURE 2: Overlap between MVP and HMP Development

1.1.2 Overview of the Community Resilience Building (CRB) Process

The CRB methodology is an "anywhere at any scale" format that draws on stakeholders' wealth of information and experiences to foster a collaborative dialogue about the strengths and vulnerabilities within a community, identify potential resiliency actions, and advance the education, planning, and ultimately implementation of priority actions. Figure 3 provides an overview of this process from the CRB Workshop Guide available online at: https://www.communityresiliencebuilding.com/

During the workshops, participants interact at both small and large group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions. The workshop's central objectives are to:

- Define the top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities of the Community;

[3] More information on NMCOG is available at: https://www.nmcog.org/

- Develop prioritized actions for the Community; and
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

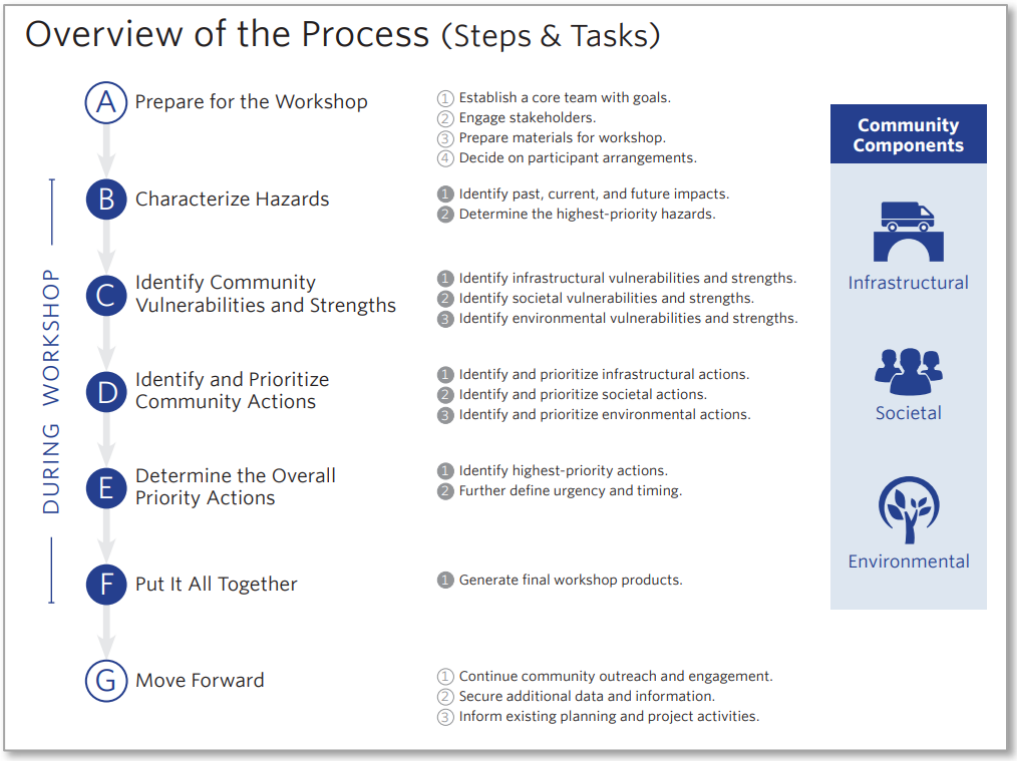


FIGURE 3: Overview of the CRB Process

1.2 Billerica's CRB Planning Activities

Rob Anderson, Community Development, served as the Local Project Manager for undertaking the integrated MVP and HMP planning process. The Town partnered with Tighe & Bond, a state-certified MVP Provider, to complete the town-specific HMP Update and undertake the CRB process including holding the CRB workshops.

To complete the first step in the CRB Process, Core Team members for the Town of Billerica MVP were identified from multiple departments, boards, and commissions. The Core Team is listed Table 1.

The role of the Core Team was to:

- Identify and engage community stakeholders to participate in the CRB workshops and the listening session;
- Review workshop materials and attend workshop session;
- Review the summary of findings; and
- Attend the final listening session.

TABLE 1: Core Team Members

Name	Title / Department / Affiliation
Abdul Alkhatib	Director of Public Works
Bill Laurendeau	Emergency Management Director
Clancy Main	Town Manager's Office
Daniel C. Rosa	Chief of Police
Ed Tierney	Highway Superintendent
Heather Chew	Assistant Town Engineer
Isabel Tourkantonis	Conservation Director
Jeff Kalmes	Wastewater Superintendent
Kelley Conway	Town Engineer
Kristel Bennet	Health Director
Rob Anderson	Community Development
Robert Cole	Fire Chief
Tom Ferraro	Deputy Fire Chief

The following provides additional detail on the overcall CRB planning process undertaken by the Town of Billerica to obtain MVP Community Designation.

1.2.1 Core Team Meetings

The MVP kickoff meeting, held on **February 10, 2020**, was coordinated to involve the Core Team at an early stage in the planning process. At this meeting, Tighe & Bond presented an overview of EEA's MVP Program and Goals, reviewed the scope, schedule, and budget, discussed public involvement and outreach, and reviewed the CRB process. Documentation is provided in Appendix A.

Due to COVID-19 and the need to accommodate social distancing and stay-at-home advisories that went into effect on March 13, additional Core Team input was completed via email. The Core team provided review on natural hazards, recommended stakeholders to invite to the workshop and identified stakeholders to interview to provide more detail on Community assets and reviewed workshop materials.

1.2.2 COVID-19 Alternate Public Engagement Strategy

Billerica worked with their MVP Provider, Tighe & Bond, to develop a virtual engagement process for the CRB workshops and public listening session following the recommendations made by the EEA MVP staff.

1. **Provide an online space for MVP materials**: A municipal-specific MVP website was designed by Tighe & Bond to provide all necessary materials for completing the MVP process. Reference material including the Massachusetts State Hazard Mitigation and Climate Action Plan, ResilientMA.org, the MVP Workshop Guide, and the municipality's Hazard Mitigation Plan were available for public access on this website. Recorded CRB Workshop Webinars, survey results, and the draft and final MVP Summary of Findings Report were also posted on the website.

2. **Survey to identify strengths and vulnerabilities**: Tighe & Bond used Survey Monkey to create and distribute a survey to members of the Core Team and identified stakeholders. The survey questionnaire results were used to develop an initial list of strengths and vulnerabilities in the community. The survey was distributed via email and linked to the MVP website.

3. **Distribute recorded presentation on background information**: Tighe & Bond developed a pre-workshop video including information on climate change and the MVP process. The short video was posted on the MVP website for viewing or downloads. Stakeholders were encouraged to view the introductory video prior to attending the Virtual CRB Workshop Webinars.

4. **Distribute virtual CRB Workshop webinar materials**: Materials necessary to participate in the workshop were distributed via email, posted on the MVP website, or sent by regular mail if requested.

5. **Hold Webinars to meet the CRB Workshop requirement**: Tighe & Bond planned to host four virtual CRB Workshop Webinars featuring each one of the Community Asset Categories: infrastructural, societal, natural environment, and the economy. During each workshop, attendees brainstormed mitigation actions for specific community assets that addressed top priority hazards.

6. **Prioritization Polling**: After the completion of the virtual CRB Workshop webinars, Tighe & Bond developed and distributed a Survey Monkey poll to the Core Team and stakeholders. This poll included a list of mitigation actions developed during the webinars. Individuals were asked to rank mitigation actions. This developed a draft prioritization.

7. **Distribute Listening Session materials**: Tighe & Bond distributed listening session materials to Core Team members and stakeholders electronically or through mailings if requested. Information about the Listening Session and directions to participate were publicly posted.

8. **Hold Listening Session:** Tighe & Bond and the Town hosted a live, one-hour Listening Session to present the draft MVP Summary of Findings Report and allow time for a Question & Answer session for community input. The Final Draft MVP Summary of Findings Report was available on the MVP website for a public comment period.

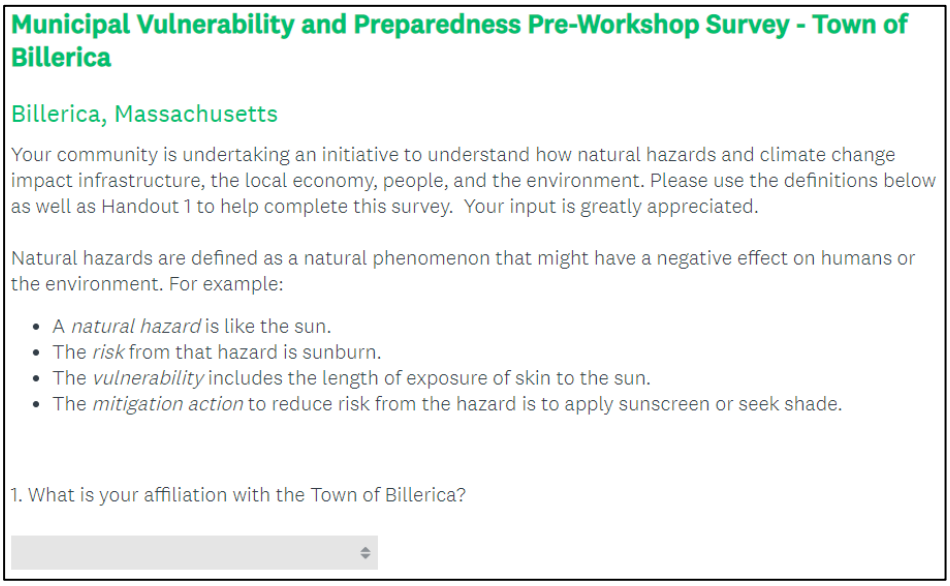
9. **MVP Website:** Tighe & Bond posted the recorded Listening Session and Final Draft MVP Summary of Findings Report on the MVP website.

A memorandum documenting the proposed alternative public engagement strategy is included in Appendix B.

1.2.3 Stakeholder Engagement and Pre-Workshop Survey

Community stakeholders included municipal staff not already a member of the Core Team, elected and appointed officials in Billerica, municipal staff and representatives from abutting communities, environmental non-profits, regional transit authorities, owners and managers of local businesses, and the residents involved in local planning and politics. The complete stakeholder list is provided in Appendix C.

Pre-workshop stakeholder engagement materials were developed including maps of community assets and hazard areas and an introductory video about the MVP program and community climate change impacts. A pre-workshop survey was created to get input from stakeholders regarding perception of natural hazard risk, future impacts due to climate change, and important community assets in each of the four sectors.



Municipal Vulnerability and Preparedness Pre-Workshop Survey - Town of Billerica

Billerica, Massachusetts

Your community is undertaking an initiative to understand how natural hazards and climate change impact infrastructure, the local economy, people, and the environment. Please use the definitions below as well as Handout 1 to help complete this survey. Your input is greatly appreciated.

Natural hazards are defined as a natural phenomenon that might have a negative effect on humans or the environment. For example:

- A *natural hazard* is like the sun.
- The *risk* from that hazard is sunburn.
- The *vulnerability* includes the length of exposure of skin to the sun.
- The *mitigation action* to reduce risk from the hazard is to apply sunscreen or seek shade.

1. What is your affiliation with the Town of Billerica?

FIGURE 4: Pre-Workshop Survey via SurveyMonkey

Billerica's MVP local Project Manager, Rob Anderson emailed invitations to 113 stakeholders to participate in the MVP CRB workshop process. The email included a link to the MVP website, instructions on how to take the survey, access pre-workshop materials and links to sign up for the four workshops.

1.2.4 Community Resilience Building Workshop

The four workshops focusing on society, infrastructure, economy and the environment were held over a four-week period from May 13th through June 3rd, 2020.

Each workshop followed a similar format with an introduction by Community Development Director, Rob Anderson, an overview of the MVP planning process, discussion of top natural hazards impacting Billerica including future climate change impacts, followed by a discussion of the featured community assets and survey results. The working sessions with stakeholders included an initial session to dive further into specific strengths and vulnerabilities of the community assets and a second session to develop mitigation strategies that addressed the top identified natural hazards.

The virtual workshops used the Zoom platform, which enabled a production team to provide live video and audio, present slides and complete the CRB worksheets based on input from stakeholders. Participants in the workshop provided comment verbally and through the Zoom chat function.

As each workshop was completed, a recording of the workshop, documented chat and a draft of the CRB matrix was uploaded to the website. The website address is: http://services.tighebond.com/mvp/billerica

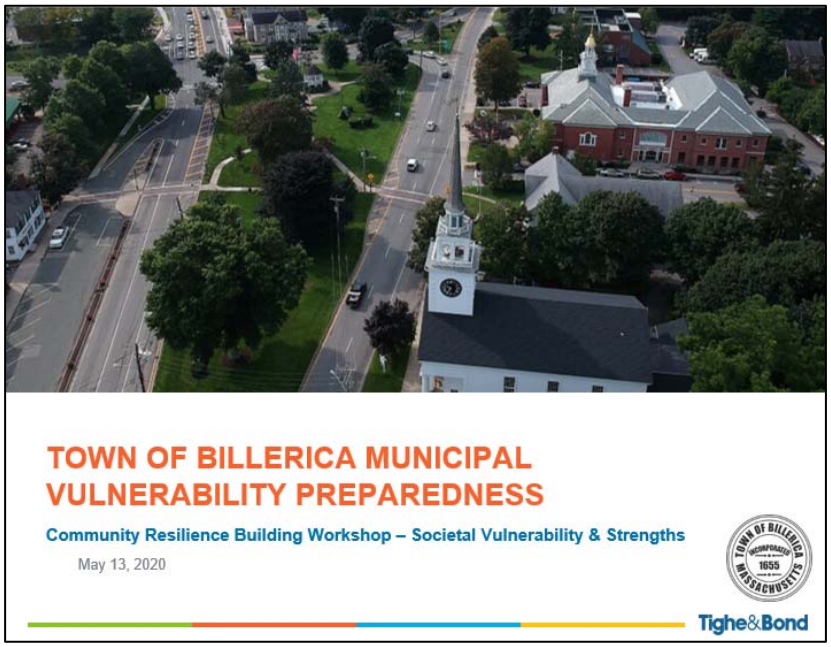


FIGURE 5: Presentation for Billerica's Virtual Workshop #1

Appendix D contains the MVP website page, the SurveyMonkey Pre-Webinar Survey, and supplemental workshop materials including PowerPoint Presentations. Community Asset List and Maps are included in Appendix E. The completed CRB matrix is included in Appendix H.

1.2.5 Public Meeting

A public meeting to support the parallel update of the Local Hazard Mitigation Plan was held on May 27, 2020, at 6:00 PM as part of a regularly scheduled public noticed Conservation Commission Meeting. The Agenda and Presentation are included in Appendix G.

1.2.6 Listening Session

A listening session to present the final report and review the high priority actions identified through the CRB workshops was held remotely on June 29, 2020 via a Zoom Event due to the COVID-19 pandemic. Town Staff led the session with support from Tighe & Bond. 21 residents were in attendance.

Town staff facilitated discussion including resident input on each of the mitigation action categories. All feedback from the Listening Session was incorporated into the final matrix and findings report.

The presentation for the listening session and meeting notes are provided in Appendix G.

Section 2
Top Hazards and Vulnerable Areas

This section discusses Steps B and C of the CRB Process to characterize hazards and identify community vulnerabilities and strengths (a.k.a. community assets).

2.1 Natural Hazard Risk

2.1.1 State Identified Hazards

The 2018 Massachusetts Hazard Mitigation and Climate Adaptation Plan (SHMCAP)[4] provides an in-depth overview of natural hazards in Massachusetts. The State Plan identifies 14 natural hazards that have impacted or historically occurred in communities within the Commonwealth of Massachusetts. These hazards are as follows:

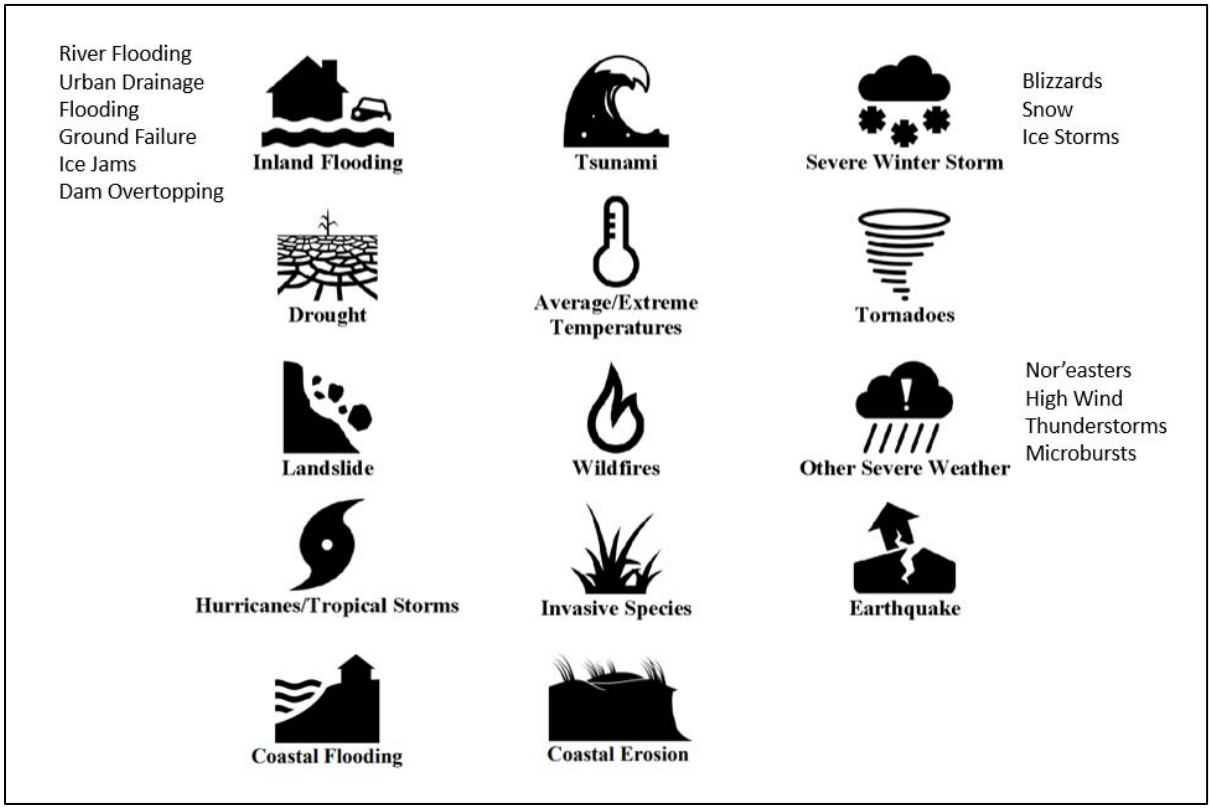


FIGURE 6: Hazards Identified in the SHMCAP

[4] https://www.mass.gov/files/documents/2018/10/26/SHMCAP-September2018-Full-Plan-web.pdf

2.1.2 Hazards that Apply to Billerica

The SHMCAP includes coastal flooding, coastal erosion, and tsunamis, however, because Billerica is not a coastal community, these hazards are not applicable and therefore are not further discussed or evaluated in this report.

The Core Team reviewed the remaining natural hazards identified in the SHMCAP and identified natural hazards that have impacted Billerica in the past or could impact Billerica in the future. The hazards selection for Billerica was made using local expertise from the Planning Team, information from the 2015 Regional Hazard Mitigation Plan, the SHMCAP and other sources. All of the natural hazards presented in the SHMCAP except those applicable to coastal communities were included in the ranking process.

The Core Team reviewed each natural hazard and analyzed the history of occurrence in Town, hazard probability, hazard frequency, geographic extent, and severity of impact. Each of these categories were ranked based off of the Hazard Profile Definitions, displayed in Table 1 and taken from the 2018 SHMCAP.

TABLE 1: Hazard Profile Definitions (2018 SHMCAP)

Points	Rank	Description
Hazard Probability (Possible occurrence in the future)		
1	Unlikely	Less than a 1% probability over the next 100 years
2	Possible	1-10% probability in the next year or at least one chance in the next 100 years
3	Likely	10-100% probability in the next year or at least one chance in the next 10 years
4	Highly Likely	Near 100% probability in the next year
Hazard Frequency		
0	Very Low	Events that occur less frequently than once in 1,000 years (less than 0.1% per year)
1	Low	Events that occur from once in 100 years to once in 1,000 years (0.1% - 1% per year).
2	Medium	Events that occur from once in 10 years to once in 100 years (1% - 10% per year).
3	High	Events that occur more frequently than once in 10 years (greater than 10% per year).
Geographical Extent (Area Impacted by a Given Natural Hazard)		
1	Small	Less than 10% of the Town affected
2	Medium	10-50% of the Town affected
3	Large	More than 50% of the Town affected
Severity of Impact from Hazard		
1	Minor	Limited and scattered property damage; no damage to public infrastructure (roads, bridges, trains, airports, public parks, etc.); contained geographic area (i.e. one or two communities); essential services (utilities, hospitals, schools, etc.) not interrupted; no injuries or fatalities.

Points	Rank	Description
2	Serious	Scattered major property damage (more than 10% destroyed); some minor infrastructure damage; wider geographic area (several communities); essential services briefly interrupted up to 1 day; some minor injuries.
3	Extensive	Consistent major property damage (more than 25%); major damage public infrastructure damage (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and possible fatalities.
4	Catastrophic	Property and public infrastructure destroyed (more than 50%); essential services stopped for 30 days or more, multiple injuries and fatalities.

Table 2 includes list of the hazards selected by Billerica for inclusion in this Summary of Findings Report and the HMP update. The HMP Update includes profiles for each natural hazard and documents additional detail about the history of occurrence and potential future occurrence.

TABLE 2: Relevant Natural Hazards for the Town of Billerica

Type of Natural Hazard	History of Occurrence in Billerica	Hazard Probability	Hazard Frequency	Geographic Extent	Severity of Impact	Hazard Risk Ranking
Inland Flooding	Yes	3	3	2	3	**11**
Severe Winter-Storm/Nor'easter	Yes	3	3	3	2	**11**
Drought	Yes	3	3	2	2	**10**
Extreme Temperature	Yes	3	3	3	1	**10**
Tropical Storms/ Hurricanes	Yes	3	2	3	2	**10**
Severe Weather-Strong Wind and High Precipitation	Yes	3	3	3	1	**10**
Invasive Species	Yes	4	3	2	1	**10**
Microburst	Yes	3	3	1	1	**8**
Earthquake	Yes	1	0	3	3	**7**
Wildfires	Yes	3	1	1	1	**6**
Tornadoes	No	1	0	1	3	**5**
Landslide	No	1	0	1	1	**3**

2.1.3 Top Hazards for Billerica from Risk Matrix

Based on the evaluation of natural hazard risk ranking, coupled with the history of occurrence, the geographic extent of impact, economic impact, and consideration for climate change, the Core Team determined the highest ranked natural hazards for Billerica consist of:

- Severe winter storms/Nor'easters
- Inland Flooding

2.1.4 Top Hazards for Billerica from Survey

The Pre-workshop survey included polling to identify the top natural hazards currently impacting Billerica, and hazards likely to impact Billerica in the future with climate change. The survey agreed with the findings of the Core Team for natural hazards that are currently impacting Billerica or have impacted the Town in the past, however future natural hazard concerns with climate change included flooding from dam overtopping/breach, invasive species and impacts due to hurricanes and tropical storms.

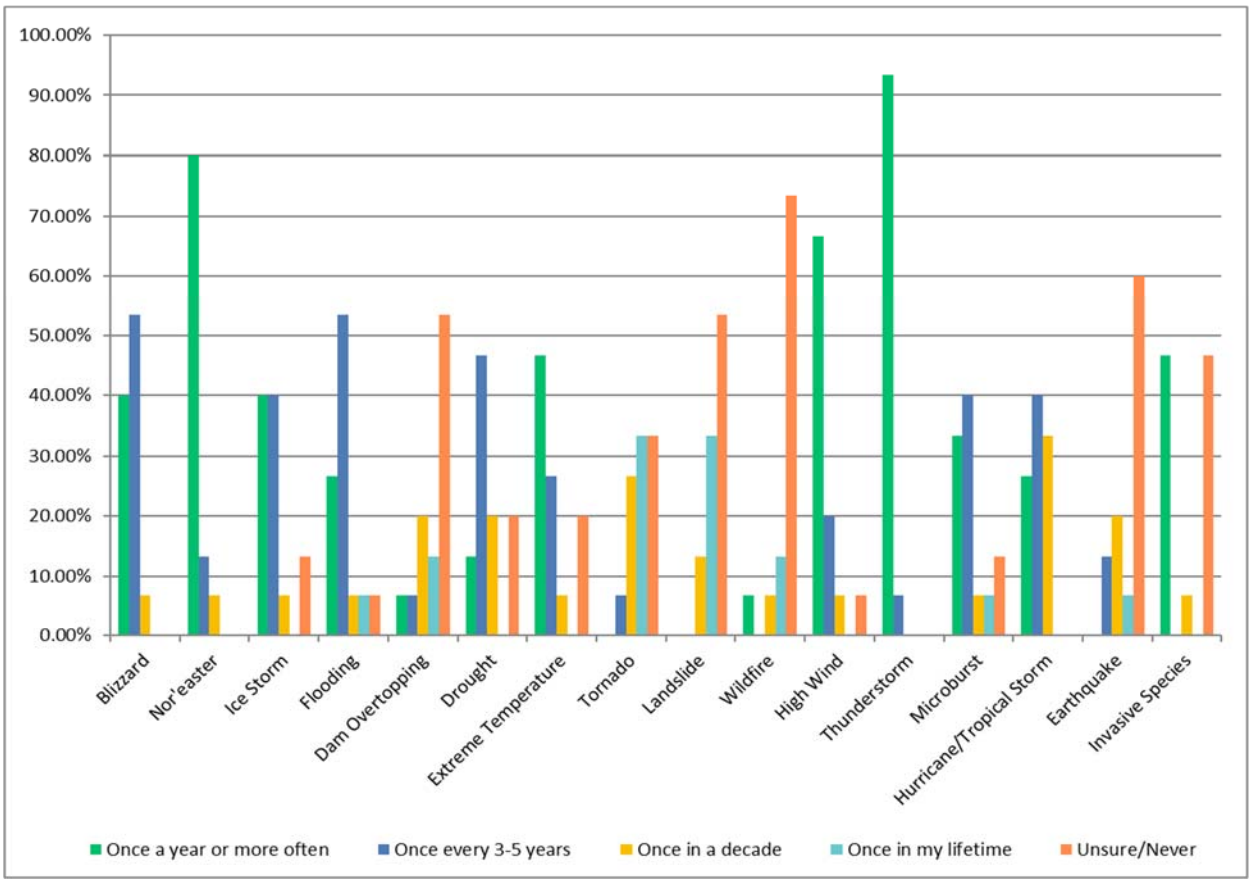


FIGURE 7: Billerica MVP Survey Results for Natural Hazards with Climate Change

The survey agreed with the findings of the Core Team for natural hazards that are currently impacting Billerica or have impacted the Town in the past, however future natural hazard concerns with climate change emphasized flooding and Nor'easters.

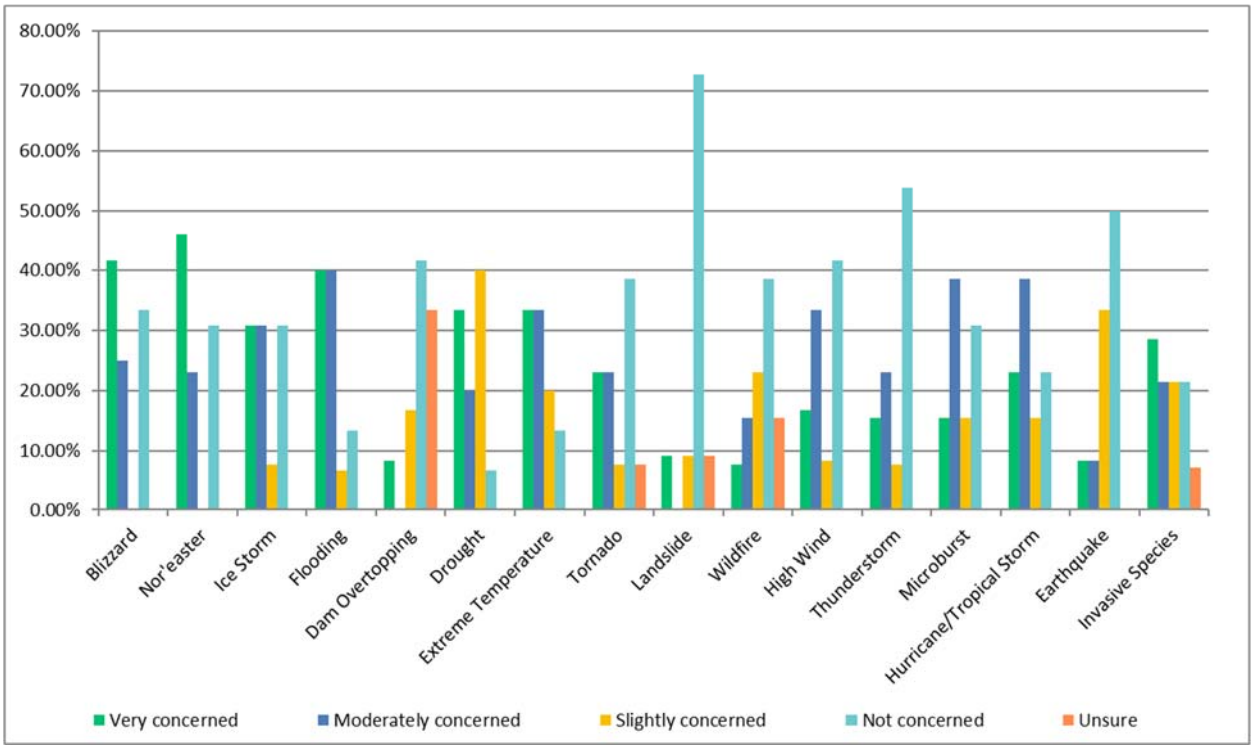


FIGURE 8: Survey Results Showing Concern over Future Natural Hazards with Climate Change

The CRB Workshop top natural hazards are based on combining the Core Team evaluation with the stakeholder survey results, resulting in a final list consisting of:

- Thunderstorms
- Nor'easters/Blizzards/Ice Storm
- Flooding
- High Wind
- Invasive Species
- Extreme Temperature/Drought

2.2 Areas of Concern

During the CRB Workshops, areas of concern were distributed under four categories of community assets, infrastructural, societal, environmental and the economy. A complete list of community assets by category is included in Appendix E. The completed CRB Risk Matrix in Appendix H provides additional information and discussion of vulnerabilities and strengths for specific community assets.

2.2.1 Infrastructural (Built Environment)

Critical facilities necessary for a community's response to and recovery from emergencies, infrastructure critical for public health and safety, economic viability, or for critical facilities to operate.

The workshop participants identified the following infrastructure with vulnerabilities or strengths within the community:

- Bridges
- Culverts
- Dams (Talbot Mills Dam (private), Millbrook Dam (private), and Winning Dam(town-owned))
- Drinking water wells, treatment, and distribution, including pumping stations
- Electric Grid/Power utilities
- Emergency Medical Services
- Fire Department
- Natural Gas
- Police
- Roadways
- Stormwater infrastructure
- Town Hall
- Wastewater collection, pumping, and treatment facilities

FIGURE 8: North Billerica Station

2.2.2 Societal (People/Vulnerable Populations)

Areas of greater population density, or population with unique vulnerabilities or less able to respond and recover during a disaster.

The workshop participants identified the following societal sectors with vulnerabilities or strengths within the community:

1. **Buildings or facilities that support community needs**
    - Assisted living complexes
    - Council on Aging
    - Elderly housing
    - Schools (e.g., shelter)
    - Warming centers

2. **Vulnerable populations**
    - Elderly
    - Environmental Justice population

- Housebound residents
- Low income communities
- Special needs population

3. **Support services**
    - Food pantry
    - Non-profits
    - Police
    - Fire
    - Medical Services

FIGURE 9: Parker Elementary School

2.2.3 Economic

Areas that provide protective function to reduce magnitude of hazard impact and increase resiliency. Areas of sensitive habitat that are vulnerable to hazard events, protection of areas that are important to community objectives, such as the protection of sensitive habitat, provide socio-economic benefits, etc.

The workshop participants identified the following economic sectors with vulnerabilities or strengths within the community:

1. **Essential Goods- Large Retail**
    - Grocery Stores
2. **Essential Services- Small Business**
    - Convenience stores
    - Hardware stores
    - Pharmacy
    - Shops at Billerica
    - Towne Plaza
    - Treble Cove Plaza

- Restaurants
- Thrift Stores

3. **Large Employers**
    - EMD Serono Research Center
    - Technology Part
    - Entegris
4. **Other Essential Services**
    - Transportation (e.g. MBTA commuter rail, MBTA bus, Lowell Regional Transit Authority bus)
    - Utilities

FIGURE 10: Treble Cove Plaza

2.2.4 Environmental (Natural Environment)

Major employers, primary economic sectors and commercial centers where loss or inoperability would have severe impact on the community and ability to recover from a disaster.

Areas that provide protective function to reduce magnitude of hazard impact and increase resiliency. Areas of sensitive habitat that are vulnerable to hazard events, protection of areas that are important to community objectives, such as the protection of sensitive habitat, provide socio-economic benefits, etc.

The workshop participants identified the following environmental sectors with vulnerabilities or strengths within the community:

1. **Hydrologic Resources**
    - Floodplain
    - Waterbodies and wetlands (e.g., Concord River, Shawsheen River)

2. **Open Space and Conservation Lands**
    - All conservation lands
    - Connected open space

3. **Parks and Recreational Areas**
    - Nuttings Lake
    - Yankee Doodle Bike Path

4. Environmental Health
    - Wetlands buffer zones
    - Tree canopy

FIGURE 11: Winning Pond

Section 3
Current Concerns and Challenges Presented by Hazards and Climate Change

3.1 Climate Change Concerns

The pre-workshop survey results indicate that Billerica is concerned about climate change impacts on natural hazard risk. As shown in Figure 12, one third of the survey respondents were very concerned with climate change, the majority were moderately concerned, and under 10% were not concerned.

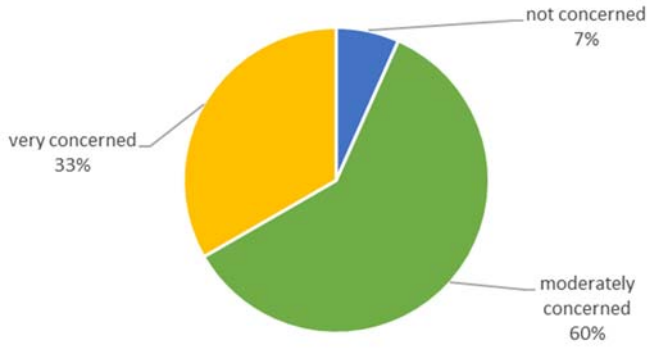


FIGURE 12: Billerica MVP Survey Results Climate Change Concerns

Natural hazards are anticipated to be amplified by climate change as discussed in Commonwealth's resilient MA Climate Change Clearinghouse website (http://www.resilientma.org/)

Changes in Precipitation: Changes in the amount, frequency, and timing of precipitation—including both rainfall and snowfall—are occurring across the globe as temperatures rise and other climate patterns shift in response.

Rising Temperatures: Average global temperatures have risen steadily in the last 50 years, and scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. The 9 warmest years on record all occurred in the last 20 years (2017, 2016, 2015, 2014, 2013, 2010, 2009, 2005, and 1998), according to the U.S. National Oceanographic and Atmospheric Administration (NOAA).

Extreme Weather: Climate change is expected to increase extreme weather events across the globe, as well as right here in Massachusetts. There is strong evidence that storms—from heavy downpours and blizzards to tropical cyclones and hurricanes—are becoming more intense and damaging and can lead to devastating impacts for residents across the state.

The following table reproduced from the SHMCAP shows how climate change interacts with natural hazards.

TABLE 3: Climate Change Interactions

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
 Changes in Precipitation	Inland Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Landslide	Rising Temperatures, Extreme Weather	
 Rising Temperatures	Average/Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 Extreme Weather	Hurricanes/Tropical Storms	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter	Rising Temperatures, Changes in Precipitation	
	Tornadoes	Rising Temperatures, Changes in Precipitation	
	Other Severe Weather (Including Strong Wind and Extreme Precipitation)	Rising Temperatures, Changes in Precipitation	
Non-Climate-Influenced Hazards	Earthquake	Not Applicable	There is no established correlation between climate change and this hazard

3.2 Massachusetts Climate Change Projections

Researchers from the Northeast Climate Adaptation Science Center (NECASC) at University of Massachusetts Amherst prepared projections for changes in temperature, precipitation, and sea level rise for the entire state, as well as for each major watershed in recognition that there are differences regionally. EEA is encouraging municipalities, industry, non-government organizations, state government and others to utilize this information as a standard, peer-reviewed set of climate change projections and is recommending these projections be included in MVP planning efforts.

The Town of Billerica is located within the Shawsheen Basin and the Sudbury-Assabet-Concord (SuAsCo) Basin. The eastern part of Town is within the Shawsheen Basin and the western part of Town is located within the SuAsCo Basin. There is a very small section of Town that is within the Ipswich Basin. The information specific to the Shawsheen Basin

and the SuAsCo Basin was excerpted from Massachusetts Climate change Projections, dated March 2018[5] and is included in Appendix F.

3.3 Specific Categories of Concerns and Challenges

Workshop attendees identified community assets that were either vulnerable to the impacts of climate change or strengths to the Town of Billerica. The completed matrix is included in Appendix H.

The vast majority of the assets were seen as a strength to the community while a number had specific vulnerabilities noted. Some examples of vulnerabilities are included below.

Societal Vulnerabilities

- Low income communities are at risk to natural hazards.
- The elderly population and disabled populations are at risk during natural hazards particularly during power outages or when travel is difficult for caretakers and food/goods access, and evacuation can be challenging.
- Outdoor workers are especially vulnerable to heat overexposure.
- Historic buildings, resources, and monuments are vulnerable to severe weather and are important to the Town's character.

Infrastructural Vulnerabilities

- Flooding can impede passage of some roadways.
- If certain overpasses were damaged, would not easily be able to get into an abutting community.
- Power losses have become more frequent and last many days, impacting both residents and businesses.
- The drinking water intake could be susceptible to water quality and stream conditions issues. Additionally, there is a lack of sustainable alternative water supply other than emergency connections to abutting communities.
- Certain areas, in the event of a natural hazard, could be cut off from adequate access to Emergency Medical Services (e.g., flooding, downed trees and power lines, etc.) or adequate access to natural gas.
- Some bridges in Town are aging and pose a risk for access and transportation.
- There are inadequate spillways at two dams that cannot handle severe flooding.

Economic Vulnerabilities

- Upon a power outage, multiple private businesses in Town may not be able to provide gas, food, or other necessary goods or services in the event of an emergency.

[5] https://www.mass.gov/files/ma-statewide-and-majorbasins-climate-projections-final.pdf

Environmental Vulnerabilities

- Storm drains that discharge to local waterbodies are vulnerable to contamination.
- There is a risk of development within the floodplain, green spaces, and wetland areas, in unprotected land.
- Nuttings Lake is at risk for drought, increased temperature, and runoff that can cause nutrient impairments and invasive species.
- Farmlands could be a potential nutrient source to waterbodies.

3.4 Current Strengths and Assets

Billerica officials and emergency response staff are actively engaged in preparing the community to respond to and adapt to current and future natural hazards. Collaboration, communication, and responsiveness of these staff is viewed as a strength in Billerica. In addition, Billerica has an active and engaged resident base that helps facilitate outreach and education and provide input on ongoing planning processes. Billerica's public works staff are viewed as a strength in terms of their operation and management of the water and wastewater systems and assistance with emergency response. The Town also completes thoughtful planning exercises, such as currently updating its Master Plan, and has begun the process of preparing a Town-specific HMP update.

Numerous community assets were identified as a strength to mitigate impacts of climate. Some examples are included below:

Societal Strengths

- Billerica has a food pantry. If there was a severe storm, flooding, drought, etc., the food pantry is a means to support low income and EJ communities.
- Assisted Living Complexes and Nursing Homes provide a safe housing for the elderly and other vulnerable populations, and density of people in one location make emergency response easier.
- Schools can be used as distribution points or as kitchen facilities for meal preparation.
- Marshall Middle School serves as a certified Red Cross shelter.
- Billerica's Council on Aging does not have an independent backup generator, but does have a generator hookup and can be used as a warming center.

Infrastructural Strengths

- Designated shelters can provide support to the community during a natural hazard.
- MBTA commuter rail provides alternative transportation to busses and cars.

Economic Strengths

- Gas stations, grocery stores, hardware stores, etc. provide necessary goods and services during a natural disaster.
- Major employers provide people with stable salaries and jobs, and many can work remotely during a natural hazard event.
- Hotels can serve as emergency alternative housing.

- Restaurants can provide de-centralized food sources during extreme storm events.
- Contractors can help with debris removal and repair to damaged buildings and infrastructure.
- Agricultural lands provide local food, open space, flood storage, and cooling.
- Thrift stores have affordable clothing.
- The HERC rental center has equipment that might be useful in the event of a cleanup from a natural disaster.

Environmental Strengths

- Rivers, streams, and waterbodies attract people from outside of Town and improves residents' health and recreational opportunities.
- Green Space/Parks provide open space for recreation.
- Floodplains allow space for flood water and some are permanently protected.
- Nutting Lake provides recreation during extreme heat.
- Tree canopy helps capture rain, reduce flooding, and reduce urban heat island concerns.

3.5 Hazard Mitigation Categories

According the FEMA's Local Multi-Hazard Mitigation Planning Guidance, hazard mitigation measures can generally be sorted into six categories:

1. **Prevention**: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built, and direct public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.

   Projects that were recommended for prevention included:

   - Identify who the EJ community includes and where they live
   - Provide sunscreen to Town employees
   - Implement a heat stress indicator to guide employees when they should or should not be outside.
   - Update list of residents on oxygen to know where they are in power outage
   - Ensure offsite backup storage and records at Town Hall
   - Establish a new Stormwater Division of DPW
   - Enterprise fund for stormwater management could provide additional funding dedicated to management
   - Prepare a clearing plan for sidewalks for access to grocery and pharmacy during winter events
   - Identify higher need facilities identified (e.g. health care and nursing homes) in the case of a power outage
   - Educate permitting boards to encourage developers to provide open space connectivity

- Complete inventory of needs for Open Space management
- Complete a Town-specific Conservation Plan/address conservation more directly in the next OSRP update
- Enhance the climate change discussion in the next update of the OSRP
- Consider changes to zoning - Billerica does not have open space zoning
- Revisit Billerica's bylaws to explore development options that provide environmental benefits
- Develop inventory of street trees and develop a management and protection plan
- Develop a tree maintenance program to minimize storm damage to power lines
- Continue to manage protection of farmlands through local code
- If properties within historic districts are under Federal flood program, require rebuild or updates to meet building code and protect against future climate change as much as possible.

2. **Property Protection**: Modification or removal of existing buildings or infrastructure to protect them from a hazard. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.

   Projects that were recommended for property protection included:

   - Elevate targeted roadways to provide access during flooding, but consider existing utilities, abutters, etc.
   - Continue acquiring land (for public ownership/maintenance) that has access to waterbodies, through CPA or other mechanisms.
   - Reduce the amount of impervious surface through education, town projects, and regulations

3. **Public Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and ways to mitigation them. Such actions include outreach projects, real estate disclosure requirements, hazard information centers, and school-age and adult education programs.

   Projects that were recommended for public education and awareness included:

   - Develop a plan for emergency response and education for seniors
   - Translate emergency education materials into different languages
   - Establish educational materials for care givers on how to handle dementia patients during severe natural hazard events
   - Provide education on protocols for evacuation during severe natural hazard events
   - Maintain public education about illegal dumping, referencing enforcement authority
   - Provide guidance to the public on how to maintain stormwater infrastructure on their property

- Establish an education process on natural hazard evacuation to private businesses
- Educate private landowners about benefits of reduction or avoiding impervious cover and maintaining natural spaces
- Educate public owners and/or municipal staff on wetland buffer zones, floodplains, vernal pools, and other conservation resource areas.
- Train volunteers on culvert inventory process to size culverts properly for replacement
- Provide recommendations to farmers for chemical uses
- Educate homeowners on the use of chemicals on their lawns, particularly in areas abutting wetlands and floodplain buffer zones
- Educate private property about value of maintaining tree canopy
- Pre-emergency education to families, medical services, etc. about available resources regarding seniors

4. **Natural Resource Protection and Green Infrastructure**: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include low impact development, sediment and erosion control, stream corridor restoration, watershed management, urban forest and vegetation management, and wetland restoration and preservation.

   Projects that were recommended for natural resource protection and green infrastructure included:

   - Coordinate efforts to reduce heat island effect (example: white pavement, roofs, impervious cover, green infrastructure), including in the next revision of the Master Plan
   - Promote plantings and other vegetation improvements that could improve air quality and runoff quality
   - Organize clean up days along public lands to improve environmental health in community
   - Implement floodplain restoration techniques
   - Encourage the replacement of lawn with native and drought resistant vegetation
   - Assess green infrastructure over grey infrastructure where suitable, for example, instead of a detention basin, could be rain garden, vegetated swale, which would look better and provide habitat
   - Control invasive vegetation on Town Property and participate in CISMA (cisma-suasco.org).
   - Manage invasive species at Nuttings Lake

5. **Structural Projects**: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.

   Projects that were recommended for structural projects included:

   - Perform culvert assessments to understand condition, capacity, and needed repairs or replacement, to couple with Town roadway projects
   - Schedule preventative culvert maintenance and inspection

- Evaluate options for water supply (e.g., wellfields near intake, maintain emergency connections with abutting water suppliers, etc.)
- Explore structures in the Concord River (such as the center pier from Historic Bridge) to see if the removal would influence future flood events
- Encourage MassDOT to update or replace bridge over the Shawsheen River on Route 3A (this causes flooding)
- Schedule preventative maintenance and inspection of stormwater infrastructure
- Maintain generator hookup at Billerica COA and begin to equip the site for a shelter/warming facility

6. **Emergency Services Protection**: Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure

   Projects that were recommended for emergency services protection included:

   - Maintain Marshall Middle School as a Red Cross shelter
   - Improve communication about locations of shelters/emergency facilities in proximity to EJ communities
   - Consider adding additional locations for cell phone charging and water distribution
   - Maintain current facilities as warming stations and maintain generator at Town Hall
   - Maintain multiple suppliers for items to keep necessary supplies and chemicals delivered to water treatment and wastewater plants in event of emergency
   - Maintain and enhance, as necessary, an inventory of fire station resources
   - Maintain inventory of redundant emergency supplies (e.g. keep list updated, routinely check for expired items, confirm stock)
   - Update supply list, check for expired items, ensure proper stock of materials, and have a test plan for designated shelters
   - Make arrangements with local clinics to have services available/needed in shelters
   - Coordinate with Fire/Police on emergency preparedness on private sites related to spill kits etc.

3.6 Top Recommendations to Improve Resilience for the Town of Billerica

All Mitigation Projects identified in the CRB workshops are a priority for the Town. The list prepared below is subject to change based on evolving conditions in the Town and will be updated annually as part of the annual reporting on the MVP program to EEA. Capacity of Town staff needs to be considered in implementation of all projects. Volunteers should be leveraged if at all feasible.

HIGHEST PRIORITY

- Complete inventory of needs to facilitate improved management of Open Space
- Complete a Town-specific Conservation Plan/address conservation more directly in the next OSRP update
- Enhance the climate change discussion in the next update of the OSRP
- Consider changes to zoning - Billerica does not have open space zoning
- Revisit Billerica's bylaws to explore development options that provide environmental benefits
- Explore strategies to protect current drinking water intake and area around intake in Concord River
- Continue acquiring land (for public ownership/maintenance) that has access to waterbodies, through CPA or other mechanisms
- Reduce the amount of impervious surface through education, town projects, and regulations
- Maintain public education about illegal dumping, referencing enforcement authority
- Educate private landowners about benefits of reduction or avoiding impervious cover and maintaining natural spaces
- Educate public owners and/or municipal staff on wetland buffer zones, floodplains, vernal pools, and other conservation resource areas
- Educate private property about value of maintaining tree canopy
- Educate homeowners on the use of chemicals on their lawns, particularly in areas abutting wetlands and floodplain buffer zones
- Coordinate efforts to reduce heat island effect (example: white pavement, roofs, impervious cover, green infrastructure)
- Encourage the replacement of lawn with native and drought resistant vegetation
- Perform culvert assessments to understand condition, capacity, and needed repairs or replacement, to couple with Town roadway projects
- Schedule preventative culvert maintenance and inspection
- Schedule preventative maintenance and inspection of stormwater infrastructure

MODERATE PRIORITY

- Maintain list of residents on oxygen to know where they are in power outage
- Enhance Town's electronic and backup records retention in accordance with state policies and guidance, as necessary and as feasible
- Enhance sidewalk clearing plan to optimize management of locations critical for transportation and goods and services
- Maintain list of higher need facilities (e.g. health care and nursing homes) in the case of a power outage
- Educate permitting boards to encourage developers to provide open space connectivity
- If properties within historic districts are under Federal flood program, require rebuild or updates to meet building code and protect against future climate change as much as possible
- Elevate targeted roadways to provide access during flooding, but consider existing utilities, abutters, etc.

- Develop a plan for emergency response and education for seniors
- Provide education on protocols for evacuation during severe natural hazard events
- Provide guidance to the public on how to maintain stormwater infrastructure on their property
- Train volunteers on culvert inventory process to size culverts properly for replacement
- Promote plantings and other vegetation improvements that could improve air quality and runoff quality
- Organize clean up days along public lands to improve environmental health in community
- Implement floodplain restoration techniques
- Assess green infrastructure over grey infrastructure where suitable, for example, instead of a detention basin, could be rain garden, vegetated swale, which would look better and provide habitat
- Manage invasive species at Nuttings Lake
- Re-establish wellfields near intake, maintain emergency connections with abutting water suppliers
- Maintain a generator hookup at Billerica COA and begin to equip the site for a shelter/warming facility
- Encourage MassDOT to update or replace bridge over the Shawsheen River on Route 3A (this causes flooding)
- Maintain Marshall Middle School as a Red Cross shelter
- Improve communication about locations of shelters/emergency facilities in proximity to EJ communities
- Maintain current facilities as warming stations and maintain generator at Town Hall.
- Maintain multiple suppliers for items to keep necessary supplies and chemicals delivered to water treatment and wastewater plants in event of emergency
- Maintain inventory of redundant emergency supplies (e.g. keep list updated, routinely check for expired items, and confirm stock)
- Make arrangements with local clinics to have services available/needed in shelters
- Coordinate with Fire/Police on emergency preparedness on private sites related to spill kits etc.

