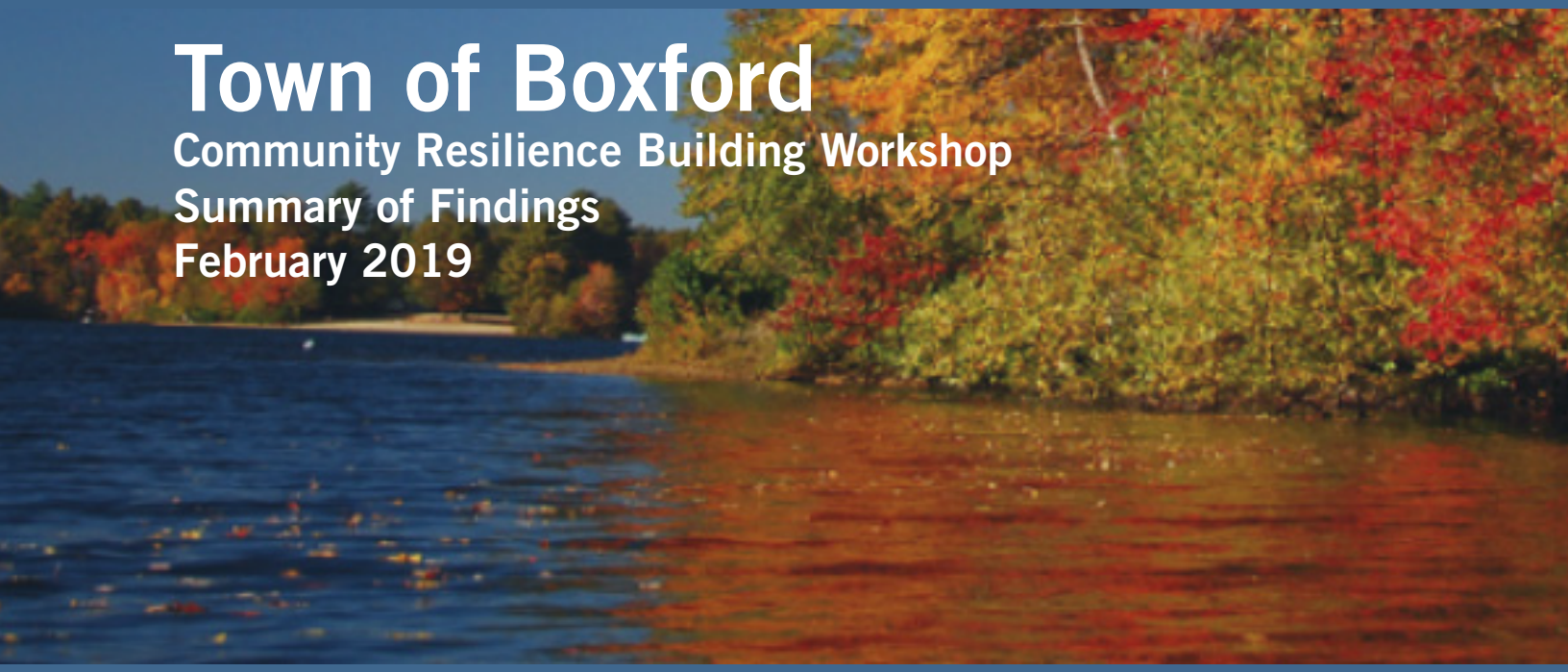

Town of Boxford

Community Resilience Building Workshop
Summary of Findings
February 2019

Town of Boxford Massachusetts

Prepared for the Town of Boxford
Prepared by Harriman

OVERVIEW

Governor Charlie Baker signed Executive Order 569 (EO 569) *Establishing an Integrated Climate Change Strategy for the Commonwealth* in September 2016. EO 569 included components for the Secretary of Energy and Environmental Affairs and the Secretary of Public Safety to "establish a framework for each City and Town in the Commonwealth to assess its vulnerability to climate change and extreme weather events, and to identify adaptation options for its assets" and "provide technical assistance to Cities and Towns to complete vulnerability assessments, identify adaptation strategies, and begin implementation of these strategies." The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) subsequently developed the Municipal Vulnerability Preparedness (MVP) program, designed to provide support for municipalities to begin the process of planning for climate change resiliency and implementing priority projects.

COMMUNITY NEED

Boxford is experiencing increasingly more unpredictable and severe weather that can potentially cause damage to the community. In recognition of the need to plan for future climate change and extreme weather events, Boxford applied for, and was awarded, a $15,000 grant from the MVP program to complete an assessment and develop a resiliency plan using the Community Resilience Building (CRB) Framework (www.communityresiliencebuilding.com). The Town retained Harriman, an urban planning, architecture, and engineering firm with State-certified MVP providers, to conduct the planning and workshop facilitation during the CRB process.

PREPARATION FOR WORKSHOPS

A Core Group was established for this planning process:

- Alan Benson, Town Administrator
- Pat Canonica, Planning Board
- John Dold, Superintendent/Town Engineer
- Bob Hazelwood, Emergency Management Director/Permanent Building Committee
- Ross Povenmire, Land Use Director

The Core Group and Harriman held a kick-off meeting during the initial stages of the planning process to discuss previous planning efforts, characterize preliminary hazards and areas of concern, and begin to develop a list of key stakeholders to invite to participate in the CRB workshops. Discussions also included logistics of the workshops, including the invitation process and format of the half-day workshops.

To prepare workshop materials, the Core Group and Harriman reviewed various resources and publications, including:

- *Massachusetts State Hazard Mitigation and Climate Adaptation Plan* (2018), Massachusetts Emergency Management Authority and the Executive Office of Energy and Environmental Affairs
- *State of the Climate* (2018), National Oceanic and Atmospheric Administration (NOAA)
- *Town of Boxford Facility Master Plan* (2018), Harriman
- *NOAA Technical Report NESDIS 149-MA* (2017), North Carolina Institute for Climate Studies
- *Massachusetts Climate Change Projections* (2017), Massachusetts Executive Office of Energy and Environmental Affairs
- *Merrimack Valley Region Multi-Hazard Mitigation Plan Update* (2015), Merrimack Valley Planning Commission
- *Boxford Master Plan* (2008), Town of Boxford
- *Open Space and Recreation Plan* (2008), Town of Boxford

The Core Group and Harriman developed base maps using data provided by the Merrimack Valley Planning Commission regarding Boxford's critical facilities, water and wetland resources, and Federal Emergency Management Authority (FEMA) flood zones.