LOW PRIORITY

- Identify who the EJ community includes and where they live
- Provide sunscreen to Town employees
- Implement a heat stress indicator to guide employees when they should or should not be outside
- Establish a new Stormwater Division of DPW
- Enterprise fund for stormwater management could provide additional funding dedicated to management
- Develop inventory of street trees and develop a management, protection, and planting plan
- Develop a tree trimming program for trees located on Town properties, not already maintained by power utilities, to minimize storm damage to power lines

- Translate emergency education materials into different languages
- Establish educational materials for care givers on how to handle dementia patients during severe natural hazard events
- Establish an education process on natural hazard evacuation to private businesses
- Provide recommendations to farmers for chemical uses
- Control invasive vegetation on Town Property and participate in CISMA (cisma-suasco.org)
- Explore structures in the Concord River (such as the center pier from Historic Bridge) to see if the removal would influence future flood events
- Consider adding additional locations for cell phone charging and water distribution
- Maintain and enhance, as necessary, an inventory of fire station resources
- Update supply list, check for expired items, ensure proper stock of materials, and have a test plan for designated shelters

Section 4
Workshop Details

4.1 Workshop Participants

A list of those invited to participate in the online virtual workshops is included in Appendix C. The following provides a list of participants and their affiliations. Members of the workshop project team that had a role are also documented.

4.1.1 Workshop #1 Attendance (Society)

Workshop Host: Rob Anderson; Community Development; Workshop Facilitators: Gabrielle Belfit, MVP Certified Provider – Tighe & Bond; Workshop Presentation: Jennie Moonan – Tighe & Bond; Chat Moderator: Kristin Dippold – Tighe & Bond

TABLE 4 – Workshop #1: May 13, 2020 – 1:00 PM

Name	Affiliation
Rob Anderson	Community Development
Ed Reiner	Resident
Jeff Kalmes	Wastewater Superintendent
Blake Robertson	Planning Board Member
Erin Anable	Board of Appeals
Douglas Fogerty	Finance Committee
Shannon O'Brien	Cabot Corporation
Heather Chew	Assistant Town Engineer
Bill Laurendeau	Emergency Management Director
Derek Doyle	Engineering Department
Tom Ferraro	Deputy Fire Chief
Marlies Henderson	Conservation Commission
Alison Field-Juma	OARS Executive Director
Abdul Alkhatib	Director of Public Works
Mike Grady	Chairman
Betsy Gallagher	Conservation Commission
Bob Cole	Fire Chief
Beverly Woods	NMCOG Executive Director

4.1.2 Workshop #2 Attendance (Built Environment)

Workshop Host: Rob Anderson; Community Development; Workshop Facilitators: Gabrielle Belfit, MVP Certified Provider – Tighe & Bond; Workshop Presentation: Jennie Moonan – Tighe & Bond; Chat Moderator: Kristin Dippold – Tighe & Bond

TABLE 5 – Workshop #2: May 20, 2020 – 1:00 PM	
Name	**Affiliation**
Rob Anderson	Community Development
Mike Grady	Chairman
Emily Scerbo	Tighe & Bond
Daryle Hillsgrove	Entegris, Inc.
Eric Anable	Board of Appeals
Derek Doyle	Engineering Department
Heather Chew	Assistant Town Engineer
Ed Reiner	Resident
Blake Robertson	Planning Board Member
Dan Rosa	Chief of Police
Ed Tierney	Highway Superintendent
Marlies Henderson	Conservation Commission
Isabel Tourkantonis	Conservation Director

4.1.3 Workshop #3 Attendance (Economy)

Workshop Host: Rob Anderson; Community Development; Workshop Facilitators: Gabrielle Belfit, MVP Certified Provider – Tighe & Bond; Workshop Presentation: Jennie Moonan – Tighe & Bond; Chat Moderator: Kristin Dippold – Tighe & Bond

TABLE 6 – Workshop #3: May 27, 2020 – 1:00 PM	
Name	**Affiliation**
Rob Anderson	Community Development
Clancy Main	Management Analyst
Eric Anable	Board of Appeals
Tom Farraro	Deputy Fire Chief
George Lima	EMD Serono
Christa Collins	Sudbury Valley Trustees
Ed Reiner	Resident
Derek Doyle	Engineering Department
Marlies Henderson	Conservation Commission
Steve Robertson	Department of Public Works
Heather Chew	Assistant Town Engineer
Daryle Hillsgrove	Entegris, Inc.
Bill Laurendeau	Emergency Management Director
Blake Robertson	Planning Board Member

4.1.4 Workshop #4 Attendance (Natural Hazards)

Workshop Host: Rob Anderson; Community Development; Workshop Facilitators: Gabrielle Belfit, MVP Certified Provider – Tighe & Bond; Workshop Presentation: Jennie Moonan – Tighe & Bond; Chat Moderator: Kristin Dippold – Tighe & Bond

TABLE 7 – Workshop #4: June 3, 2020 – 1:00 PM

Name	**Affiliation**
Rob Anderson	Community Development
Eric Anable	Board of Appeals
Bill Laurendeau	Emergency Management Director
Marlies Henderson	Conservation Commission
Christa Collins	Sudbury Valley Trustees
Heather Chew	Assistant Town Engineer
Alison Field-Juma	OARS Executive Director
Steve Robertson	DPW Operations Supervisor
Daryle Hillsgrove	Entegris, Inc.
Emma Lord	River Stewardship Council
Michelle Rowden	MVP Program Regional Coordinator
Emily Scerbo	Tighe & Bond
Isabel Toukantonis	Conservation Director
Ed Reiner	Resident
Blake Robertson	Planning Board Member
George Lima	EMD Serono
Tony Fields	Bedford Planning Director

4.2 Acknowledgements

Funding for the CRB workshop was provided through a Massachusetts Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness Planning Grant during Fiscal Year 20.

Many thanks to Rob Anderson, Community Development for serving as the lead for the MVP Planning Process. A special thanks to all MVP Core Team members and everyone who participated in the CRB workshops as presenters, facilitators, scribes and stakeholders.

4.3 Report Citation

Tighe & Bond (2020). *Community Resilience Building Workshop Summary of Findings*, Town of Billerica, Massachusetts.

J:\B\B0874 Town of Billerica MA Stormwater\005 MVP Planning Grant\08 - MVP Report\02 - Billerica MVP Findings Report.docx

Tighe&Bond
Engineers | Environmental Specialists

APPENDIX A

Billerica MVP/HMP Core Team Kickoff Meeting Agenda

ATTENDEES: MVP/HMP CORE TEAM
DATE: Monday, Friday 10, 2020
TIME: 10:00 AM – 12:00 AM

10:00 AM **Welcome & Introductions**

10:05 AM **Presentation (Tighe & Bond)**
Background (purpose and scope)
MVP/HMP Grant Benefits
Community Resilience Building Process
Workshop Goals (one 8-hour or two 4-hour workshops)
Guidelines/Guidance
Roles & Responsibilities
Deliverables
Schedule (final products delivered to EEA by June 30, 2020)

10:30 AM **Discussion Item: Natural Hazard Risks**
Review Matrix

11:15 AM **Discussion Item: HMP Goals**
2015 Regional Plan Goals
New Goals

11:40 AM **Discussion Item: Community Asset**

11:50 AM **Next Steps**

12:00 PM **Conclude**

Town of Billerica, MA
MVP/HMP Planning Grant
Sign-in Sheet

Date: Monday February 10, 2020 **Time:** 10 AM to Noon

Location:

Attendees:

Name (please print)	Title/Department	Email
Heather Chew	DPW- Engineering	hchew@town.billerica.ma.us
ROB ANDERSON	COMMUNITY DEVELOPMENT	RANDERSON@TOWN.BILLERICA.MA.US
Kelley Conway	DPW-engineering	Kconway@town.billerica.ma.us
Don Rosa	Police	drosa@billericapolice.org
Emily Scerbo	Tighe & Bond	EJScerbo@tighebond.com
Wayne O'Loughlin	Hwy dept	
Bill Lauxendeau	EMD	blauxendeau@town.billerica.ma.us
Heather Tecca	MEMA	heather.tecca@mass.gov
TOM FERRARO	Fire Dept	TFERRARO@BILLERICAFIRE.COM
Kyle Grant	GIS Coordinator	kgrant@town.billerica.ma.us
Kristel Bennett	Director of Board of Health	kbennett@town.billerica.ma.us
Abdul Alkhatib	DPW	aalkhatib@town.billerica.ma.us
Jennie Moran	Tighe & Bond	

BILLERICA HAZARD MITITGATION AND MUNICIPAL VULNERABILITY PREPAREDNESS

Core Team Kickoff Meeting

February 10, 2020

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

INTRODUCTIONS

BACKGROUND

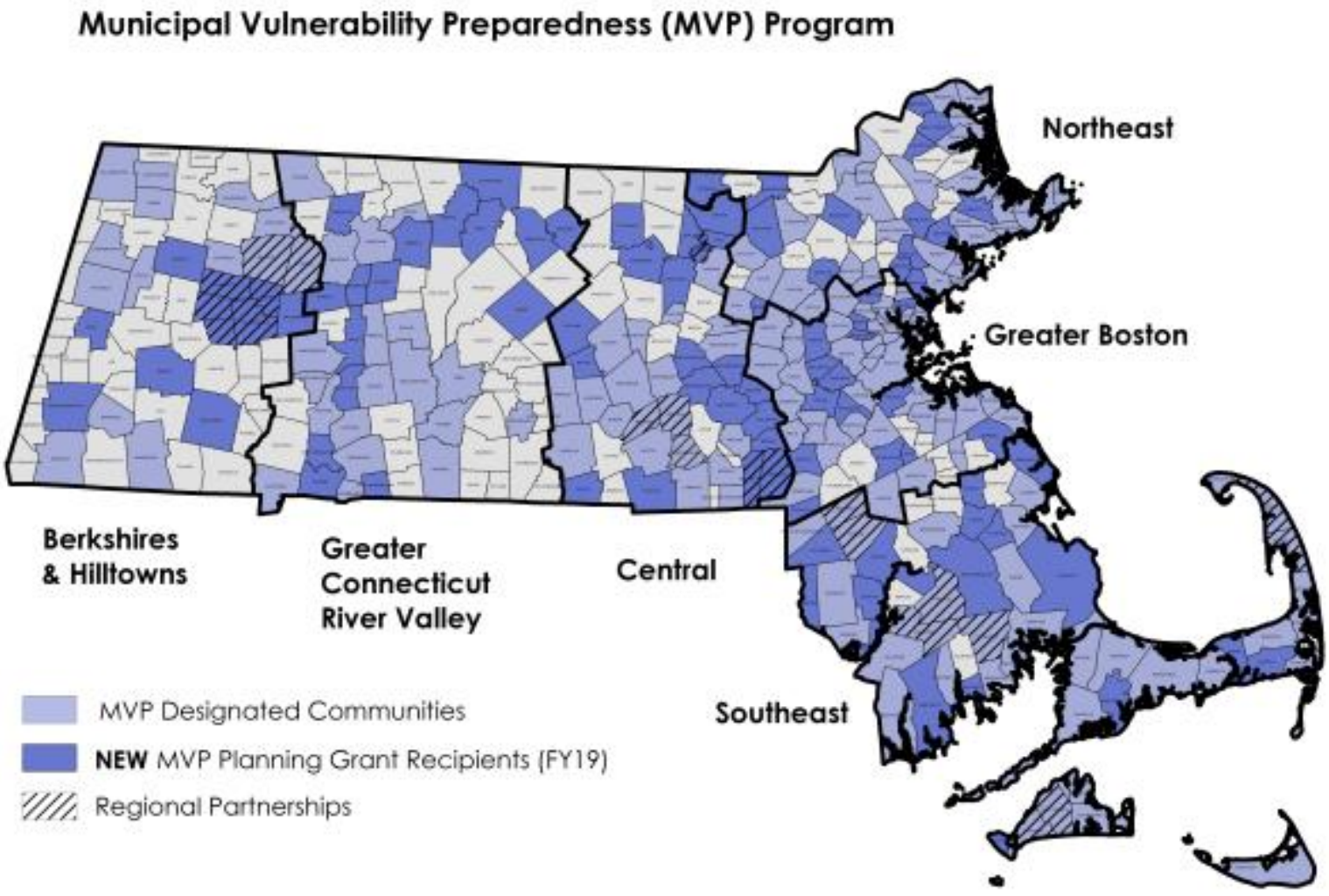
- Executive Order 569: An Integrated Climate Change Strategy for the Commonwealth

- Environmental Bond Bill: $2.4 billion - focus on climate change resiliency. Over $200 million for climate change. Bill codified EO569, including the MVP program

- Billerica was awarded $39K for **Municipal Vulnerability Preparedness (MVP)** Community Resilience Building (CRB) Workshop Process and to prepare a **draft Hazard Mitigation Plan (HMP) Update**

Tighe&Bond

BACKGROUND



Updated November 4, 2019

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TODAY'S AGENDA

1. Review MVP/HMP grant and CRB process and schedule
2. Discuss Roles and Responsibilities
3. Update Natural Hazard Risks
4. Review Workshop Goals
5. Next Steps

MVP/HMP GRANT AND WORKSHOP PROCESS GOALS

Build Resilience and Preparedness:

- Understand community assets and vulnerabilities
- Plan for more frequent and intense weather events
- Improve pre-event planning, response & recovery, and identify long-term mitigation actions

A prepared and resilient Billerica will be able to maintain functions, protect its residents, and be ready for future storm events and a changing climate

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

MVP/HMP GRANT AND CRB PROCESS

1. Establish Core Team
2. Complete MVP/HMP Evaluation/Assessment
   - Natural Hazard Risks
   - Community Assets
   - Multi-Hazard Vulnerability Assessment
   - Capabilities Assessment
   - Mitigation Strategies
   - Adaptation Projects for priority sites
3. Hold workshops
4. Public Meeting
5. Draft MVP Report
6. Hold Listening Session
7. Final MVP Report & Draft HMP Report

THERE IS AN OVERLAP WITH LOCAL PLANNING

- Comprehensive Emergency Management Plan
- Capital Planning
- Open Space and Recreation Plan
- Master Planning

Tighe&Bond

Community Resilience Building
WORKSHOP GUIDE

www.CommunityResilienceBuilding.org

resilient MA
Climate Change Clearinghouse for the Commonwealth
ResilientMA.org

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Copies available

Tighe&Bond

Overview of the Process (Steps & Tasks)

DURING WORKSHOP

A Prepare for the Workshop
1. Establish a core team with goals.
2. Engage stakeholders.
3. Prepare materials for workshop.
4. Decide on participant arrangements.

B Characterize Hazards
1. Identify past, current, and future impacts.
2. Determine the highest-priority hazards.

C Identify Community Vulnerabilities and Strengths
1. Identify infrastructural vulnerabilities and strengths.
2. Identify societal vulnerabilities and strengths.
3. Identify environmental vulnerabilities and strengths.

D Identify and Prioritize Community Actions
1. Identify and prioritize infrastructural actions.
2. Identify and prioritize societal actions.
3. Identify and prioritize environmental actions.

E Determine the Overall Priority Actions
1. Identify highest-priority actions.
2. Further define urgency and timing.

F Put It All Together
1. Generate final workshop products.

G Move Forward
1. Continue community outreach and engagement.
2. Secure additional data and information.
3. Inform existing planning and project activities.

Community Components

Infrastructural

Societal

Environmental

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MULTI-HAZARD MITIGATION PLAN GUIDANCE

- **Disaster Mitigation Act of 2000, 44 CRF Part 201.6**
- **Commonwealth of Massachusetts State Hazard Mitigation & Climate Adaptation Plan 2018**
- ***FEMA Local Mitigation Plan Review Guidance, October 2011***
- ***FEMA Local Mitigation Planning Handbook, March 2013***

1. Document the Planning Process
2. Document Methodologies Used
3. Involve Larger Community
4. Address FEMA concerns from 2015

FEMA

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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WHAT ARE THESE WORKSHOPS…?

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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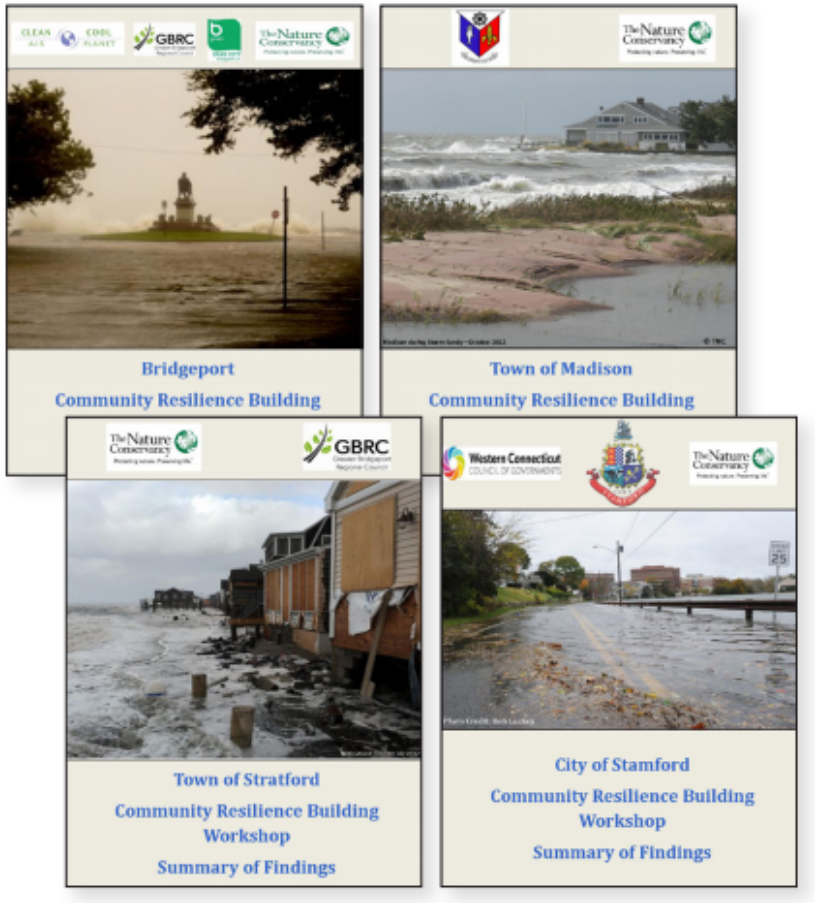
DELIVERABLES

MVP Report



Hazard Mitigation Plan

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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HOW DOES THIS PROCESS BENEFIT BILLERICA?

MVP Community Designation = Eligibility for MVP Action Grants

Once approved, HMP = Eligibility for FEMA Hazard Mitigation Grants

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

WHY ARE YOU HERE?

- Kickoff Meeting
- Two interim meetings to review / provide input on work products
- Attend public hearing
- Attend one MVP Workshop
- Review draft reports & provide comments
- Attend the final listening session

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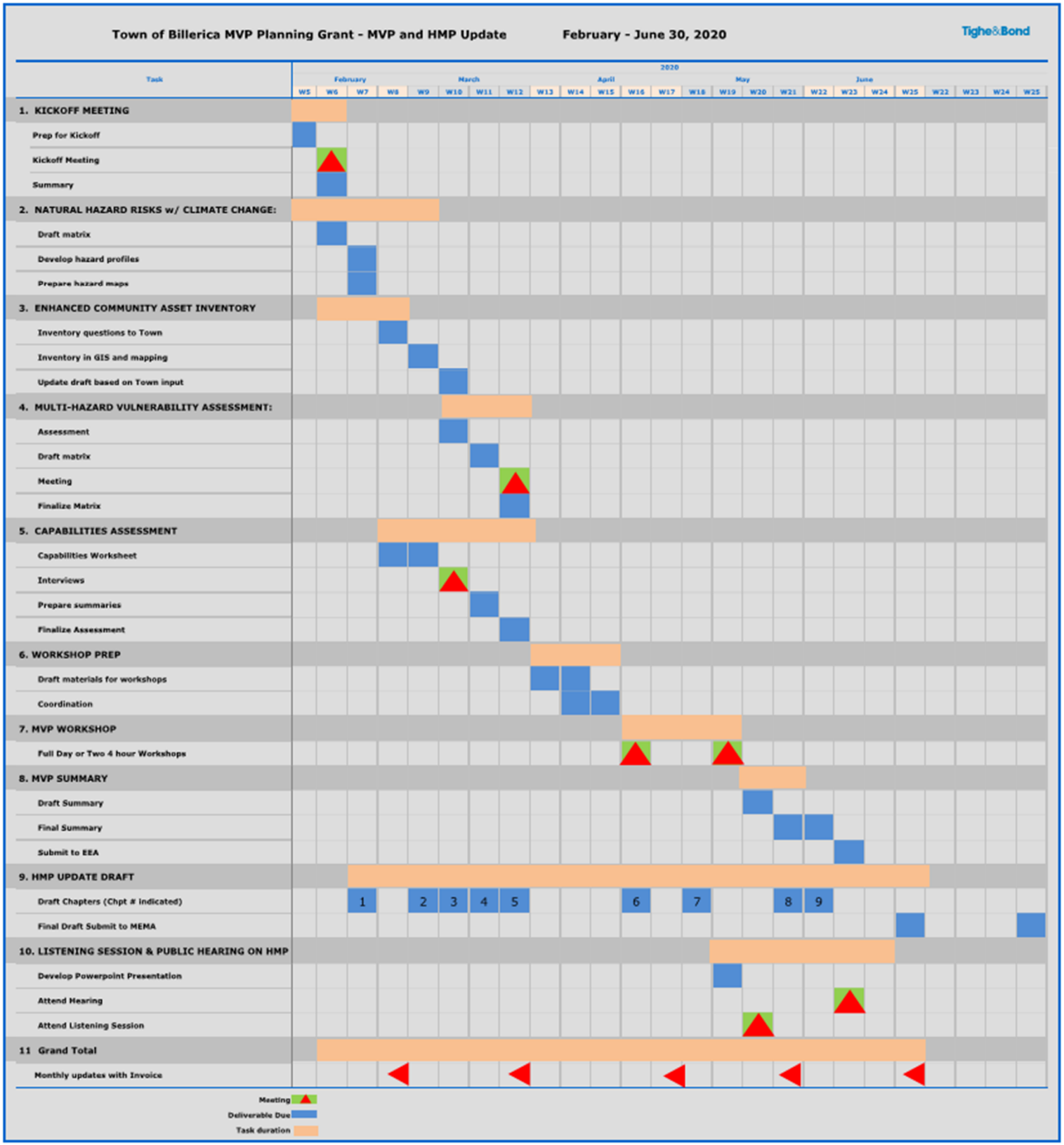
SCHEDULE



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DISCUSSION ITEM: NATURAL HAZARD RISKS

See Handout

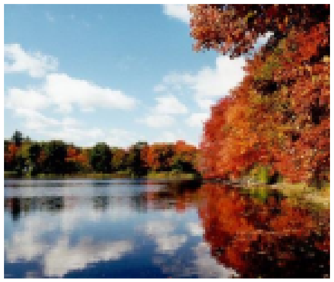
Tighe&Bond

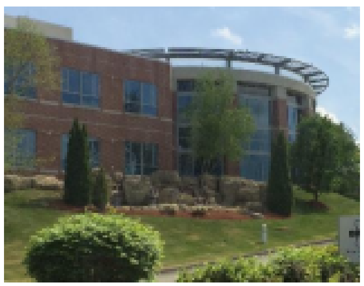
DISCUSSION ITEM: WORKSHOP GOALS

See Handout

DISCUSSION ITEM: COMMUNITY ASSETS

Process and schedule






TOWN OF BILLERICA
INCORPORATED 1655
MASSACHUSETTS

YOUR CHANCE FOR INPUT TODAY ON LOGISTICS…

- **Plan for communication & workshops**
  - Identify stakeholders
  - Public notification- Town Website, Press Releases, direct email
  - Approach to staffing workshops (size, facilitators: 1 per table)

Tighe&Bond

NEXT STEPS

- Core Team to review Asset Inventory
- Town staff to assist with Capabilities Assessment
- Core Team to review Draft Deliverables
- Brainstorm stakeholders for Workshop

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

OPEN DISCUSSION & QUESTIONS

Contact Information:

- **Janet Moonan, PE, Project Manager**
  - JSMoonan@tighebond.com
  - 781.708.9826

- **Gabrielle Belfit, CFM, Senior Environmental Scientist**
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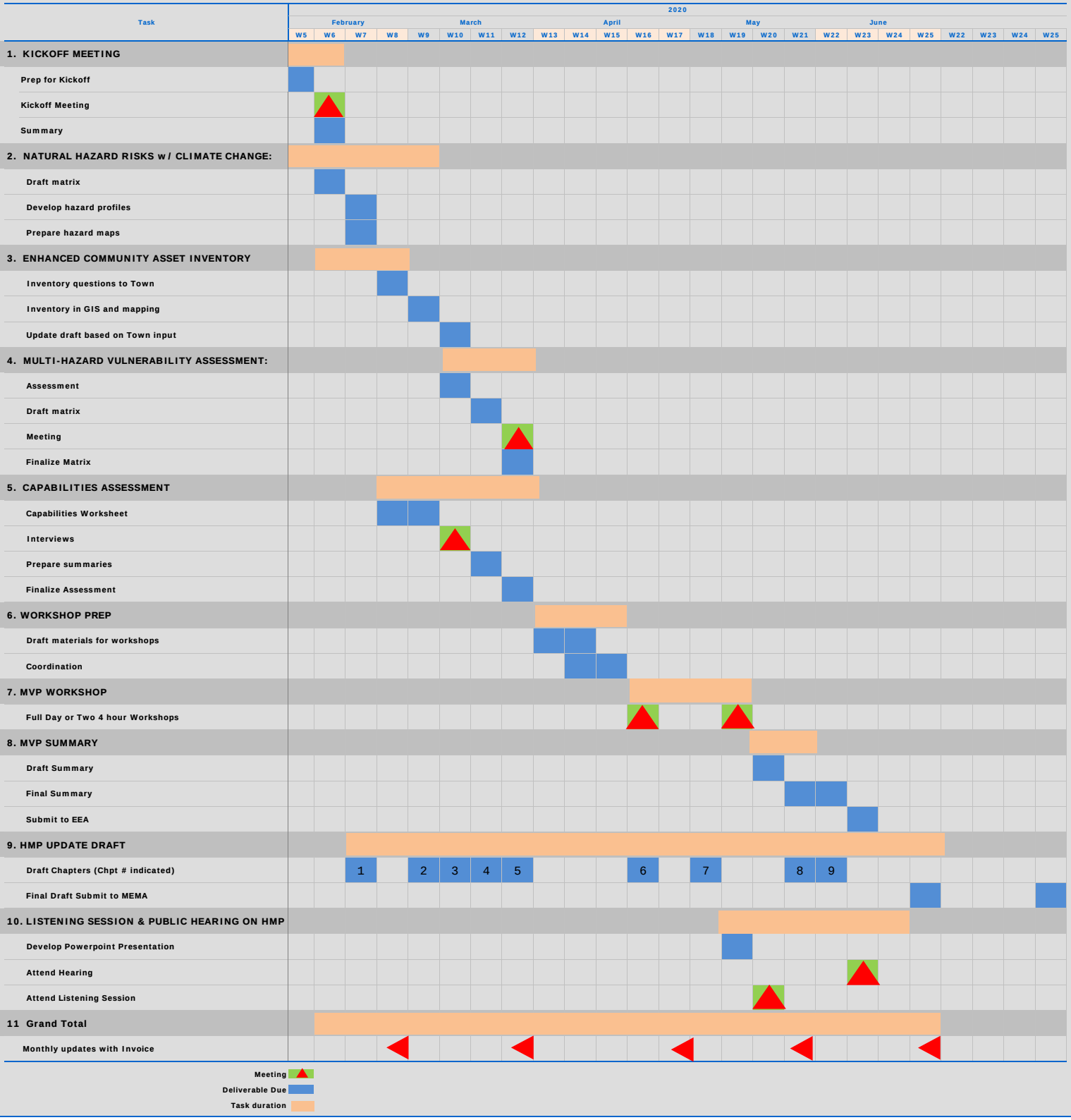
  - 508.304.6362

Tighe&Bond

Town of Billerica MVP Planning Grant - MVP and HMP Update

February - June 30, 2020

Tighe&Bond



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APPENDIX B

Town of Billerica MVP Grants – Virtual Public Engagement During COVID-19

TO: Michelle Rowden, MVP Northeast Regional Coordinator, Executive Office of Energy and Environmental Affairs (EEA)

FROM: Janet S. Moonan, PE, Project Manager, Tighe & Bond

COPY: Rob Anderson, Community Development Director

DATE: April 23, 2020

On behalf of the Town of Billerica, Tighe & Bond is providing this memorandum to document the Town's proposed strategy to accomplish the Fiscal Year 2020 Municipal Vulnerability Preparedness (MVP) grant program requirements with alternative public engagement efforts.

The Town received EEA's April 7, 2020, email that contained recommendations for adjusting the public engagement strategies to accommodate social distancing and stay-at-home advisories due to the ongoing COVID-19 crisis.

Based on this guidance, and to meet the requirements of the program, the virtual public engagement plan proposed below recognizes equitable engagement within the MVP process as a top priority. The engagement methods proposed below allow participation from key stakeholders as well as vulnerable populations.

The MVP Planning Grant process typically includes a minimum of three in-person, group meetings: Core Team Meeting, the Community Resilience Building (CRB) Workshop, and Public Listening Session. In addition, Billerica was awarded funds to complete a Hazard Mitigation Plan (HMP) Update which requires a Public Meeting. Billerica has completed one initial in-person Core Team meeting.

The sections below outline Billerica's proposed strategy to virtually meet the goals of the MVP engagement process. **We are is seeking confirmation from EEA as soon as possible that the proposed virtual engagement strategy meets the requirements of the MVP contract so we may proceed.**

Overview of Proposed Virtual MVP Engagement Process

To meet the requirements of the in-person meetings outlined above, Billerica will work with their MVP Provider, Tighe & Bond, to complete the following virtual engagement process:

1. **Provide an online space for MVP materials**: A municipal-specific MVP website will be designed and hosted by Tighe & Bond to provide all necessary materials for completing the MVP process. Reference material such as the Massachusetts State Hazard Mitigation and Climate Action Plan, ResilientMA.org, the MVP Workshop Guide, and the Regional Hazard Mitigation Plan that covers Billerica will be available for public access on this website. Municipal-specific information such as maps and the workshop matrix will also be provided via the online website or through email. Recorded meetings and Virtual CRB Workshop Webinars and the draft and final MVP Summary of Findings Report will be posted to the website.

2. **Survey to identify strengths and vulnerabilities**: Tighe & Bond will use Survey Monkey to create and distribute a survey to members of the Core Team and identified

stakeholders. The survey questionnaire results will be used to develop a master list of strengths and vulnerabilities in the community. The survey will be distributed via email, the MVP website, and/or regular mail if requested.

3. **Distribute recorded presentation on background information**: Tighe & Bond will develop a pre-workshop video including information on climate change and the MVP process. The short video will be recorded and posted on the MVP website for viewing or downloads. This presentation will be made available to workshop participants for independent viewing prior to attending the Virtual CRB Workshop Webinars.

4. **Distribute Virtual CRB Workshop Webinar materials**: Tighe & Bond will develop all materials necessary to participate in the workshop. Materials will be distributed via email, posted on the MVP website, and/or sent by regular mail if requested. Materials will include: (1) a partially, pre-populated CRB Matrix according to the Strengths and Vulnerabilities survey, (2) applicable slides to discuss natural hazard risk for the specific community asset sector featured in the workshop, and (3) a map of the municipality and featured community assets.

5. **Hold Webinars to meet the CRB Workshop requirement**: Tighe & Bond will develop and host 4 separate Virtual CRB Workshop Webinars using Skype. Each meeting will feature one of the Community Asset Categories: infrastructural, societal, natural environment, and economic. During the workshop, attendees will brainstorm mitigation actions for specific community assets, addressing top priority hazards.

6. **Prioritization Polling**: After the completion of all four Virtual CRB Workshop Webinars, Tighe & Bond will develop and distribute a Survey Monkey poll to the Core Team and stakeholders. This poll will include a list of mitigation actions developed during the webinar. Individuals will be asked to rank actions one through five in each of the four categories. This will develop a draft prioritization.

7. **Core Team Meeting**: Tighe & Bond will host a final Core Team meeting via Skype. The goal of the meeting will be to review the results of the prioritization polling and discuss the first Draft MVP Summary of Findings Report.

8. **Distribute Public Meeting materials**: Tighe & Bond will distribute public meeting materials to Core Team members and stakeholders electronically or through mailings if requested. Information about the Public Meeting and directions to participate will also be publicly posted. Materials will include an agenda and copy of the Draft HMP report.

9. **Hold Public Meeting:** Tighe & Bond and the Local Project Manager will host a live, 30-minute public meeting to present the draft HMP report and allow time for a Question & Answer session for community input. The Final Draft HMP report will be available on the MVP website for a 14-day public comment period. This is planned to be completed at a regularly scheduled Planning Board meeting.

10. **Distribute Listening Session materials**: Tighe & Bond will distribute listening session materials to Core Team members and stakeholders electronically or through mailings if requested. Information about the Listening Session and directions to participate will also be publicly posted. Materials will include an agenda and copy of the Draft MVP Summary of Findings Report.

11. **Hold Listening Session:** Tighe & Bond and the Core Team will host a live, one-hour Listening Session on Skype to present the draft MVP Summary of Findings Report and

allow time for a Question & Answer session for community input. The Final Draft MVP Summary of Findings Report will be available on the MVP website for a 14-day public comment period.

12. **MVP Website:** Tighe & Bond will post the recorded Listening Session, Question & Answer dialog, and Final MVP Summary of Findings Report on the MVP website.

The following tables describe the typical format for each meeting and a summary of the proposed format for comparison.

Core Team Meeting

Typical Format	Proposed Format
In-person meeting at Town Hall with representatives from municipal departments and any other core stakeholders.	Use Skype virtual meeting software to conduct meetings with representatives from the Core Team. Pre-meeting materials will be distributed electronically via email.

CRB Workshop

Typical Format	Proposed Format
One 8-hour, or two 4-hour, in person workshops with representatives from municipal departments, local organizations, State agencies, surrounding communities, and other stakeholders	Billerica's MVP provider will host four 1 to 1.5 hour Virtual CRB Workshop Webinars using Skype with identified stakeholders and the Core Team. These virtual workshops will address four categories: infrastructural, societal, natural environment, and economic. The Skype webinars will include question and answer periods, live polling and be recorded for later viewing. Workshop preparation materials will be distributed to participants prior to the webinar including instructions as to how to access the webinar. Material distribution is via email, regular mail if requested and posted for downloading on a dedicated Community MVP website. After the webinar, the recorded meetings will be posted on the website. A post-workshop survey will be distributed to participants via email and regular mail if requested. The survey may be completed online, via email, or completed surveys may be mailed in. The total time required for participants will be approximately 8 hours between the pre-meeting work, attending the 4 workshops, and completing the follow up surveys and rankings.

Public Meeting

Typical Format	Proposed Format
Daytime or evening meeting open to all members of the public	Provide meeting materials to stakeholders and the Core Team via email and post on the MVP community website including agenda, HMP report chapters in progress, and instructions to access the meeting. Hold one, 30-minute meeting. The Town will organize comments received, respond, and Tighe & Bond will post to the MVP community website.

Public Listening Session

Typical Format	Proposed Format
Daytime or evening meeting open to all members of the public	Provide listening session meeting materials to stakeholders and the Core Team via email and post on the MVP community website including agenda, draft MVP report and instructions to access the Listening Session. Hold one, hour long meeting using Skype. The final draft MVP Summary of Findings Report will be available post-meeting for a 14-day review period to allow for additional comment from members of the community. The Town will organize comments received, respond, and post to the MVP community website.

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APPENDIX C

List of Stakeholders Invited to MVP Workshops and Listening Session

Group	Name
Assessor's Office	Rich Scanlon
Billerica Public Schools	Tim Piwowar
Building Department	Mark LaLumiere
Building Department	Dave Lenzie
Billerica Housing Authority	Bob Correnti
City of Lowell	Christine McCall
City of Lowell	Maria Dickinson
Community Development	Rob Anderson
Community Development	Katie Mahoney
Conservation	Mike DeVito
Conservation	Isabel Tourkantonis
Council on Aging	Jean Bushnell
Recreation Department	David Grubb
DPW	Abdul Alkhatib
DPW	Jeff Kalmes
DPW	John McGovern
DPW	Steve Robertson
DPW	Michael Haines
Emergency Management	Bill Laurendeau
Engineering	Kelley Conway
Engineering	Heather Chew
Engineering	Kyle Grant
Fire Department	Bob Cole
Fire Department	Tom Ferraro
Fire Department	Steve Kennedy
Greater Lowell Chamber	Tara Morrissey
Health Department	Kristel Bennett
Health Department	Shelagh Collins
Health Department	Phavy Pheng
Highway Department	Wayne O' Loughlin
Highway Department	Ed Tierney
Library Director	Jan Hagman
LRTA	Andrew Jennings
NMCOG	Beverly Woods
NMCOG	Alicia Geilen
Police Department	Dan Rosa
Police Department	Roy Frost
Police Department	Craig Grogan
Resident	Trek Reef
OARS	Alison Field-Juma
Sudbury Valley Trustees	Christa Collins
Shawsheen River Watershed Association	
Shawsheen Tech	Andrew Pigeon
Resident	Sharon Lapham
SuAsCo River Stewardship Council	Emma Lord
EMD Serono	George Lima
Resident	Ed Reiner
Entegris	Daryle Hillsgrove
EEA Regional Coordinator	Michelle Rowden
Cabot Corporation	Michael Coveno
Town Manager's Office	John Curran
Town Manager's Office	Cathy O'Dea
Town Manager's Office	Clancy Main
Town of Bedford	Alyssa Sandoval

List of Stakeholders Invited to MVP Workshops and Listening Session

Group	Name
Town of Bedford	Tony Fields
Town of Burlington	John Keeley
Town of Burlington	Kristin Kassner
Town of Carlisle	George Mansfield
Town of Chelmsford	Evan Belansky
Town of Chelmsford	Lisa Marrone
Town of Tewksbury	Steve Sadwick
Town of Wilmington	Valerie Gingrich
Board of Appeals	Richard Colantuoni
Board of Appeals	Doris Pearson
Board of Appeals	Eric Anable
Board of Appeals	Bob Accomando
Board of Appeals	Anupam Wali
Board of Appeals	Ralph McKenna
Board of Appeals	Sal Dampolo
Board of Health	Sandra Giroux
Board of Health	Marie O'Rourke
Board of Health	Mike Grady
Board of Health	Elizabeth Villar
Board of Health	Robert Reader
Board of Selectmen	Kim Conway
Board of Selectmen	Ed Giroux
Board of Selectmen	Andrew Deslaurier
Board of Selectmen	Dan Burns
Board of Selectmen	Mike Rosa
Conservation Commission	Paul Hayes
Conservation Commission	Joanne Giovino
Conservation Commission	Diane DePaso
Conservation Commission	Betsy Gallagher
Conservation Commission	Marlies Henderson
Conservation Commission	Jack Bowen
Conservation Commission	Jeff Connell
Finance Committee	David Gagliardi
Finance Committee	Doug Meagher
Finance Committee	Mary McBride
Finance Committee	Cheri Gargalianos
Finance Committee	Philip Newfell
Finance Committee	John Mulloy
Finance Committee	Tony Ventresca
Finance Committee	Douglas Fogerty
Finance Committee	Rino Moriconi
Finance Committee	Patrick Logue
Finance Committee	John Kleschinsky
Finance Committee	Donald Damon
Finance Committee	John Piscatelli
Planning Board	Matty Battcock
Planning Board	Gary DaSilva
Planning Board	Pat Flemming
Planning Board	Blake Robertson
Planning Board	Chris Tribou
Planning Board	Janet Morris
Planning Board	Mike Reily
School Committee	Darlene Torre
School Committee	Annette Famolare
School Committee	John Burrows
School Committee	Jim Gately

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APPENDIX D

Municipal Vulnerability and Preparedness Planning for the Town of Billerica Public Engagement Information

Municipal Vulnerability Preparedness Planning Background The Town of Billerica was recently awarded a $39,000 grant by the Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness (MVP) Planning Grant program to complete a public engagement and climate resilience planning process before June 30, 2020. Billerica's Economic Development Department is taking the lead on the MVP program, with participation of a Core Team of Town Staff to plan for ways to better prepare and protect the Town from natural and climate-related hazards. Once the plan is completed and approved by EEA, the Town of Billerica will be designated as an MVP Community, joining 287 communities across Massachusetts that have been designated since the MVP program began in 2017. This work also includes preparing a Town-specific Hazard Mitigation Plan (HMP) 5-year update to help Billerica continue to be eligible to receive certain types of non-emergency disaster assistance, including funding for mitigation projects.

Why plan for climate resilience? Resilience is the ability of a community to address the needs of its built, social and natural environment to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards. Planning for climate resilience allows Billerica to build capacity to reduce the impacts from future climate events rather than just react to events as they occur.

How will the public engage? MVP is a Community Driven Process to understand climate vulnerabilities and identify priority actions. MVP provides structured opportunities for public engagement through review of community specific mapping and climate data, participation in unique Community Resilience Building Workshops, and developing priority action plans to improve their community's resilience with an emphasis on nature-based solutions. There will be a public meeting to review the HMP update, as well.

Due to COVID-19, previously planned public meetings and workshops will be held online.

The Town is utilizing a number of public engagement methods including:

- Posting online resources that will be used in the workshops
- Conducting pre- and post- workshop surveys
- Hosting virtual workshops focusing on climate resilience within the context of Billerica's societal, built infrastructure, natural resources and economic community assets.
- Hosting a community listening session

More information is coming soon, including how to participate and dates/times for all meetings.

Read More About EEA Municipal Vulnerability Preparedness (MVP) here

How do I participate in the Community Resilience Building Workshops ?

1. Reserve your spot in one or more of the 90-minute workshops by clicking on the dates below.

Community Resilience Building Workshop Dates/Time

#1 Societal Assets - Vulnerable Populations and Cultural Facilities: May 12 – 1:00-2:30PM
#2 Infrastructural Assets - Critical Facilities and Built Environment: May 19 – 1:00-2:30PM
#3 Economic Assets - Economic Sectors and Commercial Centers: May 26 – 1:00-2:30PM
#4 Environmental Assets - Natural Resources and Open Space: June 9 – 1:00-2:30PM

2. View the planning resources linked below, especially the video. You may wish to download the maps and data for easy reference during the workshops and save these to your desktop.

Planning Resources

- Introductory Video – MVP and climate change impact on local assets
- Community Asset Maps – Distribution of Local Community Assets
- Handout 1: List of Community Assets
- Billerica's currentHazard Mitigation Plan, prepared in 2015
- Massachusetts' Climate Change Clearinghouse
- State Hazard Mitigation and Climate Adaptation Plan (SHMCAP)
- Billerica's Emergency Management
- Billerica's flood plain maps

3. If you have not already done so, please take the pre-workshop survey, by clicking here . The results of the survey will be used in the workshops.

Frequently Asked Questions:

Q: How much time will it take to participate?
A: You should plan on spending about 6 hours over a 3-week period, responding to surveys, previewing planning resources and participating in one or more workshops

Q: Do I have to commit to participating in all of the virtual workshops, or can I choose which ones I want to participate in?
A: You are welcome to join each virtual workshop, but may opt to only attend one. You will be able to view and provide input on all of the recorded

workshops, which will each be posted on the municipal MVP website after they are completed.

Q: What if I have special circumstances that prohibit participating in an online format?
A:You can still participate using alternate format materials. Please send an email to Rob Anderson, Community Development Director, to discuss your needs.

Q: What online meeting platform will be used? Is it easy to join?
A: Microsoft Teams Live Event will be used for the meeting platform. Full instructions will be provided.

Q: I am not very tech savvy. Is there anyone that can help if I have issues with connecting?
A: Yes, we can arrange a test connection in advance of the meeting to make sure that you are all set to access the workshop online portion of the program.

Municipal Vulnerability and Preparedness Pre-Workshop Survey - Town of Billerica

Billerica, Massachusetts

Your community is undertaking an initiative to understand how natural hazards and climate change impact infrastructure, the local economy, people, and the environment. Please use the definitions below as well as Handout 1 to help complete this survey. Your input is greatly appreciated.

Natural hazards are defined as a natural phenomenon that might have a negative effect on humans or the environment. For example:

- A *natural hazard* is like the sun.
- The *risk* from that hazard is sunburn.
- The *vulnerability* includes the length of exposure of skin to the sun.
- The *mitigation action* to reduce risk from the hazard is to apply sunscreen or seek shade.

1. What is your affiliation with the Town of Billerica?

2. How often have each of these natural hazards occurred in your community?

	Once a year or more often	Once every 3-5 years	Once in a decade	Once in my lifetime	Unsure/Never
Blizzard	○	○	○	○	○
Nor'easter	○	○	○	○	○
Ice Storm	○	○	○	○	○
Flooding	○	○	○	○	○
Dam Overtopping	○	○	○	○	○
Drought	○	○	○	○	○
Extreme Temperature	○	○	○	○	○
Tornado	○	○	○	○	○
Landslide	○	○	○	○	○
Wildfire	○	○	○	○	○
High Wind	○	○	○	○	○
Thunderstorm	○	○	○	○	○
Microburst	○	○	○	○	○
Hurricane/Tropical Storm	○	○	○	○	○
Earthquake	○	○	○	○	○
Invasive Species	○	○	○	○	○

3. What natural hazards are you concerned about experiencing in the future?

	Very concerned	Moderately concerned	Slightly concerned	Not concerned	Unsure
Blizzard	○	○	○	○	○
Nor'easter	○	○	○	○	○
Ice Storm	○	○	○	○	○
Flooding	○	○	○	○	○
Dam Overtopping	○	○	○	○	○
Drought	○	○	○	○	○
Extreme Temperature	○	○	○	○	○
Tornado	○	○	○	○	○
Landslide	○	○	○	○	○
Wildfire	○	○	○	○	○
High Wind	○	○	○	○	○
Thunderstorm	○	○	○	○	○
Microburst	○	○	○	○	○
Hurricane/Tropical Storm	○	○	○	○	○
Earthquake	○	○	○	○	○
Invasive Species	○	○	○	○	○

4. How concerned are you about climate change impacting your community in the future and exacerbating these existing natural hazards?

- ○ Not concerned
- ○ Slightly concerned
- ○ Moderately concerned
- ○ Very Concerned

Provide additional detail if desired

5. Which of the following categories are most susceptible to natural hazards in your community? Please rank the community assets in order of vulnerability, 1 being the most vulnerable and 5 being the least vulnerable.

	1	2	3	4	5
People: Loss of life and/or injuries	○	○	○	○	○
Economic: Business interruptions/closures, job losses, etc.	○	○	○	○	○
Infrastructure: Damage/loss of roads, bridges, utilities, schools, etc.	○	○	○	○	○
Cultural/Historic: Damage or loss of libraries, museums, historic properties, etc.	○	○	○	○	○
Environment: Damage, contamination or loss of forests, wetlands, waterways, etc.	○	○	○	○	○
Governance: Ability to maintain order and/or provide public amenities and services	○	○	○	○	○

6. Natural hazards can have a significant impact on a community. Please tell us how important each statement is to you by checking the appropriate box for each.

	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Protecting private property	○	○	○	○	○
Protecting critical facilities (transportation networks, hospitals, fire stations, etc)	○	○	○	○	○
Preventing development in hazard areas	○	○	○	○	○
Enhancing function off natural assets (streams, wetlands, beaches, etc)	○	○	○	○	○
Protecting historic and cultural landmarks	○	○	○	○	○
Protecting and reducing damage to utilities	○	○	○	○	○
Strengthening emergency services (police, fire, ambulance, etc)	○	○	○	○	○
Promoting cooperation among public agencies, citizens, non-profits, academia, and businesses	○	○	○	○	○

7. What specific community assets have helped you get through storm events and aided in recovery after storm events such as blizzards, flooding, extreme heat? Please be specific and list name, location, and owner of the three most important. (Examples include: Gas stations, pharmacies, supermarkets, towing services, etc) You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Name/Location/Owner

Name/Location/Owner

Name/Location/Owner

8. What infrastructure (examples include: roadways, community buildings, churches, schools, open space, dams, etc) have been impacted by storm events? Please list 3 specific things in Town that you have seen impacts to in the past. You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Name/Location/Owner

Name/Location/Owner

Name/Location/Owner

9. If there were a loss or inoperability, what major employers, primary economic sectors, and commercial centers would have a severe impact on the community and its ability to recover from a disaster? You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Name/Location/Owner

Name/Location/Owner

Name/Location/Owner

10. Which populations, groups of people, or communities are less able to respond and recover during a disaster? (examples include: elderly populations, environmental justice populations, special needs schooling, child care, shelters, homeless, etc.) You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Name/Location/Owner

Name/Location/Owner

Name/Location/Owner

11. Please list the top 3 natural environments in town that the community values and provides protective function to reduce the magnitude of hazard impact and increase resiliency? (examples include: open space, wetlands and waterbodies, trails, recreation areas, etc.)

Name/Location/Owner

Name/Location/Owner

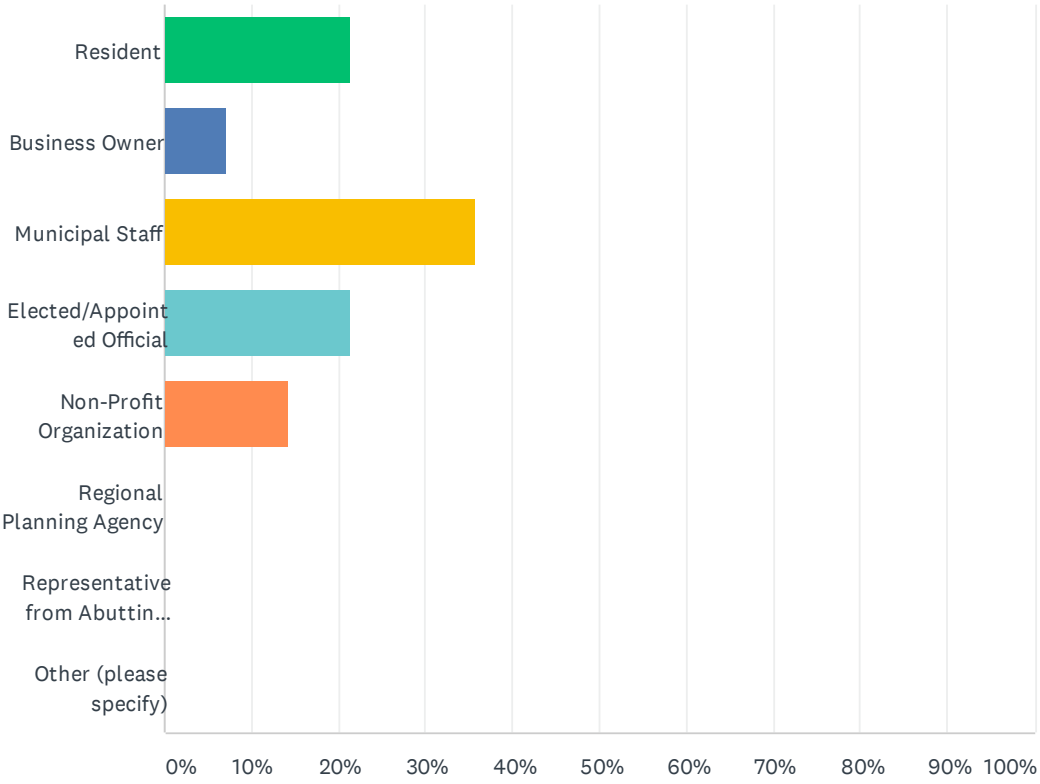
Name/Location/Owner

12. Is there any other input or questions you would like to have discussed during the Town's MVP planning process?

Done

Q1 What is your affiliation with the Town of Billerica?

Answered: 14 Skipped: 1

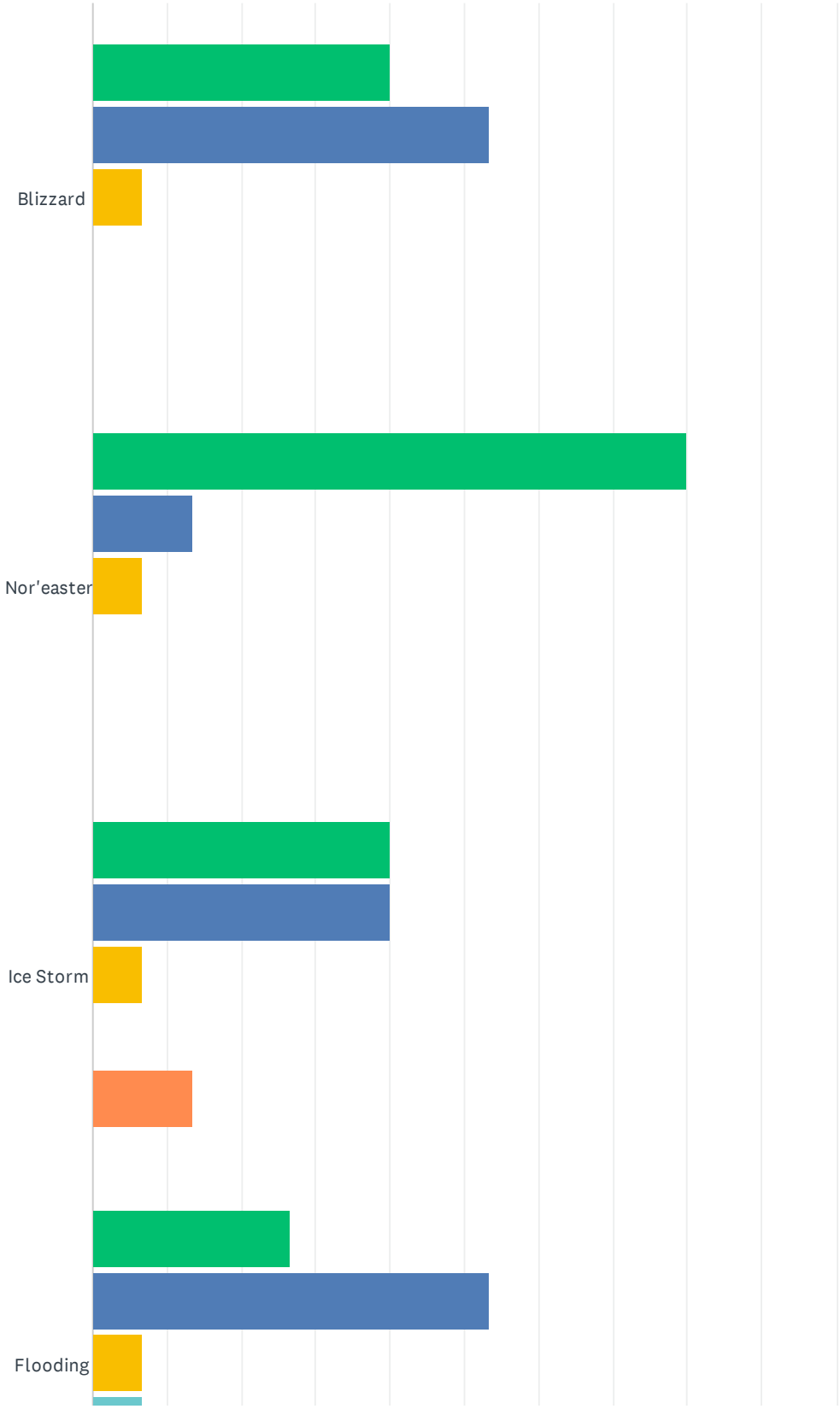


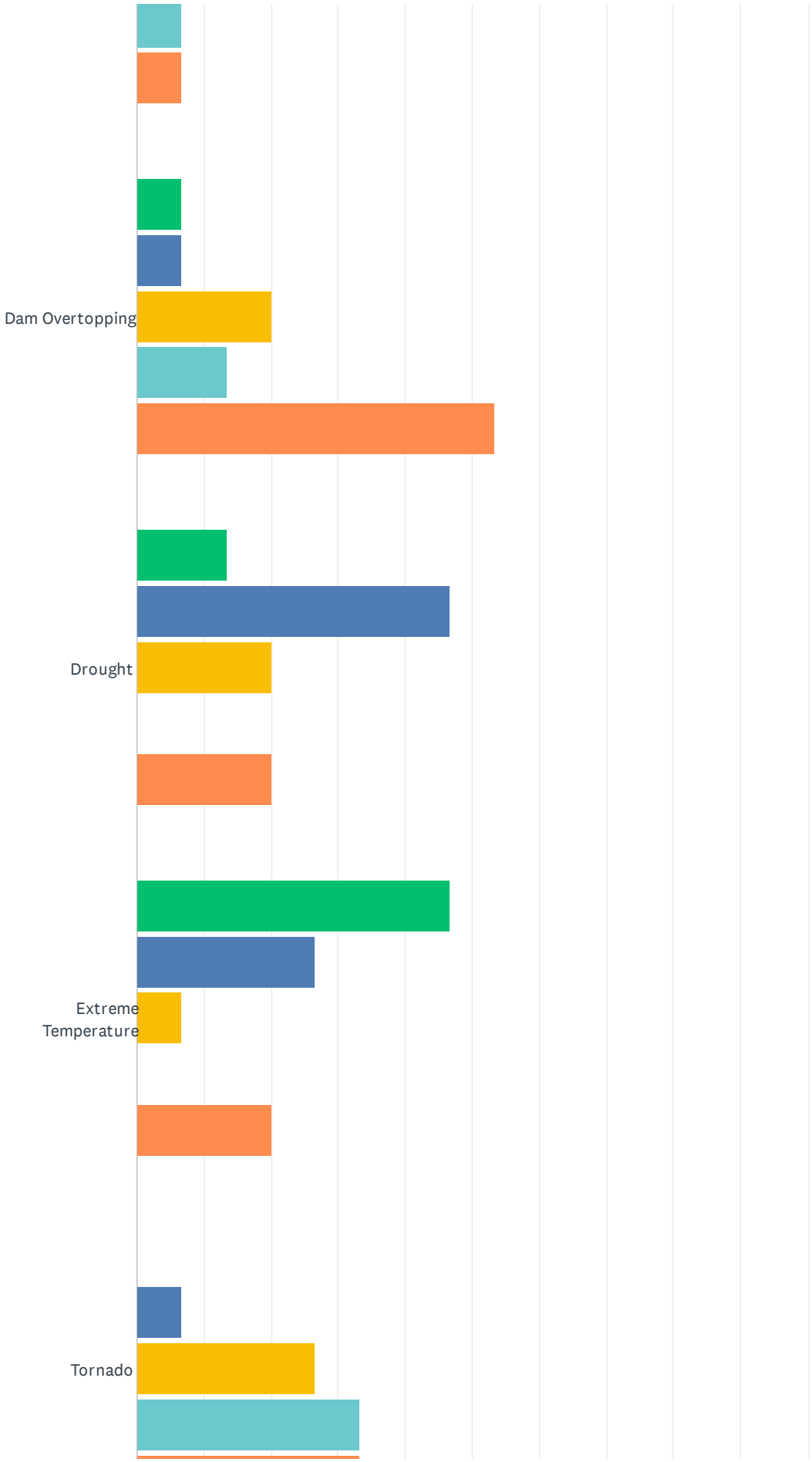
ANSWER CHOICES	RESPONSES	
Resident	21.43%	3
Business Owner	7.14%	1
Municipal Staff	35.71%	5
Elected/Appointed Official	21.43%	3
Non-Profit Organization	14.29%	2
Regional Planning Agency	0.00%	0
Representative from Abutting Community	0.00%	0
Other (please specify)	0.00%	0
TOTAL		14

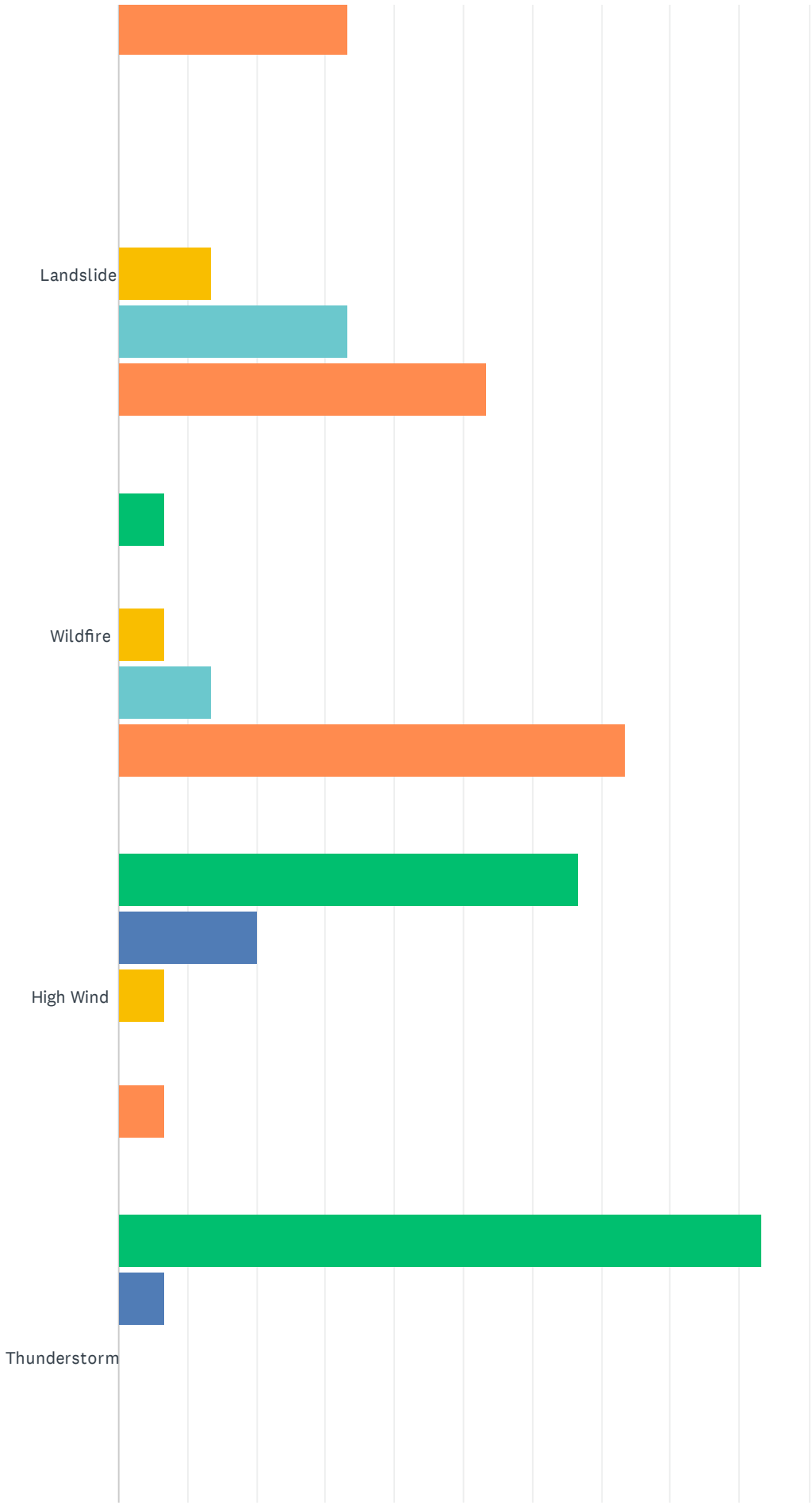
#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

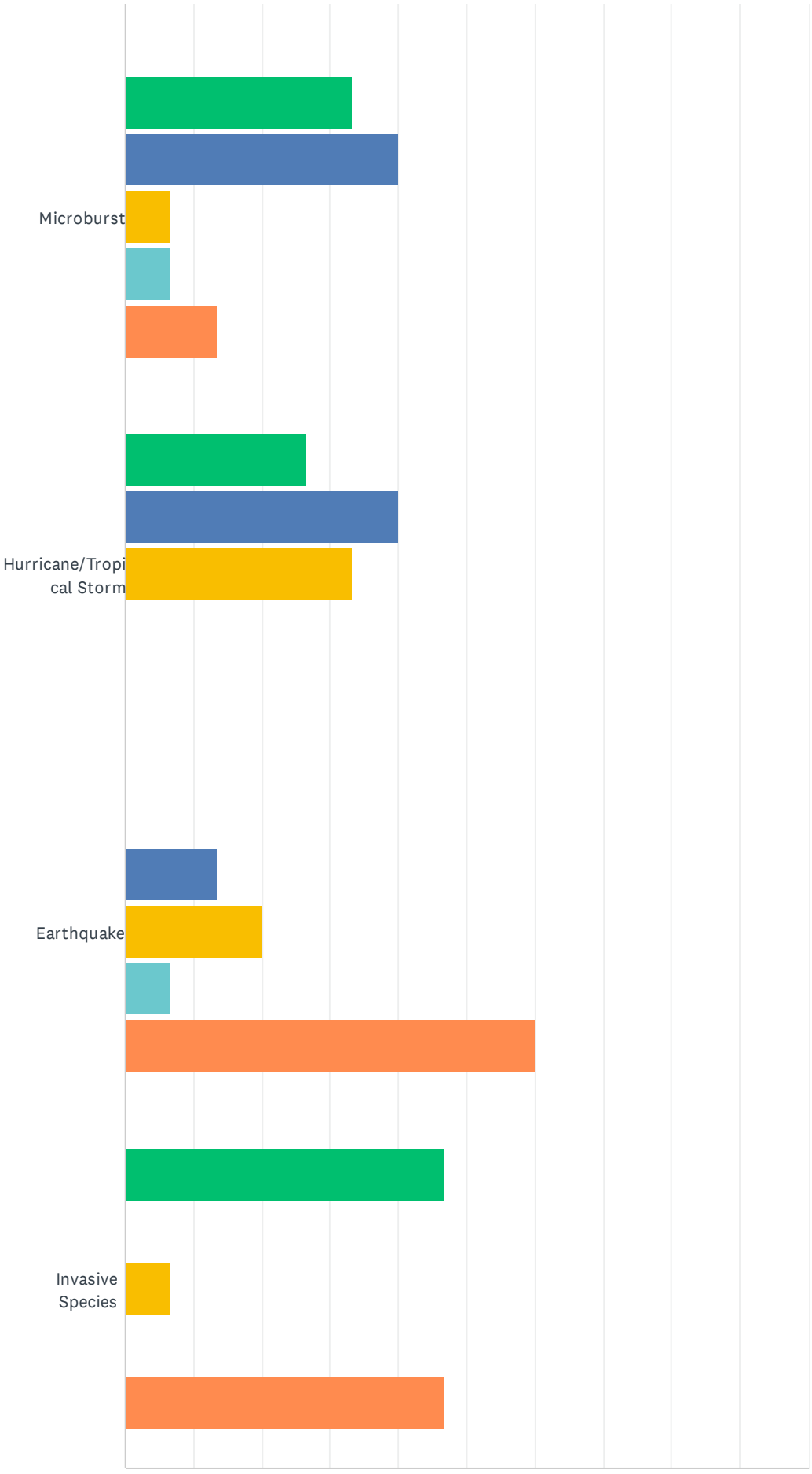
Q2 How often have each of these natural hazards occurred in your community?

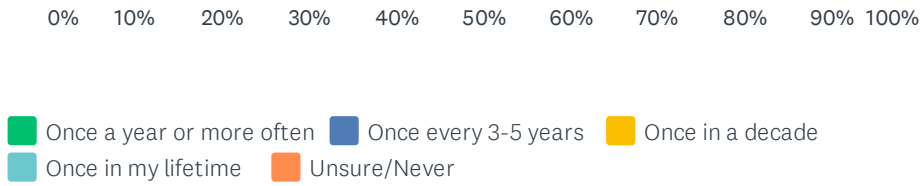
Answered: 15 Skipped: 0




Dam Overtopping
Drought
Extreme Temperature
Tornado


Landslide
Wildfire
High Wind
Thunderstorm

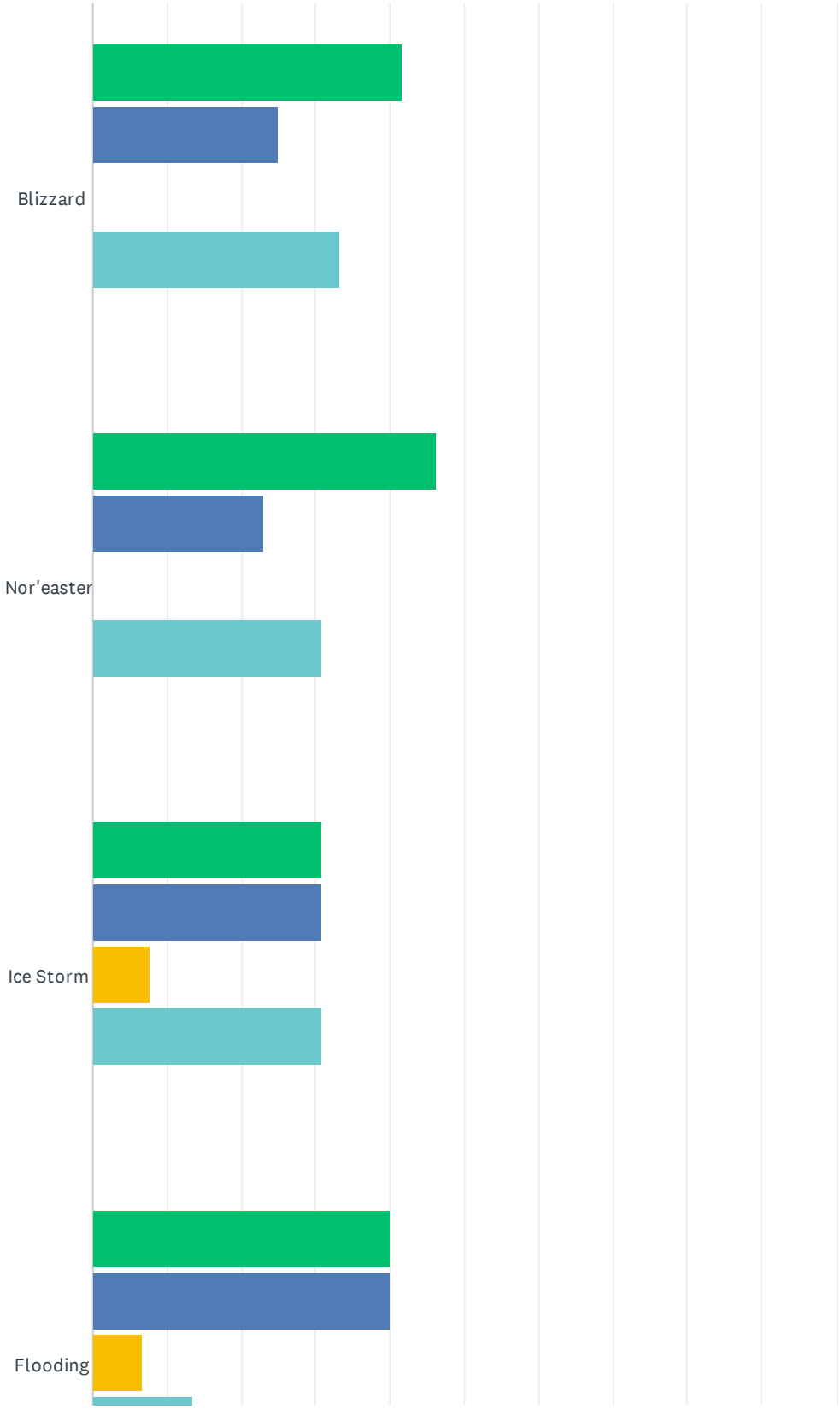

Microburst
Hurricane/Tropical Storm
Earthquake
Invasive Species

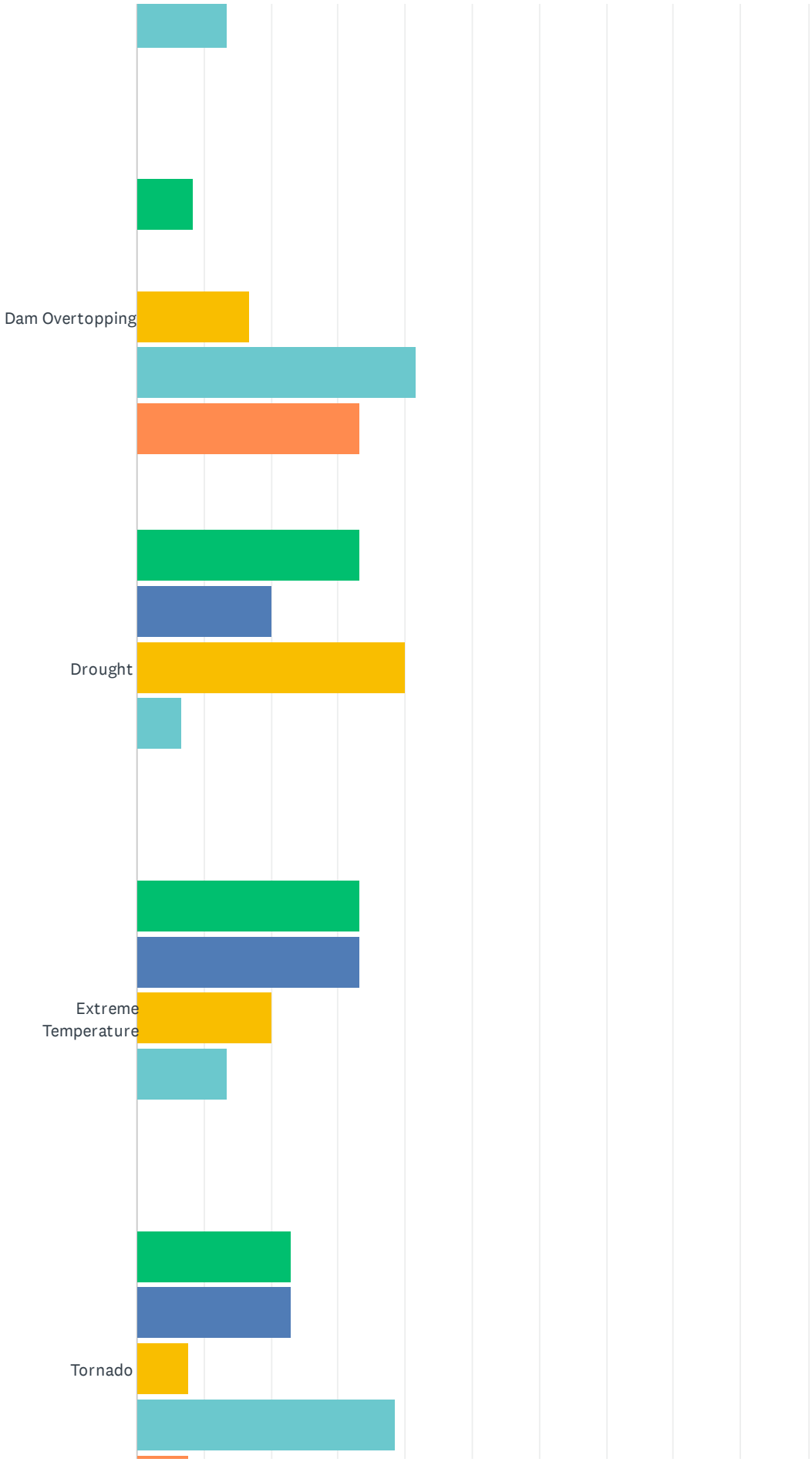


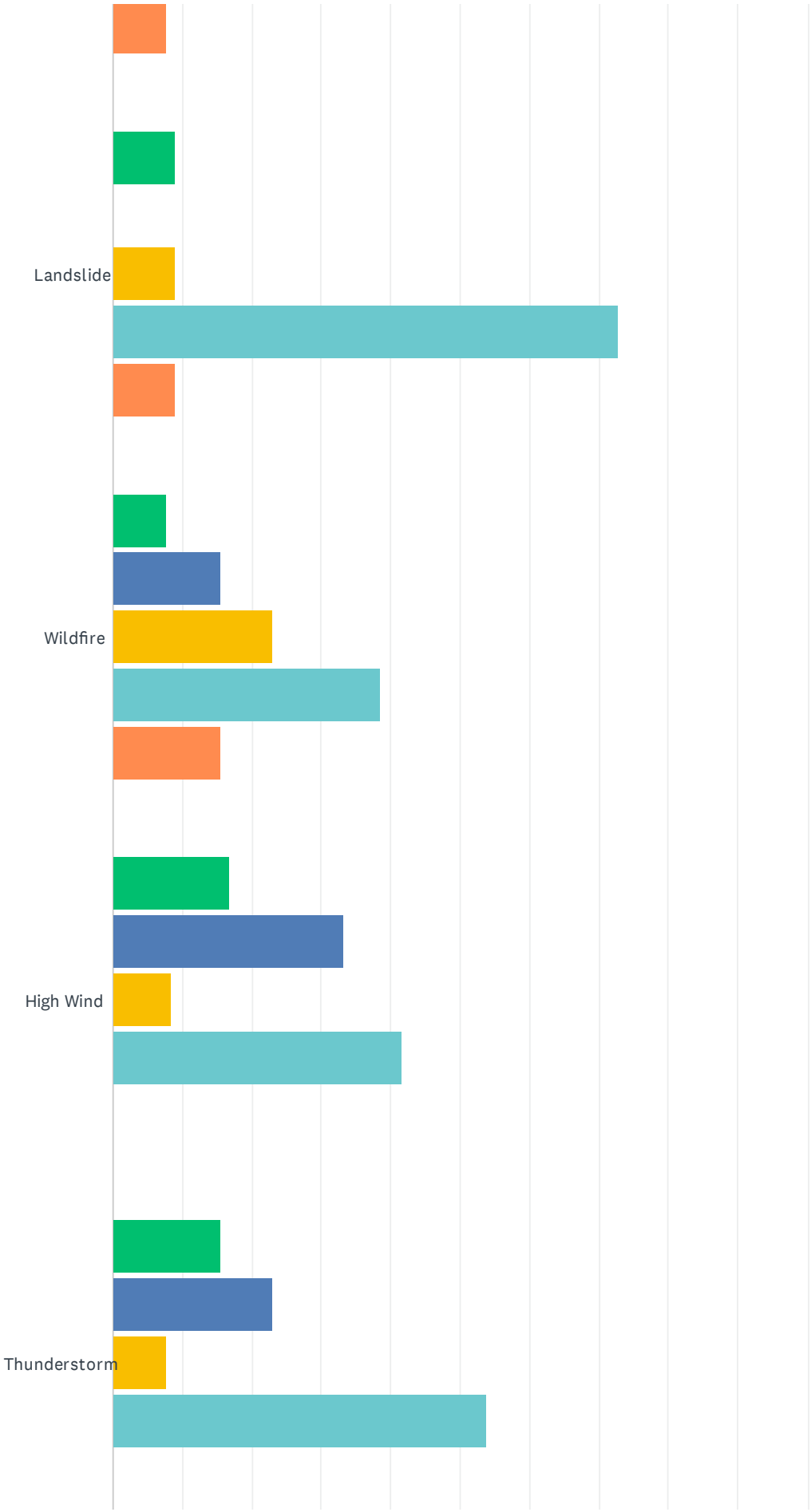
	ONCE A YEAR OR MORE OFTEN	ONCE EVERY 3-5 YEARS	ONCE IN A DECADE	ONCE IN MY LIFETIME	UNSURE/NEVER	TOTAL
Blizzard	40.00% 6	53.33% 8	6.67% 1	0.00% 0	0.00% 0	15
Nor'easter	80.00% 12	13.33% 2	6.67% 1	0.00% 0	0.00% 0	15
Ice Storm	40.00% 6	40.00% 6	6.67% 1	0.00% 0	13.33% 2	15
Flooding	26.67% 4	53.33% 8	6.67% 1	6.67% 1	6.67% 1	15
Dam Overtopping	6.67% 1	6.67% 1	20.00% 3	13.33% 2	53.33% 8	15
Drought	13.33% 2	46.67% 7	20.00% 3	0.00% 0	20.00% 3	15
Extreme Temperature	46.67% 7	26.67% 4	6.67% 1	0.00% 0	20.00% 3	15
Tornado	0.00% 0	6.67% 1	26.67% 4	33.33% 5	33.33% 5	15
Landslide	0.00% 0	0.00% 0	13.33% 2	33.33% 5	53.33% 8	15
Wildfire	6.67% 1	0.00% 0	6.67% 1	13.33% 2	73.33% 11	15
High Wind	66.67% 10	20.00% 3	6.67% 1	0.00% 0	6.67% 1	15
Thunderstorm	93.33% 14	6.67% 1	0.00% 0	0.00% 0	0.00% 0	15
Microburst	33.33% 5	40.00% 6	6.67% 1	6.67% 1	13.33% 2	15
Hurricane/Tropical Storm	26.67% 4	40.00% 6	33.33% 5	0.00% 0	0.00% 0	15
Earthquake	0.00% 0	13.33% 2	20.00% 3	6.67% 1	60.00% 9	15
Invasive Species	46.67% 7	0.00% 0	6.67% 1	0.00% 0	46.67% 7	15

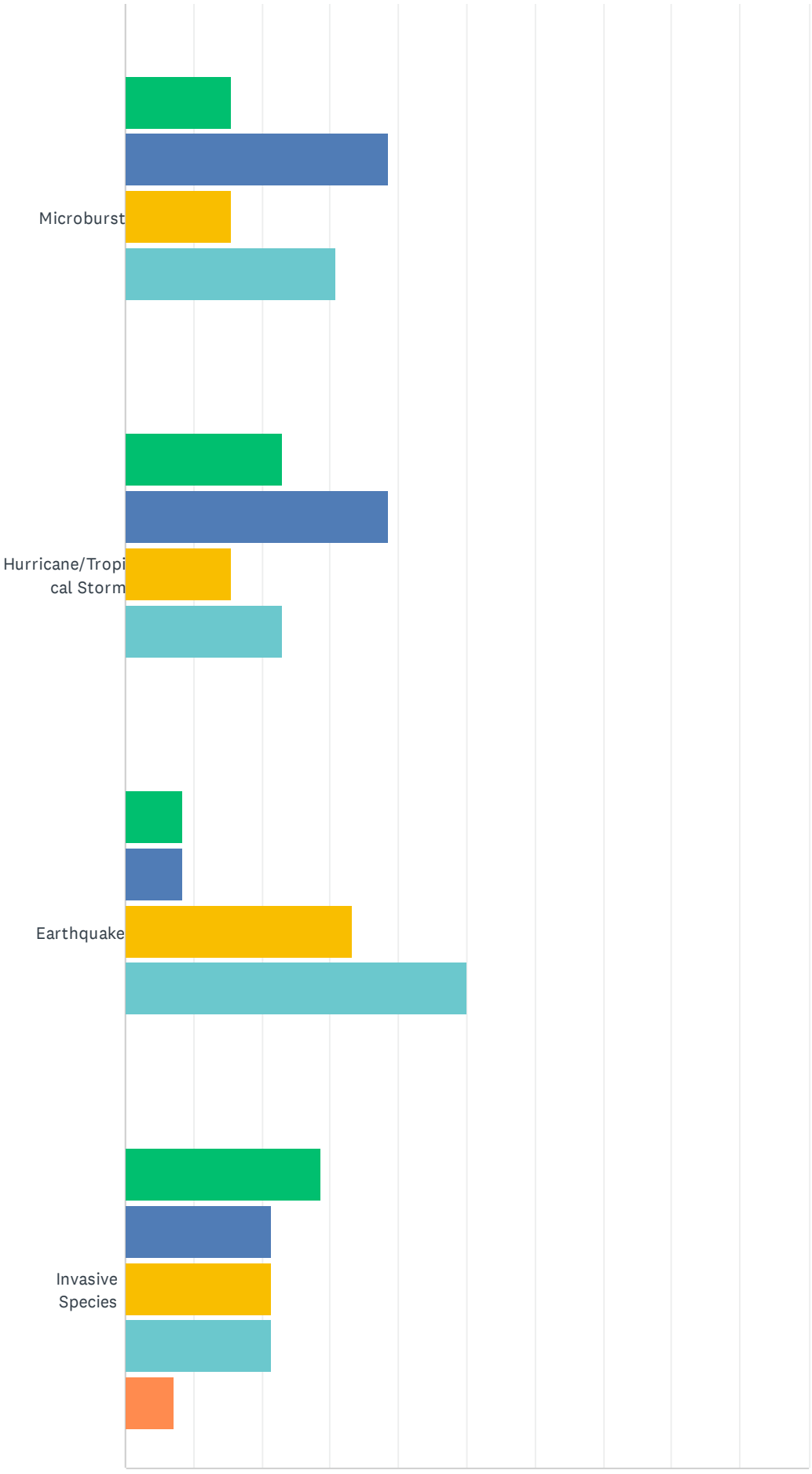
Q3 What natural hazards are you concerned about experiencing in the future?

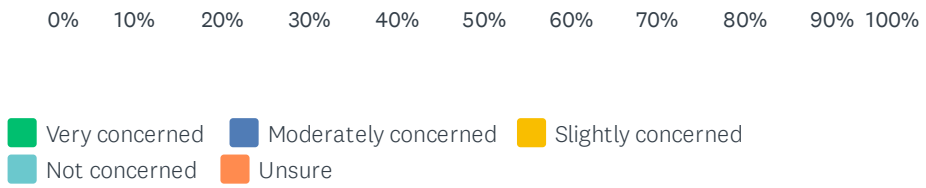
Answered: 15 Skipped: 0




Dam Overtopping
Drought
Extreme Temperature
Tornado


Landslide
Wildfire
High Wind
Thunderstorm

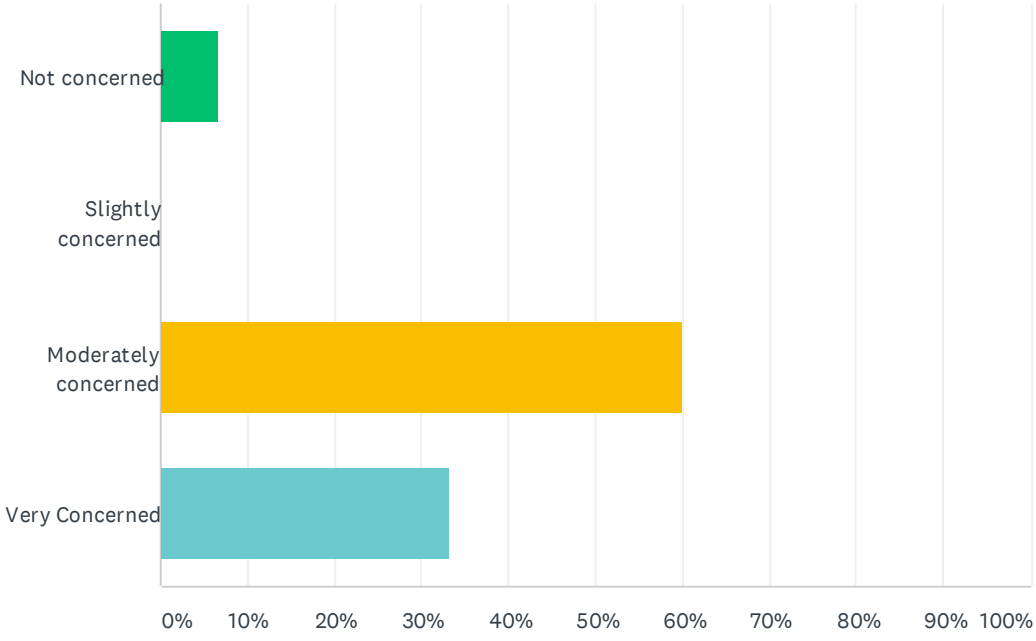

Microburst
Hurricane/Tropical Storm
Earthquake
Invasive Species



	VERY CONCERNED	MODERATELY CONCERNED	SLIGHTLY CONCERNED	NOT CONCERNED	UNSURE	TOTAL
Blizzard	41.67% 5	25.00% 3	0.00% 0	33.33% 4	0.00% 0	12
Nor'easter	46.15% 6	23.08% 3	0.00% 0	30.77% 4	0.00% 0	13
Ice Storm	30.77% 4	30.77% 4	7.69% 1	30.77% 4	0.00% 0	13
Flooding	40.00% 6	40.00% 6	6.67% 1	13.33% 2	0.00% 0	15
Dam Overtopping	8.33% 1	0.00% 0	16.67% 2	41.67% 5	33.33% 4	12
Drought	33.33% 5	20.00% 3	40.00% 6	6.67% 1	0.00% 0	15
Extreme Temperature	33.33% 5	33.33% 5	20.00% 3	13.33% 2	0.00% 0	15
Tornado	23.08% 3	23.08% 3	7.69% 1	38.46% 5	7.69% 1	13
Landslide	9.09% 1	0.00% 0	9.09% 1	72.73% 8	9.09% 1	11
Wildfire	7.69% 1	15.38% 2	23.08% 3	38.46% 5	15.38% 2	13
High Wind	16.67% 2	33.33% 4	8.33% 1	41.67% 5	0.00% 0	12
Thunderstorm	15.38% 2	23.08% 3	7.69% 1	53.85% 7	0.00% 0	13
Microburst	15.38% 2	38.46% 5	15.38% 2	30.77% 4	0.00% 0	13
Hurricane/Tropical Storm	23.08% 3	38.46% 5	15.38% 2	23.08% 3	0.00% 0	13
Earthquake	8.33% 1	8.33% 1	33.33% 4	50.00% 6	0.00% 0	12
Invasive Species	28.57% 4	21.43% 3	21.43% 3	21.43% 3	7.14% 1	14

Q4 How concerned are you about climate change impacting your community in the future and exacerbating these existing natural hazards?

Answered: 15 Skipped: 0

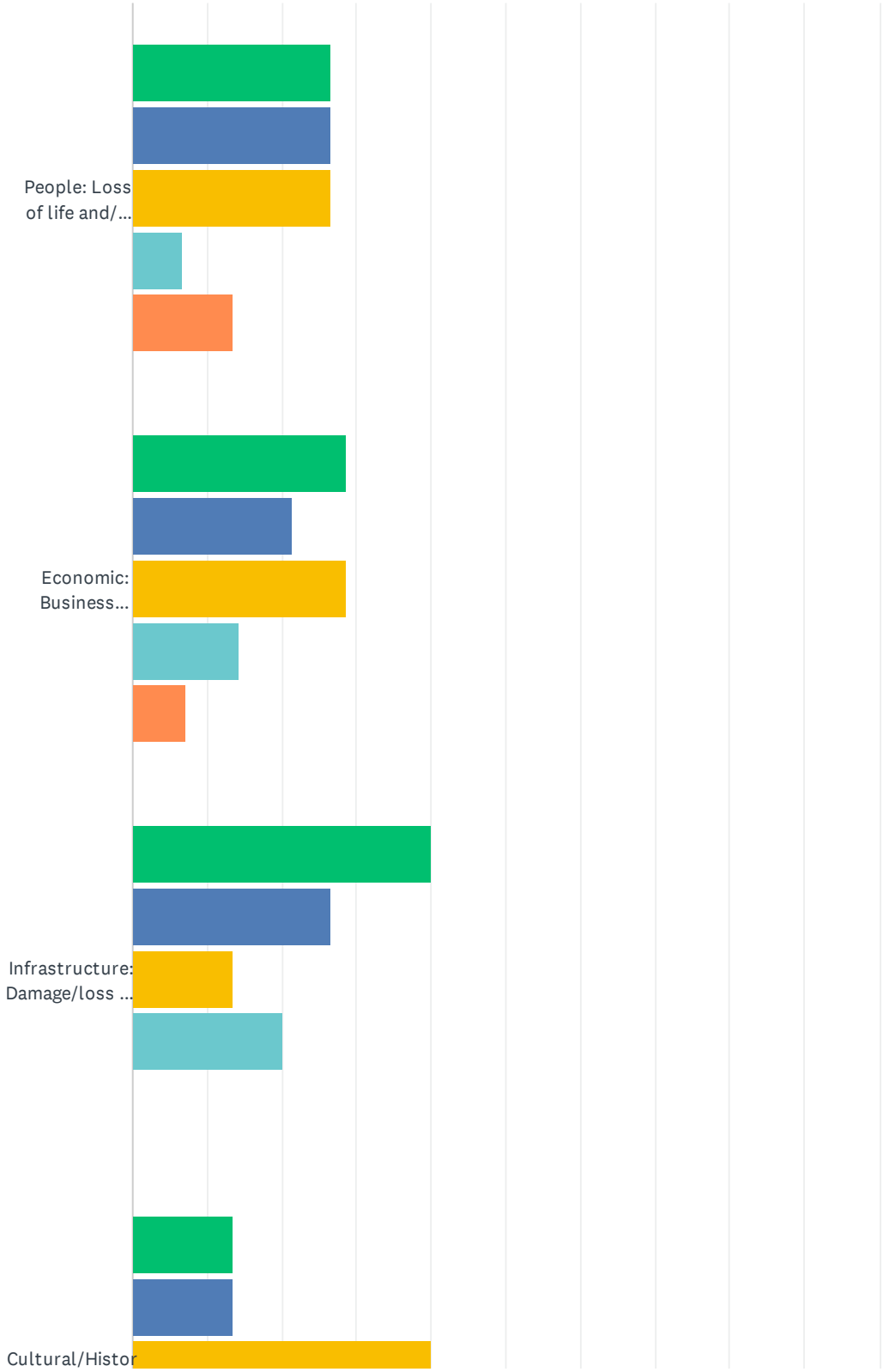


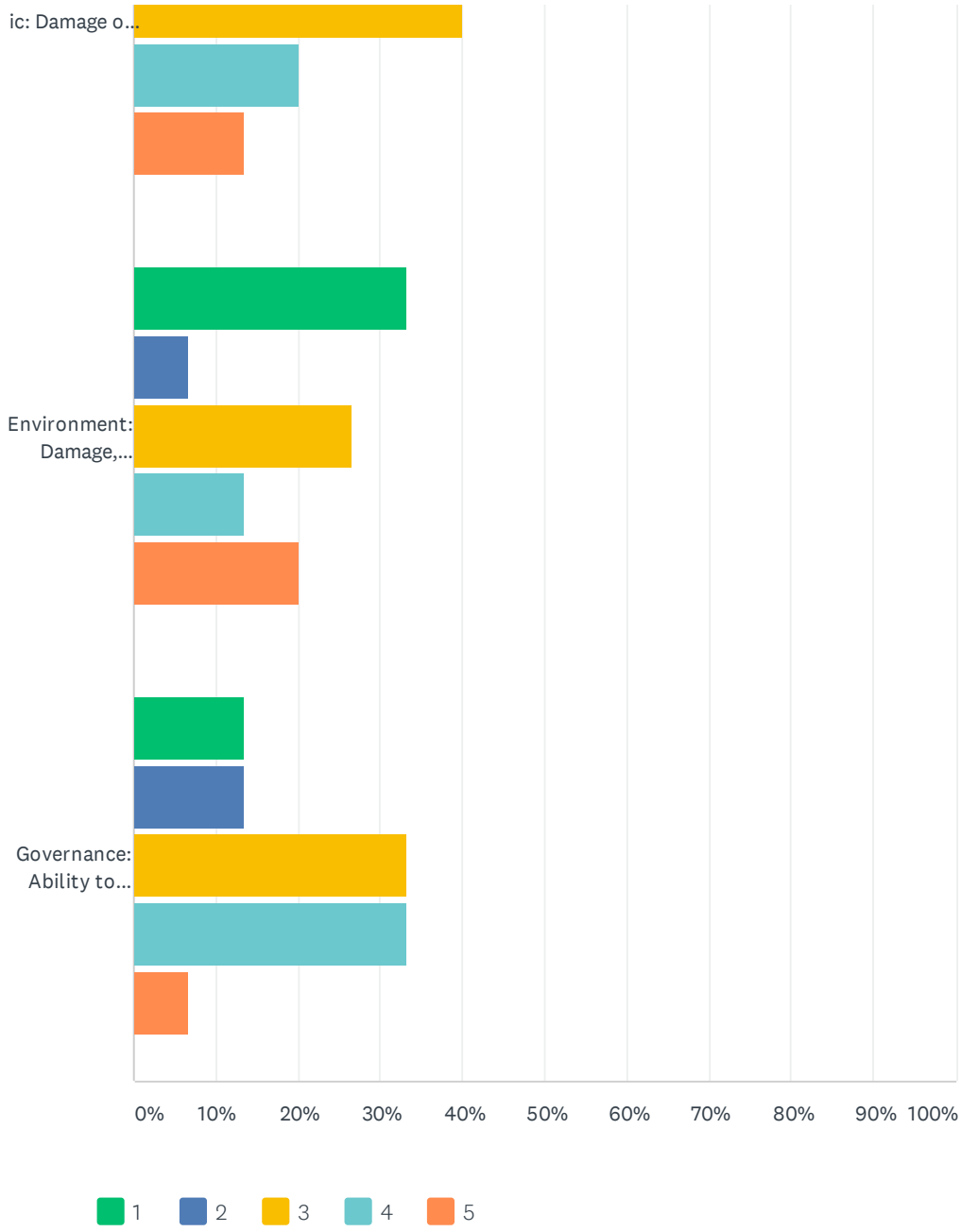
ANSWER CHOICES	RESPONSES	
Not concerned	6.67%	1
Slightly concerned	0.00%	0
Moderately concerned	60.00%	9
Very Concerned	33.33%	5
TOTAL		15

#	PROVIDE ADDITIONAL DETAIL IF DESIRED	DATE
1	Warming weather will increase the eutrophication of the Concord River which stagnates behind the dam. Our water quality will degrade and it will cost more to treat water for drinking. With only one source of water for the entire town are drinking water is the most serious municipal asset at risk from more than just climate change.	5/20/2020 8:36 AM
2	The climate is naturally cyclical. I am not convinced by the hype of man induced impact to the world's ecosystem.	5/20/2020 8:30 AM
3	Particular concern with water resources and natural areas	5/6/2020 4:36 PM

Q5 Which of the following categories are most susceptible to natural hazards in your community? Please rank the community assets in order of vulnerability, 1 being the most vulnerable and 5 being the least vulnerable.