Ross Povenmire, Boxford's Land Use Director, distributed email invitations and preparatory information, including background information about the MVP program and the base maps to the identified stakeholders. The distributed preparatory information can be found in *Appendix A*. A public notice regarding the location and timing of the workshops was posted on the Town's website, in addition to distributing emailed invitations.

WORKSHOPS PROCESSES

Half-day workshops were held on Tuesday, December 4, 2018, and Thursday, December 13, 2018 in Meeting Room 1 at Boxford Town Hall. The agendas and presentations for each workshop are included in *Appendix B*. The goals of the workshops were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for the community;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Workshop 1

Workshop 1 focused on identifying the Town's top hazards and determining if identified community features were strengths, vulnerabilities, or both given potential effects of the

identified hazards. The workshop on December 4 began with a formal welcome by Selectman Barbara Jessel. Harriman presented an overview of the workshop's agenda, introduced the Core Group and facilitators, and described the MVP program and the CRB workshop process. The presentation also reviewed recent climate events within the United States, climate projections for Massachusetts, and climate projections and potential impacts on Boxford. Finally, the presentation concluded with previously identified hazards in Boxford and introduced the small group exercises.

The workshop participants then divided into three small groups for focused discussions. The Core Group and Harriman determined the composition of each group prior to the workshop to ensure each group was composed of a mixture of stakeholders. Participants were asked to characterize their top four priority hazards in Boxford and identify community vulnerabilities and strengths of Boxford's infrastructural, societal, and environmental features. Each group filled in the corresponding portion of the CRB Risk Matrix after identifying the priority hazards and community features.

WORKSHOP 1

Each group was also asked to identify and map the community vulnerabilities and strengths using the base maps (see *Appendix C* for the results). Facilitators were provided the following sample questions related to hazard characterization and community features from the CRB Workshop Guide:

- Hazards
  - What hazards have impacted Boxford in the past/currently/future?
  - What effects will these hazards/changes have on Boxford in the future (5, 10, 25, years)?
  - What is exposed to hazards and climate threats?
- Infrastructure
  - What infrastructure is vulnerable to hazards? (transportation, schools, dams, churches, grocery stores, gas stations, etc.)
  - What infrastructure should be added to the map? (equipment storage locations, bridges on main streets/evacuation route, heating/cooling/emergency shelter center)
- Societal
  - Are there any areas with vulnerable populations? (elderly, disabled, youth, special needs, etc.)

- What are the strengths and vulnerabilities of people in your community? (active civic groups, full-time police/fire/emergency services, strong communication for emergency information, etc.)

- Environmental
  - What natural resources are important to Boxford?
  - Are there any areas with vulnerable plants or animals?
  - Are there any areas with Title V concerns?

Workshop participants reunited in a large group and a representative of each small group reported a brief summary of their group's discussion, top priority hazards, and community vulnerabilities and strengths.

Workshop 2

Workshop 2 focused on building upon the findings of Workshop 1 to develop action steps the Town can take to be more resilient to the projected impacts of climate change. The workshop on December 13 began with a review of Workshop 1's findings of the small groups and an overview of Workshop 2. Workshop participants then divided into the same three small groups used in Workshop 1. Participants were asked to briefly review the top four priority hazards and community vulnerabilities and strengths in Boxford from Workshop 1, identify actions to address community vulnerabilities and reinforce strengths, and prioritize actions and identify timeframe for each action. Each group filled in the corresponding portion of the CRB Risk Matrix after discussing priority of actions and associated timeframes.

Workshop participants reunited in a large group while facilitators compiled the listing of each group's top actions. During a lunch break, each participant was given four sticky dots and asked to place a dot next to their top priority action items. Facilitators then concluded the workshop with the results of the overall priority action items and described next steps for the MVP process and the community.

WORKSHOP 2
CREDIT: K. GRUBBS, IPSWICH RIVER WATERSHED ASSOCIATION

PUBLIC LISTENING SESSION

The findings from the workshops was presented to the public at a listening session on April 22, 2019. A draft copy of this report was made available on the town's website prior to the listening session. A public notice regarding the location and timing of the listening session was also posted on the Town's website and sent electronically to all CRB Workshop invitees, members of relevant town boards and commissions, and Board of Selectmen. A copy of the public notice is included in *Appendix E*.

TOP HAZARDS AND VULNERABLE AREAS

When scientists talked about global warming in the 1990s, they focused on the average annual global temperature and sea level rise. Scientists now have more data, better computational models, and better observations to record and analyze what affects people most. Wildfires, hurricanes and associated extreme rainfalls, flooding, drought, and heat waves have all worsened due to climate change, in addition to the global temperature and sea level rise.

Public health is also being affected; the Centers for Disease Control and Prevention (CDC) has found that illnesses from mosquito, tick, and flea bites more than tripled in the United States from 2004-2016. New disease vectors are possible from newly invasive species, such as the Asian longhorned tick – the first invasive tick in the United States in approximately 80 years).

The presentation during Workshop 1 reviewed recent climate events within the United States, climate impacts within Massachusetts, and climate projections and potential impacts on Boxford. For example, data for Massachusetts from *NOAA Technical Report NESDIS 149-MA* (2017) show average annual temperatures increased almost 3°F between 1900-2014 and the number of days when the maximum temperature was above 90°F has been consistently above average since the 1990s. The report also noted that all precipitation metrics (e.g., observed extreme precipitation events) have been highest during the most recent decade of data (2005–2014).