Answered: 15 Skipped: 0

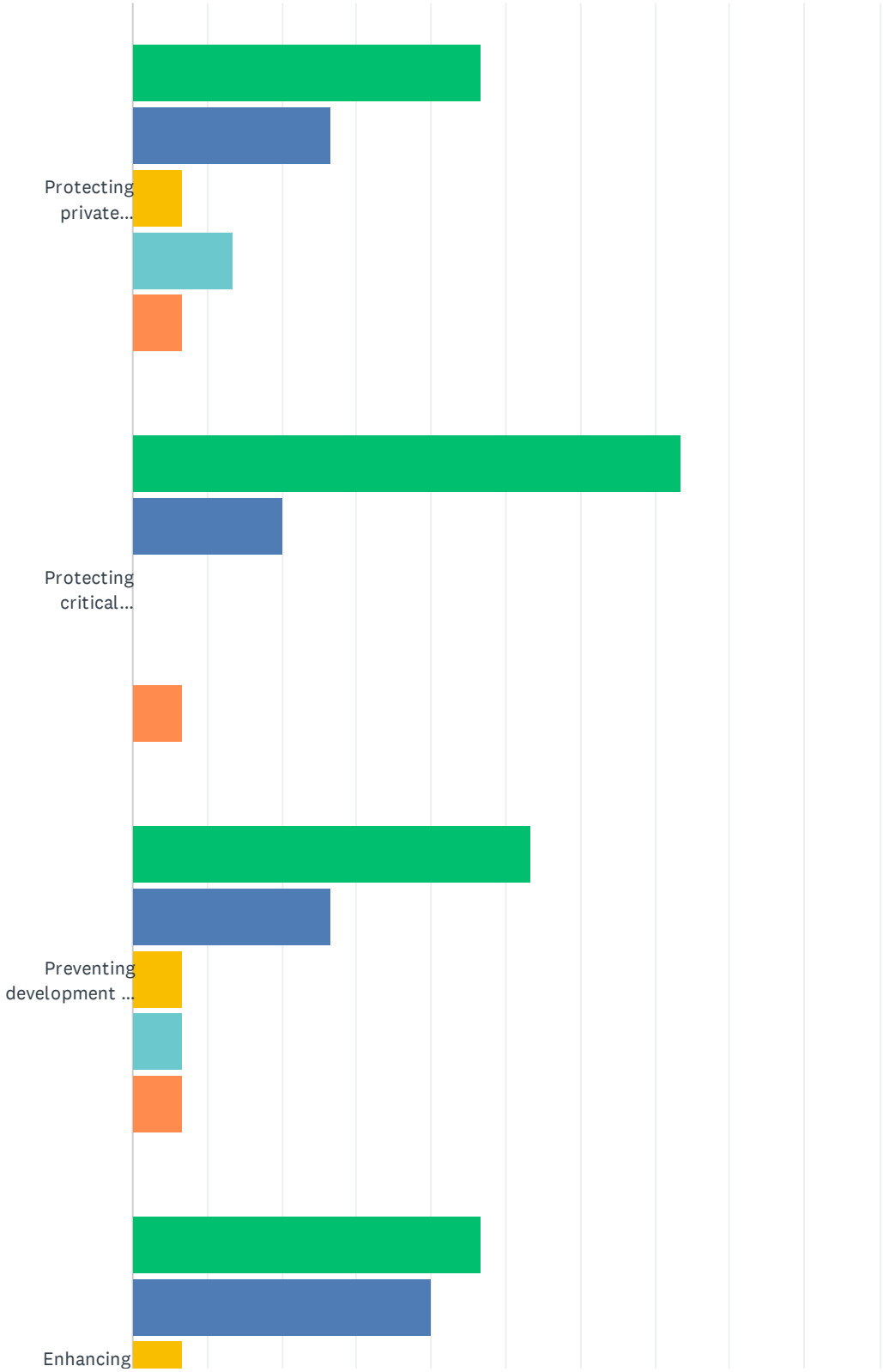


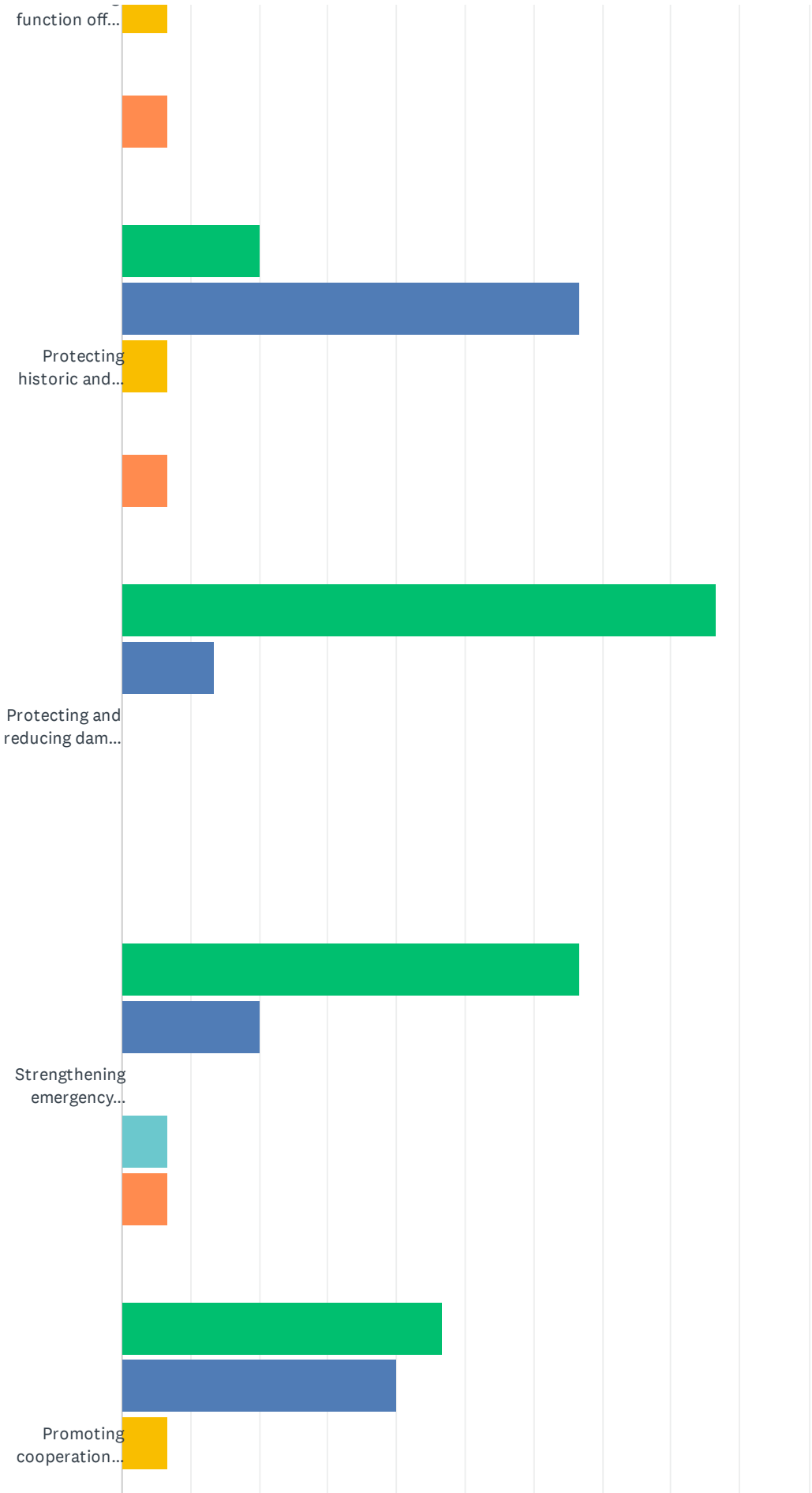


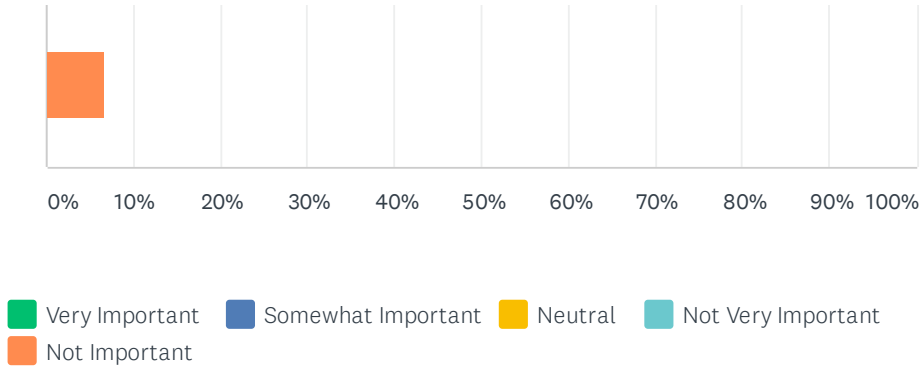
	1	2	3	4	5	TOTAL	WEIGHTED AVERAGE
People: Loss of life and/or injuries	26.67% 4	26.67% 4	26.67% 4	6.67% 1	13.33% 2	15	2.53
Economic: Business interruptions/closures, job losses, etc.	28.57% 4	21.43% 3	28.57% 4	14.29% 2	7.14% 1	14	2.50
Infrastructure: Damage/loss of roads, bridges, utilities, schools, etc.	40.00% 6	26.67% 4	13.33% 2	20.00% 3	0.00% 0	15	2.13
Cultural/Historic: Damage or loss of libraries, museums, historic properties, etc.	13.33% 2	13.33% 2	40.00% 6	20.00% 3	13.33% 2	15	3.07
Environment: Damage, contamination or loss of forests, wetlands, waterways, etc.	33.33% 5	6.67% 1	26.67% 4	13.33% 2	20.00% 3	15	2.80
Governance: Ability to maintain order and/or provide public amenities and services	13.33% 2	13.33% 2	33.33% 5	33.33% 5	6.67% 1	15	3.07

Q6 Natural hazards can have a significant impact on a community. Please tell us how important each statement is to you by checking the appropriate box for each.

Answered: 15 Skipped: 0




function off...
Protecting historic and...
Protecting and reducing dam...
Strengthening emergency...
Promoting cooperation...



	VERY IMPORTANT	SOMEWHAT IMPORTANT	NEUTRAL	NOT VERY IMPORTANT	NOT IMPORTANT	TOTAL
Protecting private property	46.67% 7	26.67% 4	6.67% 1	13.33% 2	6.67% 1	15
Protecting critical facilities (transportation networks, hospitals, fire stations, etc)	73.33% 11	20.00% 3	0.00% 0	0.00% 0	6.67% 1	15
Preventing development in hazard areas	53.33% 8	26.67% 4	6.67% 1	6.67% 1	6.67% 1	15
Enhancing function off natural assets (streams, wetlands, beaches, etc)	46.67% 7	40.00% 6	6.67% 1	0.00% 0	6.67% 1	15
Protecting historic and cultural landmarks	20.00% 3	66.67% 10	6.67% 1	0.00% 0	6.67% 1	15
Protecting and reducing damage to utilities	86.67% 13	13.33% 2	0.00% 0	0.00% 0	0.00% 0	15
Strengthening emergency services (police, fire, ambulance, etc)	66.67% 10	20.00% 3	0.00% 0	6.67% 1	6.67% 1	15
Promoting cooperation among public agencies, citizens, non-profits, academia, and businesses	46.67% 7	40.00% 6	6.67% 1	0.00% 0	6.67% 1	15

Q7 What specific community assets have helped you get through storm events and aided in recovery after storm events such as blizzards, flooding, extreme heat? Please be specific and list name, location, and owner of the three most important. (Examples include: Gas stations, pharmacies, supermarkets, towing services, etc) You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Answered: 10 Skipped: 5

ANSWER CHOICES	RESPONSES	
Name/Location/Owner	100.00%	10
Name/Location/Owner	90.00%	9
Name/Location/Owner	70.00%	7

#	NAME/LOCATION/OWNER	DATE
1	Fuel Oil Delivery	5/20/2020 12:45 PM
2	None - we strive to be self-sufficient for known/predicted events for our area	5/20/2020 8:30 AM
3	Cumberland Farms/301 Boston Rd./Billerica	5/12/2020 2:01 PM
4	DPW. 250 Boston Rd Billerica,MA	5/7/2020 7:30 AM
5	Town snow removal	5/6/2020 6:24 PM
6	store awnings over sidewalks, benches in the shade	5/6/2020 4:36 PM
7	Market Basket, 199 Boston Road	5/6/2020 3:53 PM
8	Town Department of Public Works	5/6/2020 12:33 PM
9	Public utility	5/6/2020 12:31 PM
10	national grid	5/6/2020 12:02 PM
#	NAME/LOCATION/OWNER	DATE
1	National Grid	5/20/2020 12:45 PM
2	7-Eleven/314 Boston Rd./Billerica	5/12/2020 2:01 PM
3	Town Hall 365 Boston Rd,MA	5/7/2020 7:30 AM
4	Town Parks Department	5/6/2020 6:24 PM
5	fire department water rescue	5/6/2020 4:36 PM
6	CVS, Boston Road	5/6/2020 3:53 PM
7	Market Basket	5/6/2020 12:33 PM
8	Local cooling center in extreme heat	5/6/2020 12:31 PM
9	townof billerica	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Wendy's/312 Boston Rd./Billerica	5/12/2020 2:01 PM
2	Marshall Middle School Floyd St. Billerica,MA	5/7/2020 7:30 AM
3	Town Fire Department	5/6/2020 6:24 PM
4	Cumberland Farms Gas Station, Boston Road	5/6/2020 3:53 PM
5	Gas Stations	5/6/2020 12:33 PM
6	supermarkets	5/6/2020 12:31 PM
7	walgrens	5/6/2020 12:02 PM

Q8 What infrastructure (examples include: roadways, community buildings, churches, schools, open space, dams, etc) have been impacted by storm events? Please list 3 specific things in Town that you have seen impacts to in the past. You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Answered: 12 Skipped: 3

ANSWER CHOICES	RESPONSES	
Name/Location/Owner	100.00%	12
Name/Location/Owner	91.67%	11
Name/Location/Owner	50.00%	6

#	NAME/LOCATION/OWNER	DATE
1	Extended power outages	5/20/2020 12:45 PM
2	None I have personally seen.	5/20/2020 8:30 AM
3	Boston rd rt 3A	5/19/2020 11:47 AM
4	All Schools	5/12/2020 2:01 PM
5	Elsie Ave. Billerica,MA	5/7/2020 7:30 AM
6	Elsie Ave, residences in flood plain	5/6/2020 6:24 PM
7	Elsie Ave and abutting properties	5/6/2020 5:06 PM
8	street trees in town centers and residential neighborhoods	5/6/2020 4:36 PM
9	Boston Road, Flooding	5/6/2020 3:53 PM
10	ELECTRICAL POWER, NATIONAL GRID!!!	5/6/2020 12:33 PM
11	Schools closed due to snowstorms	5/6/2020 12:31 PM
12	culverts whipple road	5/6/2020 12:02 PM
#	NAME/LOCATION/OWNER	DATE
1	Water main breaks	5/20/2020 12:45 PM
2	Water Intake Concord River	5/19/2020 11:47 AM
3	All Roadways	5/12/2020 2:01 PM
4	Shawsheen Rd. Billerica,MA	5/7/2020 7:30 AM
5	Shawsheen River abutters	5/6/2020 6:24 PM
6	Boston Road & abutting properties at the Shawsheen River Bridge	5/6/2020 5:06 PM
7	wetlands and floodplains along streams and rivers	5/6/2020 4:36 PM
8	Elsie Ave, Flooding	5/6/2020 3:53 PM
9	Roadways due to Flooding	5/6/2020 12:33 PM
10	Low roads flooding	5/6/2020 12:31 PM
11	flooding by jade pacific	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Riverbank Terrace.Billerica,MA	5/7/2020 7:30 AM
2	Pace gas station, Boston Road (Rte 3A) closed at bridge	5/6/2020 6:24 PM
3	Mount Pleasant Street under railroad bridge	5/6/2020 5:06 PM
4	Town Hall, Power outages	5/6/2020 3:53 PM
5	Schools due to Snow/Ice Storms	5/6/2020 12:33 PM
6	flodding by dpw	5/6/2020 12:02 PM

Q9 If there were a loss or inoperability, what major employers, primary economic sectors, and commercial centers would have a severe impact on the community and its ability to recover from a disaster? You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Answered: 8 Skipped: 7

ANSWER CHOICES	RESPONSES	
Name/Location/Owner	100.00%	8
Name/Location/Owner	75.00%	6
Name/Location/Owner	62.50%	5

#	NAME/LOCATION/OWNER	DATE
1	Entegris Inc.	5/20/2020 12:45 PM
2	None. Due to traffic and other issues, remote working and alternate site planning is in place for most of these activities.	5/20/2020 8:30 AM
3	All businesses	5/12/2020 2:01 PM
4	Public works	5/7/2020 7:30 AM
5	Town Hall	5/6/2020 6:24 PM
6	Billerica Mall, 480 Boston Road	5/6/2020 3:53 PM
7	EMD Serono	5/6/2020 12:33 PM
8	maeket basket	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Food establishments that provide supplies and food to facility	5/20/2020 12:45 PM
2	Police,FIre	5/7/2020 7:30 AM
3	MBTA	5/6/2020 6:24 PM
4	Treble Cove Plaza, 199 Boston Road	5/6/2020 3:53 PM
5	Towne Plaza	5/6/2020 12:33 PM
6	national grid	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	EMS	5/7/2020 7:30 AM
2	Schools	5/6/2020 6:24 PM
3	Towne Plaza, 700 Boston Road	5/6/2020 3:53 PM
4	Billerica Mall	5/6/2020 12:33 PM
5	town water system	5/6/2020 12:02 PM

Q10 Which populations, groups of people, or communities are less able to respond and recover during a disaster? (examples include: elderly populations, environmental justice populations, special needs schooling, child care, shelters, homeless, etc.) You may find it helpful to reference the community asset list included in Handout 1 to answer this question.

Answered: 11 Skipped: 4

ANSWER CHOICES	RESPONSES	
Name/Location/Owner	100.00%	11
Name/Location/Owner	90.91%	10
Name/Location/Owner	54.55%	6

#	NAME/LOCATION/OWNER	DATE
1	Low income housing	5/20/2020 12:45 PM
2	None. The identified items are known and as such it is individual and family responsibilty to plan for such events.	5/20/2020 8:30 AM
3	Elderly population	5/12/2020 2:01 PM
4	Elderly populations	5/7/2020 7:30 AM
5	No handout community asset list?	5/6/2020 6:24 PM
6	elderly	5/6/2020 5:06 PM
7	heat--elderly, those with respiratory illness	5/6/2020 4:36 PM
8	Elderly populations (particularly those with Dementia)	5/6/2020 3:53 PM
9	Elderly	5/6/2020 12:33 PM
10	Elderly	5/6/2020 12:31 PM
11	senior housing	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Elderly	5/20/2020 12:45 PM
2	Homeless	5/12/2020 2:01 PM
3	Schooling	5/7/2020 7:30 AM
4	No handout community asset list?	5/6/2020 6:24 PM
5	low income	5/6/2020 5:06 PM
6	flooding--housebound, elderly	5/6/2020 4:36 PM
7	Residents at the assisted living complexes (Brightview, Benchmark, etc.)	5/6/2020 3:53 PM
8	Childcare	5/6/2020 12:33 PM
9	EJ communities	5/6/2020 12:31 PM
10	nursing homes	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Child care	5/7/2020 7:30 AM
2	No handout community asset list?	5/6/2020 6:24 PM
3	heat--environmental justice	5/6/2020 4:36 PM
4	School children	5/6/2020 12:33 PM
5	Homeless population	5/6/2020 12:31 PM
6	public housing	5/6/2020 12:02 PM

Q11 Please list the top 3 natural environments in town that the community values and provides protective function to reduce the magnitude of hazard impact and increase resiliency? (examples include: open space, wetlands and waterbodies, trails, recreation areas, etc.)

Answered: 12 Skipped: 3

ANSWER CHOICES	RESPONSES	
Name/Location/Owner	100.00%	12
Name/Location/Owner	83.33%	10
Name/Location/Owner	75.00%	9

#	NAME/LOCATION/OWNER	DATE
1	Rivers and streams	5/20/2020 12:45 PM
2	Yankee Doodle Bike Path	5/20/2020 8:30 AM
3	Concord River Water Intake	5/19/2020 11:47 AM
4	Recreations areas	5/12/2020 2:01 PM
5	Vietnam Veterans Park	5/7/2020 7:30 AM
6	All Concord River RFA	5/6/2020 6:24 PM
7	Concord River	5/6/2020 5:06 PM
8	green open space and forest, trails	5/6/2020 4:36 PM
9	Concord River (recreation, wetland buffer zones, preservation)	5/6/2020 3:53 PM
10	Concord River	5/6/2020 12:33 PM
11	Concord River	5/6/2020 12:31 PM
12	concord river	5/6/2020 12:02 PM
#	NAME/LOCATION/OWNER	DATE
1	open space	5/20/2020 12:45 PM
2	Open Spaces	5/12/2020 2:01 PM
3	Boys and Girls club	5/7/2020 7:30 AM
4	All Shawsheen River RFA	5/6/2020 6:24 PM
5	Shawsheen River	5/6/2020 5:06 PM
6	wetlands, vernal pools, floodplains	5/6/2020 4:36 PM
7	Shawsheen River	5/6/2020 3:53 PM
8	Shawsheen River/watershed	5/6/2020 12:33 PM
9	Riparian forests and wetlands	5/6/2020 12:31 PM
10	vietnam veterans park	5/6/2020 12:02 PM

#	NAME/LOCATION/OWNER	DATE
1	Waterbodies	5/12/2020 2:01 PM
2	High School	5/7/2020 7:30 AM
3	Fox Hill, Iron Horse Park	5/6/2020 6:24 PM
4	Nuttings Lake	5/6/2020 5:06 PM
5	river access and blue trails	5/6/2020 4:36 PM
6	Manning State Forest (Recreation and trails)	5/6/2020 3:53 PM
7	Nutting Lake	5/6/2020 12:33 PM
8	Tree canopy	5/6/2020 12:31 PM
9	shawsheen river	5/6/2020 12:02 PM

Q12 Is there any other input or questions you would like to have discussed during the Town's MVP planning process?

Answered: 6 Skipped: 9

#	RESPONSES	DATE
1	Supporting businesses that provide significant numbers of jobs to residents in Billerica and nearby communities.	5/20/2020 12:45 PM
2	Flooding problems in town in particular the need to replace the route 3A bridge over the Shawsheen River which is a bottleneck for water. In addition Concord River flooding only increases with development and expected rainfall intensity. Removal of the dam would benefit water quality, fish passage, and decrease flooding over what could be a catastrophic watershed flood.	5/20/2020 8:36 AM
3	No. I am not readily seeing the value of this exercise. It seems to me to be a let me help you create a problem you didn't know you had, and then we can request funds to fix this previously non-existent problem.	5/20/2020 8:30 AM
4	NO	5/7/2020 7:30 AM
5	I just want to note that my answers in sections 1 and 2 above are estimates, not properly researched. I did not provide an answer to Question 7 or 9 because I was unsure of the answers.	5/6/2020 5:06 PM
6	How to maintain drinking water quality during droughts. Collaborating with neighboring towns.	5/6/2020 4:36 PM

TOWN OF BILLERICA MUNICIPAL VULNERABILITY PREPAREDNESS

Community Resilience Building Workshop – Societal Vulnerability & Strengths

May 13, 2020

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TODAY'S AGENDA

1:00 *Introduction & Workshop Goals*

1:10-1:20 *Natural Hazard Risks and Identified Community Assets -Survey Summary*

1:20-1:30 *Confirm Societal Assets List and Strengths and Vulnerabilities (via Q&A)*

1:30-1:45 *Mitigation Action Definitions and Examples*

1:45-2:15 *Discussion on Mitigation Actions (via Q&A)*

2:15-2:30 *Wrap up and Participant Homework (post workshop survey)*

WHY DO THIS PLANNING?

Help Billerica Build Resilience and Preparedness:

- Build on the Town's existing emergency management capabilities
- Plan for more frequent and intense weather events that are linked to climate change
- Engage multiple stakeholders in the planning process
- Improve access to funding for mitigation and adaptation

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

A brief thanks to Billerica's MVP Core Team

Abdul Alkhatib – Director of Public Works

Bill Laurendeau – Emergency Management Director

Clancy Main – Town Manager's Office

Daniel C. Rosa – Chief of Police

Ed Tierney – Highway Superintendent

Heather Chew – Assistant Town Engineer

Isabel Tourkantonis – Conservation Director

Jeff Kalmes – Wastewater Superintendent

Kelley Conway – Town Engineer

Kristel Bennet – Health Director

Rob Anderson – Community Development

Robert Cole – Fire Chief

Tom Ferraro – Deputy Fire Chief

BILLERICA'S MVP WEBSITE

http://services.tighebond.com/mvp/billerica/

Municipal Vulnerability and Preparedness Planning for the Town of Billerica Public Engagement Information

Municipal Vulnerability Preparedness Planning Background The Town of Billerica was recently awarded a $39,000 grant by the Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness (MVP) Planning Grant program to complete a public engagement and climate resilience planning process before June 30, 2020. Billerica's Economic Development Department is taking the lead on the MVP program, with participation of a Core Team of Town Staff to plan for ways to better prepare and protect the Town from natural and climate-related hazards. Once the plan is completed and approved by EEA, the Town of Billerica will be designated as an MVP Community, joining 287 communities across Massachusetts that have been designated since the MVP program began in 2017. This work also includes preparing a Town-specific Hazard Mitigation Plan (HMP) 5-year update to help Billerica continue to be eligible to receive certain types of non-emergency disaster assistance, including funding for mitigation projects.

Why plan for climate resilience? Resilience is the ability of a community to address the needs of its built, social and natural environment to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards. Planning for climate resilience allows Billerica to build capacity to reduce the impacts from future climate events rather than just react to events as they occur.

How will the public engage? MVP is a Community Driven Process to understand climate vulnerabilities and identify priority actions. MVP provides structured opportunities for public engagement through review of community specific mapping and climate data, participation in unique Community Resilience Building Workshops, and developing priority action plans to improve their community's resilience with an emphasis on nature-based solutions. There will be a public meeting to review the HMP update, as well.

Due to COVID-19, previously planned public meetings and workshops will be held online.

The Town is utilizing a number of public engagement methods including:

- Posting online resources that will be used in the workshops
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More information is coming soon, including how to participate and dates/times for all meetings.

Session #1 Presentation

Identify Natural Hazards, Risk Areas and Community Strengths

1:10 PM

WHAT ARE NATURAL HAZARDS?

Poor Urban Drainage
Regional Flooding
Culvert Failure

Inland Flooding

Tsunami

Severe Winter Storm

Blizzards
Snow
Ice Storms

Drought

Average/Extreme Temperatures

Tornadoes

Landslide

Wildfires

Other Severe Weather

Nor'easters
High Wind
Heavy Precipitation
Microbursts

Coastal Flooding

Invasive Species

Earthquake

Coastal Erosion

Hurricanes/Tropical Storms

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TOP NATURAL HAZARDS – PAST & PRESENT

Thunderstorms

Nor’easters

High wind

Extreme Temperature

Tighe&Bond

TOP NATURAL HAZARDS – FUTURE

Drought / extreme temperatures (tie)

Nor’easters/ Blizzards/ flooding (tie)

Ice storm/ tornado

Invasive species

Tighe&Bond

BILLERICA'S TOP NATURAL HAZARDS
THE SURVEY SAYS….

Severe Storms (Nor'easters, Blizzards, Thunderstorms, Ice storms, High Wind)

Flooding

Drought/ Extreme Temperatures

Invasive Species

+ **CLIMATE CHANGE**

=

AMPLIFIED RISKS

- Community and regional infrastructure
- Local and regional economies
- Public Health
- Natural resources and our environment

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

WHAT ARE COMMUNITY ASSETS?

Societal

Infrastructure

Economy

Natural Resources

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

PEOPLE – SOCIETAL ASSETS

- Child Care
- Nursing Homes/ Elderly Housing
- Churches
- Emergency Shelters
- Food Pantry
- Historical Places
- Senior Centers
- Schools
- Libraries
- Veterinary Hospitals
- Boys & Girls Club
- Cemeteries
- BHA Parker House
- BHA McColough House

Session #1 Discussion

Societal Assets: Strengths and Vulnerabilities

1:20 PM

Switch to Community Resilience Building Workshop Risk Matrix to review societal assets and their strengths and vulnerabilities

Session #2 Presentation

Identify Actions to Address Vulnerabilities and Protect Strengths

1:30 PM

TYPES OF MITIGATION ACTIONS

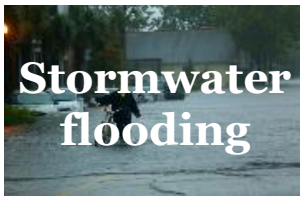
1. Prevention
2. Property Protection
3. Public Education and Awareness
4. Natural Resource Protection and Green Infrastructure (nature-based solutions)
5. Structural Projects
6. Emergency Services Protection

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

DISCUSSION ITEM: Mitigation Strategies

Hazards



Nature-based solutions

- Open space preservation
- Ecosystem restoration
- Low Impact Development

Municipal benefits

Avoided Costs

Enhanced Safety

Environmental Services

Switch to Community Resilience Building Workshop Risk Matrix to populate mitigation strategies

Session #3

Wrap up and Assignments

2:15 PM

PARTICIPANT ASSIGNMENTS

- **Take the Post Workshop Survey!**
  - http://services.tighebond.com/mvp/billerica/
- **Sign up for Additional Workshops**
  - Infrastructural assets: May 20th 1:00-2:30 PM
  - Economic assets: May 27th, 1:00-2:30 PM
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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

STILL HAVE QUESTIONS OR COMMENTS?

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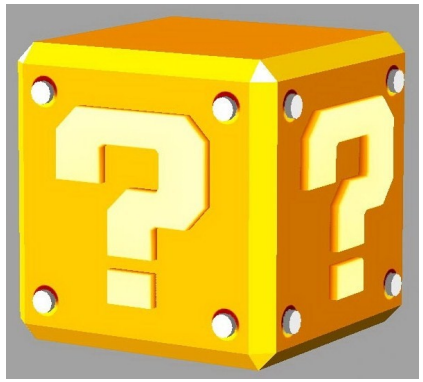


Billerica – MVP Webinar #1 Society – Notes

Attendees:

- Rob Anderson
- Ed Reiner
- Jeff Kalmes
- Blake
- Erin Anable
- Douglas Fogerty
- Shannon O'Brien
- Heather Chew
- Bill Laurendeau
- Derek Doyle
- Jennie Moonan
- Kristin Dippold
- Gabrielle Belfit
- Jim?
- Marlies
- Alison Field-Juma
- Abdul
- Mike Grady
- Betsy Gallagher
- Bob Cole
- Beverly Woods
- MCoveno?

TOWN OF BILLERICA
MUNICIPAL VULNERABILITY PREPAREDNESS

Community Resilience Building Workshop

Built Environment/Infrastructure Vulnerability & Strengths

May 20, 2020

Tighe&Bond

TODAY'S AGENDA

1:00 *Introduction & Workshop Goals*

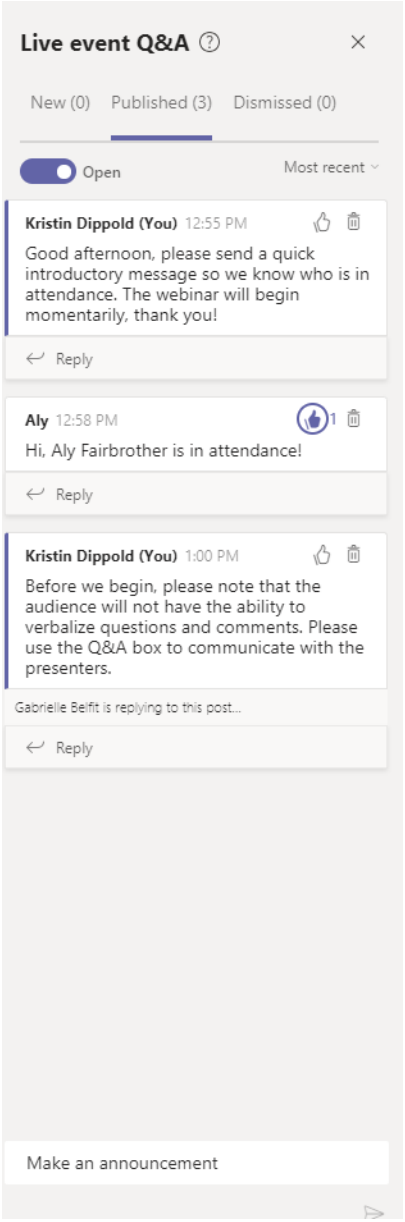
1:10-1:20 *Natural Hazard Risks and Identified Community Assets -Survey Summary*

1:20-1:30 *Confirm Infrastructural Assets List and Strengths and Vulnerabilities (via Q&A)*

1:30-1:45 *Mitigation Action Definitions and Examples*

1:45-2:15 *Discussion on Mitigation Actions (via Q&A)*

2:15-2:30 *Wrap up and Participant Homework (post workshop survey)*



TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

WHY DO THIS PLANNING?

Help Billerica Build Resilience and Preparedness:

- Build on the Town's existing emergency management capabilities
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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

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BILLERICA'S MVP WEBSITE

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Municipal Vulnerability Preparedness Planning Background The Town of Billerica was recently awarded a $39,000 grant by the Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness (MVP) Planning Grant program to complete a public engagement and climate resilience planning process before June 30, 2020. Billerica's Economic Development Department is taking the lead on the MVP program, with participation of a Core Team of Town Staff to plan for ways to better prepare and protect the Town from natural and climate-related hazards. Once the plan is completed and approved by EEA, the Town of Billerica will be designated as an MVP Community, joining 287 communities across Massachusetts that have been designated since the MVP program began in 2017. This work also includes preparing a Town-specific Hazard Mitigation Plan (HMP) 5-year update to help Billerica continue to be eligible to receive certain types of non-emergency disaster assistance, including funding for mitigation projects.

Why plan for climate resilience? Resilience is the ability of a community to address the needs of its built, social and natural environment to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards. Planning for climate resilience allows Billerica to build capacity to reduce the impacts from future climate events rather than just react to events as they occur.

How will the public engage? MVP is a Community Driven Process to understand climate vulnerabilities and identify priority actions. MVP provides structured opportunities for public engagement through review of community specific mapping and climate data, participation in unique Community Resilience Building Workshops, and developing priority action plans to improve their community's resilience with an emphasis on nature-based solutions. There will be a public meeting to review the HMP update, as well.

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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TOP NATURAL HAZARDS – PAST & PRESENT

Thunderstorms

Nor’easters

High wind

Extreme Temperatures / Invasive species (tied)

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TOP NATURAL HAZARDS – FUTURE

Nor’easters/ Flooding (Tie)

Blizzard/ Drought / extreme temperatures (tie)

Ice storm

Invasive species

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THE SURVEY SAYS….

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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

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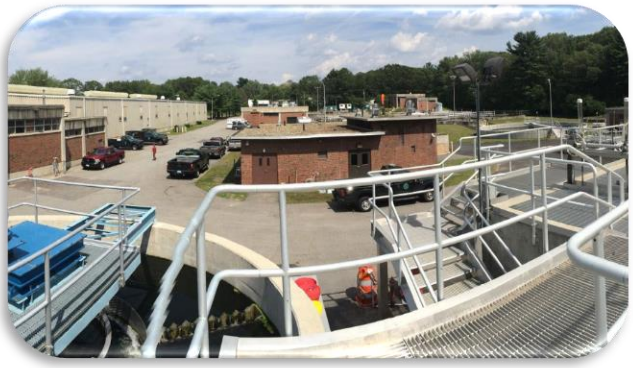
Societal



Infrastructure

Economy

Natural Resources

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

INFRASTRUCTURAL ASSETS

- Emergency Management
- Billerica Fire Department Stations
- Billerica Police Department Stations
- Public Works Department
- Cell Towers
- Town Hall
- Substations
- Evacuation Routes
- Roadways
- Culverts
- Bridges
- Stormwater Infrastructure
- Communications Infrastructure
- Industrial Areas

Session #1 Discussion

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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

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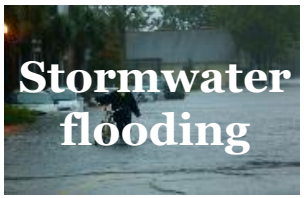

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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

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  - 781.708.9826

Billerica Webinar #2 – Infrastructure – Q&A

Attendee List

Mike Grady
Rob Anderson
Emily Scerbo
Daryle Hillsgrove
Eric Anable
Derek Doyle
Heather Chew
Ed Reiner
Blake Robertson
Dan Rosa
Ed Tierney
Marlies
Isabel Tourkantonis

Kristin Dippold (You)
12:59 PM
Good afternoon, please send a quick introductory message so we know who is in attendance. Feel free to share your affiliation (resident, business owner, municipal staff, etc). The webinar will begin momentarily, thank you!

Anonymous
1:00 PM
mike grady

Anonymous
1:00 PM
Hello! Emily Scerbo is here from Tighe & Bond.

Daryle Hillsgrove
1:00 PM
Good Afternoon this is Daryle Hillsgrove, Sr. EHS Specialist for Entegris Inc. We employee about 350 people at our site in Billerica.

Eric Anable
1:02 PM
Member of Board of Appeals

Derek Doyle
1:02 PM
Derek Doyle from Town of Billerica here.

Heather Chew
1:02 PM
Good Afternoon, Heather Chew here from the Town of Billerica Engineering Division.

Ed Reiner
1:03 PM
Hi

Kristin Dippold (You)
1:04 PM
Welcome! Please note that the audience will not have the ability to verbalize questions and comments. Use the Q&A box to the right of your screen to communicate with the presenters. You may need to continually scroll down to see the moderator's questions and other participants comments.

Kristin Dippold (You)
1:04 PM
If you have an issue with Microsoft Teams, please send a text message to our IT support at 508-499-8193

Blake Robertson
1:05 PM
Just letting you all know I am online.

Dan Rosa BPD
1:09 PM
Good Afternoon

Ed Tierney
1:15 PM
Having trouble hearing

Marc Perryman (Moderator)
1:16 PM
Is it too quiet ? make sure your volume is turned up enough

Kristin Dippold (You)
1:16 PM
Based on the survey, here are the infrastructure assets for the Town of Billerica. Should any assets be added to this list? Should any items be deleted?

Marlies
1:18 PM
Not easy to join. I got in 'anonymously'. Is there any chance to give input, or are we just attending to listen?

Kristin Dippold (You)
1:18 PM
Hi Marlies - Joining anonymously is fine. You cannot give verbal input, however, you will have the ability to give input through this Q&A chat.

Anonymous
1:19 PM
Can you please get closer to the mic as you are talking as your voice is very low, even with my volume all the way up

Daryle Hillsgrove
1:20 PM
Are you including emergency medical services in the asset?

Daryle Hillsgrove
1:20 PM

Waste Water Treatment Facility is a significant asset. Loss impacts sanitary for community and would shut down our facility.

Gabrielle Belfit (Moderator)
1:20 PM
we're looking forward to all of your comments! just have to type them!

Daryle Hillsgrove
1:21 PM
Natural gas - are there areas that can only be fed from one line that would cut off gas to sections of the town.

Daryle Hillsgrove
1:21 PM
No, in general. Are there areas that may get cut off from services?

Good afternoon! Isabel Tourkantonis from Billerica Conservation Dept.
1:22 PM
Good afternoon, Isabel Tourkantonis from Billerica Conservation Dept.

Heather Chew
1:23 PM
Please add Water Treatment Plant also.

Heather Chew
1:24 PM
Fire Stations

Daryle Hillsgrove
1:24 PM
Are there designated shelters in the town that need to be maintained?

Anonymous
1:25 PM
Would we ever consider our town businesses as infrastructure?

Emily Scerbo, Tighe & Bond
1:26 PM
Should WWTP include WW collection system and pump stations?

Marlies
1:27 PM
Old bridges are an infrastructural vulnerability. (Shawsheen and Concord River i.e. Faulkner St.

Ed Reiner
1:27 PM
Is the Route 3A bridge on the Shawsheen River on the TIP to be replaced by Mass Highway?

Heather Chew
1:28 PM
The roads listed are flood areas. Boston Road at Jade Pacific floods. I'm not sure about Shawsheen Road.

Marlies
1:28 PM
EMS is strength in center. It might not reach Pinehurst in flood conditions. Or Elsie Ave.

Gabrielle Belfit (Moderator)
1:32 PM
We have your comment! All comments are published so we can go back and review everyone's input

Marlies
1:29 PM
I guess nobody sees the input.

Heather Chew
1:29 PM
There are no TIP projects that we are aware of to replace any bridges right now.

Dan Rosa BPD
1:30 PM
with water plant should water intake

Marlies
1:30 PM
They are asking for input. Mine is not acknowledged

Blake Robertson
1:31 PM
I an unable to see the comments

Blake Robertson
1:31 PM
Viewable by switching to Featured

Ed Reiner
1:32 PM
Dam removal at the North Billerica Mills Dam would decrease flooding potential. Historically low level gates were used to relieve flooding in Billerica. These gates have not operated in my lifetime to my knowledge. Water does not go thru the mills. The spillway is not adequate to handle the 1 percent storm.

Eric Anable
1:32 PM
I keep having to hit "most recent" to see any new comments. don't have scroll bar.

Heather Chew
1:32 PM
The tab to see all comments is called "featured"

Daryle Hillsgrove
1:33 PM
For Waste Water, are there pumping stations that are old or are close to capacity that could back up in a major flood?

Ed Reiner
1:33 PM
Lack of alternative water supply is the issue if the water was not suitable to drink due to a hazardous chemical spill. The town may want to re-establish the historic well fields near the intake.

Dan Rosa BPD
1:34 PM
Cook st should be added to Shawsheen river flood issue

Daryle Hillsgrove
1:34 PM
Route 3 overpass on Concord Road. If this is damaged it would impact ability to get to Bedford for residents and for emergency services.

Ed Reiner
1:35 PM
Removal of the center pier left in the River from the Historic Bridge Street Bridge would also mitigate flooding since the granite center pier is in the floodway of the River.

Heather Chew
1:36 PM
We will have to follow up with the Wastewater Superintendent on the question regarding pump stations.

Ed Reiner
1:37 PM
Large trees have fallen into the Concord River below the Pollard Street Bridge. While trees in the river is good habitat, tress which block water flow at the drowned three rapids back up the water. Removal should be considered.

Good afternoon! Isabel Tourkantonis from Billerica Conservation Dept.
1:42 PM
for roadways, culvert assessments

Daryle Hillsgrove
1:44 PM
Establish capital accounts if possible, for replacing culverts, fire cisterns, other physical things that may be damaged. Pelham NH did this to repair cisterns.

Daryle Hillsgrove
1:43 PM
Culverts-scheduled preventative maintenance and inspection.

Heather Chew
1:43 PM
As previously mentioned, replacement of the Boston Road bridge over Shawsheen River could be a solution for this particular area.

Anonymous
1:44 PM
Its the bridge at the Shawsheen that is too small on Route 3A that causes the flooding.

Anonymous
1:44 PM
Power losses during big storms over the recent years has increased significantly and last many days and effect all aspects of the Town, residences, businesses, etc.

Daryle Hillsgrove
1:45 PM
Establish capital accounts if possible for replacing culverts, fire cisterns, other physical things that may be damaged. Pelham NH did this to repair cisterns.

Heather Chew

1:46 PM
A Stormwater Division of DPW dedicated to Stormwater and the drainage system would be of great value.

Anonymous
1:46 PM
Blockages by trees along brooks back up water. People add to the problem by dumping brush at the brook.

Daryle Hillsgrove
1:47 PM
Fire stations, review resources. For items with high expense, does it make sense to strategically purchase some items to spread out to prevent a single item resource from being cut off from other vulnerable areas.

Daryle Hillsgrove
1:47 PM
I am a business but also served in Pelham. We used capital savings accounts to put in small amounts over several years and repairs needed could withdraw from that account rather than the general budget.

Daryle Hillsgrove
1:49 PM
Update lists of residents who may be on oxygen or other medical treatments that would be impacted in power outage. Reach out to senior centers and other aspects to let residents know there are things in place to support them. Many elderly are not aware.

Gabrielle Belfit (Moderator)
1:50 PM
thank you, great idea and we'll cover this under societal mitigation strategy

Blake Robertson
1:51 PM
What about personal responsibility? It was mentioned last week.

Daryle Hillsgrove
1:51 PM
Update supply list and check for expired items for shelter areas. Have a restock plan. Conduct drills to help test plans.

Daryle Hillsgrove
1:52 PM
Make arrangements with local clinics to help support medical services that may be needed in a shelter including providing supplies.

Anonymous
1:52 PM
with the dependance on internet, especially during this time, would cable line be a critical infrastructure item now?

Daryle Hillsgrove
1:54 PM
Does town hall have off-site back up storage of hard drives and records

Daryle Hillsgrove
1:56 PM

For Waste Water, do they have two suppliers for critical items to keep facility running and do they know the lead times. For many services, an alternate source would be good and establish minimum requirements to keep on hand the critical items that could get delayed.

Dan Rosa BPD
1:56 PM
many of the issues mentioned regarding public buildings mentioned have been addressed but this format is not good to address this

Heather Chew
1:57 PM
No audio for the past 5 minutes. Any suggestions?

Gabrielle Belfit (Moderator)
1:58 PM
Did you try the volume control?

Gabrielle Belfit (Moderator)
1:59 PM
I'm really sorry you are having an issue

Anonymous
1:57 PM
Do we have emergency connections for water supply from other towns?

Anonymous
1:59 PM
We may only have a possible connection in chelmsford to my knowledge

Heather Chew
2:00 PM
I know some communities have dedicated archivists. Billerica could definitely benefit from an archivist for filing and offsite back up of files.

Daryle Hillsgrove
2:02 PM
Thank you. Good discussion

TOWN OF BILLERICA MUNICIPAL VULNERABILITY PREPAREDNESS

Community Resilience Building Workshop – Economic Vulnerability & Strengths

May 27, 2020

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

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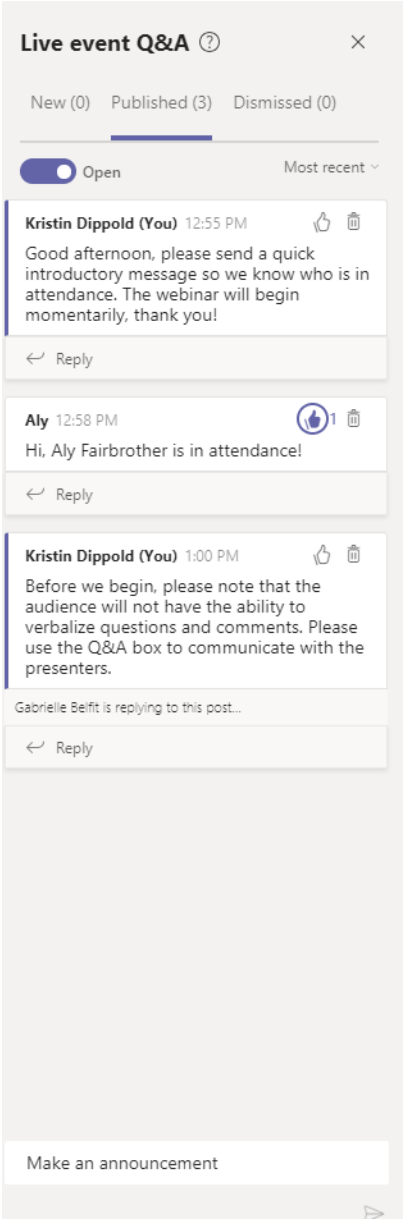

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- Hosting virtual workshops focusing on climate resilience within the context of Billerica's societal, built infrastructure, natural resources and economic community assets.
- Hosting a community listening session

More information is coming soon, including how to participate and dates/times for all meetings.

Session #1 Presentation

Identify Natural Hazards, Risk Areas and Community Strengths

1:10 PM

WHAT ARE NATURAL HAZARDS?

Poor Urban Drainage
Regional Flooding
Culvert Failure

Inland Flooding

Tsunami

Severe Winter Storm

Blizzards
Snow
Ice Storms

Drought

Average/Extreme Temperatures

Tornadoes

Landslide

Wildfires

Other Severe Weather

Nor'easters
High Wind
Heavy Precipitation
Microbursts

Coastal Flooding

Invasive Species

Earthquake

Coastal Erosion

Hurricanes/Tropical Storms

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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TOP NATURAL HAZARDS – PAST & PRESENT

Thunderstorms

Nor’easters

High wind

Extreme Temperature

Tighe&Bond

TOP NATURAL HAZARDS – FUTURE

Drought / extreme temperatures (tie)

Nor’easters/ Blizzards/ flooding (tie)

Ice storm/ tornado

Invasive species

Tighe&Bond

BILLERICA'S TOP NATURAL HAZARDS
THE SURVEY SAYS….

Severe Storms (Nor'easters, Blizzards, Thunderstorms, Ice storms, High Wind)

Flooding

Drought/ Extreme Temperatures

Invasive Species

+ **CLIMATE CHANGE**

=

AMPLIFIED RISKS

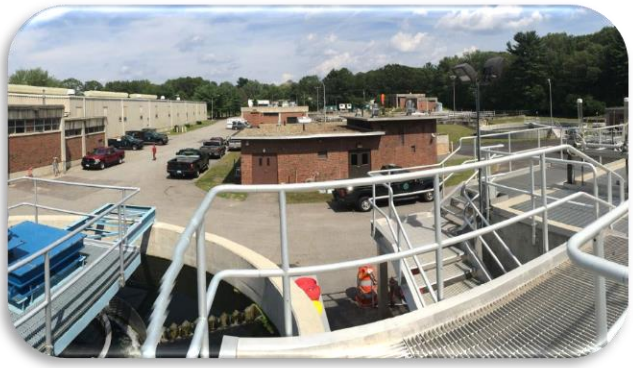
- Community and regional infrastructure
- Local and regional economies
- Public Health
- Natural resources and our environment

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

WHAT ARE COMMUNITY ASSETS?

Societal



Infrastructure

Economy

Natural Resources

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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ECONOMIC ASSETS

- Grocery Stores
- Pharmacies
- Hardware Stores
- Small Businesses
- Commercial Centers
- Towing Companies
- Malls
- Plazas
- Major Employers

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

Session #1 Discussion

Societal Assets: Strengths and Vulnerabilities

1:20 PM

Switch to Community Resilience Building Workshop Risk Matrix to review economic assets and their strengths and vulnerabilities

Session #2 Presentation

Identify Actions to Address Vulnerabilities and Protect Strengths

1:30 PM

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TYPES OF MITIGATION ACTIONS

1. Prevention
2. Property Protection
3. Public Education and Awareness
4. Natural Resource Protection and Green Infrastructure (nature-based solutions)
5. Structural Projects
6. Emergency Services Protection

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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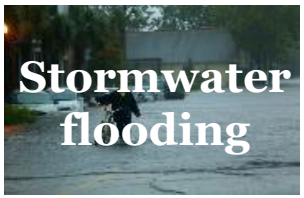
DISCUSSION ITEM: Mitigation Strategies

Hazards



Nature-based solutions

- Open space preservation
- Ecosystem restoration
- Low Impact Development

Municipal benefits

Avoided Costs

Enhanced Safety

Environmental Services

Switch to Community Resilience Building Workshop Risk Matrix to populate mitigation strategies

Session #3

Wrap up and Assignments

2:15 PM

PARTICIPANT ASSIGNMENTS

- **Take the Post Workshop Survey!**
  - http://services.tighebond.com/mvp/billerica/
- **Sign up for Additional Workshops**
  - Environmental assets: June 3nd, 1:00-2:30 PM
- **Review the Draft Findings CRB Report**
  - Available on the website in mid-June
- **Attend the Listening Session**

STILL HAVE QUESTIONS OR COMMENTS?

Contact Information:

- **Gabrielle Belfit, CFM, Senior Environmental Scientist**
  - GCBelfit@tighebond.com
  - 508.304.6362

- **Jennie Moonan, PE, Project Manager**
  - JSMoonan@tighebond.com
  - 781.708.9826

Billerica – Webinar #3 – Economy

Attendees - 15

- Clancy Main
- Rob Anderson
- Eric Anable
- Tom Farraro
- George ____
- Christa Collins
- Derek Doyle
- Ed Reiner
- Marlies
- Steve ___
- Heather Chew
- Daryle Hillsgrove
- Bill Laurendeau
- Blake Robertson
- Unknown (978-821-7025)

Chat

From Marlies to Everyone: 01:11 PM
I miss restaurants in this line-up

From Eric Anable to Everyone: 01:17 PM
How about Hotels/motels for emergency shelters?

From Heather Chew to Everyone: 01:18 PM
O'Connor Hardware?

From Daryle Hillsgrove to Everyone: 01:19 PM
Was O'conner hardware included?
Landscape often have equipment for clean up.
What about the new rental center near treble cove plaza? This has equipment that might be needed to help with clean up activities or repairs.

From Christa Collins to Everyone: 01:21 PM
Agriculture is also a strength because the open land provides some natural services and climate resiliency.

From Heather Chew to Everyone: 01:22 PM
Contractors as a strength - ability to repair damaged infrastructure

From Daryle Hillsgrove to Everyone: 01:22 PM
I belive so.

From Derek Doyle to Everyone: 01:23 PM
Address for Herc rentals is 257 Boston Road

From Daryle Hillsgrove to Everyone: 01:23 PM
There is a gulf near the herc
Are there thrift stores that might have clothing and other items needed?