Data from the Massachusetts Executive Office of Energy and Environmental Affairs' clearinghouse of climate science maps, data, documents (resilientMA.org) was also presented during Workshop 1. ResilientMA provides climate projections from the Northeast Climate Adaptation Science Center. Downscaled to the level of major watershed basins, these projections provide a more focused look at what specific municipalities may experience in the future. The Ipswich Basin is composed of 20 municipalities, including the majority of Boxford. Some key projections for the Ipswich Basin include:

- Average, maximum, and minimum temperatures are expected to increase

- Seasonally, maximum summer and fall temperatures are expected to see the highest projected increase
- Days with daily maximum temperatures over 90°F are expected to increase
- Days with daily minimum temperatures below 32°F are expected to decrease
- Precipitation will be more variable
- "Extreme" precipitation events are likely to occur more frequently

Workshop 1 also reviewed the following previously identified hazards:

- Floods, winter storms, power loss from storms, major storms (hurricane), drought, dam failure (Boxford's high and moderate risk hazards as identified in the *Merrimack Valley Region Multi-Hazard Mitigation Plan Update*)
- Average and extreme temperatures (cold and/or heat), invasive species, landslide, wildfire, other severe weather (wind, thunderstorm) (Natural hazards related to climate change as identified in the *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*)

TOP HAZARDS

Each small group identified their top four priority hazards in Boxford within the context provided by the information regarding climate change impacts and previously characterized hazards. Hazards identified during this exercise were:

- Flooding (3 groups)
- Drought (3 groups)
- Major storms/Winter storms (3 groups)
- Invasive species (1 group)
- Wind (1 group)
- Wildfire (1 group)

AREAS OF CONCERN

The impacts of hazards are anticipated to be experienced throughout Boxford. The following were identified by the workshop participants as specific areas and facilities of concern:

- **Vulnerable Populations –** The elderly (both current and proposed care facilities and residents living at home), those with disabilities, people in isolated residences, and people living alone
- **Environmental –** Silvermine Road (Natural Heritage area for endangered turtles), Fish Brook, Lockwood Dam, Bald Hill and Boxford State Forest
- **Facilities –** Schools (Masconomet Regional High and Middle schools, Spofford Pond Elementary School), Council on Aging (high water table)
- **Transportation –** Glendale Road and Main Street (access), Main Street (flooding in heavy rains between Bennett Road and Mortimer Road), Wildmeadow Road (access and flooding issues)

- **Infrastructure –** Culverts (Stiles Pond Dam, Baldpate ponds), natural gas lines along bridges (Towne Road, Middleton Road, Lockwood Lane), dams (Stiles Pond Dam, Lockwood Dam, Lowe Pond Dam, Four Mile Pond Dam), private wells

CURRENT CONCERNS AND CHALLENGES PRESENTED BY HAZARDS AND CLIMATE CHANGE

The Commonwealth experienced 22 coastal and inland flood-related disaster declaration events between 1954 and 2017; Essex County, which includes Boxford, had the most (18 flood-related disaster declarations).

Boxford has faced multiple challenges related to the impacts from natural hazards in recent years. For example, heavy snow and wind from several winter storms in March 2018 caused power outages lasting multiple days in many areas of Boxford and the region. Fallen trees from a windstorm in October 2017 downed power lines that provide 90% of the town's power and completely or partially blocked 23 roads to traffic. Boxford experienced a severe drought in 2016-2017 that hydrologically stressed the area's rivers, streams, and the water supply of many residents with private wells. A winter storm in 2010 resulted in a loss of power for over many of the town's homes for several days. A storm in March 2010 caused the closure of 10 roads and flooding of many homes. The flooding in May 2006, the "Mother's Day Flood," saw 12 to 17 inches of rain in the region over three days, causing significant flooding of homes and roadways.

The Massachusetts Department of Conservation and Recreation provided data from the Federal Emergency Management

DAMAGE FROM MARCH 2018 STORM.
CREDIT: W. WATERS, WICKED LOCAL

DAMAGE FROM OCTOBER 2017 STORM.
CREDIT: W. WATERS, WICKED LOCAL

DAMAGE FROM MOTHER'S DAY FLOOD, MAY 2006.
CREDIT: TOWN OF BOXFORD

Agency's (FEMA's) National Flood Insurance Program showing 19 policies for single-family homes valued at $5,655,000 in Boxford. Many of the policies are for structures in B/C/X flood zones, rather than higher hazard A/AE zones. There is one policy with a repetitive loss claim located within the B/C/X flood zone.

Workshop participants generally agreed Boxford is experiencing more frequent and intense storms that occur throughout the year. The impacts from flooding and natural hazards that result in fallen trees were mentioned as a concern in all three small groups. The Town has worked to identify dams of concern and completed structural work on improperly sized road-stream crossings to reduce flood-prone areas. However, as discussed during the workshops, additional repairs or replacement are needed in vulnerable areas. Boxford Town staff have also worked with National Grid regarding the company's tree trimming program. Feedback from workshop discussions indicate improved communication and partnership between the Town and National Grid would help address service interruption resulting from storm damages.

SPECIFIC CATEGORIES OF CONCERNS AND CHALLENGES

The small groups discussed specific infrastructural, societal, and environmental concerns and challenges during the workshop. Some of the specific concerns were characterized as vulnerabilities, though some were considered both vulnerabilities and strengths depending on the hazard or impact. A full listing of vulnerabilities is found in the CRB risk matrices in *Appendix D*.

Infrastructural

Dams

Dams, both beaver dams and man-made dams, were generally characterized as vulnerabilities, with some specific dams noted by one small group. Beaver dams may cause unexpected flooding in unpredictable locations due the nature of their creation. Beavers are active throughout town, and many dams are only discovered after flooding or anecdotally. Many man-made dams need repair and capacity improvement to address the threat to nearby and downstream homes and structures. The Great Marsh Barriers Assessment also noted removal may address current obstacles for some aquatic species. Many dams within Boxford, however, are privately owned, requiring communication and cooperation between the Town, neighbors, and dam owners.

Private Wells, Septic Systems

Boxford does not have a municipal water system or centralized sewage treatment facility; private wells and septic systems are pervasive. Private wells as a home's water supply are vulnerable to power disruption and the potential for a dry well during drought conditions.

Septic systems may potentially fail due to flooding or a potentially increased water table in the future. The private wells and septic systems were also viewed as a strength, as discussed in following section.

Transportation/Road Access

Participants expressed concern regarding the vulnerability of the road network. Many culverts are incorrectly sized or operate improperly, causing the roads to be prone to overtopping and possible washouts. One group noted that the *Great Marsh Barriers Assessment* (2018) determined that six out of the top 35 highest priority road-stream crossing structures were in Boxford. It was also noted that the ability to access many areas of town or roadways accessing nearby areas was highly affected by downed power lines or roadway flooding. Many roads become impassable following storms which limits the number of access points to homes and neighborhoods, further isolating areas from emergency services. Accessibility along fire pond roads was also noted as a public safety concern.

Electric Distribution System

Small groups noted that most electric utility infrastructure is on above ground transmission lines and poles. These lines are easily and frequently affected by falling trees during wind and winter storms. The majority of solar energy systems attached to the grid shut down during a power loss so as not to feed electricity back into the system in case of a downed wire. Participants in the workshops discussed equipping solar energy systems, both private and municipal, with batteries to allow those systems to continue producing electricity during an outrage. Batteries would allow the storage and use of power during an outage while preventing the backflow of electricity into the grid.

Societal

Isolated Population

Many homes within Boxford have limited access points, as noted in the concerns regarding road access, mentioned above. Participants mentioned the challenge of communicating information with the secluded homes throughout town and noted that household income may influence the vulnerability to the impacts of various hazards. The isolated population was also viewed as a strength, as discussed in the following section.

Elderly Population

Workshop participants discussed that the ability to provide the special care and assistance requirements of elderly residents may be affected due to the impacts of extreme weather. Communication issues, lack of access to transportation, and a widely dispersed population

(found throughout town in private homes and care facilities) were concerning to participants.

Environmental

Disease-bearing Insects

Small groups discussed concerns regarding increases in the population of mosquitos and ticks due to the warmer and wetter conditions and fewer periods of cold weather. The town has already experienced a significant increase in ticks and associated diseases. As the climate shifts, the same pests may carry new types of disease. For example, mosquitos may carry Zika or West Nile Virus. There is also concern regarding new pests and the diseases associated with them.

Trees

Each group noted that trees throughout Boxford can pose a hazard when the town experiences extreme weather. Fallen trees, especially pine trees, frequently make roads impassable, pose a danger to built structures like homes, and can bring down power lines. There was some concern expressed regarding a changing climate and the impact on the species of trees within the town, die-off due to drought, and new pests and associated diseases. The presence of trees throughout Boxford, however, was also viewed as a strength, as discussed in the following section.

CURRENT STRENGTHS AND ASSETS

Workshop participants identified strengths and assets within Boxford that help the community mitigate or be more resilient to the impacts of hazards related to climate change and extreme weather events. Some of the strengths were also characterized as vulnerabilities, which were noted in the previous section, depending on the hazard or impact. A full listing of strengths and assets is found in the CRB risk matrices in *Appendix D*.

HIGHLAND ROAD DRAINAGE PIPE REPLACEMENT. CREDIT: TOWN OF BOXFORD

- **Municipal Infrastructure and Town Operations –** The Town has reduced its vulnerability to flooding by updating its zoning bylaw to minimize development in high hazard areas. The Town has also implemented a capital investment program in infrastructure capacity, in-

cluding culvert replacements and repairs. Boxford's Emergency Operations Center is not located within a floodplain and the Emergency Operations Center and emergency shelters all have emergency generators available. Boxford's Director of Communication attends monthly regional communications meetings to garner up-to-date information from his peers and sits on a state level advisory board. Participants in the workshop, however, were concerned about best practices in terms of outreach to and education of residents and businesses, helping them to understand current and future risks and what they could do in an emergency.

- **Private Wells, Septic Systems –** Public water supply wells are widespread and maintain safe drinking water for residents. The dispersed nature of the wells reduces broad vulnerability from contamination. Septic systems are a sustainable approach to the town's sewage and are easier to modify to increase sustainability than centralized systems that may involve more widespread inconvenience from disruption of service or additional infrastructure needs (e.g., paving operations, system maintenance).
- **Emergency Response Systems –** Boxford has a robust emergency communication system, Reverse 911, providing timely warnings to the public about pending hazards. The Boxford Communications Department, in conjunction with the Council on Aging, elicits and maintains in the cell phone numbers of all residents who will provide one to be used with the communications department Reverse 911 dialing program. In addition, the Town's website provides hazard preparedness tips, techniques, and links to Massachusetts Emergency Management Agency (MEMA) and FEMA websites.
- **Isolated Population –** The community's isolated population, also identified as a concern, creates a small-town identity that facilitates communication and cooperation. Boxford has a history of active resident volunteerism on numerous local committees and addressing significant community needs. The engaged residents can convey information from the Town to the public and assist neighbors when needed.
- **Trees –** Boxford's extensive trees provide many benefits to the community, including cooling from its tree canopy, rainwater retention, air filtration, and wildlife habitat. The town's identity as a rural community is also reinforced by the presence of the many trees. The Town has worked with National Grid on tree clearing to remove vulnerable trees near electrical infrastructure.

CREDIT: TOWN OF BOXFORD

TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

Workshop 2 focused on developing and prioritizing actions to reduce vulnerabilities and enhance strengths for the infrastructural, societal, and environmental features identified in Workshop 1. The participants were instructed to consider the following when determining the priority of a given action:

- Funding availability and terms
- Agreement on outstanding impacts from recent hazard events
- Necessity for advancing longer-term outcomes
- Contribution towards meeting existing local/regional planning objectives

A full listing of actions, prioritization, and associated time frames is found in the CRB risk matrices in *Appendix D*. Each small group identified their top four priority actions, which were compiled for the large group to "vote" on their overall top priority action items. The top four actions receiving the most votes are listed as the highest priority, below.

HIGHEST PRIORITY

- Establish a tree/vegetation maintenance program (1/3/5 year cycle); increase coordination between the Town and National Grid; bury power lines, where feasible.
- Identify and fix roads/culverts/bridges that prevent access in emergencies.
- Support/create robust municipal infrastructure: power supply and people.
- Educate the community by identifying impacts to the environment, vulnerabilities, and volunteers.