From George's iPhone to Everyone: 01:25 PM
you cannot assume that a business has a generator and can operate 100%. typically the generator is for critical support of assets like freezers so they are not lost during an outage. recent experience in Billerica is the vulnerability of power loss to storms

From Christa Collins to Everyone: 01:25 PM
Maybe hotels are a vulnerability if guests get trapped there in a weather emergency

From Daryle Hillsgrove to Everyone: 01:38 PM
It may be good to promote plantings and other vegetation improvements that could improve water capture/storage and improve air quality Provide promote types of vegetation desired.
Promote/coordination with Fire Department and other hazard mitigation to agencies for volunteer improvements (spill kits for gas stations, training on preventing spills, addressing spills etc.)

From Christa Collins to Everyone: 01:41 PM
Could public works create a sidewalk clearing plan (snow and storm debris) that prioritized routes from neighborhoods to grocery stores?

From Daryle Hillsgrove to Everyone: 01:42 PM
Code but also just sending inforamtion to landscapers, and private facilities that might be looking at landscape improvements. For Example, Cooperative Extension Service has many free publications that could be promoted and/or distributed.

From Steve to Everyone: 01:44 PM
Sidewalks are cleared of snow by a private contractor. Brush and tree debris sidewalk clearing would come after streets and safety problem locations.

From Clancy Main to Everyone: 01:46 PM
A note: Master Plan was completed in 2018 and is updated every 10 years.

From Steve to Everyone: 01:46 PM
Certain townwide sidewalks, primarily in school zones and the center area for snow removal.

From Ed Reiner to Everyone: 01:46 PM
The side walk does not reach Bridge Street.

From Blake to Everyone: 01:47 PM
Master plan is disjointed and internally contradictory irrespective of when it is next scheduled for update. it needs to be revisited immediately

From Daryle Hillsgrove to Everyone: 01:50 PM
Does National Grid have multiple sources of power feeding into the community? Ability to re-route power? It would be good to know so if there is an outage, higher impacted areas can be identified (health care facilties, nursing homes (ie. Bright View on Concord Road, the other assisted living facility near funeral home.

From Christa Collins to Everyone: 01:50 PM
Do large businesses (those with a lot of employees on site) have to share emergency and evacuation plans with fire and police?

From George's iPhone to Everyone: 01:50 PM
in my opinion the most disruptive events that have effected the Billerica economy have been the lengthy power losses in town especially serving the southern end of town. what mitigation can be done?

From Daryle Hillsgrove to Everyone: 01:51 PM
What type of evaluation is done for trees near power lines and is there a maintenance plan by the town or national grid?

From Heather Chew to Everyone: 01:52 PM
National Grid is responsible for maintenance under their power lines.

From Eric Anable to Everyone: 01:52 PM
Do gas stations that are in the flood zones have any extra storage safety requirements?
From Steve to Everyone: 01:55 PM
National Grid regularly trims trees adjacent to their power lines. New residential subdivisions typically do have underground utilities.

From Heather Chew to Everyone: 01:56 PM
My comment was referring to trimming trees, vegetation removal/control under the Grid power lines. Grid is responsible.

TOWN OF BILLERICA MUNICIPAL VULNERABILITY PREPAREDNESS

Community Resilience Building Workshop – Natural Environment Vulnerability & Strengths

June 3, 2020

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

TODAY'S AGENDA

1:00 *Introduction & Workshop Goals*

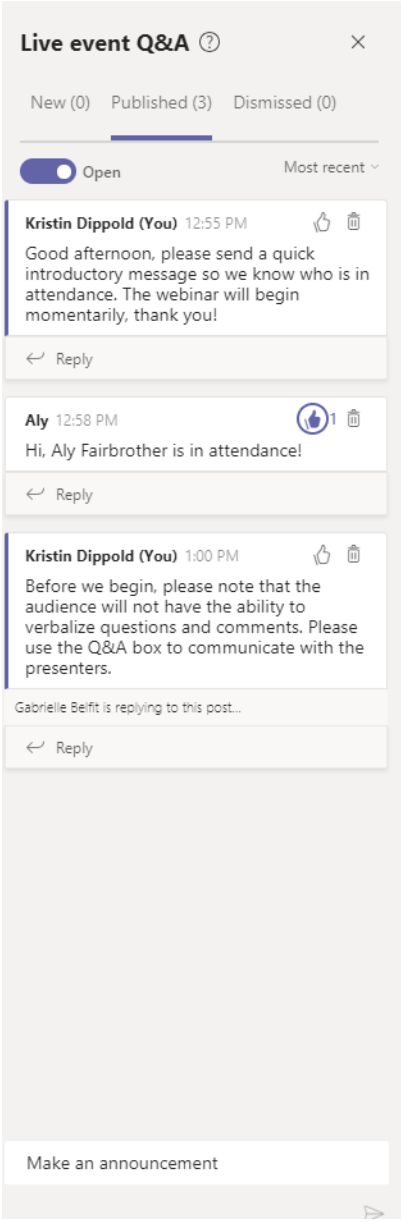
1:10-1:20 *Natural Hazard Risks and Identified Community Assets -Survey Summary*

1:20-1:30 *Confirm Natural Environment Assets List and Strengths and Vulnerabilities (via Q&A)*

1:30-1:45 *Mitigation Action Definitions and Examples*

1:45-2:15 *Discussion on Mitigation Actions (via Q&A)*

2:15-2:30 *Wrap up and Participant Homework (post workshop survey)*



WHY DO THIS PLANNING?

Help Billerica Build Resilience and Preparedness:

- Build on the Town's existing emergency management capabilities
- Plan for more frequent and intense weather events that are linked to climate change
- Engage multiple stakeholders in the planning process
- Improve access to funding for mitigation and adaptation

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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A brief thanks to Billerica's MVP Core Team

Abdul Alkhatib – Director of Public Works

Bill Laurendeau – Emergency Management Director

Clancy Main – Town Manager's Office

Daniel C. Rosa – Chief of Police

Ed Tierney – Highway Superintendent

Heather Chew – Assistant Town Engineer

Isabel Tourkantonis – Conservation Director

Jeff Kalmes – Wastewater Superintendent

Kelley Conway – Town Engineer

Kristel Bennet – Health Director

Rob Anderson – Community Development

Robert Cole – Fire Chief

Tom Ferraro – Deputy Fire Chief

BILLERICA'S MVP WEBSITE

http://services.tighebond.com/mvp/billerica/

Municipal Vulnerability and Preparedness Planning for the Town of Billerica Public Engagement Information

Municipal Vulnerability Preparedness Planning Background The Town of Billerica was recently awarded a $39,000 grant by the Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness (MVP) Planning Grant program to complete a public engagement and climate resilience planning process before June 30, 2020. Billerica's Economic Development Department is taking the lead on the MVP program, with participation of a Core Team of Town Staff to plan for ways to better prepare and protect the Town from natural and climate-related hazards. Once the plan is completed and approved by EEA, the Town of Billerica will be designated as an MVP Community, joining 287 communities across Massachusetts that have been designated since the MVP program began in 2017. This work also includes preparing a Town-specific Hazard Mitigation Plan (HMP) 5-year update to help Billerica continue to be eligible to receive certain types of non-emergency disaster assistance, including funding for mitigation projects.

Why plan for climate resilience? Resilience is the ability of a community to address the needs of its built, social and natural environment to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards. Planning for climate resilience allows Billerica to build capacity to reduce the impacts from future climate events rather than just react to events as they occur.

How will the public engage? MVP is a Community Driven Process to understand climate vulnerabilities and identify priority actions. MVP provides structured opportunities for public engagement through review of community specific mapping and climate data, participation in unique Community Resilience Building Workshops, and developing priority action plans to improve their community's resilience with an emphasis on nature-based solutions. There will be a public meeting to review the HMP update, as well.

Due to COVID-19, previously planned public meetings and workshops will be held online.

The Town is utilizing a number of public engagement methods including:

- Posting online resources that will be used in the workshops
- Conducting pre- and post- workshop surveys
- Hosting virtual workshops focusing on climate resilience within the context of Billerica's societal, built infrastructure, natural resources and economic community assets.
- Hosting a community listening session

More information is coming soon, including how to participate and dates/times for all meetings.

Session #1 Presentation

Identify Natural Hazards, Risk Areas and Community Strengths

1:10 PM

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Coastal Flooding

Invasive Species

Earthquake

Coastal Erosion

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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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TOP NATURAL HAZARDS – PAST & PRESENT

Thunderstorms

Nor’easters

High wind

Extreme Temperature

Tighe&Bond

TOP NATURAL HAZARDS – FUTURE

Drought / extreme temperatures (tie)

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BILLERICA'S TOP NATURAL HAZARDS
THE SURVEY SAYS….

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Flooding

Drought/ Extreme Temperatures

Invasive Species

+ **CLIMATE CHANGE**

=

AMPLIFIED RISKS

- Community and regional infrastructure
- Local and regional economies
- Public Health
- Natural resources and our environment

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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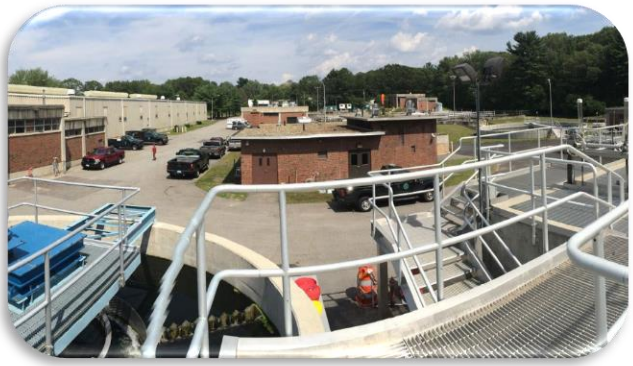
WHAT ARE COMMUNITY ASSETS?

Societal



Infrastructure

Economy

Natural Resources

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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NATURAL ENVIRONMENTAL ASSETS

- Open Space
- Conservation Areas
- Playing Fields
- Outdoor Recreation
- Rivers/Streams
- Ponds/Lakes
- Wetlands
- Flodoplains
- Vernal Pools
- Trees/Tree Cover

Session #1 Discussion

Societal Assets: Strengths and Vulnerabilities

1:20 PM

Switch to Community Resilience Building Workshop Risk Matrix to review natural environment assets and their strengths and vulnerabilities

Session #2 Presentation

Identify Actions to Address Vulnerabilities and Protect Strengths

1:30 PM

TYPES OF MITIGATION ACTIONS

1. Prevention
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TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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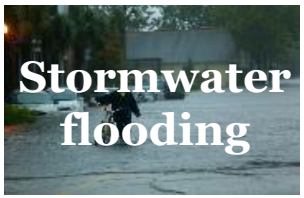
DISCUSSION ITEM: Mitigation Strategies

Hazards



Nature-based solutions

- Open space preservation
- Ecosystem restoration
- Low Impact Development

Municipal benefits

Avoided Costs

Enhanced Safety

Environmental Services

Switch to Community Resilience Building Workshop Risk Matrix to populate mitigation strategies

Session #3

Wrap up and Assignments

2:15 PM

PARTICIPANT ASSIGNMENTS

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- **Review the Draft Findings CRB Report**
  - Available on the website in mid-June
- **Attend the Listening Session**

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

STILL HAVE QUESTIONS OR COMMENTS?

Contact Information:

- **Gabrielle Belfit, CFM, Senior Environmental Scientist**
  - GCBelfit@tighebond.com
  - 508.304.6362

- **Jennie Moonan, PE, Project Manager**
  - JSMoonan@tighebond.com
  - 781.708.9826

Billerica – Workshop #4 – Natural Environment – Chat/Notes

Date
June 3, 2020

Attendees

1. Rob Anderson
2. Eric Anable
3. Bill Laurendeau
4. Marlies
5. Sudbury Valley Trustees (No name – brunette female with glasses)
6. Alison Field-Juma
7. Heather Chew
8. Steve Robertson
9. Emma Lord
10. Michelle Rowden
11. Emily Scerbo
12. Isabel Toukantonis
13. Ed Reiner
14. Blake Robertson
15. Tony Fields
16. Daryle Hillsgrov
17. George
18. 978-671-0966 (unknown number)

Community Input – About half of the discussion was through verbal communication, any input through the chat function is documented below.

From Daryle Hillsgrove to Everyone: 01:20 PM
Concord River-Storm drains to the river are a vulnerability for potential contamination and Strength to divert water to reduce flooding

From Sudbury Valley Trustees to Everyone: 01:23 PM
Lakes and ponds?

From Alison Field-Juma, OARS to Everyone: 01:23 PM
Tree canopy can be urban, suburban, or protected areas. Quite different in character and benefits.

From Daryle Hillsgrove to Everyone: 01:24 PM
Watersheds strength to help with flood flow. Vulnerable-build up on sites may not maintain aspects of water shed. Sites may inadvertently impact watershed with changes in landscape etc. If the activity doesn't require a permit, due diligence may not be conducted properly to prevent damage.

From Alison Field-Juma, OARS to Everyone: 01:26 PM
Floodplains are a strength, allow space for floodwater.

From Sudbury Valley Trustees to Everyone: 01:26 PM

Under "floodplains", there are strengths in the amount of permanently protected lands, such as the Great Meadows NWR, and vulnerabilities in unprotected, potentially developable land such as the Daughters of St. Paul property.

From Alison Field-Juma, OARS to Everyone: 01:27 PM
Same vulnerability for floodplains as wetlands re: building.

From Alison Field-Juma, OARS to Everyone: 01:27 PM
Same vulnerability for floodplains as wetlands re: building.

From Isabel Toukantonis to Everyone: 01:30 PM
I was told Griggs Farm was actively used, limited however and potentially for hay. It is mowed and may be somewhat treated with pesticides and/or herbicides during diff times of the year. There are wetland resource areas nearby by and the farm area, or portion of drains to Nutting Lake. From a stormwater management standpoint is considered a potential nutrient source to Nutting Lake. Level of use and/or management/treatment should be verified however.

From Daryle Hillsgrove to Everyone: 01:31 PM
A vulnerability for many of the things like watsheds,floodplaines, buffers ect. is the update on the maps and conditions which can change over time.

From Ed Reiner to Everyone: 01:31 PM
The North Billerica Dam is a vulnerability as it has no working gates to relieve flooding.

From Marlies to Everyone: 01:31 PM
Should the dam be mentioned?

Talbot Dam

From Ed Reiner to Everyone: 01:32 PM
Water levels are also affected by the dam.

From Alison Field-Juma, OARS to Everyone: 01:32 PM
River access is a strength since it enables recreation during heatwaves.

From Ed Reiner to Everyone: 01:33 PM
Hazardous rocks are not marked in any way to inform the public of potential motor boat damage on the Concord.

From Alison Field-Juma, OARS to Everyone: 01:34 PM
Nutting Lake is also a strength since it enables recreation during heatwaves.

From Ed Reiner to Everyone: 01:35 PM
fallow

From EmilyScerbo to Everyone: 01:35 PM
Nutting Lake and other lakes/ponds. Vulnerability - drought, increased temps, and more runoff can cause algal blooms (nutrients). Strength - recreation and quality of life.

From Alison Field-Juma, OARS to Everyone: 01:36 PM
Talbot Dam DOES result in invasive plants, not “can.” Thx!

From Heather Chew to Everyone: 01:36 PM
There is town owned land adjacent to Griggs Farm that may be leased for farming. I do not know the status of this property other than that there is restriction on this property.

From Bill Laurendeau to Everyone: 01:37 PM
Talbot Dam is privately owned. Not a Town infrastructure

From Isabel Toukantonis to Everyone: 01:37 PM
Correct dam is privately owned

From Ed Reiner to Everyone: 01:37 PM
Some towns have markings to help avoid a collision.

From Rob Anderson, Community Development to Everyone: 01:37 PM
Iron Horse Park is a Superfund site; zoned industrial with lots of businesses. Does this fit in the Natural Hazard section?

From Ed Reiner to Everyone: 01:37 PM
They use floats or other markers.
There is only one main spot that deserves a marker just downstream of Route 3.

From Alison Field-Juma, OARS to Everyone: 01:38 PM
All tree canopies—reduce heat island, and high temperatures in general. Hazard for urban and suburban is falling limbs.

From Isabel Toukantonis to Everyone: 01:44 PM
stormwater and nutrients for nuttings lake
There is a lake management plan since there is an active beach and overall an important recreational resource for the town both summer and winter. Invasive plant vegetation and excessive vegetation is a safety and pollution issue.
The town's sole water intake structure is about 1-mile upstream from the dam.
Superfund sites I think should be noted in a study from various stand point. Most of Iron Horse park is privately owned.

From Daryle Hillsgrove to Everyone: 01:46 PM
Is the concern that building and development conditions (maintaining plantings, types of planting, landscaping, etc) need to be part of the planning process. Possibly consider changes to zoning and or requirements for maintaining adequate vegetation etc.?

From Isabel Toukantonis to Everyone: 01:48 PM
Green space and the preservation of buffer zone is covered under Planning and Conservation boards (bylaws).

From Kristin Dippold to Everyone: 01:50 PM
I have copied and flagged the comments that were not verbally addressed. They will all be added to the matrix after the webinar.

From Daryle Hillsgrove to Everyone: 01:51 PM

Education to private landowners on benefits of vegetation and avoiding concreting and paving large areas of properly.

From Emma Lord to Everyone: 01:52 PM
Reduced use of impervious surfaces

From Daryle Hillsgrove to Everyone: 01:53 PM
To follow up-The EHS professionals have a better understanding but often a facilities department is leading a project and may or may not have a good understanding of the environmental impact.

From Marlies to Everyone: 01:53 PM
no open space zoning

From Sudbury Valley Trustees to Everyone: 01:53 PM
Floodplain restoration (one way would be to encourage replacement of lawn with native vegetation).

From Alison Field-Juma, OARS to Everyone: 01:53 PM
Use the 500-year flood delineation to replace the 100-year flood delineation in the wetlands bylaw to reflect actual and future flood levels (FEMA cannot do this). At a minimum reflect the 500-year flood on all maps and aim for this outcome.

From Daryle Hillsgrove to Everyone: 01:53 PM
Does the town have conservation plan? For example my home town put together a bond and plan to acquire lands strategically to meet a recommended percentage of undeveloped land.

From Isabel Toukantonis to Everyone: 01:55 PM
There is conservation plan through RSC in which the town periodically updates.
Yes we do have an Open Space and Rec plan and yes that contributes to conservation planning efforts.

From Daryle Hillsgrove to Everyone: 01:56 PM
Are there any town forests and is there a management plan for those?

From Alison Field-Juma, OARS to Everyone: 01:57 PM
River Conservation Plan Update is here: https://www.sudbury-assabet-concord.org/perch/resources/suasco-plan-whole-final-5-30-19.pdf

From Isabel Toukantonis to Everyone: 01:58 PM
Currently the Bylaw is consistent with the Mass WPA regarding protection of floodplain (BLSF) --100-yr floodplain.

From Daryle Hillsgrove to Everyone: 01:58 PM
Develop guidelines for maintenance of storm drains on private property (cleaning etc).

From Alison Field-Juma, OARS to Everyone: 02:00 PM
Urban and suburban tree canopy: Conduct an inventory of street trees and develop a plan to protect and increase street trees and tree canopy, have a suitable tree maintenance program.

From Isabel Toukantonis to Everyone: 02:00 PM
there are town and state operated forests. A goal is to develop formal management plans.

From Daryle Hillsgrove to Everyone: 02:01 PM

If you aren't required to comply with the new storm water permit you may not have to have a plan for your storm drains. Smaller sites might have them but not need a permit

From Sudbury Valley Trustees to Everyone: 02:03 PM
Train volunteers through the North Atlantic Aquatic Connectivity Collaborative to assess culverts for their ability to allow wildlife to pass through them. Then when culverts are replaced as part of routine roadwork,, they can be sized more appropriately.

From Isabel Toukantonis to Everyone: 02:06 PM
culvert replacement projects or new culverts are required to address compliance with the MA Stream Crossing Standards.

From Alison Field-Juma, OARS to Everyone: 02:06 PM
Adhere to Mass. Stream Crossing Standards for all bridge and culvert replacement (probably already being done…but check). Helps with both wildlife and flooding.

From Michelle.Rowden to Everyone: 02:07 PM
To echo the point about green infrastructure, the MVP program highly prioritizes projects that employ what we call Nature Based Solutions which would be green infrastructure such as the LID techniques that were mentioned. They can be used in many many projects

From Isabel Toukantonis to Everyone: 02:11 PM
Concord and Shawsheen have many associated tributaries and floodplain that are very attractive to beaver population. Town has a Beaver Management Plan -- Conservation and Board of Health work closely with specialist to address beaver related flooding of roadways and town properties, various resources. Program has been very successful and other communities are reaching out to Billerica for assistance and guidance.

From Daryle Hillsgrove to Everyone: 02:13 PM
Recommendations on chemical use on the land can also be given to private business and landscaping companies servicing Billerica clients. With education, people may make better decisions or be willing to pay a little more to improve community health as a good faith effort on behalf of the business Many larger companies have environmental objectives that they also are trying to implement it.

From Michelle.Rowden to Everyone: 02:13 PM
An example of a MVP funded project to educate Cambridge residents on climate change and private property can be found on our website - https://www.mass.gov/doc/mvp-toolkit-homeowners/download

From Alison Field-Juma, OARS to Everyone: 02:15 PM
Set up a Stormwater Utility to ensure adequate funding of stormwater management to reduce flooding, water pollution, etc. ? Meshes with MS4 program.

Tighe&Bond
Engineers | Environmental Specialists

APPENDIX E

Town of Billerica Community Assets - Infrastructure

ID	Description	Address #	Street Name	Type
BE-1	B-12-001 NASHUA RD/CONCORD RD		NASHUA RD	Bridge
BE-2	B-12-002 RIVER ST/CONCORD RIVER		RIVER ST	Bridge
BE-3	B-12-003 BOSTON RD/CONCORD RIVER		BOSTON RD	Bridge
BE-4	B-12-005 POLLARD ST		POLLARD ST	Bridge
BE-5	B-12-006 FAULKNER ST		FAULKNER ST	Bridge
BE-6	B-12-007 WHIPPLE RD		WHIPPLE RD	Bridge
BE-7	B-12-008 SALEM RD		SALEM RD	Bridge
BE-8	B-12-009 BOSTON RD/SHAWSHEEN RIVER		BOSTON RD	Bridge
BE-9	B-12-011 TOWN FARM LN		TOWN FARM LN	Bridge
BE-10	B-12-012 GRAY ST		GRAY ST	Bridge
BE-11	B-12-013 ANDOVER RD		ANDOVER RD	Bridge
BE-12	B-12-014 GEORGE BROWN ST		GEORGE BROWN ST	Bridge
BE-13	B-12-015 POND ST		POND ST	Bridge
BE-14	B-12-016 HIGH ST		HIGH ST	Bridge
BE-15	B-12-021 CONCORD RD		CONCORD RD	Bridge
BE-16	B-12-022 RTE 3/CONCORD RIVER			Bridge
BE-17	B-12-022 RTE 3/CONCORD RIVER			Bridge
BE-18	B-12-023 RTE 3/WATER TREATMENT PLANT DRIVEWAY			Bridge
BE-19	B-12-023 RTE 3/WATER TREATMENT PLANT DRIVEWAY			Bridge
BE-20	B-12-024 TREBLE COVE RD		TREBLE COVE RD	Bridge
BE-21	B-12-025 RANGEWAY RD		RANGEWAY RD	Bridge
BE-22	B-12-026 ELIOT ST		ELIOT ST	Bridge
BE-23	Alexander Road Cell Tower	19	ALEXANDER RD	Cell Tower
BE-24	Andover Road Cell Tower		ANDOVER RD	Cell Tower
BE-25	Baldwin Road Cell Tower	51	BALDWIN RD	Cell Tower
BE-26	Boston Road Cell Tower	549	BOSTON RD	Cell Tower
BE-27	Boston Road Cell Tower	486	BOSTON RD	Cell Tower
BE-28	Concord Road Cell Tower	300	CONCORD RD	Cell Tower
BE-29	Faulkner Streer Cell Tower	71	FAULKNER ST	Cell Tower
BE-30	Gray Street Cell Tower		GRAY ST	Cell Tower
BE-31	High Street Cell Tower		HIGH ST	Cell Tower
BE-32	Manning Road Cell Tower	47	MANNING RD	Cell Tower
BE-33	Old Middlesex Tpke Cell Tower	347	OLD MIDDLESEX TPKE	Cell Tower
BE-34	Rangeway Road Cell Tower	135	RANGEWAY RD	Cell Tower
BE-35	Republic Road Cell Tower	20	REPUBLIC RD	Cell Tower
BE-36	Sullivan Road Cell Tower	41	SULLIVAN RD	Cell Tower
BE-37	Sullivan Road Cell Tower	36	SULLIVAN RD	Cell Tower
BE-38	Town Farm Lane Cell Tower	24	TOWN FARM LN	Cell Tower
BE-39	Council on Aging	25	CONCORD RD	Council on Aging
BE-40	Millbrook Dam			Dam
BE-41	Talbot Mills Dam		FAULKNER ST	Dam
BE-42	Winning Pond Dam			Dam
BE-43	EOC	6	GOOD ST	EOC Location
BE-44	East Billerica Fire Station	295	SALEM RD	Fire Dept
BE-45	Fire Department Headquarters	8	GOOD ST	Fire Dept
BE-46	North Billerica Fire Station	21	LOWELL ST	Fire Dept
BE-47	Pinehurst Fire Station	832	BOSTON RD	Fire Dept
BE-48	West Billerica Fire Station	359	TREBLE COVE RD	Fire Dept
BE-49	Burns Funeral Home	354	BOSTON RD	Funeral home
BE-50	Sweeney Memorial Funeral Home	66	CONCORD RD	Funeral home
BE-51	Highway Department	250	BOSTON RD	Highway Dept
BE-52	Parks & Trees Dept	67	ALEXANDER RD	Parks & Trees Dept
BE-53	Police Department Headquarters	6	GOOD ST	Police Dept
BE-54	Post Office	880	BOSTON RD	Post Office
BE-55	Post Office	612	MIDDLESEX TP	Post Office
BE-56	Post Office	460	BOSTON RD	Post Office
BE-57	Post Office	95	BOSTON RD	Post Office

ID	Description	Address #	Street Name	Type
BE-58	Recreation Dept	250	BOSTON RD	Recreation Dept
BE-59	Town Hall	365	BOSTON RD	Town Hall
BE-60	Billerica Train Station		STATION ST	Train Station
BE-61	CareWell Urgent Care	510	BOSTON RD	Urgent Care/Clinic
BE-62	Circle Health Urgent Care	199	BOSTON RD	Urgent Care/Clinic
BE-63	Lahey Billerica	267	BOSTON RD	Urgent Care/Clinic
BE-64	Wastewater Treatment Plant	70	LETCHWORTH AV	Wastewater Dept
BE-65	Water Treatment Plant	270	TREBLE COVE RD	Water Dept
BE-66	Boston Rd Water Tower	486	BOSTON RD	Water Tank
BE-67	Boston Rd Water Tower	549	BOSTON RD	Water Tank

Town of Billerica Community Assets - Society

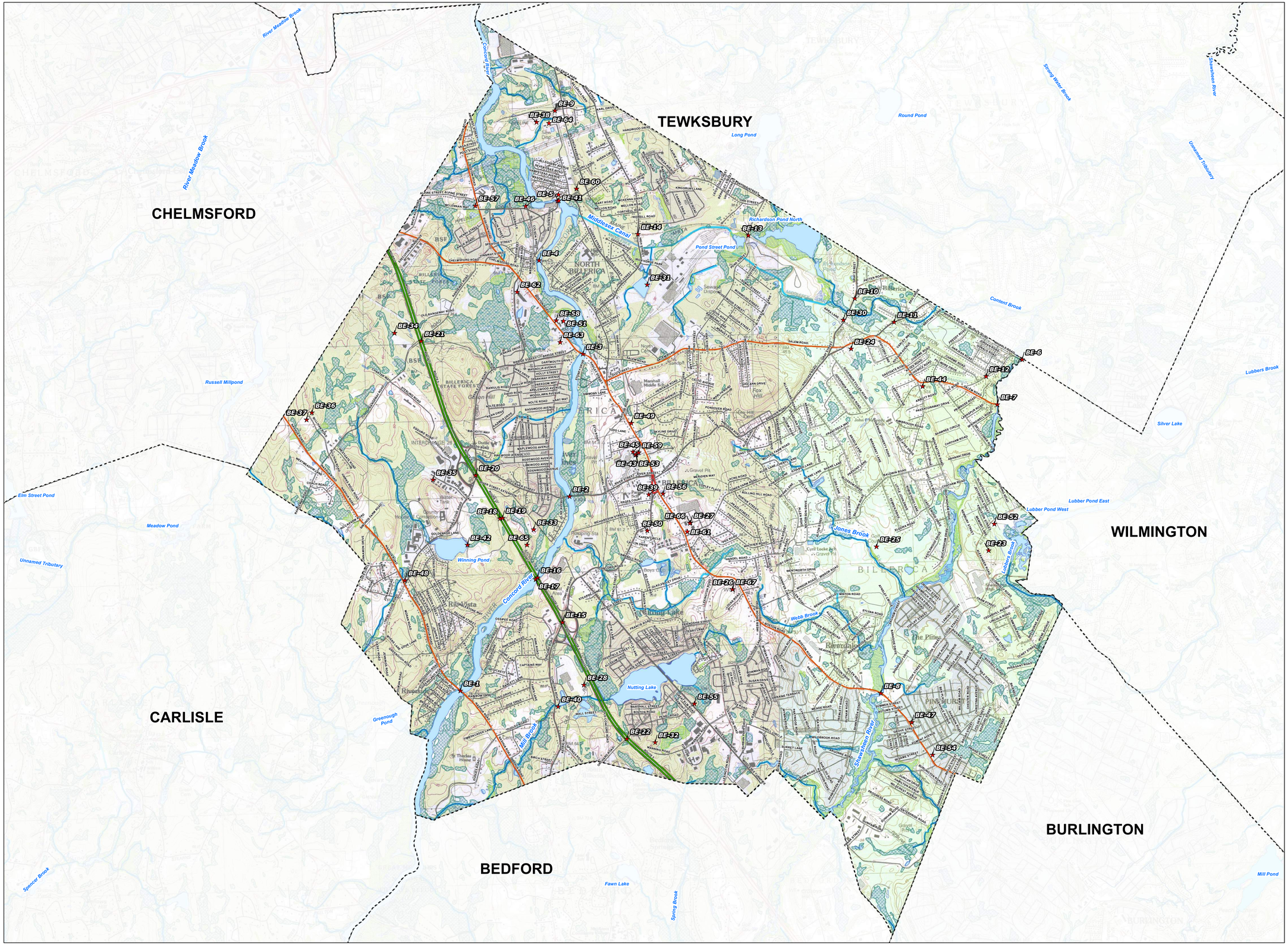
ID	Description	Address #	Street Name	Type
P-1	Fox Hill Cemetery		ANDOVER RD	Cemetery
P-2	Jacob Hill Cemetery		NASHUA RD	Cemetery
P-3	North Cemetery		SALEM RD	Cemetery
P-4	Old Corner Burying Ground		POLLARD ST	Cemetery
P-5	Rogers Family Plot Cemetery		HIGH ST	Cemetery
P-6	South Burying Ground Cemetery		CONCORD RD	Cemetery
P-7	A Brighter Rainbow Learning Center	862	BOSTON RD	Child care
P-8	Billerica Boys & Girls Club	19	CAMPBELL RD	Child care
P-9	Kindercare Learning Center	179	BOSTON RD	Child care
P-10	Knowledge Beginnings	262	CONCORD RD	Child care
P-11	Learning Garden Pre-School	5	ANDOVER RD	Child care
P-12	Little Learners Pre-School	306	BOSTON RD	Child care
P-13	New England Pediatric Care	78	BOSTON RD	Child care
P-14	Tiny Tikes Preschool I	25	BRIDGE ST	Child care
P-15	Tiny Tikes Preschool II	258	SALEM RD	Child care
P-16	Courtyard Boston Billerica/Bedford	270	CONCORD RD	Hotel
P-17	Billerica Public Library	15	CONCORD RD	Library
P-18	BHA Greenwood Complex	13	RIVER ST	Nursing homes/elderly housing/elderly care
P-19	BHA McCarthy Complex	16	RIVER ST	Nursing homes/elderly housing/elderly care
P-20	Billerica Crossings	20	CHARNSTAFFE LN	Nursing homes/elderly housing/elderly care
P-21	Brightview Senior Living	199	CONCORD RD	Nursing homes/elderly housing/elderly care
P-22	Life Care Center of Merrimack Valley	80	BOSTON RD	Nursing homes/elderly housing/elderly care
P-23	New England Pediatric Care	78	BOSTON RD	Nursing homes/elderly housing/elderly care
P-24	Talbot School Elderly Housing	33	TALBOT AV	Nursing homes/elderly housing/elderly care
P-25	Chelmsford Forum	2	BRICK KILN RD	Other
P-26	Hallenborg Ice Rink	10	GOOD ST	Other
P-27	Manning State Park		CHELMSFORD RD	Other
P-28	Nuttings Lake		MIDDLESEX TP	Other
P-29	Winning Pond		TREBLE COVE RD	Other
P-30	Billerica House of Corrections	269	TREBLE COVE RD	Prison
P-31	Billerica Memorial High School	35	RIVER ST	School
P-32	Ditson School	39	COOK ST	School
P-33	Dutile School	10	BIAGIOTTI WY	School
P-34	Hajjar School	59	ROGERS ST	School
P-35	Kennedy School	20	KIMBROUGH RD	School
P-36	Locke School	110	ALLEN RD	School
P-37	Marshall Middle School	15	FLOYD ST	School
P-38	Parker School	52	RIVER ST	School
P-39	Shawsheen Valley Technical High School	100	COOK ST	School
P-40	Marshall Middle School	15	FLOYD ST	Shelter
P-41	Church of Latter Day Saints	70	CONCORD RD	Religious
P-42	Community Congregational Church	803	BOSTON RD	Religious
P-43	First Congregational Church	18	ANDOVER RD	Religious
P-44	First Parish Unitarian Church	7	CONCORD RD	Religious
P-45	Hajjar School	59	ROGERS ST	Religious
P-46	Jehovah's Witnesses	310	RIVER ST	Religious
P-47	Masjid Mosque	246	RANGEWAY RD	Religious
P-48	New Colony Baptist Church	30	RIVER ST	Religious
P-49	North Billerica Baptist Church	17	COLSON ST	Religious
P-50	Seventh-Day Adventist Church	30	POND ST	Religious
P-51	St Andrew's Church	49	TALBOT AV	Religious
P-52	St Anne's Episcopal Church	14	TREBLE COVE RD	Religious
P-53	St Mary's Church	796	BOSTON RD	Religious
P-54	St Theresa's Church	466	BOSTON RD	Religious
P-55	BHA McCarthy Complex	16	RIVER ST	Special Needs
P-56	Billerica Crossings	20	CHARNSTAFFE LN	Special Needs
P-57	Life Care Center of Merrimack Valley	80	BOSTON RD	Special Needs
P-58	Masjid School	246	RANGEWAY RD	Special Needs

ID	Description	Address #	Street Name	Type
P-59	Talbot School Elderly Housing	33	TALBOT AV	Special Needs
P-60	BHA McColough House	609	BOSTON RD	Vulnerable population, environmental justice area
P-61	BHA Parker House	16A	RIVER ST	Vulnerable population, environmental justice area
P-62	Villas at Old Concord	4	RIVERHURST RD	Affordable housing
P-63	Aspen Regency	147	RANGEWAY RD	Affordable housing
P-64	The Commons at Boston Road	499	BOSTON RD	Affordable housing
P-65	The Point at 3 North	71	BOSTON RD	Affordable housing
P-66	Broadstone Middlesex	164	LEXINGTON RD	Affordable housing
P-67	Hawthorn Senior Living	44	NASHUA RD	Nursing homes/elderly housing/elderly care

Town of Billerica Community Assets - Economy

ID	Description	Address #	Street Name	Type
EC-1	O'Connor Ace Hardware	446	BOSTON RD	Hardware store
EC-2	AS&E	829	MIDDLESEX TP	Major employer
EC-3	Baker Hughes Digital Solutions	1100	TECHNOLOGY PARK DR	Major employer
EC-4	Bruker	40	MANNING RD	Major employer
EC-5	BTU International	23	ESQUIRE RD	Major employer
EC-6	Cabot	157	CONCORD RD	Major employer
EC-7	ClearMotion	805	MIDDLESEX TP	Major employer
EC-8	Curriculum Associates	153	RANGEWAY RD	Major employer
EC-9	E-Ink	1000	TECHNOLOGY PARK DR	Major employer
EC-10	EMD Serono	45	MIDDLESEX TP	Major employer
EC-11	Entegris	129	CONCORD RD	Major employer
EC-12	FLIR Thermography	25	ESQUIRE RD	Major employer
EC-13	Lantheus Medical Imaging	331	TREBLE COVE RD	Major employer
EC-14	Nuvera	129	CONCORD RD	Major employer
EC-15	Parexel	1	FEDERAL ST	Major employer
EC-16	Quanterix Corporation	900	MIDDLESEX TP	Major employer
EC-17	Raytheon	880	TECHNOLOGY PARK DR	Major employer
EC-18	SunPharma	29	DUNHAM RD	Major employer
EC-19	TECNAU, Inc.	4	SUBURBAN PARK DR	Major employer
EC-20	WL French	14	STERLING RD	Major employer
EC-21	H Wrights Services Inc	19	BOSTON RD	Oil delivery service
EC-22	R.E.R Fuel Service	244	NASHUA RD	Oil delivery service
EC-23	CVS	210	BOSTON RD	Pharmacy
EC-24	CVS	700	BOSTON RD	Pharmacy
EC-25	Medical Center Pharmacy	221	BOSTON RD	Pharmacy
EC-26	Neighborhood Diabetes	600	TECHNOLOGY PARK DR	Pharmacy
EC-27	Rite Aid	467	BOSTON RD	Pharmacy
EC-28	Walgreens	446	BOSTON RD	Pharmacy
EC-29	Market Basket	199	BOSTON RD	Supermarket
EC-30	Market Basket	496	BOSTON RD	Supermarket
EC-31	Market Basket	700	BOSTON RD	Supermarket
EC-32	4 Seasons Towing and Recovery	56	SULLIVAN RD	Towing service
EC-33	Automotive Technology & Transmission	737	BOSTON RD	Towing service
EC-34	Ken's Auto Repair	1	EVERREADY CR	Towing service
EC-35	L&A Auto & Gas Service Inc.	98	BOSTON RD	Towing service
EC-36	Ronnie's Total Car Care	626	BOSTON RD	Towing service
EC-37	Bartlett Tree Experts	36	LINNELL CR	Tree removal service
EC-38	K.A. McDonald Tree & Landscape	8	SYCAMORE LN	Tree removal service
EC-39	Marquis Tree	10	REPUBLIC RD	Tree removal service
EC-40	Martel Crane Service & Tree Removal	4	RIVERHURST RD	Tree removal service
EC-41	ValleyCrest Tree Care Services	12	HADLEY ST	Tree removal service
EC-42	AirGas	1	PLANK ST	Major employer

Community Assets Inventory: Built Environment



LEGEND

- Community Assets Built Environment
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Town Boundary
- Public Surface Water Supply (PSWS)
- Water Bodies
- Inland Wetlands
- Stream/Intermittent Stream
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- NWI Rivers and Streams

LOCUS MAP

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NOTES

1. Based on USGS Topo Map (1987)
2. MassGIS: 2014 Integrated List Data (2016), , Community Boundary (2017), National Wetlands Inventory (2007), FEMA National Flood Hazard (2017), MassDOT Major Roads (2014)

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Community Assets Inventory: People

LEGEND

- Community Assets People
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Town Boundary
- Public Surface Water Supply (PSWS)
- Water Bodies
- Inland Wetlands
- Stream/Intermittent Stream
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
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LOCUS MAP

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Community Assets Inventory: Economy

LEGEND

- Community Assets Economy
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Town Boundary
- Public Surface Water Supply (PSWS)
- Water Bodies
- Inland Wetlands
- Stream/Intermittent Stream
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
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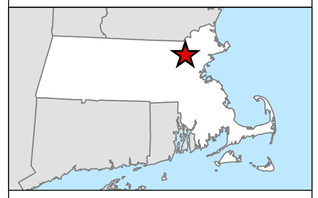
LOCUS MAP



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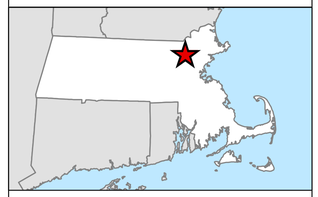
Community Assets Inventory: Environment

LEGEND

- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Public Surface Water Supply Protection Area (Zone A)
- DEP Interim Wellhead Protection Area (IWPA)
- Protected and Recreational Open Space
- Area of Critical Environmental Concern (ACEC)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- Town Boundary
- Public Surface Water Supply (PSWS)
- Water Bodies
- Inland Wetlands
- Stream/Intermittent Stream
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- NWI Rivers and Streams

LOCUS MAP



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APPENDIX F

Sudbury-Assabet-Concord (SuAsCo) Basin

Increased Average Temperature

The SuAsCo basin is expected to experience increased average temperatures throughout the 21st century. Maximum and minimum temperatures are also expected to increase throughout the end of the century. These increased temperature trends are expected for annual and seasonal projections. The table below demonstrates how temperature will change over the course of the century.

TABLE 1
Increased Average Temperature

SuAsCo Basin		Observed Baseline 1971-2000 (°F)	Projected Change in 2030s (°F)	Mid-Century Projected Change in 2050s (°F)	Projected Change in 2070s (°F)	End of Century Projected Change in 2090s (°F)
Average Temperature	Annual	48.7	+2.2 to +4.4	+2.9 to +6.3	+3.5 to +9.0	+3.8 to +10.9
	Winter	27.4	+2.2 to +4.9	+2.8 to +7.3	+3.6 to +8.9	+4.0 to +10.2
	Spring	46.8	+1.7 to +3.5	+2.5 to +5.7	+2.7 to +7.9	+3.2 to +9.6
	Summer	69.5	+2.1 to +4.4	+2.7 to +6.9	+3.2 to +10.2	+3.7 to +12.7
	Fall	50.8	+2.2 to +5.0	+3.7 to +6.6	+3.5 to +9.5	+4.0 to +11.7
Maximum Temperature	Annual	59.6	+2.0 to +4.1	+2.7 to +6.3	+3.2 to +9.1	+3.4 to +10.9
	Winter	37.3	+1.9 to +4.4	+2.5 to +6.7	+3.0 to +8.1	+3.4 to +9.4
	Spring	57.9	+1.6 to +3.4	+2.3 to +5.6	+2.6 to +8.0	+3.2 to +9.7
	Summer	80.7	+1.9 to +4.5	+2.6 to +7.1	+3.1 to +10.5	+3.6 to +13.0
	Fall	62.1	+2.4 to +4.8	+3.6 to +6.8	+3.3 to +9.6	+3.8 to +12.1
Minimum Temperature	Annual	37.9	+2.3 to +4.6	+3.1 to +6.4	+3.8 to +9.0	+4.1 to +11.0
	Winter	17.5	+2.5 to +5.5	+3.3 to +7.8	+4.1 to +9.6	+4.6 to +10.9
	Spring	35.8	+1.8 to +3.7	+2.7 to +6.0	+2.8 to +7.7	+3.3 to +9.5
	Summer	58.3	+2.1 to +4.5	+2.9 to +7.2	+3.3 to +9.9	+3.9 to +12.4
	Fall	39.6	+2.1 to +5.2	+3.6 to +6.6	+3.6 to +9.3	+4.1 to +11.6

Seasonally, maximum summer and fall temperatures are expected to see the highest projected increase throughout the 21st century. o Summer mid-century increase of 2.6 °F to 7.1 °F (3-9% increase); end of century increases of 3.6 °F to 13 °F (4-16% increase). o Fall mid-century increase of 3.6 °F to 6.8 °F (6-11% increase); end of century increases by and 3.8 °F to 12.1 °F (6-20% increase).

Seasonally, minimum winter and fall temperatures are expected to see increases throughout the 21st century. o Winter mid-century increase of 3.3 °F to 7.8 °F (19-44% increase); end of century increases by 4.6 °F to 10.9 °F (26-63% increase). o Fall mid-century of 3.6 °F to 6.6 °F (9-17% increase); end of century increases of 4.1°F to 11.6 °F (10-29% increase).

Days with Maximum Temperatures

Due to projected increases in average and maximum temperatures throughout the end of the century, the SuAsCo basin is also expected to experience an increase in days with daily maximum temperatures over 90°F, 95°F, and 100°F. The table below demonstrates this.

TABLE 2
Days with Maximum Temperatures

SuAsCo Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Maximum Temperature Over 90°F	Annual	8	+7 to +20	+10 to +35	+12 to +56	+14 to +76
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	1	+<1[87] to +1	+<1[87] to +2	+<1[87] to +3	+<1[87] to +5
	Summer	7	+7 to +17	+9 to +30	+11 to +46	+13 to +60
	Fall	<1[87]	+<1[87] to +2	+1 to +5	+1 to +9	+1 to +12
Days with Maximum Temperature Over 95°F	Annual	1	+2 to +8	+3 to +17	+4 to +32	+6 to +48
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	<1[87]	+<1[87] to +<1[87]	+<1[87] to +<1[87]	+<1[87] to +1	+<1[87] to +2
	Summer	1	+2 to +8	+3 to +15	+3 to +28	+5 to +42
	Fall	<1[87]	+<1[87] to +1	+<1[87] to +1	+<1[87] to +3	+<1[87] to +5
Days with Maximum Temperature Over 100°F	Annual	<1[87]	+<1[87] to +2	+<1[87] to +5	+1 to +12	+1 to +22
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+0 to +<1[87]	+0 to +<1[87]	+0 to +<1[87]	+0 to +<1[87]
	Summer	<1[87]	+<1[87] to +2	+<1[87] to +5	+1 to +11	+1 to +20
	Fall	0	+0 to +<1[87]	+0 to +<1[87]	+0 to +1	+0 to +1

Annually, the SuAsCo basin is expected to see days with daily maximum temperatures over 90°F increase by 10 to 35 more days by mid-century, and 14 to 76 more days by the end of the century. Seasonally, summer is expected to see an increase of 9 to 30 more days with daily maximums over 90°F by mid-century. By end of century, the SuAsCo basin is expected to have 13 to 60 more days

Days with Minimum Temperatures

Due to projected increases in average and minimum temperatures throughout the end of the century, the SuAsCo basin is expected to experience a decrease in days with daily minimum temperatures below 32°F and 0°F. The table below demonstrates this.

TABLE 3
Days with Minimum Temperatures

SuAsCo Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Minimum Temperature Below 0°F	Annual	6	-2 to -4	-2 to -4	-2 to -5	-2 to -5
	Winter	6	-2 to -3	-2 to -4	-2 to -4	-2 to -5
	Spring	<1[88]	-0 to +<1[88]	-0 to -0	-0 to -0	-0 to -0
	Summer	0	-0 to -0	-0 to -0	-0 to -0	-0 to -0
	Fall	0	-0 to -0	-0 to -0	-0 to -0	-0 to -0
Days with Minimum Temperature Below 32°F	Annual	143	-12 to -28	-19 to -40	-22 to -55	-24 to -65
	Winter	83	-2 to -7	-3 to -11	-5 to -20	-6 to -25
	Spring	34	-3 to -11	-7 to -15	-8 to -19	-9 to -20
	Summer	0	-0 to -0	-0 to -0	-0 to -0	-0 to -0
	Fall	26	-5 to -11	-8 to -14	-9 to -18	-8 to -20

Seasonally, winter, spring and fall are expected to see the largest decreases in days with daily minimum temperatures below 32°F. Winter is expected to have 3 to 11 fewer days by mid-century, and 6 to 25 fewer days by end of century. Spring is expected to have 7 to 15 fewer days by mid-century, and 9 to 20 fewer days by end of century. Fall is expected to have 8 to 14 fewer days by mid-century, and 8 to 20 fewer days by end of century.

Heating Degree-Days and Cooling Degree-Days

Due to projected increases in average, maximum, and minimum temperatures throughout the end of the century, the SuAsCo basin is expected to experience a decrease in heating degree days and increases in both cooling degree-days and growing degree-days. The table below demonstrates this.

TABLE 4
Heating and Cooling Degree-Days

SuAsCo Basin		Observed Baseline 1971-2000 (Degree-Days)	Projected Change in 2030s (Degree-Days)	Mid-Century Projected Change in 2050s (Degree-Days)	Projected Change in 2070s (Degree-Days)	End of Century Projected Change in 2090s (Degree-Days)
Heating Degree-Days (Base 65°F)	Annual	6535	-544 to -1137	-750 to -1587	-873 to -2094	-984 to -2460
	Winter	3406	-194 to -454	-251 to -669	-316 to -807	-369 to -942
	Spring	1695	-137 to -293	-207 to -473	-225 to -619	-284 to -726
	Summer	90	-29 to -56	-40 to -72	-47 to -81	-48 to -84
	Fall	1340	-166 to -374	-279 to -461	-262 to -639	-276 to -731
Cooling Degree-Days (Base 65°F)	Annual	585	+216 to +456	+285 to +771	+343 to +1197	+398 to +158
	Winter	0	-1 to +2	+0 to +2	+1 to +3	+2 to +4
	Spring	25	+12 to +31	+20 to +62	+24 to +105	+22 to +143
	Summer	505	+158 to +350	+197 to +569	+238 to +860	+282 to +1086
	Fall	49	+30 to +95	+44 to +159	+52 to +254	+77 to +341
Growing Degree-Days (Base 50°F)	Annual	2592	+408 to +822	+546 to +1274	+642 to +1976	+729 to +2475
	Winter	6	-1 to +11	+0 to +15	+4 to +23	+3 to +29
	Spring	314	+66 to +145	+92 to +251	+108 to +398	+120 to +500
	Summer	1795	+192 to +404	+251 to +636	+293 to +934	+342 to +1167
	Fall	469	+113 to +302	+180 to +412	+170 to +621	+217 to +792

Seasonally, winter historically exhibits the highest number of heating degree-days and is expected to see the largest decrease of any season, but spring and fall are also expected to see significant change. The winter season is expected to see a decrease of 7-20% (251 -669 degree-days) by mid-century, and a decrease of 11-28% (369 -942 degree-days) by the end of century. The spring season is expected to decrease in heating degree-days by 12-28% (207 -473 degree-days) by mid-century, and by 17-43% (284 -726 degree-days) by the end of century. The fall season is expected to decreases in heating degree-days by 21-34% (279 -461 degree-days) by mid-century, and by 21-55% (276 -731 degree-days) by the end of century.