HIGH PRIORITY

- Create a tree/vegetation management program.
- Exempt pine trees from Scenic Road Act (from town land) to remove.
- Assess culverts, dams, aging infrastructure for repairs or replacement requirements.
- Evaluate culverts and create dam management plans to address transportation-related flooding issues.
- Replace and continue to replace culverts to increase water flow (e.g., Endicott Street/ Washington Street); prioritize by age and capacity.
- Rebuild and maintain fire pond access roads, trails; increase communication with adjacent properties regarding maintenance.
- Prioritize debris clearance and maintenance of access during and following hazardous situations along roads near shelters (e.g., south of Fish Brook).
- Re-establish the Streams Committee within Boxford.
- Continue to maintain the Reverse 911 program and conduct outreach to increase awareness of the program and participation by members of vulnerable populations and the greater community. Vulnerable populations include the elderly, those with disabilities, and/or people living alone.
- Conduct public outreach regarding awareness and communication of hazards through multiple methods (e.g., currently established mailings like census or tax rolls, Town website, social media).
- Identify volunteers, especially with specific expertise (e.g., medical training), that can provide assistance during emergency situations.
- Evaluate the capacity of existing emergency shelter volunteers.

- Identify and train additional volunteers for emergency shelters.
- Continue to support Town staff's participation in educational and regional/state coordination opportunities to discuss best practices from other communities in terms of outreach to the public about what to do in emergencies and the risks from the impacts of climate change and evaluate the applicability of those best practices for Boxford.
- Install batteries in solar municipal infrastructure to capture and store solar energy.
- Develop program where the Town can provide and distribute temporary generators to the vulnerable population.
- Create a "neighbor helping neighbor" program.
- Explore creation or participation in a battery rental program where small handheld batteries are available to those with limited resources for use during the loss of power to charge phones, computers, lanterns, or other chargeable devices. Such devices could be available at shelters.
- Conduct cell tower power outage mitigation (e.g., batteries, generator, solar, generator track).
- Develop and conduct education program for the community regarding the risks of hazards and the resources available to the community.
- Conduct education with regional partners regarding dams and their removal or maintenance, water conservation, and invasive species.
- Conduct education regarding the impacts of spraying for insects.
- Develop a system to opt-in for spraying for insects.
- Require potential development to provide information regarding hazard mitigation plans for water wells, generators, sewage handling, and water quality.

MODERATE PRIORITY

- Streamline the ability of residents to report debris in dams and culverts so that the DPW can continue to coordinate its clearing efforts throughout town.
- Replace the culvert at Endicott Street/Washington Street.
- Develop a field-deployed siphon to temporarily direct water flow over a blocked culvert. For example, an old fire hose with a mechanism to fill the hose and then release the water past a blocked culvert to prevent flooding from culvert blockage. It could be housed in the Department of Public Works building and loaded on a pickup truck for deployment by a single person.
- Conduct education regarding chemical composition for septic owners, especially for upstream and older systems.
- Develop a network of homes with generators and water supply to support clusters of private homes in emergencies.
- Explore the potential for small power systems (e.g., solar, wind) throughout town.
- Evaluate existing shelters for capacity as both warming and cooling centers, resources for distribution of food and supplies, and ability to provide power to recharge small devices during an emergency. Consider whether additional locations are necessary to

supplement the existing shelters, including Masconomet Regional High School, which is in a flood plain.

- Hire an additional licensed driver for the Council on Aging.
- Identify bus drivers available during emergency events.
- Work with the State to minimize salt runoff from Interstate 95.
- Create cluster zoning and floodplain regulations to discourage development in hazard-prone areas.
- Explore communication of hazardous conditions (e.g., ice) through programmable speed signs.
- Continue beaver deceiver deployment to discourage damming of waterways.
- Investigate the effectiveness of tick tubes and their distribution.

LOWER PRIORITY

- Explore green and natural solutions to flooding on private properties.
- Encourage homeowners not to dam waterbodies.
- Explore MEMA/FEMA/EPA grants for infrastructure improvements related to limiting vulnerability to private homes (flooding, wildfire, power loss).
- Replace fire ponds with tanks.
- Investigate the need to update Boxford's bylaws to allow public water from outside of the town.
- Work with Boxford Trails Association/Boxford Open Land Trust (BTA/BOLT) to continue to encourage access and awareness of trails and protected habitats in Boxford.

ACKNOWLEDGEMENTS

Thank you to the Core Group members for planning and facilitating the MVP process:

- Alan Benson, Town Administrator
- Pat Canonica, Planning Board
- John Dold, Superintendent/Town Engineer
- Bob Hazelwood, Emergency Management Director/Permanent Building Committee
- Ross Povenmire, Land Use Director
- Katie Moore, Facilitator – MVP Provider, Harriman
- Emily Keys Innes, Facilitator – MVP Provider, Harriman
- Will Gatchell, Facilitator, Harriman

Special thanks to the Boxford community members and organizations who contributed their time and expertise during the workshops to make this a comprehensive document:

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Note: An asterisk (*) indicates the individual attended one or both CRB workshops.

RECOMMENDED CITATION

Town of Boxford. (2017). Community Resilience Building Workshop Summary of Findings. Boxford, Massachusetts.

APPENDIX A: PREPARATORY INFORMATION

What is the Municipal Vulnerability Preparedness (MVP) Program

Governor Charlie Baker signed Executive Order 569 in 20016, instructing the Secretary of Energy and Environmental Affairs and the Secretary of Public Safety to "coordinate efforts across the Commonwealth to strengthen the resilience of our communities, prepare for the impacts of climate change, and to prepare for and mitigate damage from extreme weather events," including establishing a framework for municipalities to complete climate change vulnerability assessments and resiliency action plans.

The Commonwealth's Municipal Vulnerability Preparedness (MVP) grant program provides funding to municipalities to conduct vulnerability assessments and develop action-oriented resiliency plans.

Why the Town is Participating

Increasingly more unpredictable and severe weather is occurring that can potentially cause more damage to the Boxford community.

Upon completion of the MVP grant program, Boxford can achieve "MVP" designation from the Commonwealth – a designation that gives the Town access to further funding to implement resilient actions.