Conversely, due to projected increasing temperatures, summer cooling degree-days are expected to increase by 39-113% (197 -569 degree-days) by mid-century, and by 56-215% (282 - 1086 degree-days) by end of century.

Seasonally, summer historically exhibits the highest number of growing degree-days and is expected to see the largest decrease of any season, but the shoulder seasons of spring and fall are also expected to see an increase in growing degree-days. The summer season is projected to increase by 14-35% (251 -636 degree-days) by midcentury, and by 19-65% (342 -1167 degree-days) by end of century. Spring is expected to see an increase by 29-80% (92 -251 degree-days) by mid-century and 38-159% (120 -500 degree-days) by end of century. Fall is expected to see an increase by 38-88% (180 -412 degree-days) by mid-century and 46-169% (217 -792 degree-days) by end of century.

Days with Precipitation Over 1", 2", and 4"

The projections for expected number of days receiving precipitation over one inch are variable for the SuAsCo basin, fluctuating between loss and gain of days. This is demonstrated in the table below.

TABLE 5
Days with Precipitation Over 1", 2", and 4"

SuAsCo Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Precipitation Over 1"	Annual	7	+<1[89] to +2	+1 to +3	+1 to +3	+1 to +4
	Winter	2	-0 to +1	+<1[89] to +1	+<1[89] to +2	+<1[89] to +2
	Spring	1	-0 to +1	-0 to +1	+<1[89] to +1	+<1[89] to +1
	Summer	2	-0 to +1	-0 to +1	-0 to +1	-0 to +1
	Fall	2	-0 to +1	-0 to +1	-0 to +1	-0 to +1
Days with Precipitation Over 2"	Annual	1	-0 to +<1[89]	+<1[89] to +1	+<1[89] to +<1[89]	+<1[89] to +1
	Winter	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
	Spring	<1[89]	-0 to +<1[89]	+<1[89] to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
	Summer	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
	Fall	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
Days with Precipitation Over 4"	Annual	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
	Winter	0	-0 to +0	+0 to +0	-0 to +0	-0 to +0
	Spring	0	-0 to +0	+0 to +<1[89]	-0 to +0	-0 to +<1[89]
	Summer	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]
	Fall	<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]	-0 to +<1[89]

Seasonally, the winter season is generally expected to see the highest projected increase. The winter season is expected to see an increase in days with precipitation over one inch of 0-1 days by mid-century, and an increase of 0-2 days by the end of century. The spring season is expected to see an increase in days with precipitation over one inch of -0-1 days by mid-century, and of an increase of 0-1 days by the end of century.

Total Precipitation

Similar to projections for number of days receiving precipitation over a specified threshold, seasonal projections for total precipitation are also variable for the SuAsCo basin. The table below shows total precipitation projections in the SuAsCo Basin.

TABLE 6
Total Precipitation

SuAsCo Basin		Observed Baseline 1971-2000 (Inches)	Projected Change in 2030s (Inches)	Mid-Century Projected Change in 2050s (Inches)	Projected Change in 2070s (Inches)	End of Century Projected Change in 2090s (Inches)
Total Precipitation	Annual	45.4	+0.2 to +4.8	+0.6 to +6.1	+1.5 to +7.8	+1.2 to +8.0
	Winter	11.2	-0.4 to +2.1	+0.1 to +2.6	+0.5 to +3.2	+0.4 to +4.1
	Spring	11.6	-0.1 to +2.4	+0.0 to +2.1	+0.3 to +2.6	+0.2 to +2.6
	Summer	10.8	-0.2 to +1.5	-0.5 to +2.2	-0.6 to +2.4	-1.1 to +2.2
	Fall	12.0	-1.2 to +1.1	-1.3 to +1.7	-1.8 to +1.6	-1.5 to +1.4

The winter season is expected to experience the greatest change with an increase of 1-23% by mid-century, and of 3-36% by end of century. Projections for the summer and fall seasons are more variable, and could see either a drop or increase in total precipitation throughout the 21st century. The summer season projections for the SuAsCo or basin could see a decrease of 0.5 to an increase of 2.2 inches by mid-century (decrease of 4 to increase of 20%) and a decrease of 1.1 to an increase of 2.2 inches by the end of the century (decrease of 11% to increase of 20%). The fall season projections for the SuAsCo basin could see a decrease of 1.3 to an increase of 1.7 inches by mid-century (decrease of 11% to increase of 14%) and a decrease of 1.5 to an increase of 1.4 inches by the end of the century (decrease of 13% to increase of 11%).

Consecutive Dry Days

Annual and seasonal projections for consecutive dry days, or for a given period, the largest number of consecutive days with precipitation less than 1 mm (~0.04 inches), are variable throughout the 21st century.

TABLE 7
Consecutive Dry Days

SuAsCo Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Consecutive Dry Days	Annual	17	-1 to +1	-0 to +2	-1 to +2	-1 to +3
	Winter	12	-1 to +1	-1 to +1	-1 to +2	-1 to +2
	Spring	11	-1 to +1	-1 to +1	-1 to +1	-1 to +1
	Summer	12	-1 to +2	-1 to +2	-1 to +3	-1 to +2
	Fall	12	-0 to +2	-0 to +3	-0 to +3	-0 to +3

For all the temporal parameters, the SuAsCo basin is expected to see a slight decrease to an increase in consecutive dry days throughout this century. Seasonally, the fall and summer seasons are expected to continue to experience the highest number of consecutive dry days. The fall season is expected to an increase of 0-3 days in consecutive dry days by the end of the century.

Shawsheen Basin

Increased Average Temperature

The Shawsheen basin is expected to experience increased average temperatures throughout the 21st century. Maximum and minimum temperatures are also expected to increase throughout the end of the century. These increased temperature trends are expected for annual and seasonal projections. Table 8 below shows how temperature is expected to increase throughout the century.

TABLE 8
Increased Average Temperature

Shawsheen Basin		Observed Baseline 1971-2000 (°F)	Projected Change in 2030s (°F)	Mid-Century Projected Change in 2050s (°F)	Projected Change in 2070s (°F)	End of Century Projected Change in 2090s (°F)
Average Temperature	Annual	48.9	+2.3 to +4.4	+2.9 to +6.4	+3.5 to +9.1	+3.8 to +11.0
	Winter	28.1	+2.4 to +5.0	+3.0 to +7.5	+3.8 to +9.4	+4.1 to +10.8
	Spring	46.8	+1.9 to +3.6	+2.6 to +5.5	+2.8 to +7.9	+3.4 to +9.7
	Summer	69.2	+2.2 to +4.4	+2.8 to +6.7	+3.2 to +9.8	+3.8 to +12.3
	Fall	51.0	+2.3 to +5.0	+3.7 to +6.8	+3.5 to +9.7	+4.0 to +12.1
Maximum Temperature	Annual	59.5	+2.1 to +4.2	+2.7 to +6.2	+3.2 to +9.2	+3.5 to +11.0
	Winter	37.7	+2.0 to +4.6	+2.6 to +7.0	+3.2 to +8.7	+3.6 to +10.0
	Spring	57.8	+1.7 to +3.5	+2.3 to +5.6	+2.7 to +8.1	+3.3 to +9.6
	Summer	80.3	+2.0 to +4.5	+2.7 to +6.6	+3.1 to +10.0	+3.6 to +12.4
	Fall	61.7	+2.4 to +4.9	+3.4 to +7.0	+3.4 to +10.0	+3.9 to +12.4
Minimum Temperature	Annual	38.3	+2.4 to +4.8	+3.2 to +6.5	+3.8 to +9.1	+4.2 to +11.1
	Winter	18.5	+2.6 to +5.5	+3.4 to +8.0	+4.4 to +10.1	+4.5 to +11.6
	Spring	35.8	+2.0 to +3.9	+2.9 to +5.8	+2.9 to +7.7	+3.5 to +9.6
	Summer	58.1	+2.3 to +4.4	+3.0 to +7.1	+3.3 to +9.6	+4.0 to +12.1
	Fall	40.3	+2.2 to +5.2	+3.6 to +6.7	+3.6 to +9.6	+4.1 to +11.8

Seasonally, maximum summer and fall temperatures are expected to see the highest projected increase throughout the 21st century. Summer mid-century increase of 2.7°F to 6.6°F (3-8% increase); end of century increases of 3.6°F to 12.4°F (4-15% increase). o Fall mid-century increase of 3.4°F to 7°F (6-11% increase); end of century increases by and 3.9°F to 12.4°F (6-20% increase).

Seasonally, minimum winter and fall temperatures are expected to see increases throughout the 21st century. Winter mid-century increase of 3.4°F to 8.0°F (18-43% increase); end of century increases by 4.5°F to 11.6°F (24-63% increase). Fall mid-century of 3.6°F to 6.7°F (9-17% increase); end of century increases of 4.1°F to 11.8°F (10-29% increase).

Days with Maximum Temperatures

Due to projected increases in average and maximum temperatures throughout the end of the century, the Shawsheen basin is also expected to experience an increase in days with daily maximum temperatures over 90°F, 95°F, and 100°F. Table 9 below displays this.

TABLE 9
Days with Maximum Temperatures

Shawsheen Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Maximum Temperature Over 90°F	Annual	7	+7 to +19	+10 to +32	+12 to +54	+14 to +72
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	<1[84]	+<1[84] to +1	+<1[84] to +2	+<1[84] to +3	+<1[84] to +5
	Summer	6	+6 to +17	+8 to +27	+10 to +44	+12 to +56
	Fall	<1[84]	+1 to +2	+1 to +5	+1 to +9	+1 to +13
Days with Maximum Temperature Over 95°F	Annual	<1[84]	+2 to +8	+3 to +15	+4 to +30	+6 to +46
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+<1[84] to +<1[84]	+<1[84] to +<1[84]	+<1[84] to +1	+<1[84] to +2
	Summer	<1[84]	+2 to +7	+2 to +13	+3 to +26	+5 to +39
	Fall	0	+<1[84] to +1	+<1[84] to +2	+<1[84] to +4	+<1[84] to +6
Days with Maximum Temperature Over 100°F	Annual	<1[84]	+<1[84] to +2	+<1[84] to +4	+1 to +10	+1 to +19
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+0 to +<1[84]	+0 to +<1[84]	+0 to +<1[84]	+0 to +1
	Summer	<1[84]	+<1[84] to +2	+<1[84] to +4	+1 to +9	+1 to +17
	Fall	0	+0 to +<1[84]	+0 to +<1[84]	+0 to +1	+<1[84] to +1

Annually, the Shawsheen basin is expected to see days with daily maximum temperatures over 90°F increase by 10 to 32 more days by mid-century, and 14 to 72 more days by the end of the century. Seasonally, summer is expected to see an increase of 8 to 27 more days with daily maximums over 90°F by mid-century. By the end of the century, the Shawsheen basin is expected to have 12 to 56 more days.

Days with Minimum Temperatures

Due to projected increases in average and minimum temperatures throughout the end of the century, the Shawsheen basin is expected to experience a decrease in days with daily minimum temperatures below 32°F and 0°F. The table below displays this.

TABLE 10
Days with Minimum Temperatures

Shawsheen Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Minimum Temperature Below 0°F	Annual	5	-1 to -3	-2 to -4	-2 to -4	-2 to -4
	Winter	5	-1 to -3	-2 to -4	-2 to -4	-2 to -4
	Spring	<1[85]	-0 to +<1[85]	-0 to -0	-0 to -0	-0 to -0
	Summer	0	-0 to -0	-0 to -0	-0 to -0	-0 to -0
	Fall	<1[85]	-0 to -0	-0 to -0	-0 to -0	-0 to -0
Days with Minimum Temperature Below 32°F	Annual	139	-12 to -30	-19 to -42	-22 to -57	-25 to -68
	Winter	81	-3 to -8	-4 to -14	-5 to -23	-7 to -29
	Spring	34	-4 to -11	-7 to -15	-8 to -19	-9 to -21
	Summer	0	-0 to -0	-0 to -0	-0 to -0	-0 to -0
	Fall	24	-5 to -11	-8 to -14	-8 to -17	-7 to -19

Seasonally, winter, spring and fall are expected to see the largest decreases in days with daily minimum temperatures below 32°F. Winter is expected to have 4 to 14 fewer days by mid-century, and 7 to 29 fewer days by end of century. Spring is expected to have 7 to 15 fewer days by mid-century, and 9 to 21 fewer days by end of century. Fall is expected to have 8 to 14 fewer days by mid-century, and 7 to 19 fewer days by end of century.

Heating Degree-Days and Cooling Degree-Days

Due to projected increases in average, maximum, and minimum temperatures throughout the end of the century, the Shawsheen basin is expected to experience a decrease in heating degree-days and increases in both cooling degree-days and growing degree-days. The table below displays this.

TABLE 11
Heating and Cooling Degree-Days

Shawsheen Basin		Observed Baseline 1971-2000 (Degree-Days)	Projected Change in 2030s (Degree-Days)	Mid-Century Projected Change in 2050s (Degree-Days)	Projected Change in 2070s (Degree-Days)	End of Century Projected Change in 2090s (Degree-Days)
Heating Degree-Days (Base 65°F)	Annual	6457	-557 to -1157	-745 to -1579	-882 to -2104	-989 to -2493
	Winter	3341	-205 to -469	-268 to -688	-334 to -850	-375 to -994
	Spring	1697	-152 to -297	-215 to -450	-230 to -622	-298 to -732
	Summer	96	-34 to -59	-44 to -75	-53 to -85	-55 to -88
	Fall	1321	-157 to -363	-269 to -458	-256 to -646	-274 to -732
Cooling Degree-Days (Base 65°F)	Annual	554	+221 to +464	+298 to +761	+354 to +1183	+409 to +1536
	Winter	0	+0 to +1	+0 to +4	+1 to +3	+1 to +4
	Spring	22	+14 to +34	+23 to +59	+26 to +101	+20 to +144
	Summer	478	+165 to +347	+206 to +545	+238 to +825	+286 to +1043
	Fall	47	+34 to +99	+53 to +178	+61 to +274	+87 to +354
Growing Degree-Days (Base 50°F)	Annual	2547	+42 to +829	+579 to +1258	+660 to +1979	+740 to +2480
	Winter	6	+0 to +14	+2 to +18	+5 to +29	+5 to +38
	Spring	299	+76 to +154	+101 to +257	+118 to +388	+131 to +507
	Summer	1762	+199 to +404	+259 to +614	+296 to +905	+349 to +1128
	Fall	470	+114 to +303	+189 to +433	+177 to +652	+229 to +816

Seasonally, winter historically exhibits the highest number of heating degree-days and is expected to see the largest decrease of any season, but spring and fall are also expected to see significant change. The winter season is expected to see a decrease of 8-21% (268 -688 degree-days) by mid-century, and a decrease of 11-30% (375 -994 degree-days) by the end of century. The spring season is expected to decrease in heating degree-days by 13-27% (215 -450 degree-days) by mid-century, and by 18-43% (298 -732 degree-days) by the end of century. The fall season is expected to decrease in heating degree-days by 20-35% (269 -458 degree-days) by mid-century, and by 21-55% (274 -732 degree-days) by the end of century.

Conversely, due to projected increasing temperatures, summer cooling degree-days are expected to increase by 43-114% (206 -545 degree-days) by mid-century, and by 60-218% (286 - 1043 degree-days) by end of century.

Seasonally, summer historically exhibits the highest number of growing degree-days and is expected to see the largest decrease of any season, but the shoulder seasons of spring and fall are also expected to see an increase in growing degree-days. The summer season is projected to increase by 15-35% (259 -614 degree-days) by midcentury, and by 20-64% (349 -1128 degree-days) by end of century. Spring is expected to see an increase by 34-86% (101 -257 degree-days) by mid-century and 44-169% (131 -507 degree-days) by end of century. Fall is expected to see an increase by 40-92% (189 -433 degree-days) by mid-century and 49-174% (223 -816 degree-days) by end of century.

Days with Precipitation Over 1", 2", and 4"

The projections for expected number of days receiving precipitation over one inch are variable for the Shawsheen basin, fluctuating between loss and gain of days. Table 12 below shows the days with high precipitation.

TABLE 12
Days with Precipitation Over 1", 2", and 4"

Shawsheen Basin		Observed Baseline 1971-2000 (Days)	Mid-Century		End of Century
			Projected Change in 2030s (Days)	Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	Projected Change in 2090s (Days)
Days with Precipitation Over 1"	Annual	8	+<1[86] to +2	+1 to +3	+1 to +3	+1 to +4
	Winter	2	-0 to +1	+<1[86] to +1	+<1[86] to +1	+<1[86] to +2
	Spring	2	-0 to +1	+<1[86] to +1	+<1[86] to +1	+<1[86] to +1
	Summer	2	-0 to +1	-0 to +1	-0 to +1	-0 to +1
	Fall	3	-0 to +1	-0 to +1	-0 to +1	-0 to +1
Days with Precipitation Over 2"	Annual	1	-0 to +1	+<1[86] to +1	+<1[86] to +1	+<1[86] to +1
	Winter	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
	Spring	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	+<1[86] to +<1[86]
	Summer	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
	Fall	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
Days with Precipitation Over 4"	Annual	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
	Winter	0	-0 to +0	-0 to +0	-0 to +0	-0 to +<1[86]
	Spring	0	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
	Summer	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]
	Fall	<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]	-0 to +<1[86]

Seasonally, the winter season is generally expected to see the highest projected increase. The winter season is expected to see an increase in days with precipitation over one inch of 0-1 days by mid-century, and an increase of 0-2 days by the end of century. The spring season is expected to see an increase in days with precipitation over one inch of 0-1 days by mid-century, and of an increase of 0- days by the end of century.

Total Precipitation

Similar to projections for number of days receiving precipitation over a specified threshold, seasonal projections for total precipitation are also variable for the Shawsheen basin. Table 13 below displays total precipitation for the Shawsheen Basin.

TABLE 13
Total Precipitation

Shawsheen Basin		Observed Baseline 1971-2000 (Inches)	Projected Change in 2030s (Inches)	Mid-Century Projected Change in 2050s (Inches)	Projected Change in 2070s (Inches)	End of Century Projected Change in 2090s (Inches)
Total Precipitation	Annual	45.0	+0.3 to +4.8	+0.2 to +6.5	+1.2 to +7.9	+1.2 to +8.3
	Winter	11.2	-0.6 to +1.9	+0.0 to +2.3	+0.3 to +2.9	+0.2 to +4.0
	Spring	11.4	-0.2 to +2.5	+0.1 to +2.2	+0.2 to +2.9	+0.3 to +2.8
	Summer	10.5	-0.1 to +1.4	-0.5 to +2.1	-0.5 to +2.7	-1.3 to +2.4
	Fall	12.0	-1.1 to +1.3	-1.2 to +1.7	-1.9 to +1.5	-1.6 to +1.3

The winter season is expected to experience the greatest change with an increase of 0-21% by mid-century, and of 2-36% by end of century. Projections for the summer and fall seasons are more variable and could see either a drop or increase in total precipitation throughout the 21st century. The summer season projections for the Shawsheen or basin could see a decrease of 0.5 to an increase of 2.1 inches by mid-century (decrease of 5% to increase of 20%) and a decrease of 1.3 to an increase of 2.4 inches by the end of the century (decrease of 12% to increase of 23%). The fall season projections for the Shawsheen basin could see a decrease of 1.2 to an increase of 1.7 inches by mid-century (decrease of 10% to increase of 14%) and a decrease of 1.6 to an increase of 1.3 inches by the end of the century (decrease of 13% to increase of 11%).

Consecutive Dry Days

Annual and seasonal projections for consecutive dry days, or for a given period, the largest number of consecutive days with precipitation less than 1 mm (~0.04 inches), are variable throughout the 21st century. The table below shows consecutive dry days for the Shawsheen Basin.

TABLE 14
Consecutive Dry Days

Shawsheen Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Consecutive Dry Days	Annual	17.	-1 to +2	-1 to +2	-0 to +3	-0 to +3
	Winter	12	-1 to +2	-0 to +1	-1 to +2	-1 to +2
	Spring	11	-1 to +1	-1 to +1	-1 to +1	-1 to +1
	Summer	13	-1 to +1	-1 to +2	-1 to +3	-1 to +2
	Fall	12	-0 to +2	+0 to +3	-0 to +4	-0 to +4

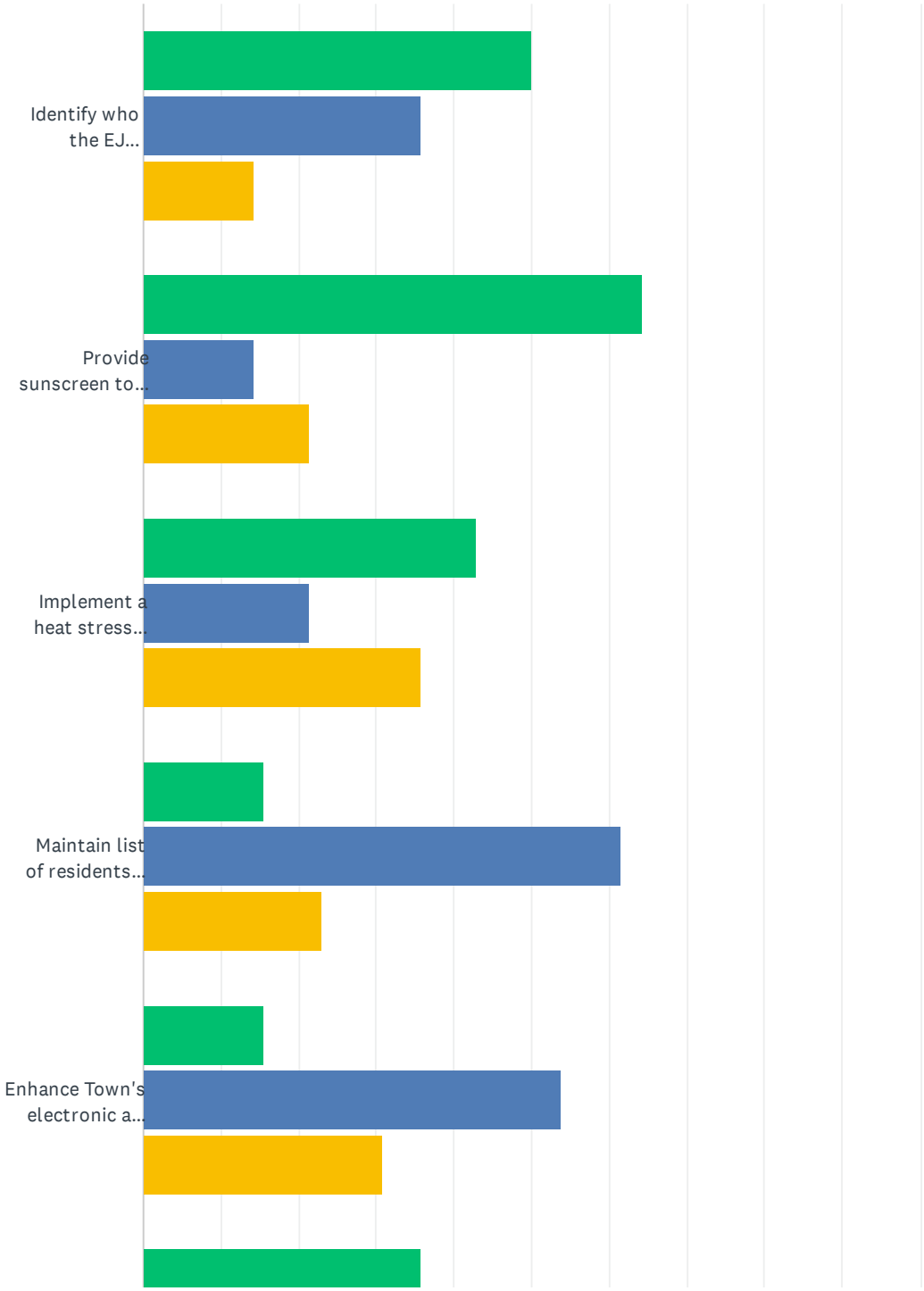
For all the temporal parameters, the Shawsheen basin is expected to see a slight decrease to an increase in consecutive dry days throughout this century. Seasonally, the fall and summer seasons are expected to continue to experience the highest number of consecutive dry days. The fall season is expected to experience an increase of 0-4 days in consecutive dry days by the end of the century

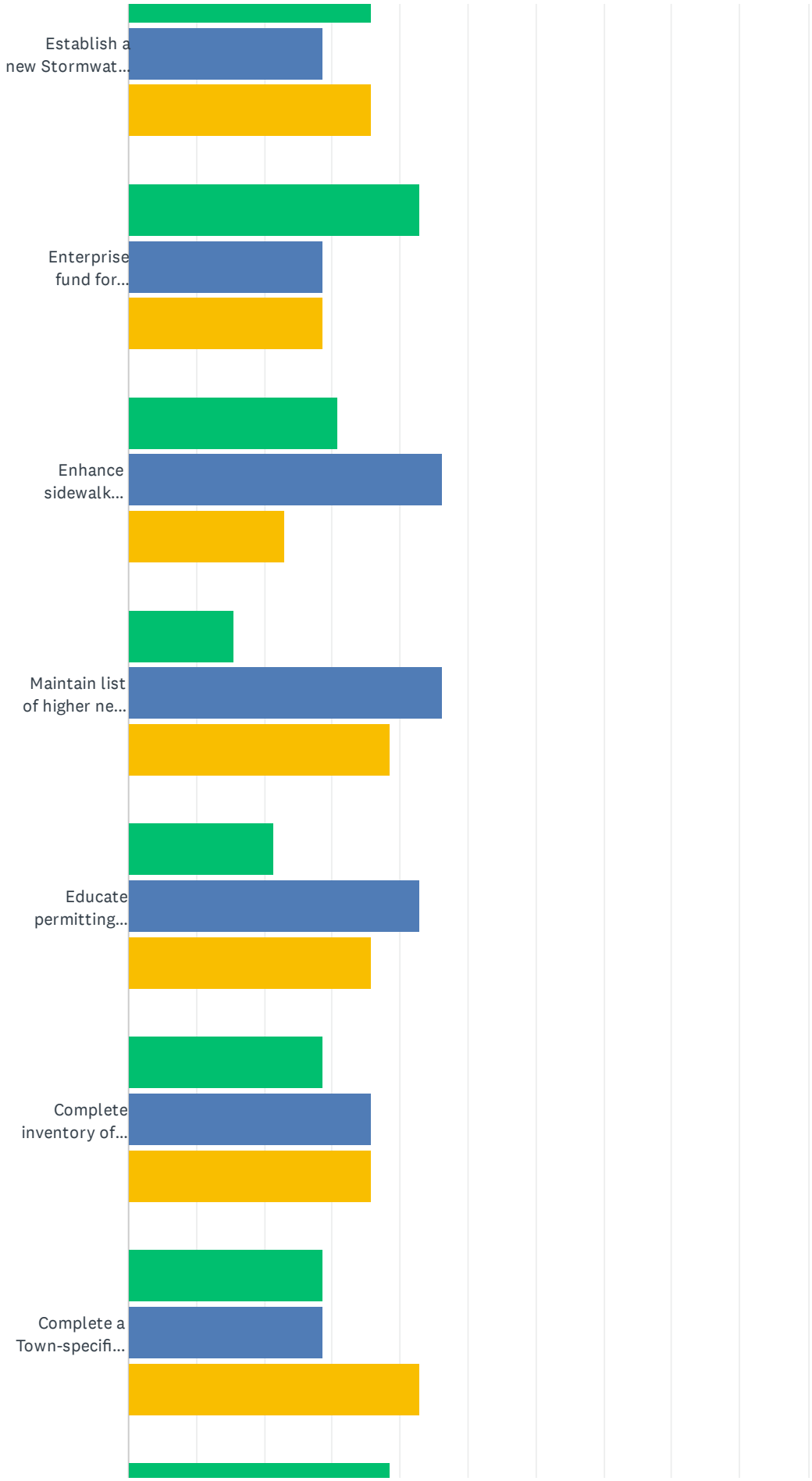
Tighe&Bond
Engineers | Environmental Specialists

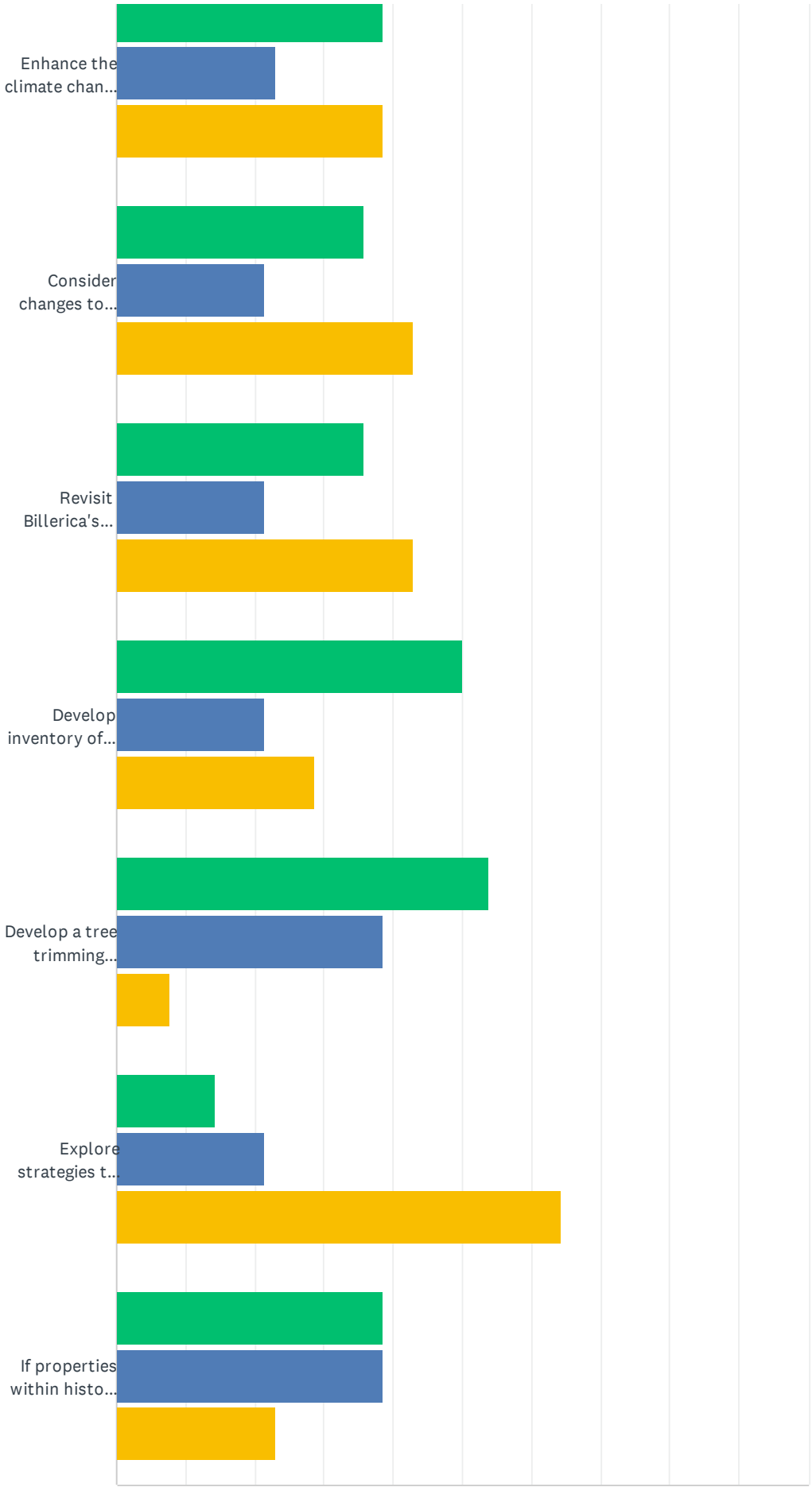
APPENDIX G

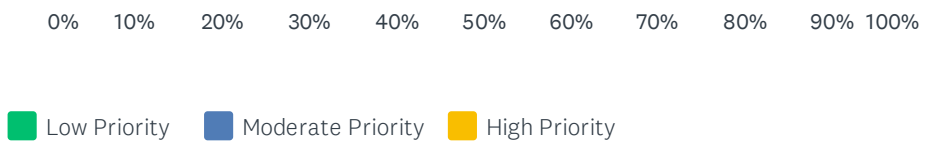
Q1 Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built, and direct public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations. Please rank the mitigation actions below.

Answered: 14 Skipped: 0




Establish a new Stormwat...
Enterprise fund for...
Enhance sidewalk...
Maintain list of higher ne...
Educate permitting...
Complete inventory of...
Complete a Town-specifi...

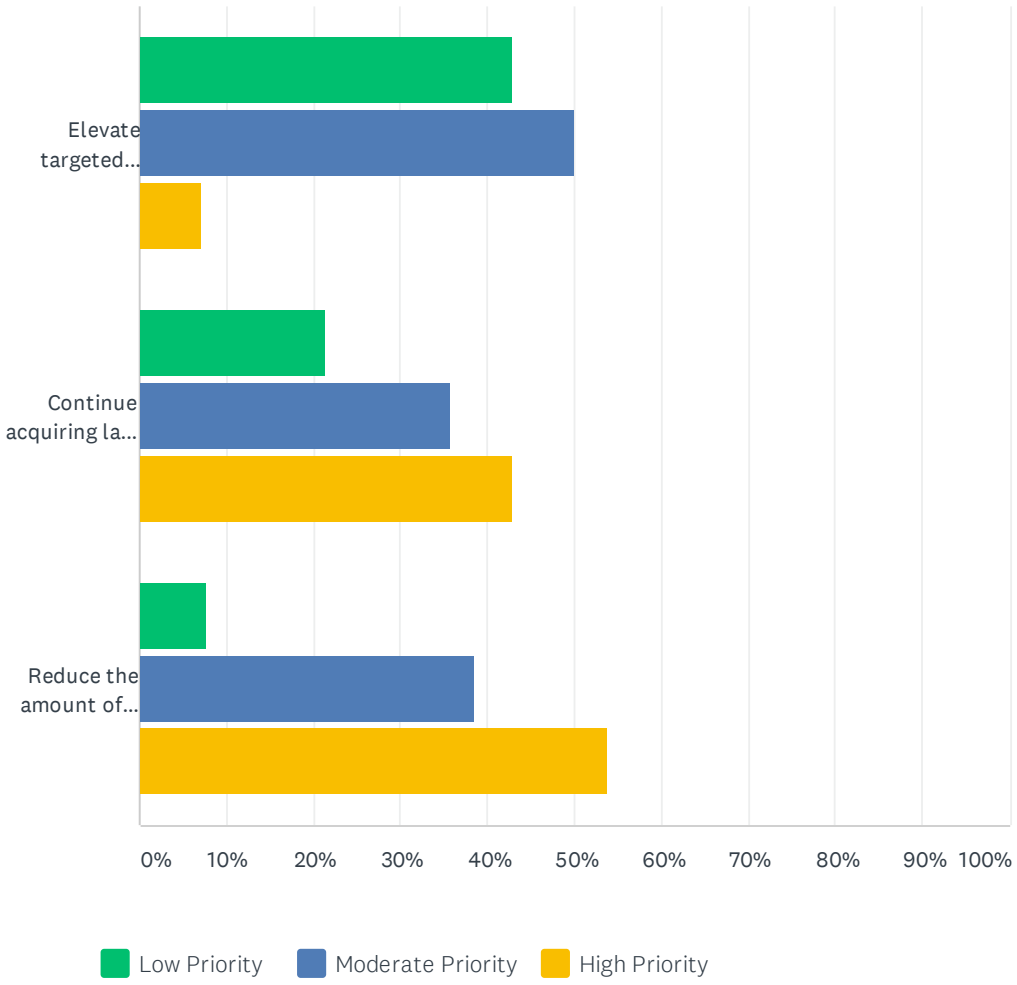

Enhance the climate chan...
Consider changes to...
Revisit Billerica's...
Develop inventory of...
Develop a tree trimming...
Explore strategies t...
If properties within histo...



	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Identify who the EJ community includes and where they live	50.00% 7	35.71% 5	14.29% 2	14
Provide sunscreen to Town employees	64.29% 9	14.29% 2	21.43% 3	14
Implement a heat stress indicator to guide employees when they should or should not be outside	42.86% 6	21.43% 3	35.71% 5	14
Maintain list of residents on oxygen to know where they are in power outage	15.38% 2	61.54% 8	23.08% 3	13
Enhance Town's electronic and backup records retention in accordance with state policies and guidance, as necessary and as feasible	15.38% 2	53.85% 7	30.77% 4	13
Establish a new Stormwater Division of DPW	35.71% 5	28.57% 4	35.71% 5	14
Enterprise fund for stormwater management could provide additional funding dedicated to management	42.86% 6	28.57% 4	28.57% 4	14
Enhance sidewalk clearing plan to optimize management of locations critical for transportation and goods and services	30.77% 4	46.15% 6	23.08% 3	13
Maintain list of higher need facilities (e.g. health care and nursing homes) in the case of a power outage	15.38% 2	46.15% 6	38.46% 5	13
Educate permitting boards to encourage developers to provide open space connectivity	21.43% 3	42.86% 6	35.71% 5	14
Complete inventory of needs to facilitate improved management of Open Space	28.57% 4	35.71% 5	35.71% 5	14
Complete a Town-specific Conservation Plan/address conservation more directly in the next OSRP update	28.57% 4	28.57% 4	42.86% 6	14
Enhance the climate change discussion in the next update of the OSRP	38.46% 5	23.08% 3	38.46% 5	13
Consider changes to zoning - Billerica does not have open space zoning	35.71% 5	21.43% 3	42.86% 6	14
Revisit Billerica's bylaws to explore development options that provide environmental benefits	35.71% 5	21.43% 3	42.86% 6	14
Develop inventory of street trees and develop a management, protection, and planting plan	50.00% 7	21.43% 3	28.57% 4	14
Develop a tree trimming program for trees located on Town properties, not already maintained by power utilities, to minimize storm damage to power lines	53.85% 7	38.46% 5	7.69% 1	13
Explore strategies to protect current drinking water intake and area around intake in Concord River	14.29% 2	21.43% 3	64.29% 9	14
If properties within historic districts are under Federal flood program, require rebuild or updates to meet building code and protect against future climate change as much as possible	38.46% 5	38.46% 5	23.08% 3	13

Q2 Property Protection: Modification or removal of existing buildings or infrastructure to protect them from a hazard. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass. Please rank the mitigation actions below.

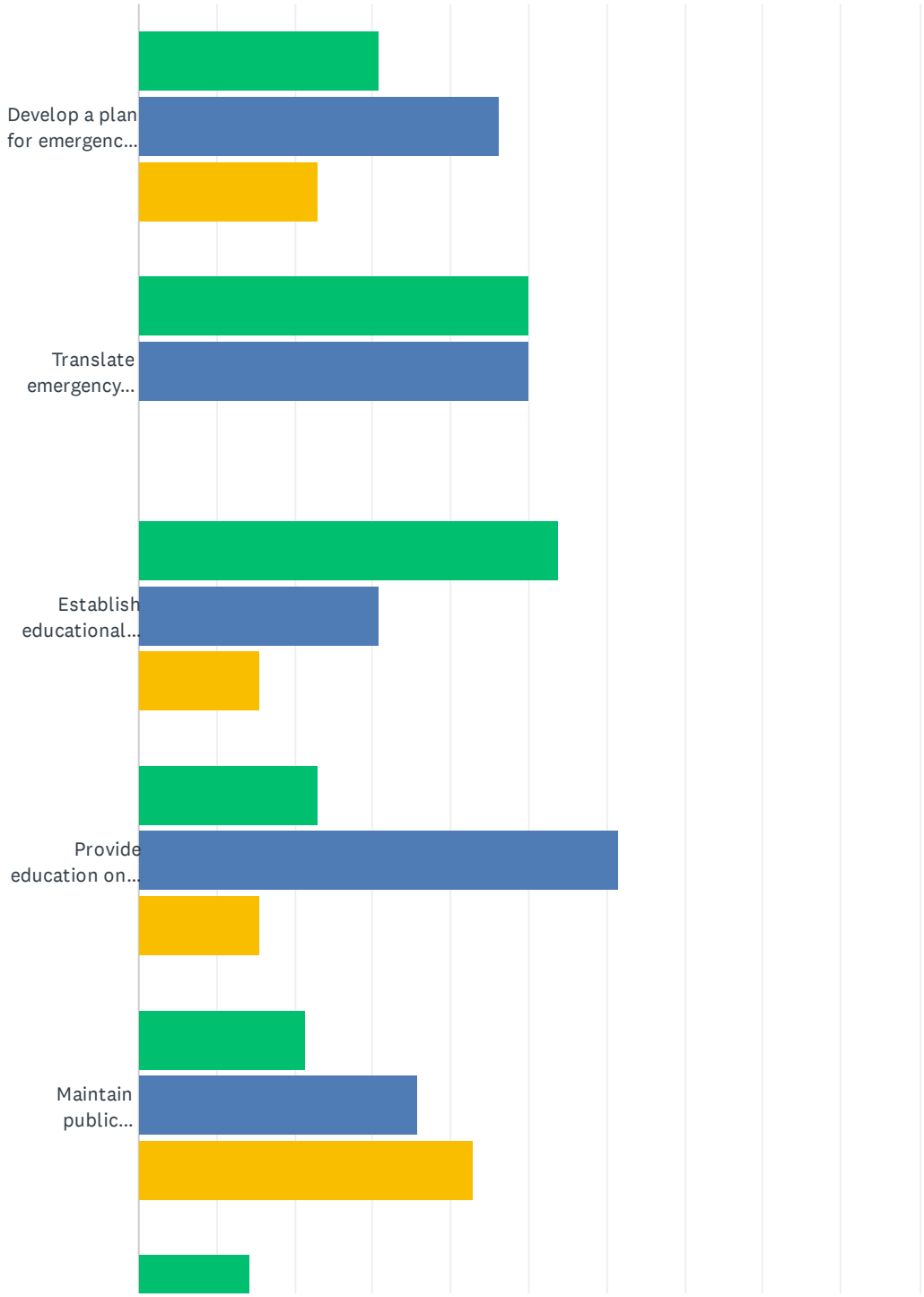
Answered: 14 Skipped: 0

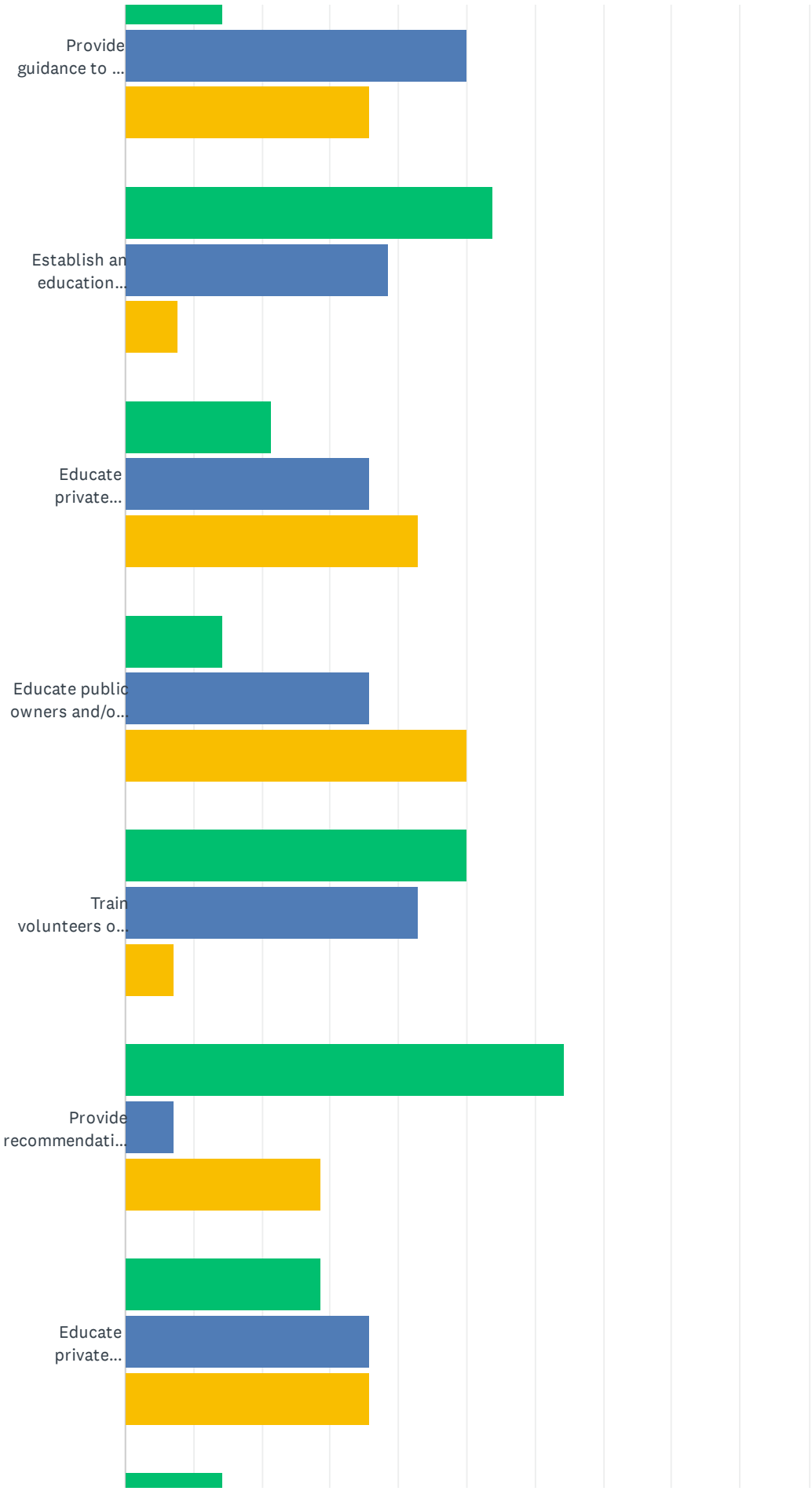


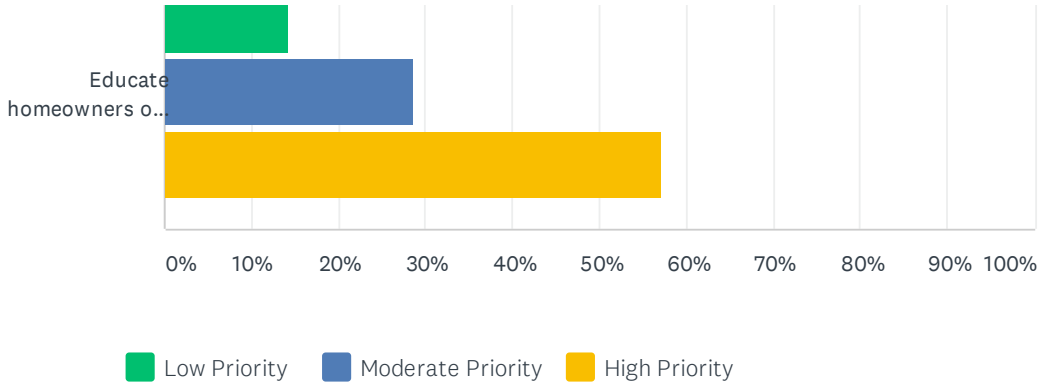
	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Elevate targeted roadways to provide access during flooding, but consider existing utilities, abutters, etc.	42.86% 6	50.00% 7	7.14% 1	14
Continue acquiring land (for public ownership/maintenance) that has access to waterbodies, through CPA or other mechanisms	21.43% 3	35.71% 5	42.86% 6	14
Reduce the amount of impervious surface through education, town projects, and regulations	7.69% 1	38.46% 5	53.85% 7	13

Q3 Public Education and Awareness: Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and ways to mitigate them. Such actions include outreach projects, real estate disclosure requirements, hazard information centers, and school-age and adult education programs. Please rank the mitigation actions below.

Answered: 14 Skipped: 0



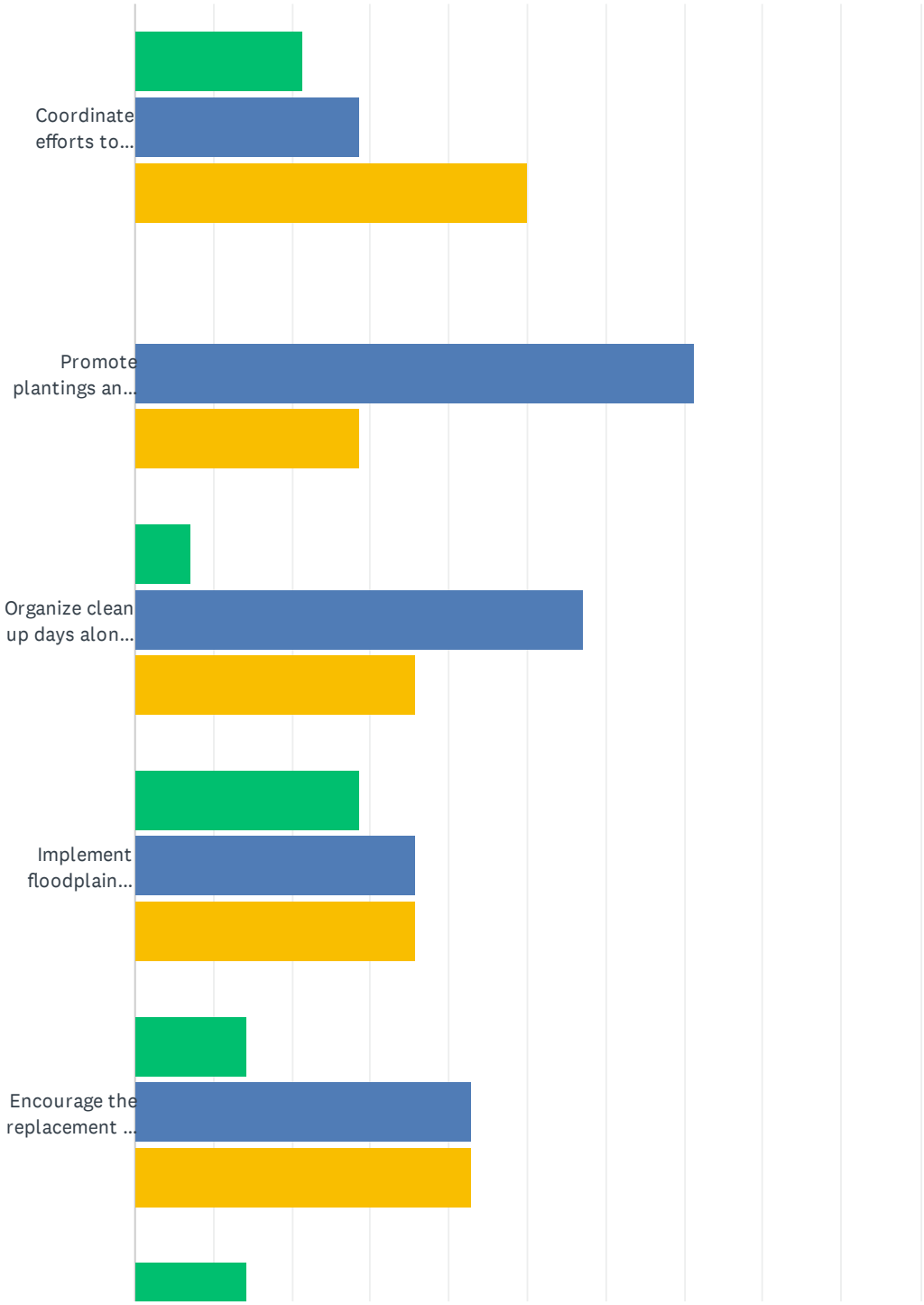

Provide guidance to ...
Establish an education...
Educate private...
Educate public owners and/o...
Train volunteers o...
Provide recommendati...
Educate private...

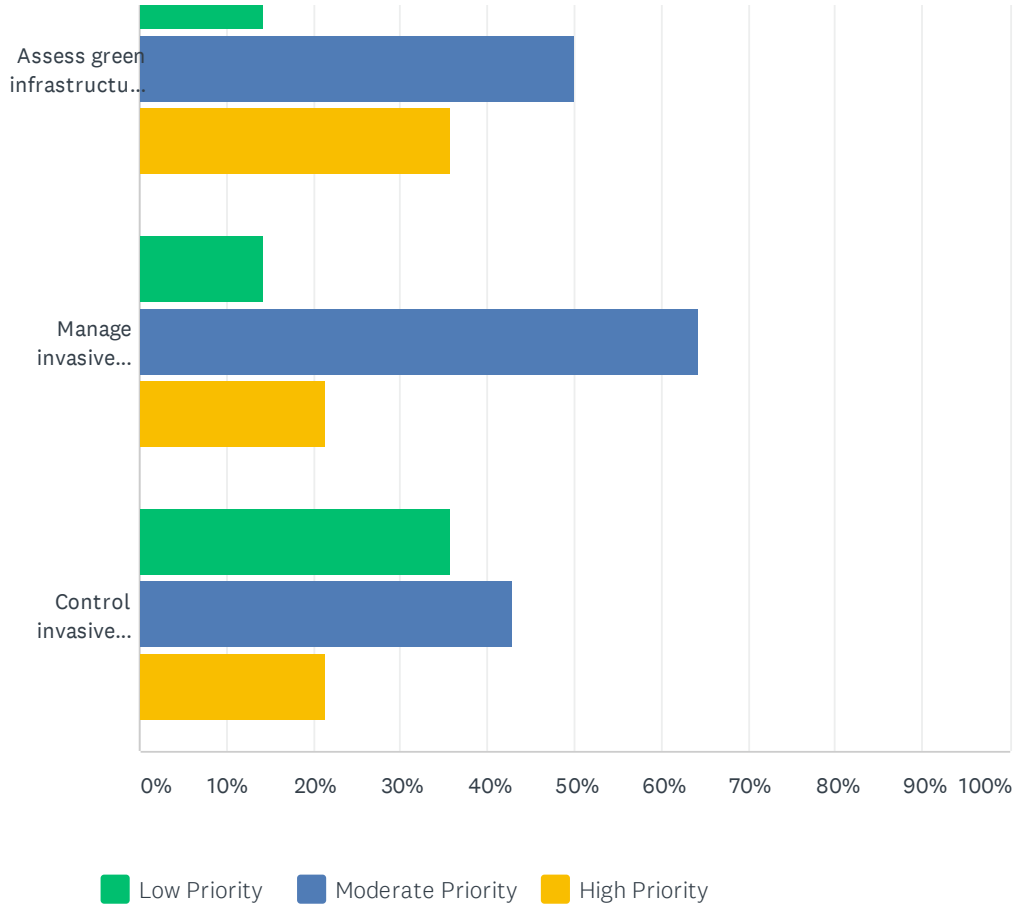


	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Develop a plan for emergency response and education for seniors	30.77% 4	46.15% 6	23.08% 3	13
Translate emergency education materials into different languages	50.00% 7	50.00% 7	0.00% 0	14
Establish educational materials for care givers on how to handle dementia patients during severe natural hazard events	53.85% 7	30.77% 4	15.38% 2	13
Provide education on protocols for evacuation during severe natural hazard events	23.08% 3	61.54% 8	15.38% 2	13
Maintain public education about illegal dumping, referencing enforcement authority	21.43% 3	35.71% 5	42.86% 6	14
Provide guidance to the public on how to maintain stormwater infrastructure on their property	14.29% 2	50.00% 7	35.71% 5	14
Establish an education process on natural hazard evacuation to private businesses	53.85% 7	38.46% 5	7.69% 1	13
Educate private landowners about benefits of reduction or avoiding impervious cover and maintaining natural spaces	21.43% 3	35.71% 5	42.86% 6	14
Educate public owners and/or municipal staff on wetland buffer zones, floodplains, vernal pools, and other conservation resource areas	14.29% 2	35.71% 5	50.00% 7	14
Train volunteers on culvert inventory process to size culverts properly for replacement	50.00% 7	42.86% 6	7.14% 1	14
Provide recommendations to farmers for chemical uses	64.29% 9	7.14% 1	28.57% 4	14
Educate private property about value of maintaining tree canopy	28.57% 4	35.71% 5	35.71% 5	14
Educate homeowners on the use of chemicals on their lawns, particularly in areas abutting wetlands and floodplain buffer zones	14.29% 2	28.57% 4	57.14% 8	14

Q4 Natural Resource Protection and Green Infrastructure: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include low impact development, sediment and erosion control, stream corridor restoration, watershed management, urban forest and vegetation management, and wetland restoration and preservation. Please rank the mitigation actions below.

Answered: 14 Skipped: 0

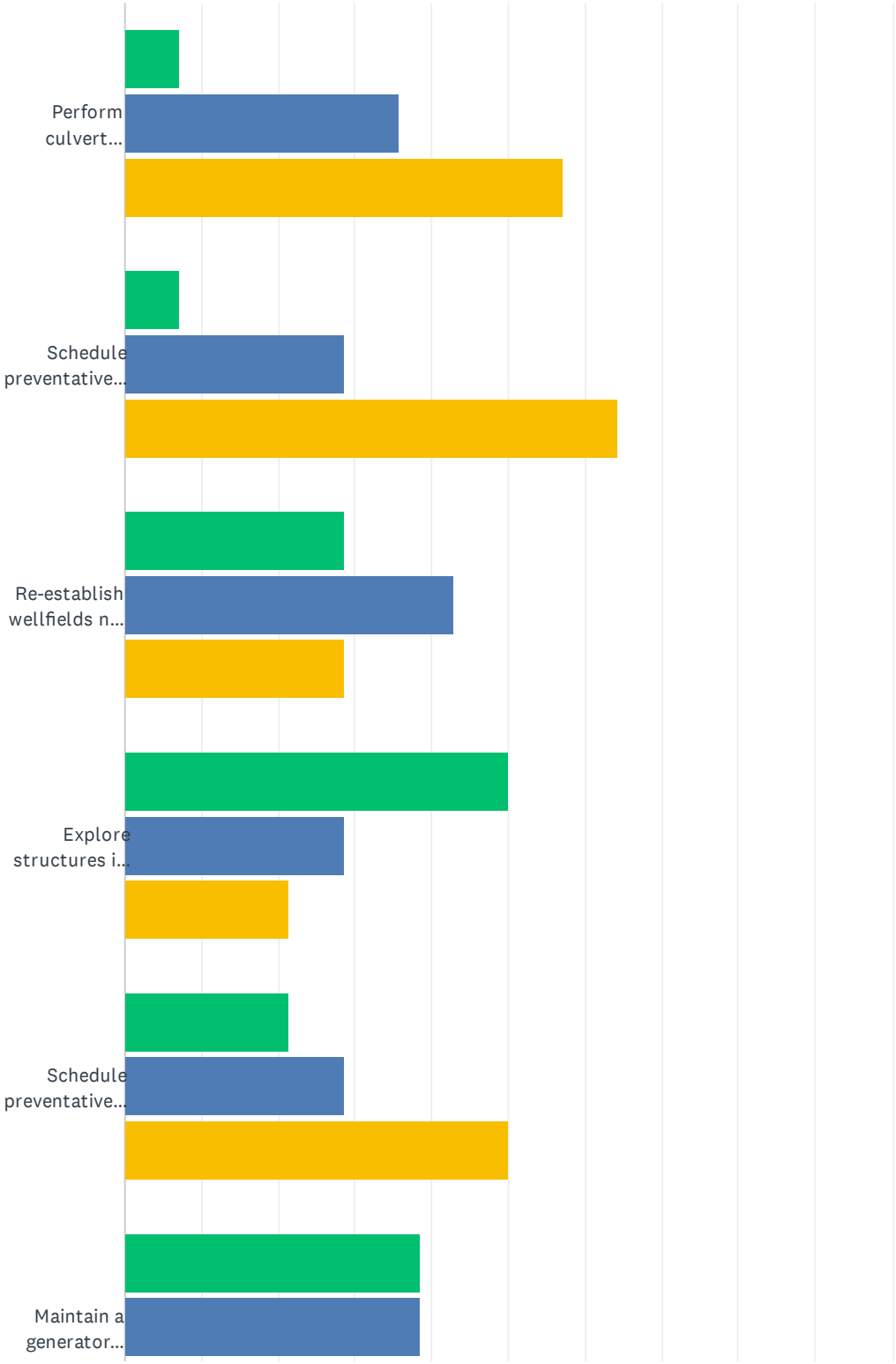


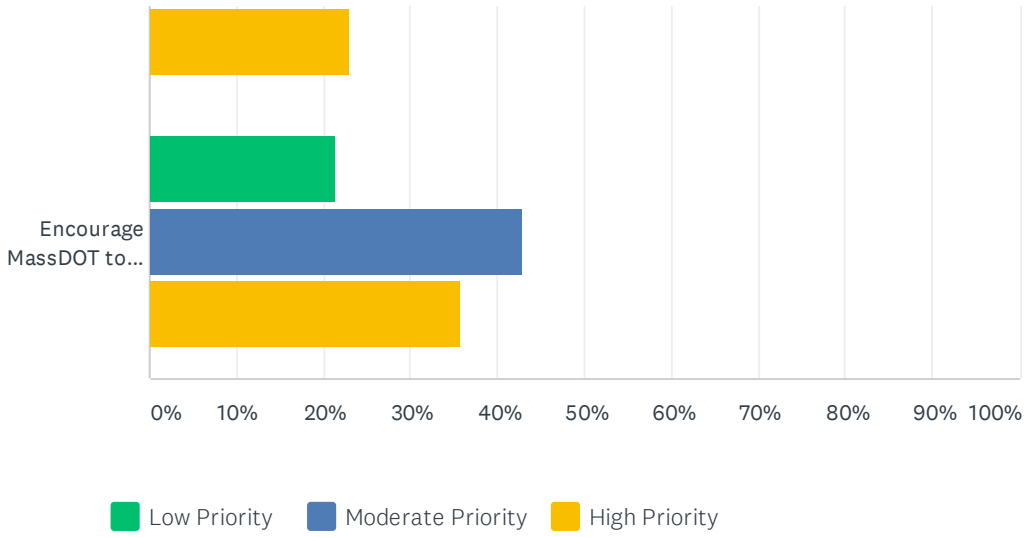


	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Coordinate efforts to reduce heat island effect (example: white pavement, roofs, impervious cover, green infrastructure)	21.43% 3	28.57% 4	50.00% 7	14
Promote plantings and other vegetation improvements that could improve air quality and runoff quality	0.00% 0	71.43% 10	28.57% 4	14
Organize clean up days along public lands to improve environmental health in community	7.14% 1	57.14% 8	35.71% 5	14
Implement floodplain restoration techniques	28.57% 4	35.71% 5	35.71% 5	14
Encourage the replacement of lawn with native and drought resistant vegetation	14.29% 2	42.86% 6	42.86% 6	14
Assess green infrastructure over grey infrastructure where suitable, for example, instead of a detention basin, could be rain garden, vegetated swale, which would look better and provide habitat	14.29% 2	50.00% 7	35.71% 5	14
Manage invasive species at Nuttings Lake	14.29% 2	64.29% 9	21.43% 3	14
Control invasive vegetation on Town Property and participate in CISMA (cisma-suasco.org)	35.71% 5	42.86% 6	21.43% 3	14

Q5 Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms. Please rank the mitigation actions below.

Answered: 14 Skipped: 0

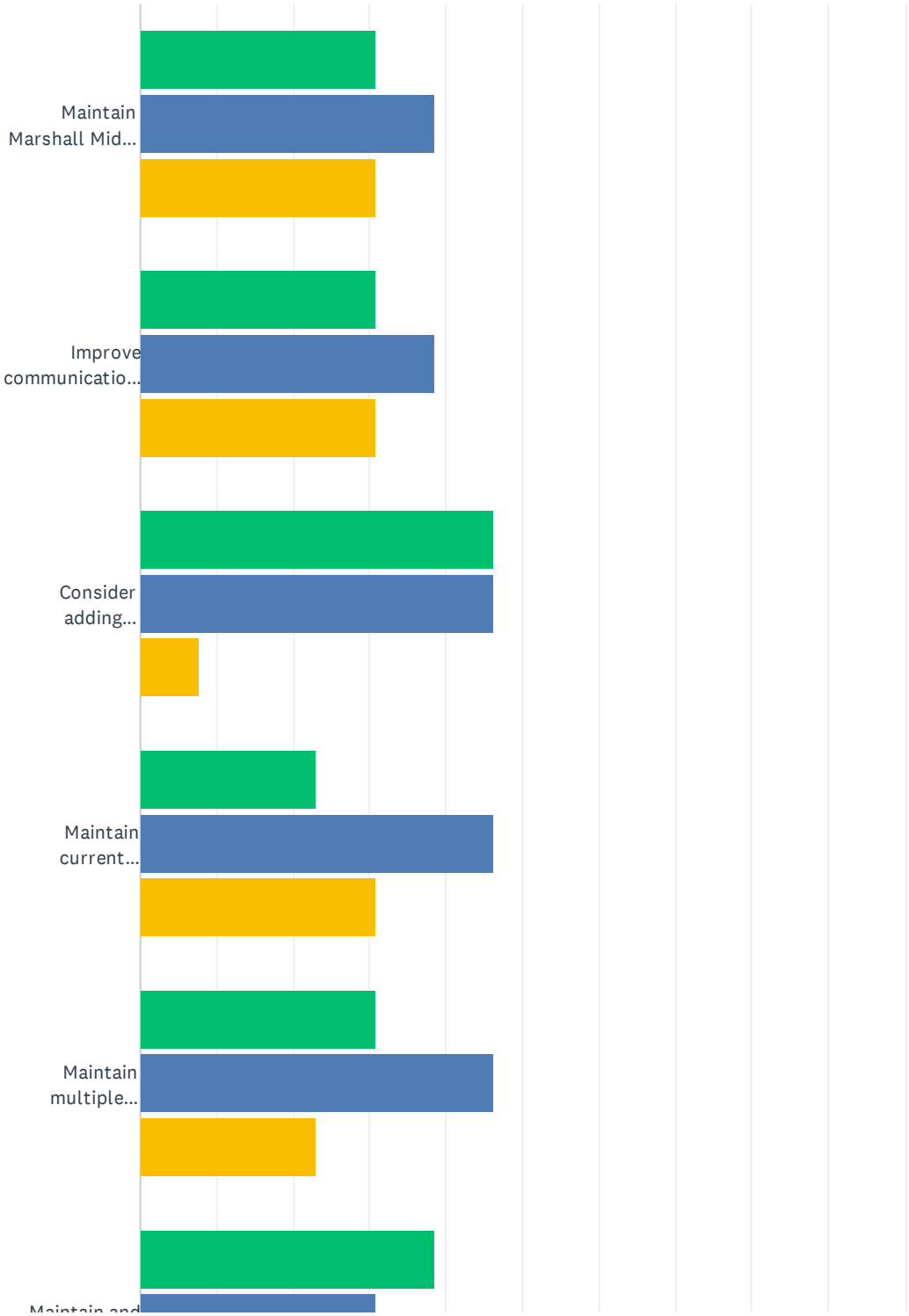


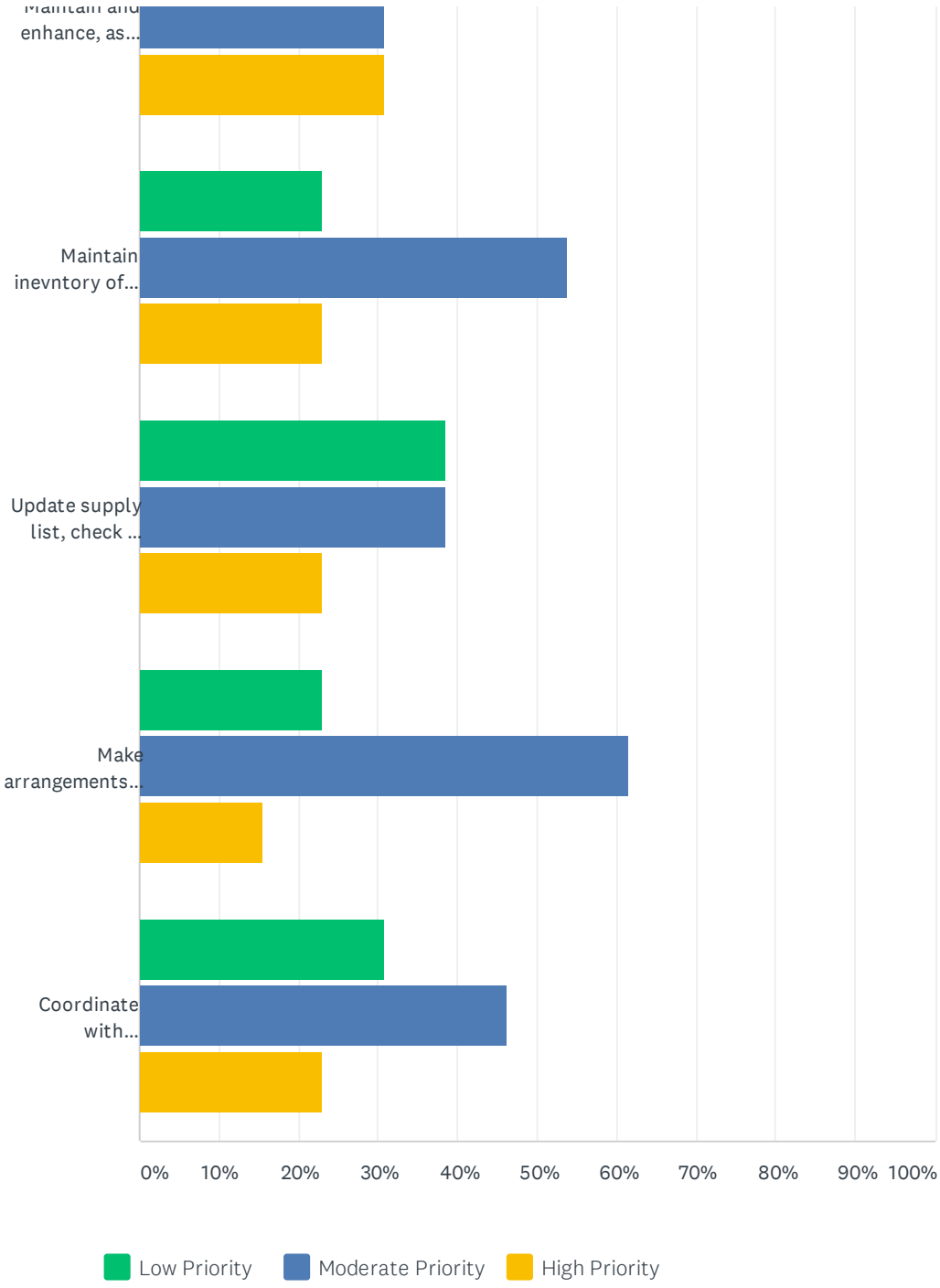


	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Perform culvert assessments to understand condition, capacity, and needed repairs or replacement, to couple with Town roadway projects	7.14% 1	35.71% 5	57.14% 8	14
Schedule preventative culvert maintenance and inspection	7.14% 1	28.57% 4	64.29% 9	14
Re-establish wellfields near intake, maintain emergency connections with abutting water suppliers	28.57% 4	42.86% 6	28.57% 4	14
Explore structures in the Concord River (such as the center pier from Historic Bridge) to see if the removal would influence future flood events	50.00% 7	28.57% 4	21.43% 3	14
Schedule preventative maintenance and inspection of stormwater infrastructure	21.43% 3	28.57% 4	50.00% 7	14
Maintain a generator hookup at Billerica COA and begin to equip the site for a shelter/warming facility	38.46% 5	38.46% 5	23.08% 3	13
Encourage MassDOT to update or replace bridge over the Shawsheen River on Route 3A (this causes flooding)	21.43% 3	42.86% 6	35.71% 5	14

Q6 Emergency Services Protection: Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure. Please rank the mitigation actions below.

Answered: 13 Skipped: 1




Maintain and enhance, as...
Maintain inevntory of...
Update supply list, check ...
Make arrangements...
Coordinate with...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Low Priority
Moderate Priority
High Priority

	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Maintain Marshall Middle School as a Red Cross shelter	30.77% 4	38.46% 5	30.77% 4	13
Improve communication about locations of shelters/emergency facilities in proximity to EJ communities	30.77% 4	38.46% 5	30.77% 4	13
Consider adding additional locations for cell phone charging and water distribution	46.15% 6	46.15% 6	7.69% 1	13
Maintain current facilities as warming stations and maintain generator at Town Hall.	23.08% 3	46.15% 6	30.77% 4	13
Maintain multiple suppliers for items to keep necessary supplies and chemicals delivered to water treatment and wastewater plants in event of emergency	30.77% 4	46.15% 6	23.08% 3	13
Maintain and enhance, as necessary, an inventory of fire station resources	38.46% 5	30.77% 4	30.77% 4	13
Maintain inevntory of redundant emergency supplies (e.g. keep list updated, routinely check for expired items, and confirm stock)	23.08% 3	53.85% 7	23.08% 3	13
Update supply list, check for expired items, ensure proper stock of materials, and have a test plan for designated shelters	38.46% 5	38.46% 5	23.08% 3	13
Make arrangements with local clinics to have services available/needed in shelters	23.08% 3	61.54% 8	15.38% 2	13
Coordinate with Fire/Police on emergency preparedness on private sites related to spill kits etc.	30.77% 4	46.15% 6	23.08% 3	13

Q7 If you have additional mitigation strategies that were not addressed in the survey, please provide the information below.

Answered: 3 Skipped: 11

#	RESPONSES	DATE
1	A number of the mitigations are self-deleting in that the town is already taking action either independently or via Town Management action. I do not recall the mitigations for section 3 in the education area.	7/10/2020 5:05 PM
2	Create and enforce stricter policies about the use of drinking water for lawn watering, given the impact to the source and our water supply capacity and infrastructure. Consider banning the use of drinking water for lawn watering. Consider banning gas and diesel powered boats above a certain engine size from the Concord River to protect our drinking water supply.	7/10/2020 12:47 PM
3	Study water intake relative to dam removal. Improved flow for better water quality. Start discussion of Talbot dam removal, because owners relinquished responsibility. And for Ecological justice, and to prevent a disaster. See also Faulkner bridge (> 100 years old concrete ...)	7/1/2020 5:27 PM

Q8 If you have any last questions or comments you want addressed as part of this process, please input them below.

Answered: 4 Skipped: 10

#	RESPONSES	DATE
1	Unfortunately this survey is not as well designed as I would have preferred. We should have an option of zero priority. That would allow for distinction between items already being addressed by the town, or items that we can't or shouldn't be addressing, and simply lower priority items relative to others. Not all mitigations reflect what was discussed in the meetings, and their intent/focus was changed, so now having to rank them in a changed state is problematic.	7/10/2020 5:05 PM
2	Consider the limitation on the use of gas powered equipment, such as leaf blowers, that create both air and noise pollution.	7/10/2020 12:47 PM
3	The questions that are not answered are because I believe they should be removed because these actions are done or are not accurate	7/5/2020 8:34 AM
4	I'm very surprised the dam is not included in this survey. Not maintained since 1850s, it is a liability under all extreme conditions (floods and droughts). Floods: breach and disaster downstream. Droughts: Water Treatment Plant has to treat pond water due to poor flow. Study of "Fordway Bar" must be approved. High priority. Forgotten survey item?	7/1/2020 5:27 PM

TOWN OF BILLERICA MUNICIPAL VULNERABILITY PREPAREDNESS PLANNING

Listening Session

June 29, 2020

Tighe&Bond

WELCOME

Billerica awarded $39K grant for two related efforts:

- Municipal Vulnerability Preparedness (MVP) Community Resilience Building (CRB) Workshop Process; and
- Draft Hazard Mitigation Plan (HMP) Update

MVP is the first step in unlocking additional funding opportunities for Billerica from Commonwealth of Massachusetts

Updating the HMP continues to keep Billerica eligible for funding from Federal Emergency Management Agency programs

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

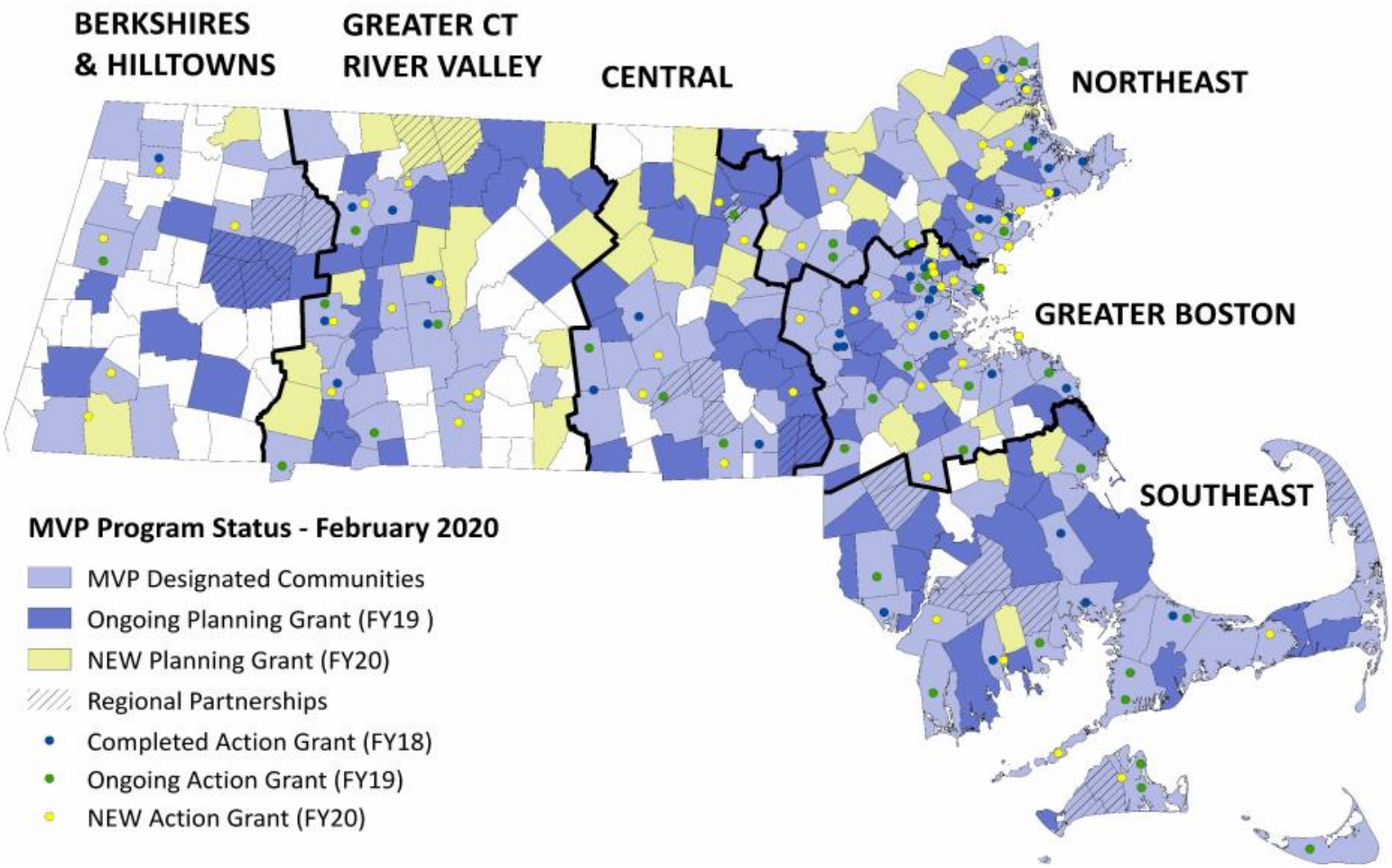
Tighe&Bond

BACKGROUND ON MVP PROGRAM

MVP Designations
82% of the Commonwealth
287 communities

Action Grant Projects
FY 18: 37
FY 19: 36
FY 20: 54

Total Awards
$33M+ in planning and action grants to date



TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

MVP GRANT AND CRB PROCESS

1. Establish Core Team
2. Complete Evaluation/Assessment
3. Hold Workshops
4. Draft MVP Report
5. **Hold Listening Session**
6. Final MVP Report

A brief thanks to Billerica's MVP Core Team

Abdul Alkhatib – Director of Public Works

Bill Laurendeau – Emergency Management Director

Clancy Main – Town Manager's Office

Daniel C. Rosa – Chief of Police

Ed Tierney – Highway Superintendent

Heather Chew – Assistant Town Engineer

Isabel Tourkantonis – Conservation Director

Jeff Kalmes – Wastewater Superintendent

Kelley Conway – Town Engineer

Kristel Bennet – Health Director

Rob Anderson – Community Development

Robert Cole – Fire Chief

Tom Ferraro – Deputy Fire Chief

NATURAL HAZARDS AND CLIMATE CHANGE

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

WHAT ARE NATURAL HAZARDS?

Poor Urban Drainage
Regional Flooding
Culvert Failure

Inland Flooding

Tsunami

Severe Winter Storm

Blizzards
Snow
Ice Storms

Drought

Average/Extreme Temperatures

Tornadoes

Landslide

Wildfires

Other Severe Weather

Nor'easters
High Wind
Heavy Precipitation
Microbursts

Coastal Flooding

Invasive Species

Earthquake

Coastal Erosion

Hurricanes/Tropical Storms

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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TOP NATURAL HAZARDS – PAST & PRESENT

Thunderstorms

Nor’easters

High wind

Extreme Temperature

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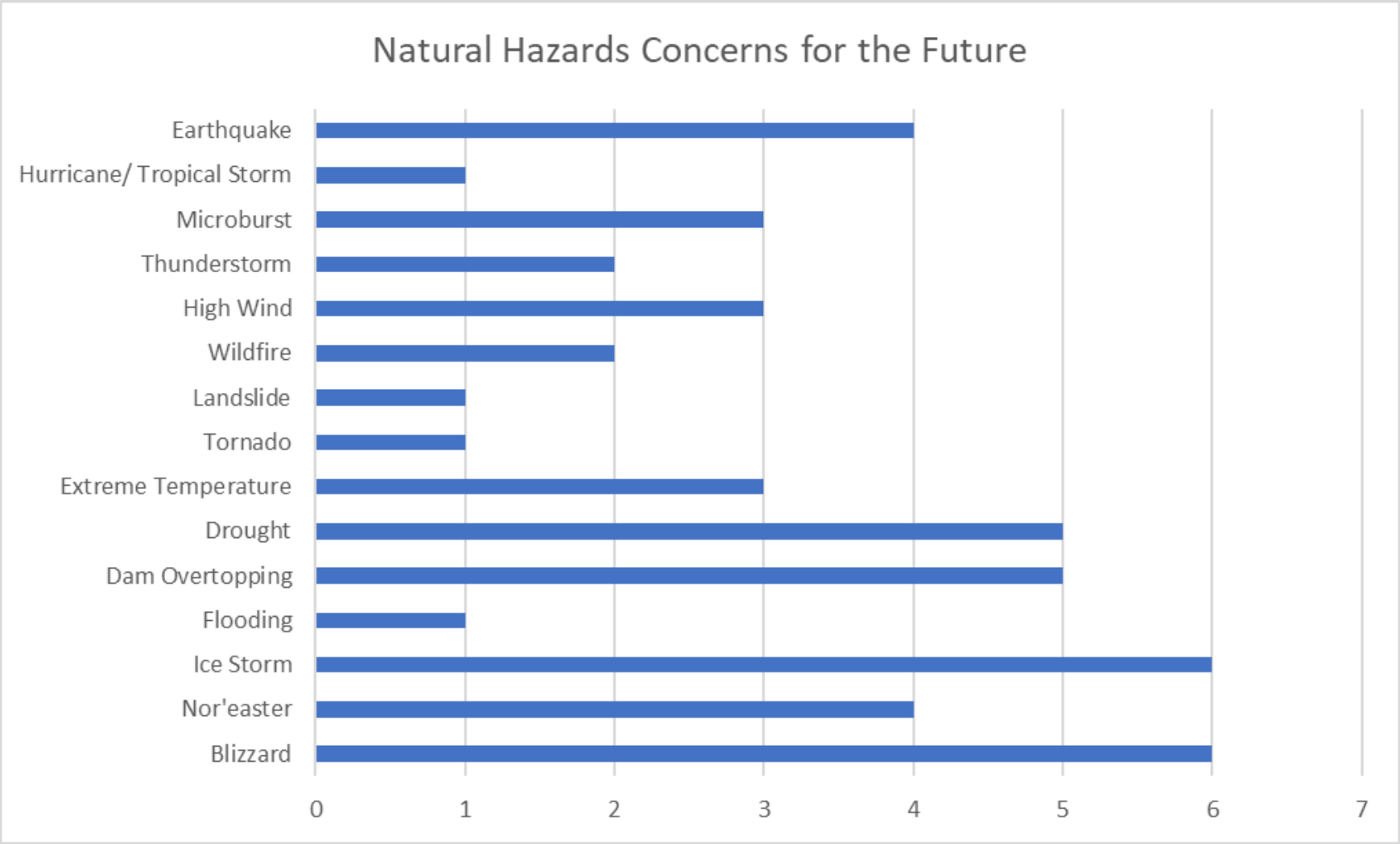
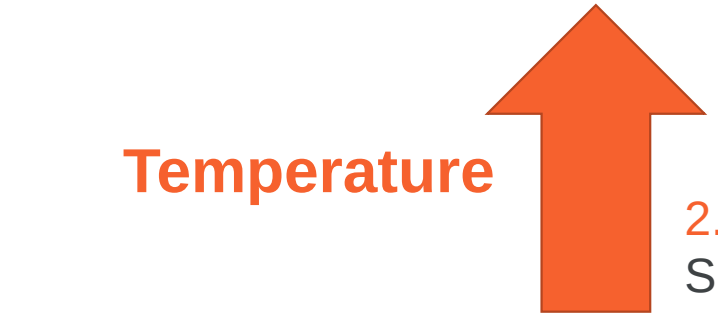
TOP NATURAL HAZARDS – FUTURE



MASSACHUSETTS OBSERVED CLIMATE CHANGES



Temperature

2.9ºF
Since 1985 (Statewide)

Growing Season

15 Days
Since 1950

Sea Level Rise

11 inches
Since 1922 (Boston)

Heavy Precipitation

55%
Since 1958

resilientma.org

Tighe&Bond

CHANGES IN PRECIPITATION

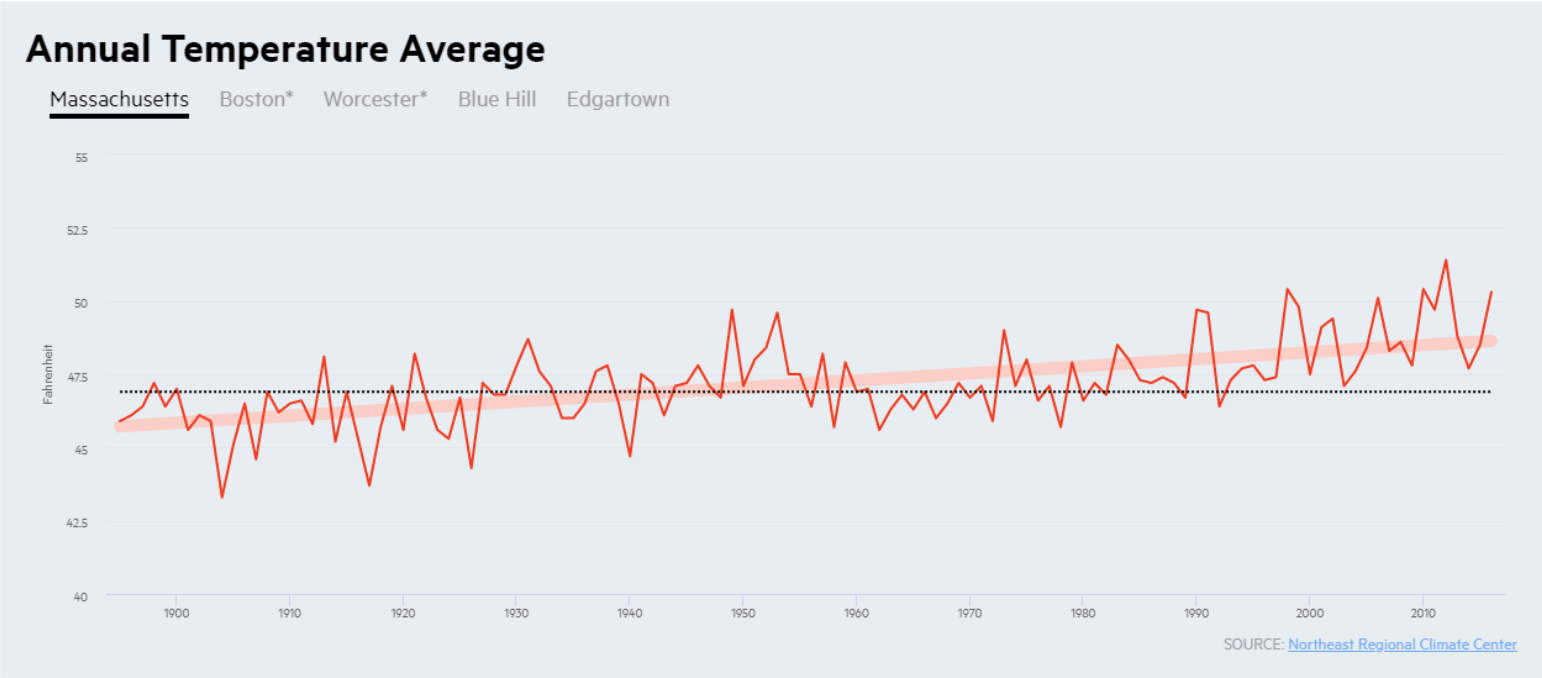
SuAsCo Basin		Observed Baseline 1971-2000 (Inches)	Projected Change in 2030s (Inches)	Mid-Century Projected Change in 2050s (Inches)	Projected Change in 2070s (Inches)	End of Century Projected Change in 2090s (Inches)
Total Precipitation	Annual	45.4	+0.2 to +4.8	+0.6 to +6.1	+1.5 to +7.8	+1.2 to +8.0
	Winter	11.2	-0.4 to +2.1	+0.1 to +2.6	+0.5 to +3.2	+0.4 to +4.1
	Spring	11.6	-0.1 to +2.4	+0.0 to +2.1	+0.3 to +2.6	+0.2 to +2.6
	Summer	10.8	-0.2 to +1.5	-0.5 to +2.2	-0.6 to +2.4	-1.1 to +2.2
	Fall	12.0	-1.2 to +1.1	-1.3 to +1.7	-1.8 to +1.6	-1.5 to +1.4

Shawsheen Basin		Observed Baseline 1971-2000 (Inches)	Projected Change in 2030s (Inches)	Mid-Century Projected Change in 2050s (Inches)	Projected Change in 2070s (Inches)	End of Century Projected Change in 2090s (Inches)
Total Precipitation	Annual	45.0	+0.3 to +4.8	+0.2 to +6.5	+1.2 to +7.9	+1.2 to +8.3
	Winter	11.2	-0.6 to +1.9	+0.0 to +2.3	+0.3 to +2.9	+0.2 to +4.0
	Spring	11.4	-0.2 to +2.5	+0.1 to +2.2	+0.2 to +2.9	+0.3 to +2.8
	Summer	10.5	-0.1 to +1.4	-0.5 to +2.1	-0.5 to +2.7	-1.3 to +2.4
	Fall	12.0	-1.1 to +1.3	-1.2 to +1.7	-1.9 to +1.5	-1.6 to +1.3

IMPACTS:

- Episodic droughts
- Concerns over food production and drinking water supply
- Stress on ecosystems
- Flooding

RISING TEMPERATURE



IMPACTS:

- Heat-related illnesses
- Vector borne-diseases
- Health of plants, animals, ecosystems
- Reduced crop production
- Larger energy demand
- Droughts and wildfires

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

EXTREME STORMS

Blizzards

- More than 5 in MA since 2011

Nor'easters and Hurricanes

- Upward trend since the 1970s

IMPACTS:

- **Public safety concerns, including increased injuries and mortality**
- **Economic damages and business disruption**
- **Property and infrastructure damage**
- **Impacts on natural resources**

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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CLIMATE CHANGES	RELATED NATURAL HAZARDS	PROJECTIONS BY THE END OF THIS CENTURY
Changes in precipitation 	– Inland flooding – Drought – Landslide	– Annual precipitation: Increase up to 16% (+7.3 inches) – Days with rainfall accumulation 1+ inch: Increase up to 57% (+4 days) – Consecutive dry days: Increase 18% (+3 days) – Summer precipitation: Decrease
Sea level rise 	– Coastal flooding – Coastal erosion – Tsunami	– Sea level: Increase 4.0 to 10.5 feet along the Massachusetts coast
Rising temperatures 	– Average/extreme temperatures – Wildfires – Invasive species	– Average annual temperature: Increase up to 23% (+10.8 degrees Fahrenheit) – Days/year with daily minimum temperatures below freezing: Decrease up to 42% (-62 days) – Winter temperatures: Increase at a greater rate than spring, summer, or fall – Long-term average minimum winter temperature: Increase up to 66% (+11.4 degrees Fahrenheit) – Days/year with daily maximum temperatures over 90 degrees Fahrenheit: Increase by up to 1,280% (+64 days) – Growing degree days: Increase by 23% to 52%
Extreme weather 	– Hurricanes/tropical storms – Severe winter storms/nor'easters – Tornadoes – Other severe weather	– Frequency and magnitude: Increase

Note: This plan also assesses earthquakes, but there is no established correlation between climate change and earthquakes.
Source of Climate Change Projections: Northeast Climate Adaptation Science Center at the University of Massachusetts, Amherst.

CLIMATE CHANGE + NATURAL HAZARDS = AMPLIFIED RISK

https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan

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COMMUNITY ASSET INVENTORY

TOWN OF BILLERICA MASSACHUSETTS INCORPORATED 1655

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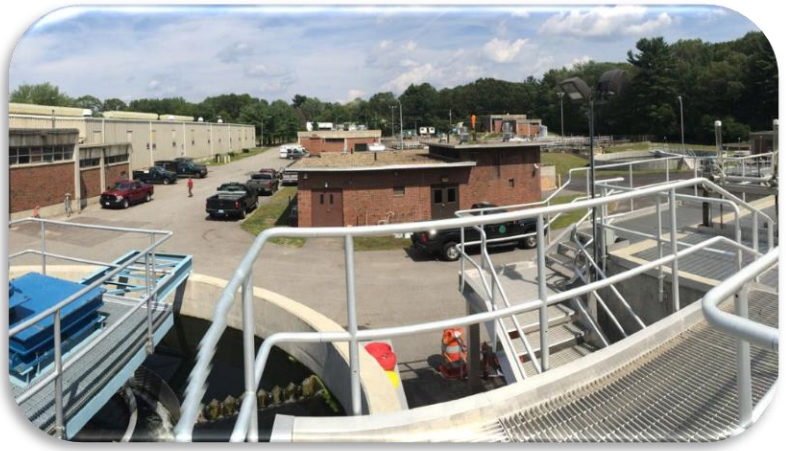
WHAT ARE COMMUNITY ASSETS?

Societal



Infrastructure

Natural Resources

Economy

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PEOPLE – SOCIETAL ASSETS

- **Public Education Facilities and Resources**
- **Buildings that Support Community Needs**
- **Vulnerable Populations**
- **Support Services**

INFRASTRUCTURAL ASSETS

- **Flood Control Infrastructure**
- **Transportation Corridors**
- **Critical Facilities**
- **Communication and Energy**

ECONOMIC ASSETS

- **Essential Goods – Large Retail**
- **Essential Service – Small Business**
- **Large Employers**
- **Other Essential Services – Lodging, Transportation and Utilities**

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ENVIRONMENTAL ASSETS

- **Hydrologic Resources**
- **Open Space and Conservation Lands**
- **Parks and Recreation Areas**
- **Forestry and Agriculture**
- **Environmental Health**
- **Environmental Education**

MVP WORKSHOPS

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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Overview of the Process (Steps & Tasks)

DURING WORKSHOP

A Prepare for the Workshop
1. Establish a core team with goals.
2. Engage stakeholders.
3. Prepare materials for workshop.
4. Decide on participant arrangements.

B Characterize Hazards
1. Identify past, current, and future impacts.
2. Determine the highest-priority hazards.

C Identify Community Vulnerabilities and Strengths
1. Identify infrastructural vulnerabilities and strengths.
2. Identify societal vulnerabilities and strengths.
3. Identify environmental vulnerabilities and strengths.

D Identify and Prioritize Community Actions
1. Identify and prioritize infrastructural actions.
2. Identify and prioritize societal actions.
3. Identify and prioritize environmental actions.

E Determine the Overall Priority Actions
1. Identify highest-priority actions.
2. Further define urgency and timing.

F Put It All Together
1. Generate final workshop products.

G Move Forward
1. Continue community outreach and engagement.
2. Secure additional data and information.
3. Inform existing planning and project activities.

Community Components

Infrastructural

Societal

Environmental

https://www.communityresiliencebuilding.com/

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CRB MATRIX

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)

V = Vulnerability **S** = Strength

Billerica's Priority Assets			Billerica's Top Natural Hazards
Name	**Location**	**Vulnerability (V) or Strength (S)**	Severe Storms Flooding Drought/ Extreme temperatures Invasive Species
Societal			**Actions to Address Billerica's Top Hazards**
Institutionalized Elderly Population	Hawthorn Senior Living Life Care Center of Merrimack Valley	V - Overheating, respiratory illness, dementia S - Density of people in same location eases speed of response	Develop a plan for emergency response and education
Assisted Living Complex	Brightview, Benchmark, etc. New England Pediatric Nursing Home	V - Elderly population congregated in one building S - provide safe housing for a population	Develop a plan for emergency response and education
Housebound - Elderly/Disabled	Town-wide	V - can be challenging evacuate during crisis	Update list of residents on oxygen to know where they are in power outage
Schools	Town-wide	S - Provide shelter space (e.g. Marshall Middle School) that is properly certified	Maintain Marshall Middle School as a Red Cross shelter.
Low Income Communities	Town-wide		Establish shelters/emergency facilities at parks and town-owned properties in proximity to these communities.
Environmental Justice Communities	BHA McCullough House, BHA Parker House		Translating emergency education materials into different languages Identify who the EJ community includes and where they live
Outdoor workers	Town-wide	V- heat overexposure	Provide sunscreen to Town employees Implement a heat stress indicator to guide employees when they should or should not be outside. Coordinate efforts to reduce heat island effect (example: white pavement, roofs, impervious cover, green infrastructure)
Dementia Friendly Billerica	Town-wide	S - Assists Billerica citizens with dementia	Establish educational materials for care givers on how to handle dementia patients during severe natural hazard events
Special Needs Population	Town-wide	V - moving them requires greater assistance S - each facility develops individual plan and files with Town	Education on protocols for evacuation during severe natural hazard events
Billerica COA		V - does not have independent backup generator	Install a generator and begin to equip the site for a shelter/warming facility
Historic Districts	Town Center and North Billerica	S - preserves history V - buildings, resources, monuments vulnerable to severe weather	If they are under Federal flood program, rebuild to meet building code as much as necessary.
Warming centers	Town Hall		Maintain current facilities as warming stations and maintain generator at Town Hall.