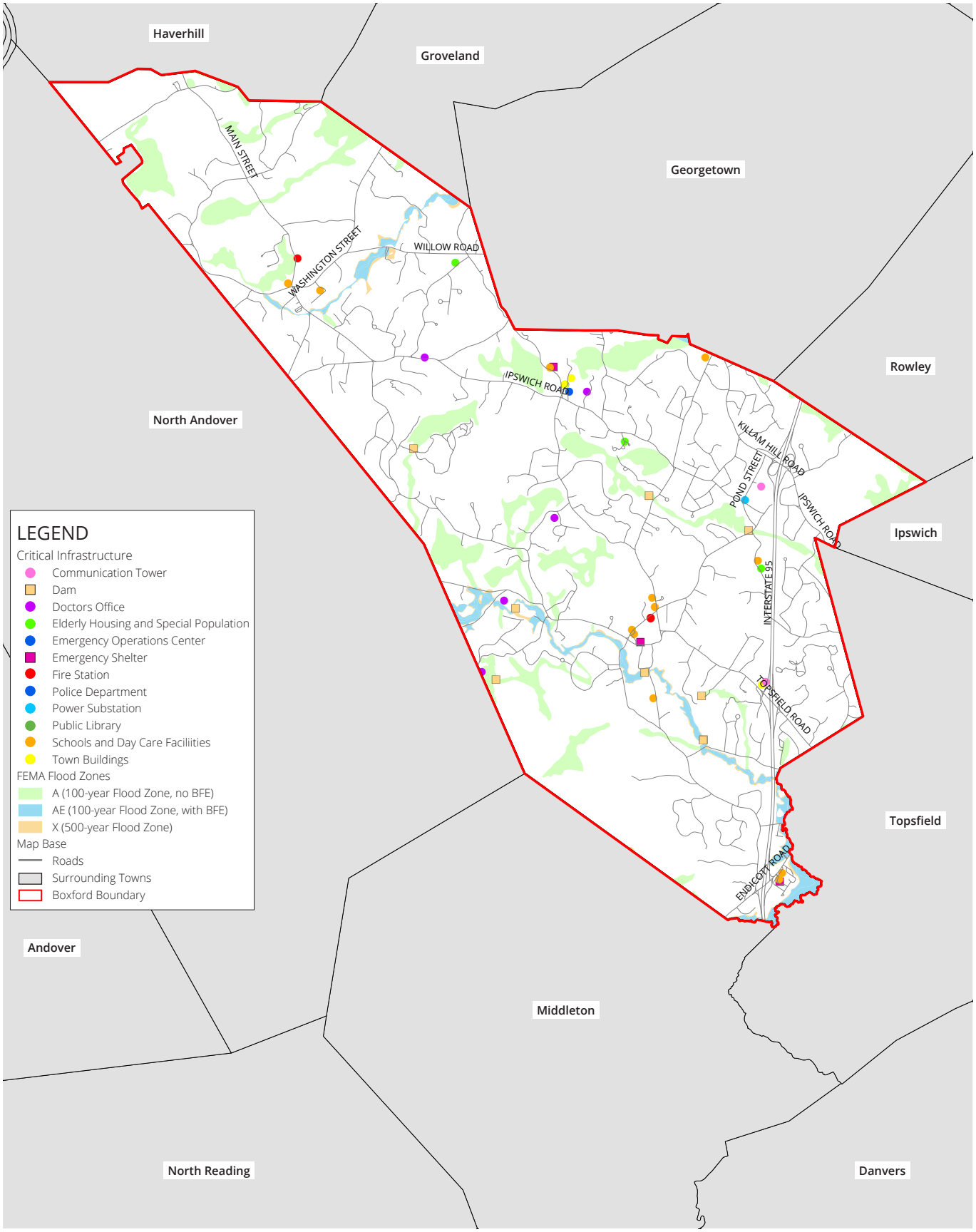
Process

The Town of Boxford is assembling a committee of stakeholders to attend two half-day workshops to collectively identify hazards and plan mitigation strategies.

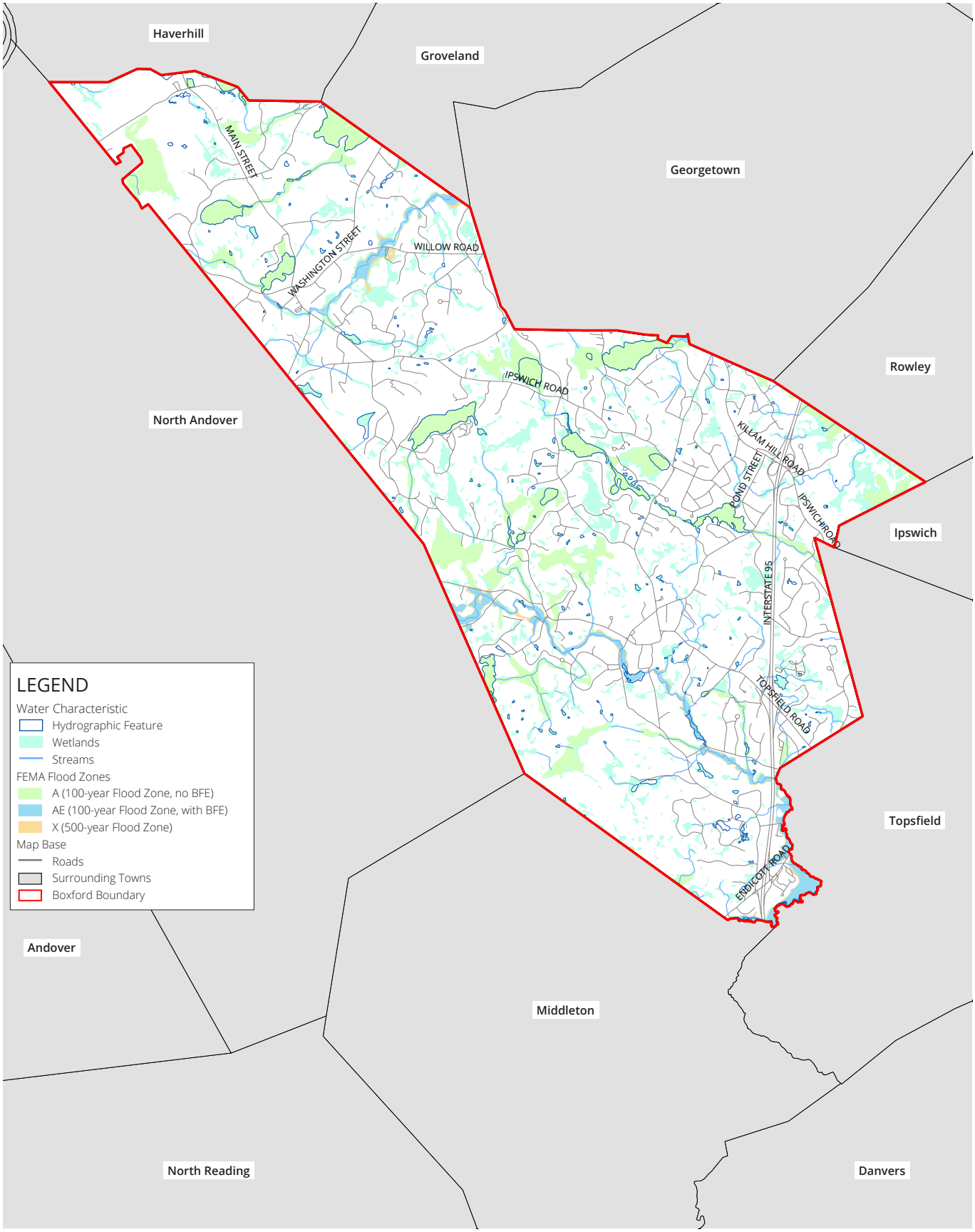
Following the two workshops, the consultant (Harriman) will develop a summary of findings report for submission to the State.