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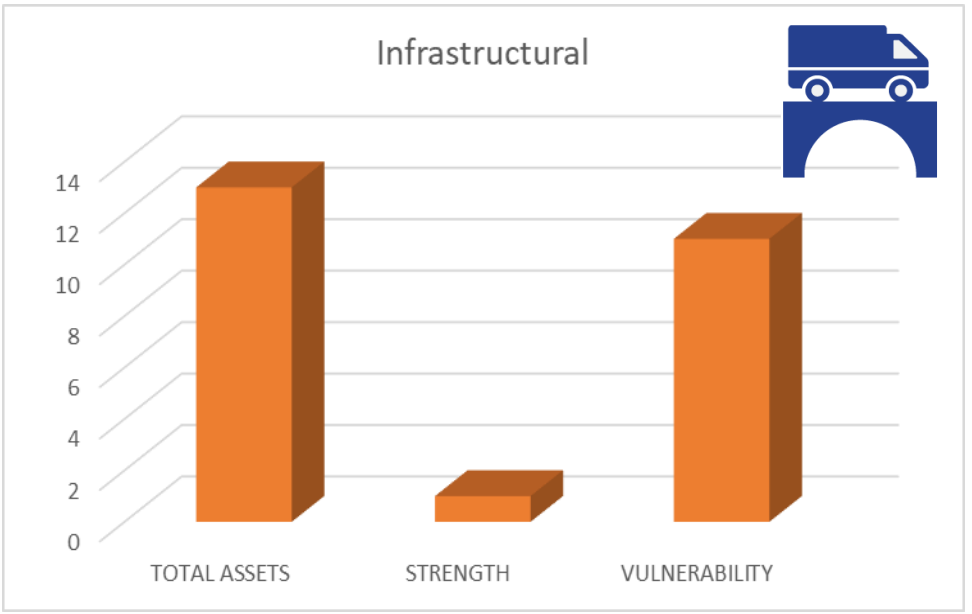
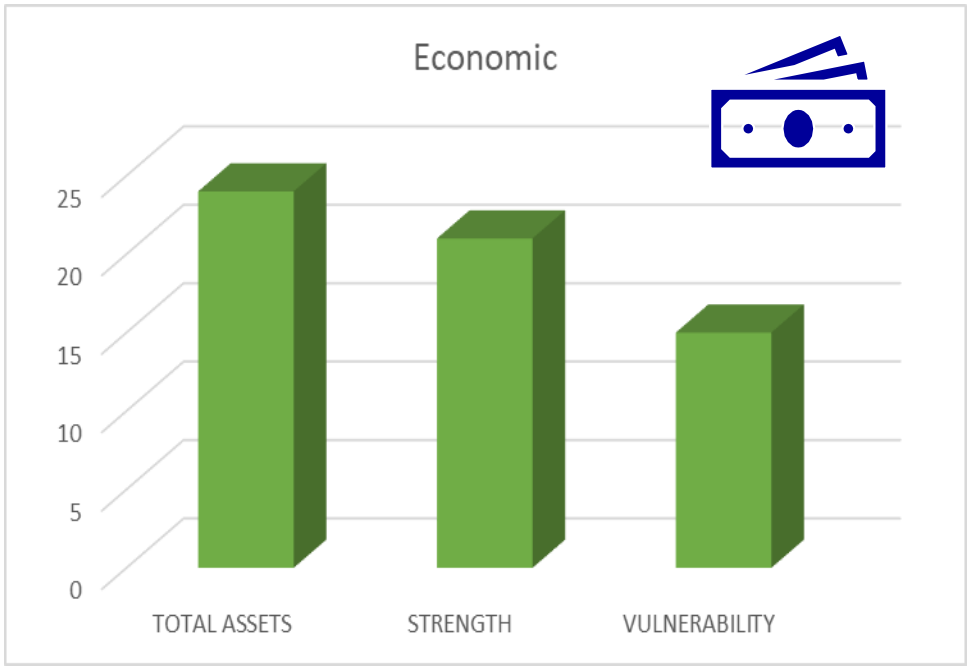
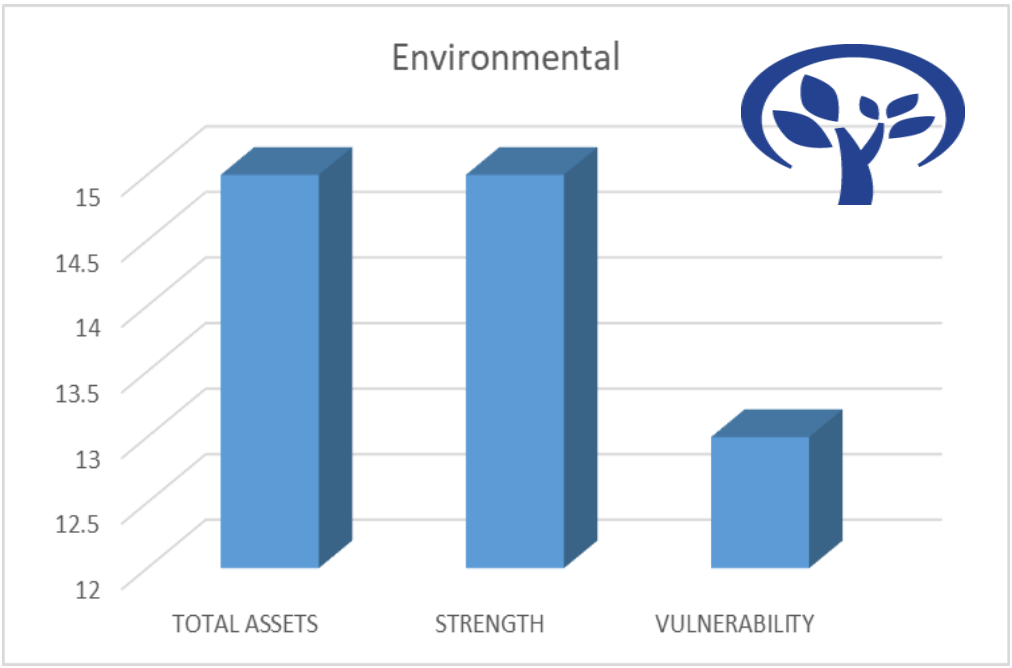
IDENTIFIED STRENGTHS AND VULNERABILITIES







MITIGATION STRATEGIES

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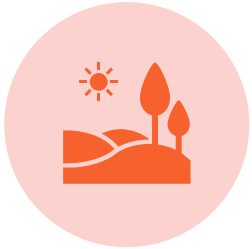
TYPES OF MITIGATION ACTIONS

Prevention

Property Protection

Public Education and Awareness



Natural Resource Protection and Green Infrastructure

Structural Projects

Emergency Services Protection

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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EXAMPLE MITIGATION ACTIONS IN BILLERICA

- **Prevention**
  - Identify higher need facilities identified (e.g. health care and nursing's homes) in the case of a power outage
- **Public Education and Awareness**
  - Education on protocols for evacuation during severe natural hazard event
- **Natural Resource Protection**
  - Manage invasive species
  - Promote plantings and other vegetation improvements that could improve air quality and runoff quality at Nuttings Lake
- **Structural Projects**
  - Replace Shawsheen Road Bridge over the Concord River to reduce flooding
- **Emergency Services Protection**
  - Conduct an inventory of emergency supplies at fire station, warming centers, shelters, etc.

Full list available in draft MVP Report on website

WHAT'S NEXT?

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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NEXT STEPS BEFORE JUNE 30, 2020

- **Complete** MVP Post-Webinar Survey:
- **DRAFT** MVP Summary of Findings Report online for public review
- Submit comments to Rob Anderson by **July 10th**
- **Final** MVP Summary of Findings Report
- Submit documents to EEA

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MVP ACTION GRANT OPPORTUNITIES

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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MVP ACTION GRANTS

- Detailed Vulnerability and Risk Assessment*
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures**
- Redesigns and Retrofits***
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality

* Most common project type

** Second-most common project type

***Third-most common project type

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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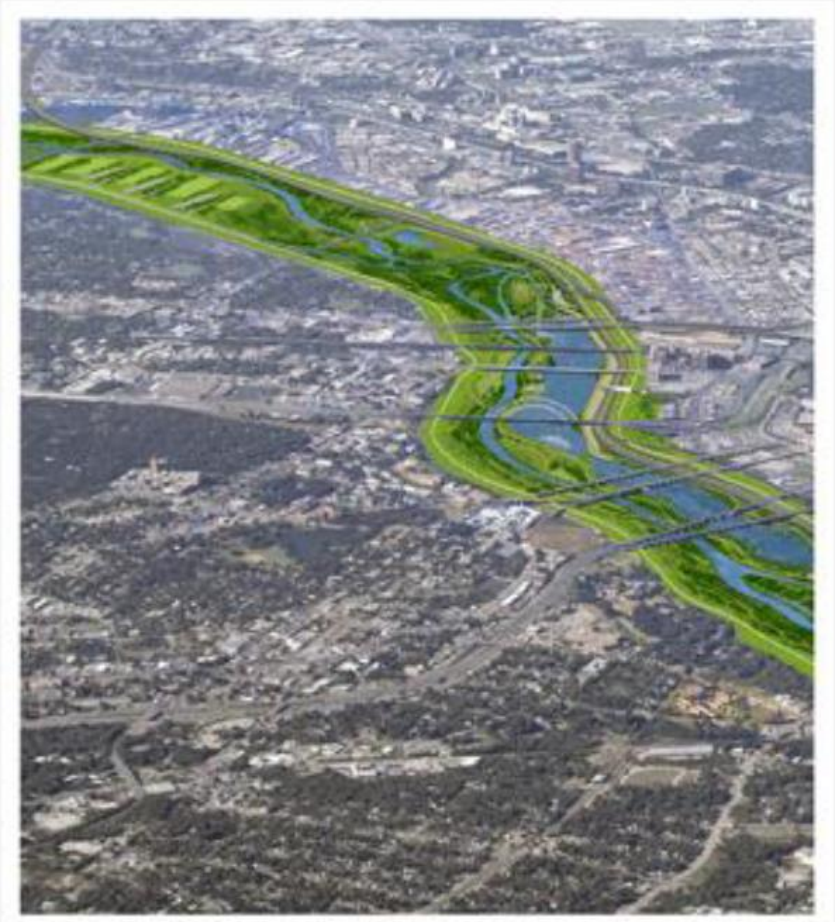
MVP ACTION GRANTS (CONT)



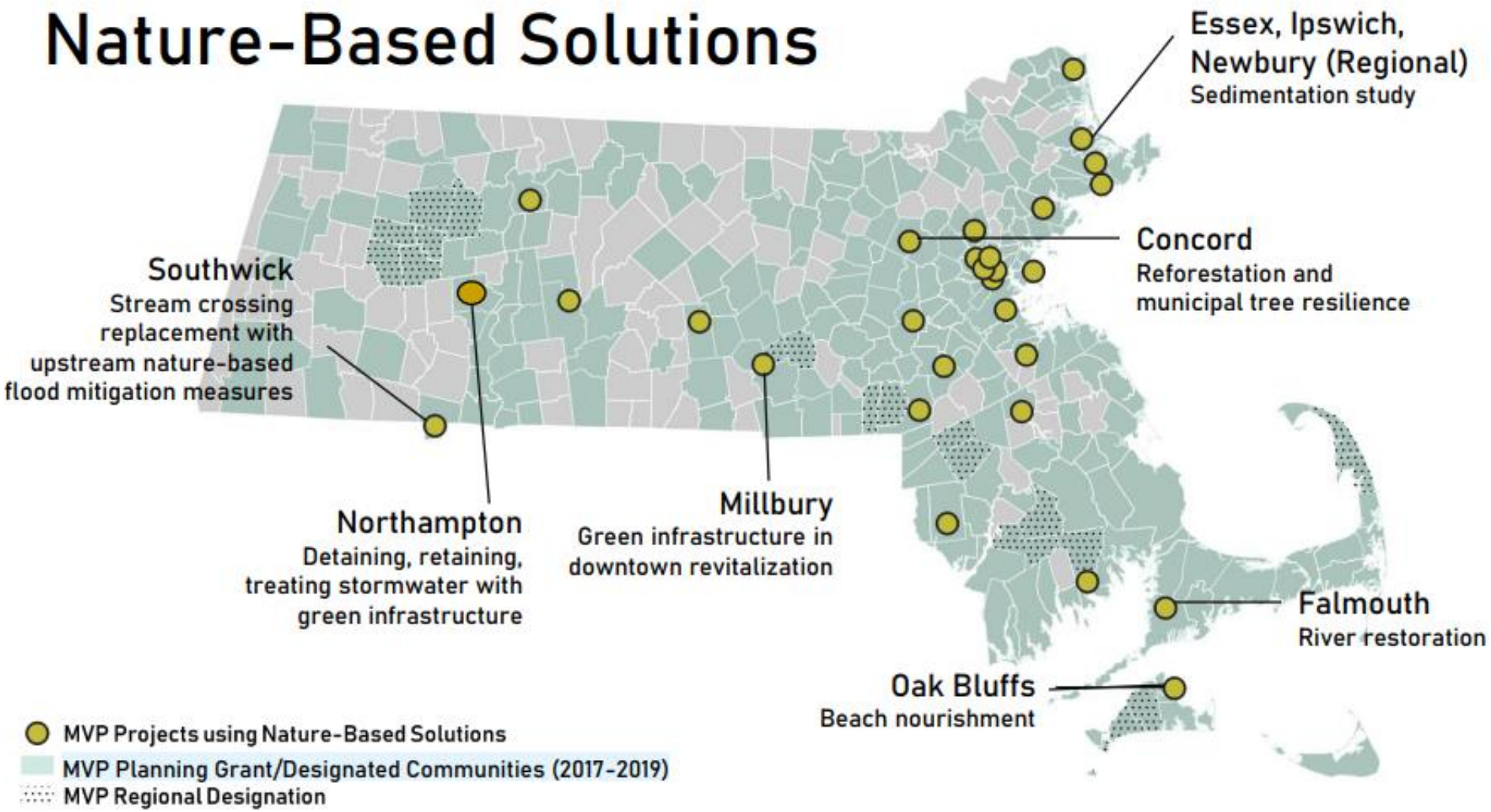
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency

NEW IN 2019

- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies

\+ Expanded eligibility of project location

Nature-Based Solutions



TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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FOR MORE INFORMATION

- **Rob Anderson, Community Development Director**
  - randerson@town.billerica.ma.us
  - 978-671-0963

- **Jennie Moonan, PE, Project Manager**
  - JSMoonan@tighebond.com
  - 781.708.9826

http://services.tighebond.com/mvp/billerica/

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AND NOW FOR QUESTIONS AND ANSWERS

Billerica MVP Planning Grant – Listening Session
June 29, 2020

Attendees:
Rob Anderson
Mike Grady
Andrew Jennings
Blake Robertson
D Rosa
Heather Chew
Annette Famolare
Bill Laurendeau
Tony Fields
Emma Lord
Ed Reiner
Steve Robertson
Kristel Bennett
Alison Field-Juma
Daryle Hillsgrove
Diane DePaso
978-215-9652
978-671-0948
978-821-7025
978-671-0955
Kristin Dippold (Tighe & Bond)
Jennie Moonan (Tighe & Bond)

Notes:

Rob emphasized that these mitigation actions are simply proposed actions (brainstorming stakeholder process). It is not obligating the Town of Billerica to complete any of these projects, but rather providing a list of actions that could be eligible for grant funding in the future.

Prevention:

- Explore alternative drinking water solutions to single public water supply source
- There are some mitigation actions that the Town is already undertaking or has already done. For example, there are backup storage for town hall, there is a list of residents on oxygen, DPW does have a clearing plan for the sidewalk when it snows, there may already be a stormwater division within the DPW, National Grid has a tree maintenance program for the power lines (out of the jurisdiction of the Town), there are not a great number of historic districts, we already have a list of higher needs facilities and emergency management is in touch with them in an event of a power outage, there is already an open space list it just needs reviewed.
    - The Core Team will have the chance to give any edits and view the entire report. Input

- Although Billerica may have a sidewalk clearing plan, it should be reviewed. The sidewalks in the vicinity of the North Billerica Train Station are sometimes not cleared for three rush hour periods – optimize locations of street clearing
- Suggest addition to Street Tree Inventory: "and develop a management, protection and planting plan"
- DPW does deal with stormwater but we do not have a designated Stormwater Division.
- Specifically, there have been talk of boat ramps at the area off water intake, so protect water intake area and water source in river – protect intake from development, including boat ramps (only canoe/kayak, no power boats)
    - Protection system/rapid response system for spills

Property Protection:

- Billerica is a CPA community – there is a committee that can step forward and purchase land through the Community Preservation Act
    - Billerica already has a process to take care of land acquisition

Public Education and Awareness

- There is already a lot of work going on with this, but there may be ways to enhance this.
- Public education about the importance of managing invasive plants on their property, and techniques for doing so. Also, for town to control invasive vegetation on town property. Participate in CISMA (cisma-suasco.org).
- Educate homeowners on the use of chemicals on their lawns, particularly in areas abutting wetlands and floodplain buffer zones.
- Need education on the benefits of protecting wetlands, floodplains, vernal pools, and other Conservation resource areas

Natural Resource Protection and Green Infrastructure

-

Structural Projects

- The Bridge should be going over the Shawsheen River not the Concord River
- NOAA is offering to pay for studies associated with the potential removal of dams or fish ladder construction as it relates to Billerica's water supply. Currently waiting for communication from the Town to make sure they are on board with the studies. Dam removal could relieve flooding issues, dam owner is willing to have work done, but the Town needs to be on board with water supply, recreation, historic, etc. Ed Reiner wrote a letter as a citizen living on the river in support of dam removal studies/dam removal. The Dam spillway cannot accommodate the 100-year flood.
- Update or replace bridge over Shawsheen River on Route 3A (This is not called the Shawsheen Road Bridge).
- MassDOT is currently doing bridge – referring to Middlesex Turnpike renovation project in Bedford – were not able to alter due to water flow downstream (next bridge is one on 3A)
    - Middlesex Turnpike Bridge in Bedford

- COA – this facility is equipped with a generator hookup
- Town does not own dam referenced above but NOAA needs the Town's support of the studies. The studies for the dam need to confirm that Fordway Bar at the Pollard Street Bridge controls water levels at the town intake. Forway bar is 11.25 inches below the crest of the Dam.

Emergency Services Protection:

- Marshall Middle School is maintained as a shelter
- Fire Stations/COA would be used as distributing water/cell charging/warming center
- Town spent $1 million for Town Hall
- COA has the ability to hook up a generator
- Water and wastewater do have emergency supply chains, and have proved it works due to COVID, as they did have to have supplies delivered under plan
- Do have multiples of shelter items and stored in specific locations but does have emergency supplies. They do have a list.
- They have arrangements with MEMA for medical assistance and Board of Health is very active with setting up services for shelters.
- Fire Department has taken an active role in the event of spill kit or emergency preparedness
- Annually, the emergency management team reviews much of the things on the mitigations.
- The Town has emergency procedures in place for call notification (reverse calling).
- Billerica has not pursued AM radio – costly and not popular with residents
- They use social media communication and CODE RED (text/telephone recording feature)
- Would be open to looking at other options, if internet/cell was d own – do have resources through Verizon and others

Billerica Conservation Commission
MEETING AGENDA
May 27, 2020
6:00 PM

The public may call in or use a computer to participate in this meeting

Pursuant to Governor Baker's March 12, 2020 Order Suspending Certain Provisions of the Open Meeting Law, G.L. c. 30A, §18, and the Governor's March 15, 2020 and subsequent Orders imposing strict limitation on the number of people that may gather in one place, this meeting of the Billerica Conservation Commission will be conducted via remote participation. Specific information and the general guidelines for remote participation by members of the public and/or parties with a right and/or requirement to attend this meeting can be found below. No in-person attendance of members of the public will be permitted, but every effort will be made to ensure that the public can adequately access the proceedings in real time, via technological means.

The Conservation Commission meeting will be held remotely via a Zoom Meeting (Internet)

Please click the link below to join the Zoom Meeting/Webinar:
https://us02web.zoom.us/j/81448882209

To call in dial: 1-929-205-6099
Meeting ID: 814 4888 2209

I. 6:00 PM – PUBLIC COMMENT

II. NEW WETLAND HEARINGS:

III. CONTINUED WETLAND HEARINGS:

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent** – Continued Public Hearing - 495R Billerica Avenue – Applicant: EIP 495 Woburn Street, LLC – DEP File No. 109-xxxx/BBL-xxxx

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent** – Continued Public Hearing - 495R Billerica Avenue – Applicant: Adam Goldberg, Seerfried Properties – DEP File No. 109-xxxx/BBL-xxxx

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent** – Continued Public Hearing - 313 Boston Road – Applicant: Rick Soly, 313 Boston Road Realty, LLC – DEP File No. 109-1402/BBL-1402

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent** - Continued Public Hearing – 27-29 Rogers Street, 7-9 Millstone Way & 1-6 Millstone Way – Applicant: 27 Rogers Street, LLC and Millstone Way, LLC – DEP File No. 109-1406/BBL-1406

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent** - Continued Public Hearing - 279 Boston Road – Applicant: Nick Aalerud, 279 Boston Road, LLC - DEP File No. 109-1404/BBL-1404 *(To be Continued to June 10, 2020)*

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING - Notice of Intent** – Continued Public Hearing - 68R Baldwin Road – Applicant: Robert Belanger – DEP File No. 109-1394/BBL-1394

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING - Notice of Intent** – Continued Public Hearing - 2 Beaconcrest Court – Applicant: Stacey Sweklo – DEP File No. 109-1389/BBL-1389

- **WETLANDS PROTECTION ACT & BILLERICA WETLANDS PROTECTION BYLAW WETLANDS HEARING – Notice of Intent –** Continued Public Hearing - 900 Middlesex Turnpike – Applicant: RHINO LLC – DEP File No. 109-1408/BBL-1408 *(To be Continued to June 10, 2020)*

IV. ADMINISTRATIVE MATTERS/DIRECTOR'S REPORT

- **Brief Municipal Vulnerability Preparedness (MVP) Presentation**
- **Request for Certificate of Compliance:**
  - DEP File No. 109-1182/BBL-1182 (11 Blades Circle and Enforcement Order)
- **Order of Conditions Extension Request:**
  - DEP File No. 109-1294/BBL-1294 (509 Middlesex Turnpike, Turnpike Market)
- **Miscellaneous Updates**
- **Violations/Enforcement Orders**
- **Minutes:** 3-11-2020, 3-25-2020, 4-8-2020

V. ADJOURN

TOWN OF BILLERICA
HAZARD MITIGATION PLANNING

Public Meeting

May 27, 2020

Tighe&Bond

WELCOME

Billerica awarded $39K grant for two related efforts:

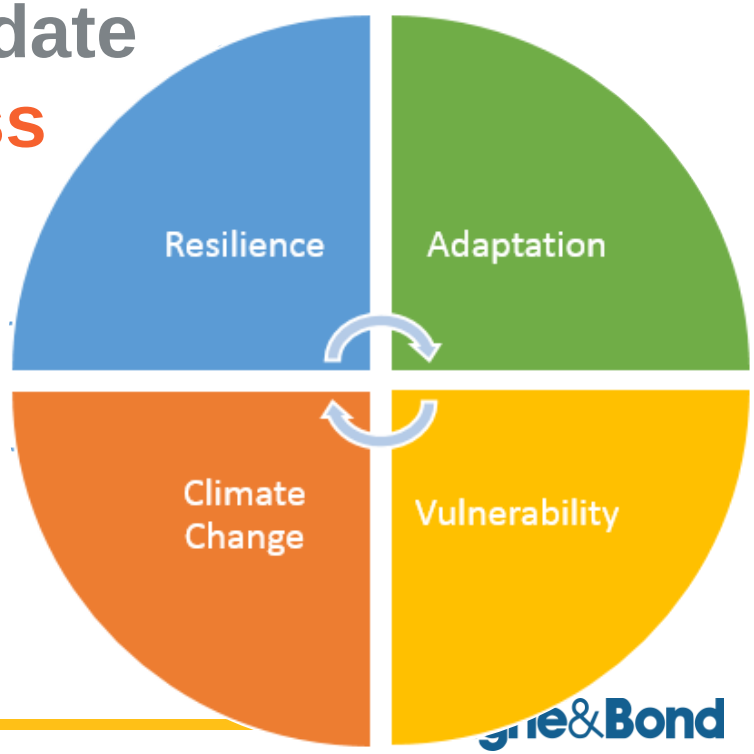
- Municipal Vulnerability Preparedness (MVP) Community Resilience Building (CRB) Workshop Process; and
- Draft Hazard Mitigation Plan (HMP) Update

MVP is the first step in unlocking additional funding opportunities for Billerica from Commonwealth of Massachusetts

Updating the HMP continues to keep Billerica eligible for funding from Federal Emergency Management Agency programs

MVP/HMP GRANT AND CRB PROCESS

1. Establish Core Team
2. Complete Evaluation/Assessment
   - Natural Hazard Risks
   - Community Assets
   - Multi-Hazard Vulnerability Assessment
   - Capabilities Assessment
   - Mitigation Strategies
3. Draft Hazard Mitigation Plan Update
4. Hold Public Meeting mid-process
5. Hold MVP Workshops
6. Draft MVP Report
7. Hold Listening Session
8. Final MVP Report



A brief thanks to Billerica's MVP Core Team

Abdul Alkhatib – Director of Public Works

Bill Laurendeau – Emergency Management Director

Clancy Main – Town Manager's Office

Daniel C. Rosa – Chief of Police

Ed Tierney – Highway Superintendent

Heather Chew – Assistant Town Engineer

Isabel Tourkantonis – Conservation Director

Jeff Kalmes – Wastewater Superintendent

Kelley Conway – Town Engineer

Kristel Bennet – Health Director

Rob Anderson – Community Development

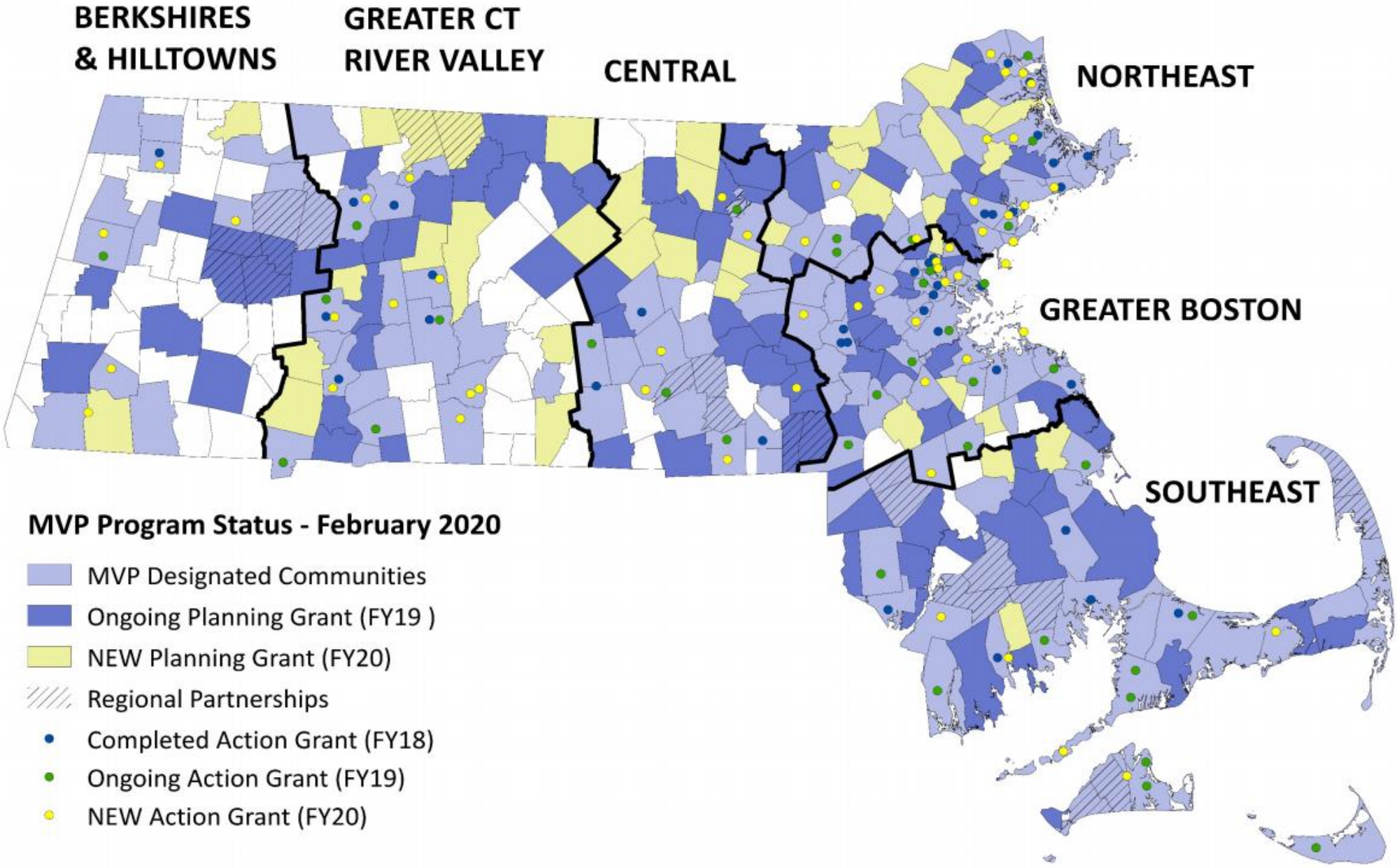
Robert Cole – Fire Chief

Tom Ferraro – Deputy Fire Chief

PURPOSE OF PUBLIC MEETING

- **Required** to comply with Federal HMP guidance and contract with EEA
- **Introduce Hazard Mitigation and Municipal Vulnerability Planning** and **provide an update** on work completed to date
- Provide opportunity for **Q&A**

OVERVIEW OF MVP



OVERVIEW ON HAZARD MITIGATION PLANNING

- **FEMA Requirements:**
  - Disaster Mitigation Act of 2000, 44 CRF Part 201.6
  - *FEMA Local Mitigation Plan Review Guidance, October 2011*
  - *FEMA Local Mitigation Planning Handbook, March 2013*
- **Billerica included in Northern Middlesex Regional Hazard Mitigation Plan, approved August 2015.**
  http://www.nmcog.org/Websites/nmcog/images/Hazard_Mitigation_Plan_FEMA_approved_8_15.pdf
- **To maintain eligibility for FEMA/MEMA funding, must update plan every 5 years**
- **Commonwealth of Massachusetts State Hazard Mitigation & Climate Adaptation Plan 2018 must be considered in update**

BILLERICA'S MVP WEBSITE

http://services.tighebond.com/mvp/billerica/

Municipal Vulnerability and Preparedness Planning for the Town of Billerica Public Engagement Information

Municipal Vulnerability Preparedness Planning Background The Town of Billerica was recently awarded a $39,000 grant by the Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability and Preparedness (MVP) Planning Grant program to complete a public engagement and climate resilience planning process before June 30, 2020. Billerica's Economic Development Department is taking the lead on the MVP program, with participation of a Core Team of Town Staff to plan for ways to better prepare and protect the Town from natural and climate-related hazards. Once the plan is completed and approved by EEA, the Town of Billerica will be designated as an MVP Community, joining 287 communities across Massachusetts that have been designated since the MVP program began in 2017. This work also includes preparing a Town-specific Hazard Mitigation Plan (HMP) 5-year update to help Billerica continue to be eligible to receive certain types of non-emergency disaster assistance, including funding for mitigation projects.

Why plan for climate resilience? Resilience is the ability of a community to address the needs of its built, social and natural environment to anticipate, cope with, and rebound stronger from events and trends related to climate change hazards. Planning for climate resilience allows Billerica to build capacity to reduce the impacts from future climate events rather than just react to events as they occur.

How will the public engage? MVP is a Community Driven Process to understand climate vulnerabilities and identify priority actions. MVP provides structured opportunities for public engagement through review of community specific mapping and climate data, participation in unique Community Resilience Building Workshops, and developing priority action plans to improve their community's resilience with an emphasis on nature-based solutions. There will be a public meeting to review the HMP update, as well.

Due to COVID-19, previously planned public meetings and workshops will be held online.

The Town is utilizing a number of public engagement methods including:

- Posting online resources that will be used in the workshops
- Conducting pre- and post- workshop surveys
- Hosting virtual workshops focusing on climate resilience within the context of Billerica's societal, built infrastructure, natural resources and economic community assets.
- Hosting a community listening session

More information is coming soon, including how to participate and dates/times for all meetings.

BILLERICA'S ASSETS

FEMA defines a community asset as anything that is important to the character and function of a community.

FEMA Community Asset Categories	Critical Sectors	Characteristics of Community Assets
People	Schools, Vulnerable Populations, Cultural Facilities	Areas of greater population density, or population with unique vulnerabilities or less able to respond and recover during a disaster.
Built Environment	Critical Municipal Facilities, Water, Wastewater, Energy, Stormwater, Transportation, Cultural Resources	Critical facilities necessary for a community's response to and recovery from emergencies, infrastructure critical for public health and safety, economic viability, or needed for critical facilities to operate.
Economy	Marinas, Business and Industry	Major employers, primary economic sectors and commercial centers where loss or inoperability would have severe impact on the community and ability to recover from a disaster.
Natural Environment	Natural Resources	Areas that provide protective function to reduce magnitude of hazard impact and increase resiliency. Areas of sensitive habitat that are vulnerable to hazard events, protection of areas that are important to community objectives, such as the protection of sensitive habitat, provide socio-economic benefits, etc.

WHAT ARE NATURAL HAZARDS?

Poor Urban Drainage
Regional Flooding
Culvert Failure

Inland Flooding

Tsunami

Severe Winter Storm

Blizzards
Snow
Ice Storms

Drought

Average/Extreme Temperatures

Tornadoes

Landslide

Wildfires

Other Severe Weather

Nor'easters
High Wind
Heavy Precipitation
Microbursts

Coastal Flooding

Invasive Species

Earthquake

Coastal Erosion

Hurricanes/Tropical Storms

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

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BILLERICA'S TOP NATURAL HAZARDS

Severe Storms (Nor'easters, Blizzards, Thunderstorms, Ice storms, High Wind)

Flooding

Drought/ Extreme Temperatures

Invasive Species

\+ **CLIMATE CHANGE**

=

AMPLIFIED RISKS

- Community and regional infrastructure
- Local and regional economies
- Public Health
- Natural resources and our environment

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

Tighe&Bond

MASSACHUSETTS CLIMATE PROJECTIONS

By end of century:

Changes in precipitation

- 18% increase in consecutive dry days
- 57% increase in days with > 1 in. rainfall
- 7.3 inches additional annual rainfall

Rising temperatures

- 10.8°F increase in average annual temperature
- 42% decrease in days/year with min. temperatures < 32* F
- 1,280% increase in 90-degree days/year

Sea level rise

- 4-10.5 feet along the MA coast

Extreme weather

- Increase in frequency and magnitude

TOWN OF BILLERICA INCORPORATED 1655 MASSACHUSETTS

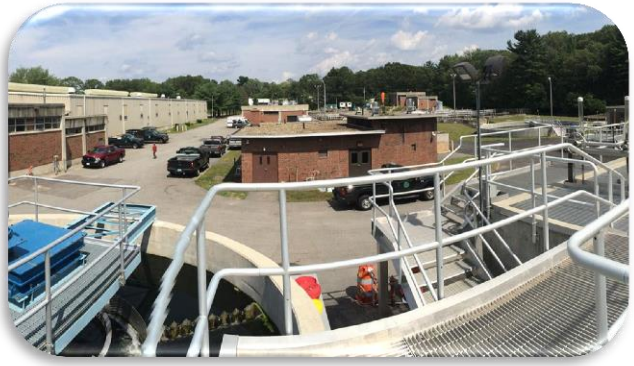
Tighe&Bond

CLIMATE CHANGE REFERENCES FOR MVP PROCESS

- **Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan, September 2018**
  - https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan
- **Massachusetts Climate Clearinghouse**
  - https://resilientma.org/
- **Statewide and Major Watershed (Basin) Climate Change Projections**
  - https://www.mass.gov/files/ma-statewide-and-majorbasins-climate-projections-final.pdf

WHAT ARE COMMUNITY ASSETS?

Societal



Infrastructure

Economy

Natural Resources

ACTIONS BILLERICA CAN TAKE TO MITIGATE HAZARDS

1. Prevention
2. Property Protection
3. Public Education and Awareness
4. Natural Resource Protection and Green Infrastructure
5. Structural Projects
6. Emergency Services Protection

MVP WORKSHOPS ARE ONGOING

1. Workshop #1: 5/13/2020 on Societal Assets and People

2. Workshop #2: 5/202020 on Infrastructure

3. Workshop #3: 5/27/2020 on Economy

4. Workshop #4: 6/3/2020 on Environment and Natural Resources

Sign up on Town website or contact Rob Anderson

WORKSHOP OBJECTIVES

- Hear from stakeholders who can help evaluate our community's strengths and vulnerabilities of residents, infrastructure, and natural resources
- Understand connections between natural hazards and local planning/mitigation efforts
- Develop and prioritize resiliency actions for the municipality, organizations, businesses, neighborhoods, and community groups
- Identify opportunities to advance actions that reduce the impact of hazards and increase resiliency in the community

NEXT STEPS BEFORE JUNE 30, 2020

- Complete draft Hazard Mitigation Plan for Town staff review (early June)
- Post Summary of Findings Report for MVP Project for public input and hold listening session (June)
- Selectmen vote to submit Hazard Mitigation Plan to FEMA
- Submit documents to EEA and FEMA

HOW DOES THIS PROCESS BENEFIT BILLERICA?

MVP Community Designation = Eligibility for MVP Action Grants

Once approved, HMP = Eligibility for FEMA Hazard Mitigation Grants

OPEN DISCUSSION & QUESTIONS

Contact Information:

- **Janet Moonan, PE, Project Manager**
  - JSMoonan@tighebond.com
  - (781) 708-9826

Information on Town's website at:

- http://services.tighebond.com/mvp/billerica/

HMP/MVP Public Meeting
Town of Billerica Conservation Commission Meeting

ATTENDEES:	Rob Anderson	Diane DePaso
	Paul Hayes	Jack Bowen
	Jeff Connell	Betsy Gallagher
	Marlies Henderson	Michael DeVito
	Isabel Tourkantonis	Liz Ells
	Janet Moonan, Tighe & Bond	
DATE:	May 27, 2020	

On May 27, 2020 the HMP/MVP Process was discussed at the Town of Billerica's Conservation Commission Meeting. The meeting was held virtually due to COVID-19 restrictions.

Meeting Summary

Janet Moonan, PE from Tighe & Bond gave a 20 minute presentation on the HMP/MVP Process and opened the floor to discussion afterwards. Presentation is included as an attachment.

Discussion items included:

- Finding MVP/HMP support materials such as maps, surveys, general information, etc.
- Directing specific questions or comments back to Tighe & Bond to be included into the reports.
- The nature of the program is an ongoing process.

Tighe&Bond
Engineers | Environmental Specialists

APPENDIX H

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L**priority for action over the **S**hort or **L**ong term (and **O**ngoing)

V = Vulnerability **S** = Strength

Billerica's Priority Assets

Billerica's Top Natural Hazards

Name	Location	Ownership (Town, State, Federal, Private)	Vulnerability (V) or Strength (S)	Severe Storms Flooding Drought/ Extreme temperatures Invasive Species	Priority H - M - L	Time Short Long Ongoing
Societal				**Actions to Address Billerica's Top Hazards**		
Institutionalized Elderly Population	Hawthorn Senior Living Life Care Center of Merrimack Valley	Private	V - Overheating, respiratory illness, dementia S - Density of people in same location eases speed of response	Develop a plan for emergency response and education	M	S
Assisted Living Complex	Brightview, Benchmark, etc. New England Pediatric Nursing Home	Private	V - Elderly population congregated in one building S - provide safe housing for a population	Develop a plan for emergency response and education	M	S
Housebound - Elderly/Disabled	Town-wide	Private	V - can be challenging evacuate during crisis	Maintain list of residents on oxygen to know where they are in power outage	M	O
Schools	Town-wide	Town	S - Provide shelter space (e.g. Marshall Middle School) that is properly certified	Maintain Marshall Middle School as a Red Cross shelter.	M	O
Low Income Communities	Town-wide	Private		Establish shelters/emergency facilities at parks and town-owned properties in proximity to these communities.	M	L
Environmental Justice Communities	BHA McCullough House, BHA Parker House	Private		Translating emergency education materials into different languages Identify who the EJ community includes and where they live	L	S
Outdoor workers	Town-wide	Private/Town/State	V- heat overexposure	Provide sunscreen to Town employees Implement a heat stress indicator to guide employees when they should or should not be outside. Coordinate efforts to reduce heat island effect (example: white pavement, roofs, impervious cover, green infrastructure)	L	S
Dementia Friendly Billerica	Town-wide	Private	S - Assists Billerica citizens with dementia	Establish educational materials for care givers on how to handle dementia patients during severe natural hazard events	L	S
Special Needs Population	Town-wide	Private	V - moving them requires greater assistance S - each facility develops individual plan and files with Town	Education on protocols for evacuation during severe natural hazard events	M	S
Billerica COA		Town	V - does not have independent backup generator	Install a generator and begin to equip the site for a shelter/warming facility	M	L
Historic Districts	Town Center and North Billerica	Private/State	S - preserves history V - buildings, resources, monuments vulnerable to severe weather	If they are under Federal flood program, rebuild to meet building code as much as necessary.	M	L
Warming centers	Town Hall	Town		Maintain current facilities as warming stations and maintain generator at Town Hall.	M	O
Built Environment/Infrastructure				**Actions to Address Billerica's Top Hazards**		
Roadways	Boston Road (Rt 3A) at Jade Pacific floods Elsie Avenue may not be able to be reached by EMS if cut off Cook Street, Shawsheen Road, Mount Pleasant Street under RR bridge, near DPW, Riverbank Terrace, Route 3 overpass on Concord Road	Town/State	V - Flooding issues impede passage, if overpass damaged would not be able to get to abutting community	Elevate roadways, but consider existing utilities, abutters, etc. Perform culvert assessments to understand condition, capacity, and needed repairs or replacement, to couple with Town roadway projects Public education about dumping, referencing enforcement authority	M/H	L
Electrical Grid/Power Utility		Private	V - Power losses are more frequent and last many days, impacting residents and businesses			
Culverts	Whipple Road	Town		Schedule preventative maintenance and inspection	H	S
Water supply/ Water Plant, water intake	Concord River, Town wide	Town	V - intake is susceptible to water quality and stream conditions, lack of alternative water supply	Explore strategies to protect current drinking water intake and area around intake in Concord River	H	L
Town Hall		Town	V - power outage	Ensure offsite backup storage and records	M	O
Emergency Medical Services			V - areas may be cut off from service due to access			
Wastewater Treatment Plant, collection and pumping stations		Town	V - loss would impact community and shutdown facility	Ensure there are two suppliers for items, to keep necessary supplies and chemicals coming in event of emergency. Planning for redundancy	M	O
Natural Gas		Private Utility	V - there are areas that can only be fed from one line that would cut of an area of Town's ability to have heat and other services			
Fire Stations	Multiple locations	Town		Conduct an inventory of fire station resources Purchase multiples of emergency supplies and spread across fire stations	L/M	S
Designated Shelters		Town	V - need to be maintained S - provide support services during natural hazard	Update supply list, check for expired items, ensure proper stock of materials, and have a test plan for designated shelters Make arrangements with local clinics to have services available/needed in shelters	L/M	O
Bridges	Shawsheen and Concord River, Faulkner Street	Town/State	V - old /aging bridges pose a risk for access and transportation	Remove center pier in river from Historic Bridge, since granite pier is in the floodway of the River Replace Shawsheen road bridge over the Concord River on Route 3A (this causes flooding)	L	L
Dams	North Billerica Mills Dam Talbot Dam	Private	V - Spillway not adequate to handle 1% storm V - Can result in invasive and negative impact water quality			L
Stormwater Infrastructure		Town		Establish a new Stormwater Division of DPW Schedule preventative maintenance and inspection for stormwater infrastructure Provide guidance to the public on how to maintain stormwater infrastructure Enterprise fund for stormwater management to provide additional funding dedicated to management	L/M	S
Economy				**Actions to Address Billerica's Top Hazards**		
Cumberland Farms	301 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food	Coordinate with Fire/Police on emergency preparedness on private sites related to spill kits etc. Establish an education process on natural hazard evacuation to private businesses	M	S
Market Basket	199 Boston Road	Private	S - This facility has generators and can maintain services.	Prepare a clearing plan for sidewalks for access to grocery and pharmacy. Establish an education process on natural hazard evacuation to private businesses	M	S
7-Eleven	314 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food	Establish an education process on natural hazard evacuation to private businesses	L	S

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)

V = Vulnerability **S** = Strength

Billerica's Priority Assets

Name	Location	Ownership (Town, State, Federal, Private)	Vulnerability (V) or Strength (S)
CVS	210 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
Wendy's	312 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
Entegris Inc.	129 Concord Road	Private	S - Major employer and provides employees with salary and jobs
Shops at Billerica	480 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
EMD Serono Research Center	45 Middlesex Turnpike	Private	S - Major employer and provides employees with salary and jobs
Treble Cove Plaza	199 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
Towne Plaza	700 Boston Road	Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
Supermarkets		Private	S - Provides needed goods during natural disaster V - Upon a power outage, the facility may not be able to provide gas and food
National Grid	Town-wide	Private	V - Power losses are more frequent and last many days, impacting residents and business
MBTA Commuter Rail	North Billerica Station	State/Private	S - Provides alternative transportation in event of natural hazard V - tracks can be impacted by storms, and susceptible to severe winter weather as well as extreme temperature
Fuel Oil Delivery	Various Locations	Private	S - provides fuel oil to residents for heat
Technology Park	Located of Rt 3	Private	
Restaurants	various locations	Private	S - provide alternative food sources during natural hazard V - don't always have back up power, don't always have ability to get employees to work
Hotels/Motels	Various Locations	private	S - emergency alternative housing V - no generator and guests could get trapped there in certain weather situations
O'Conner Hardware		Private	S - provides necessary goods before/during/after natural hazard events
Agriculture		Private	S - can provide local food, limited because only a few farms, this is also a strength due to providing open space/land for flood reduction and cooling V - storms, drought, can have a negative impact
Contractors		Private	S - can help with debris removal, ability to repair damaged infrastructure V - suffer due to natural hazards
Landscape companies		Private	S - can help with debris removal
New rental center (HERC rental)	257 Boston Road	Private	S - has equipment helpful for cleanup
Gas station by Shawsheen River and one by HERC Rental (Gulf)		Private	V - could be impacted by flooding
Thrift stores		Private	S - have needed affordable clothing and supplies
Natural Environment			
Rivers and Streams/Waterbodies		Private/Town/State/Federal	S - River access attract people from outside of Town and improves resident's health and recreation opportunities
Yankee Doodle Bike Path			
Concord River Water Intake	250 Boston Road	Town/State	V - Infrastructure building on land and intake in stream
Green Open Space/Recreational Spaces	Town Forest Yankee Doodle Bike Path Vietnam Veterans Park Bay Circuit Trail Middlesex Canal Manning State Forest	Private/Public	S - Protected open space for health/recreation
Concord River		Public	V - storm drains to river are vulnerable to contamination S - Divert/manage stormwater to reduce impact
Wetland Buffer Zones		Private/Town/State/Federal	S - Protected area V - Any buildings in the flood plain will be vulnerable to flooding

Billerica's Top Natural Hazards

Severe Storms Flooding Drought/ Extreme temperatures Invasive Species	Priority H - M - L	Time Short Long Ongoing
Prepare a clearing plan for sidewalks for access to grocery and pharmacy. Establish an education process on natural hazard evacuation to private businesses	L/M	S
Establish an education process on natural hazard evacuation to private businesses	L	S
Have recently improved stormwater and have developed with wetlands on site, and coordained with planning. Continue to promote redevelopment and smart growth Establish an education process on natural hazard evacuation to private businesses	L	O
Establish an education process on natural hazard evacuation to private businesses	L	S
Have recently improved stormwater and have developed with wetlands on site, and coordained with planning. Continue to promote redevelopment and smart growth Establish an education process on natural hazard evacuation to private businesses	L	O
Establish an education process on natural hazard evacuation to private businesses	L	S
Establish an education process on natural hazard evacuation to private businesses	L	S
Prepare a clearing plan for sidewalks for access to grocery and pharmacy. Establish an education process on natural hazard evacuation to private businesses	M	S
Identify higher need facilities identified (e.g. health care and nursing homes) in the case of a power outage Consider underground utilities/connect existing infrastructure If National Grid does not maintain trees near power lines, implement a tree management plan	L	S
Establish an education process on natural hazard evacuation to private businesses	L	S
Establish an education process on natural hazard evacuation to private businesses	L	S
Send educational materials about reducing impact to water quality	M	S
Send educational materials about reducing impact to water quality	M	S
Send educational materials about reducing impact to water quality	M	S
Update bylaws to require developers to provide open space connectivity	M	S
Establish an education process on natural hazard evacuation to private businesses Coordinate with Fire/Police on emergency preparedness on private sites related to spill kits etc.	L/M	S
Establish an education process on natural hazard evacuation to private businesses	L	S
Actions to Address Billerica's Top Hazards		
Consider acquiring land (for public ownership/maintenance) that has access to waterbodies so they do not revert to abutters	H	O
Complete inventory of needs for Open Space management Complete a Town-specific Conservation Plan/address conservation more directly in the next OSRP update Enhance the climate change discussion in the next update of the OSRP. Promote plantings and other vegetation improvements that could improve air quality and runoff quality	H	S
Education to private land owners about benefits of reduction or avoiding imperious cover, maintaining natural spaces Education to public and/or municipal staff Consider changes to zoning - Billerica does not have open space zoning Reduce the amount of impervious surface through education, town projects, and regulations. If in resource areas, Town projects are held to same standard of development. Organize clean up days along public lands to improve environmental health in community Public Works and municipal operations work on minimizing pollution.	H	S

Community Resilience Building Risk Matrix

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Billerica's Priority Assets

Name	Location	Ownership (Town, State, Federal, Private)	Vulnerability (V) or Strength (S)	Billerica's Top Natural Hazards Severe Storms Flooding Drought/ Extreme temperatures Invasive Species	Priority H - M - L	Time Short Long Ongoing
Floodplains		Private/Town/State/Federal	S - Allow space for floodwater S - Some of them are perm. Protected lands (e.g. Great Meadows National Wildlife Refuge) V - If unprotected, could be developed (e.g., Daughters of ST Paul Property) V - FEMA flood zones aren't always keeping up with climate change projections,	Implement floodplain restoration techniques Encourage the replacement of lawn with native and drought resistant vegetation	M	S
Watersheds		Public	S - Help with flood flow V - Buildup of sites may not maintain watershed function, due diligence may not be conducted	Assess green infrastructure over grey infrastructure where suitable, for example, instead of a detention basin, could be rain garden, vegetated swale, which would look better and provide habitat Train volunteers on NAACC on inventory process to size culverts properly for replacement. Revisit Billerica's bylaws that encourage better site design and LID	H	S
Fox Hill Cemetery/Forest		Town	S - Preserved space with no buildings V - the tree canopy is not replaced with same type of species	Promote plantings and other vegetation improvements that could improve air quality and runoff quality	H	S
Iron Horse Park		Private	S - Green space and tree canopy V - Risk of development.	Promote plantings and other vegetation improvements that could improve air quality and runoff quality	H	S
Nuttings Lake		Public	S - Enables recreation during heat waves, and headwater for a tributary of Concord River V - At risk for drought, increased temperature, and runoff that can cause nutrient impacts, invasive, algae S&V - Town is periodically treating to manage invasive, but is not consistently funded	Manage invasive species Promote plantings and other vegetation improvements that could improve air quality and runoff quality	H	S
Urban tree canopy		Private/Town/State/Federal	S - captures rain, helps reduce flood, reduce temperatures V - Privately owned	Develop inventory of street trees and develop a management and protection plan. Develop a tree maintenance program for storm damage Develop a plan to maintain private tree canopy that benefits the public	L	S
Suburban tree		Private/Town/State/Federal	S - captures rain, helps reduce flood, reduce temperatures V - Privately owned			
Protected tree canopy		Private/Town/State/Federal	S - captures rain, helps reduce flood, reduce temperatures			
Farmlands	Griggs Farms Card Farm	Private	S - provide open space and watershed management V - Could potentially be a nutrient source	Ensure that all farmlands are protected so farmlands remain farmlands Provide recommendations for chemical uses	M	L