A public meeting will be held (anticipated for February 2019) to discuss the hazards and plan mitigation strategies identified through the workshops.

Existing Conditions: Critical Facilities and FEMA Zones



Existing Conditions: Water, Wetlands, and FEMA Zones



APPENDIX B: WORKSHOP AGENDAS AND PRESENTATIONS

HARRIMAN

Municipal Vulnerability Preparedness (MVP) Workshop #1
Agenda

December 4, 2018

8:30 Registration

9:00 Welcome and Introductions

9:10 MVP Overview, Workshop Process, Overview of Climate Change

9:45 Small Team Exercise Introduction

9:50 Small Team Discussion

- Introductions, identify person for report out
- Characterize the hazards
- Identify Boxford's vulnerabilities and strengths for Infrastructure, Societal, and Environmental Profiles

10:30 Break

10:45 Continue Small Team Discussion

11:15 Small Team: Report Outs

11:30 Wrap up and Introduce Workshop #2

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Boxford Municipal Vulnerability Preparedness

Workshop 1

December 4, 2018

HARRIMAN

Workshop Agenda

9:00 Welcome and Introductions

9:10 MVP Overview, Workshop Process, Overview of Climate Change

9:45 Small Team Exercise Introduction

9:50 Small Team Discussion

- Introductions within the team, identify people for scribe and report out
- Characterize the hazards
- Identify Boxford's vulnerabilities and strengths for Infrastructure, Societal, and Environmental Profiles

10:30 Break

10:45 Continue Small Team Discussion

11:15 Small Team: Report Outs

11:30 Wrap up and Introduce Workshop #2

Introductions

- MVP Core Group
  - Alan Benson, Town Administrator
  - Pat Canonica, Planning Board
  - John Dold, Superintendent/Town Engineer
  - Bob Hazelwood, Emergency Management Director/Permanent Building Committee
  - Ross Povenmire, Land Use Director

- Harriman – MVP Facilitators
  - Katie Moore, Urban Planner
  - Emily Keys Innes, Associate and Senior Urban Planner
  - Will Gatchell, Associate and Senior Architect

Municipal Vulnerability Preparedness (MVP) Program Overview

What is the MVP Program?

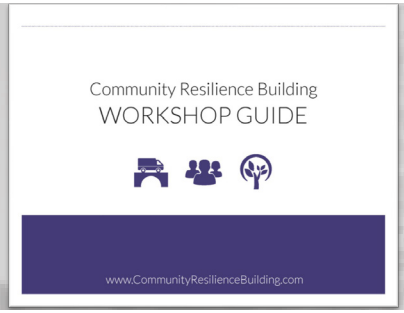
- A component of MA Executive Order 569 (2016)
- Grant funding for technical support to
  - Complete vulnerability assessments
  - Develop action-oriented resiliency plans

Why is the Town Participating?

- Increasingly more unpredictable and severe weather is occurring
- Completion qualifies Boxford for access to further grant funding

Workshop Process

A. Prepare for the Workshop
B. Characterize Hazards
C. Identify Community Vulnerabilities and Strengths
D. Identify and Prioritize Community Actions
E. Determine the Overall Priority Actions
F. Put it All Together
G. Move Forward



Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.com

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

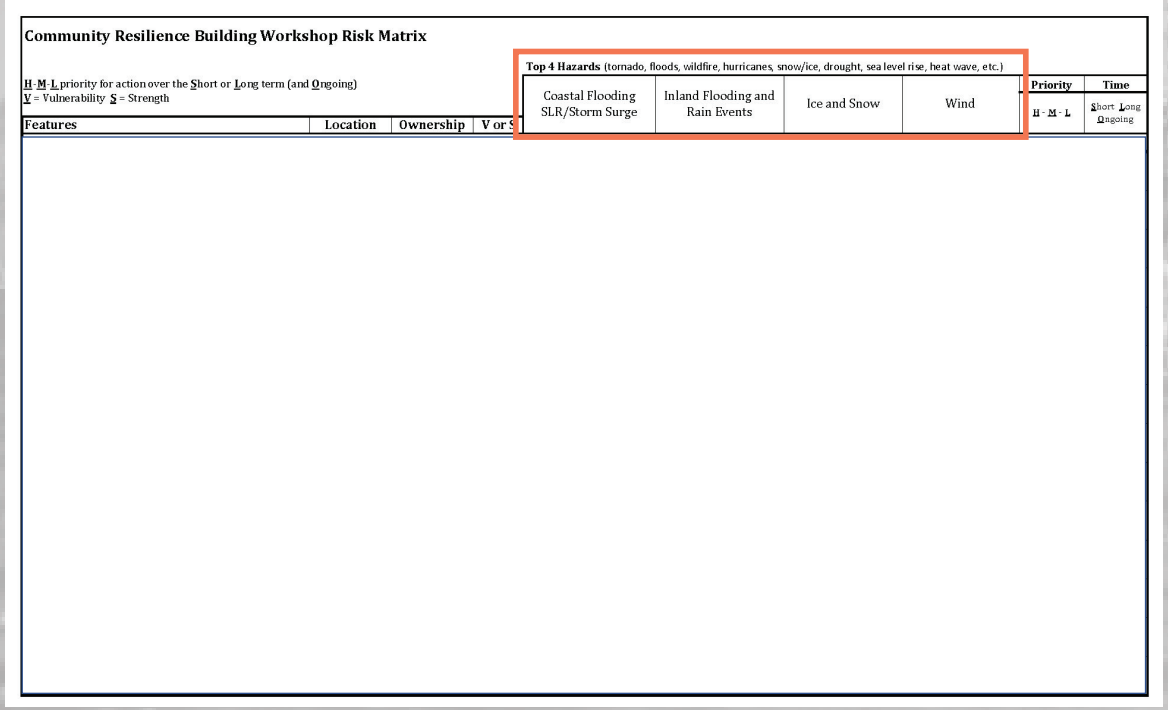
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S					Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Societal									
Environmental									

B. Characterize Hazards

- Identify past, current, and future hazards (large team)
- Determine top-priority hazards (small teams)

(Workshop 1)



Community Resilience Building Workshop Risk Matrix

H-M-L priority for action over the Short or Long term (and Ongoing)
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Top 4 Hazards (tornado, floods, wildfire, hurricanes, snow/ice, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Flooding SLR/Storm Surge	Inland Flooding and Rain Events	Ice and Snow	Wind	Priority H - M - L	Time Short Long Ongoing

C. Identify Community Vulnerability and Strengths

- Infrastructural
- Societal
- Environmental

(Workshop 1)

Community Resilience Building Workshop Risk Matrix

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Infrastructural									
Town Campus	Specific	Town	V						
Evacuation Routes - Roads	Town-wide	Town/State	V						
Nursing Homes/Elderly Care Facilities	Multiple	Private	V						
Homeowners Associations/Neighborhoods	Town-wide	Town/Private	V						
Electrical Distribution System	Multiple	CL&P/Town	V						
Dams (inland and coastal)	Multiple	Private	V						
Railway and State Bridges	Multiple	Amtrak/State	V						
Septic Systems	Town-wide	Private	V						
State Roads/Intersections	Town-wide	State/Town	V						
Wharves and Shore Infrastructure	Shore	Town-State-Private	V						
Waste Water Treatment Facility	Specific	Town	V						
New Ambulance Center	Specific	Town	S						
Zoning Regulations (maintain large lot size)	Multiple	Town	S						
Business District (power generators)	Specific	Town/Private	s						

D. Identify and Prioritize Community Actions

- Actions and Next Steps
- Prioritization
- Timeframe for Action

(Workshop 2)

Community Resilience Building Workshop Risk Matrix

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Town Campus	Specific	Town	V	Verify risk from flooding events; Identify alternative locations during peak flooding; Verify maintenance plan annually				H	S
Evacuation Routes - Roads	Town-wide	Town/State	V	Install highly visible signage for evacuation routes; Develop and implement communication program				H	S
Nursing Homes/Elderly Care Facilities	Multiple	Private	V	Improve power generation; Review building codes and zoning for existing and future facilities				H	S
Homeowners Associations/Neighborhoods	Town-wide	Town/Private	V	Engage Neighborhood Associations and develop cooperative response plan with Town: Advance "Neighbor helping Neighbor" Program; Develop comprehensive neighborhood-based emergency plans				H	S
Electrical Distribution System	Multiple	CL&P/Town	V	Within floodplain area, establish plan to address protection and long-term relocation of equipment	Upgrade transformers; Maintain power line protection zone (tree trimming)			H	O-L
Dams (inland and coastal)	Multiple	Private	V	Prevent possibility of catastrophic dam failure; Identify and remove dams to minimize downstream flooding due to failure				H	L
Railway and State Bridges	Multiple	Amtrak/State	V	Improve communications between parties; Expand green/gray infrastructure and improve bridge structures; Assess vulnerability and prioritize infrastructure improvement list				M	S
Septic Systems	Town-wide	Private	V	Assess opportunities for community systems or alternative treatment technology; Upgrade regulations to reduce contamination in water ways				M	L
State Roads/Intersections	Town-wide	State/Town	V	Coordinate with DOT, volunteers, public works to improve response; Need signage to warn of flooding risk in critical intersections				M	L
Wharves and Shore Infrastructure	Shore	Town-State-Private	V	Establish community dialogue regarding retaining/relocating infrastructure; Advance comprehensive shoreline management plan				L	S
Waste Water Treatment Facility	Specific	Town	V	Conduct alternative siting feasibility study; Relocate to low risk area within next 25 years.				L	L
New Ambulance Center	Specific	Town	S	Continue to support services in budget; Add additional staff and vehicle in next annual cycle					Ongoing
Zoning Regulations (maintain large lot size)	Multiple	Town	S	Current building codes control development in risky areas; Consider additional zoning incentives (TDRs) to reduce risk to residential units					Ongoing
Business District (power generators)	Specific	Town/Private	S	Downtown business district with power generators in place; Prioritize pharmacy and gas stations					Ongoing

Overview of Climate Change

- Climate change: A change in the state of the climate that can be identified by statistical changes of its properties that persist for an extended period, whether due to natural variability or as a result of human activity.
- Natural hazard: Natural events that threaten lives, property, and other assets. Often, natural hazards can be predicted. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.
- Risk: The potential for an unwanted outcome resulting from a hazard event, as determined by its likelihood and associated consequences.
- Vulnerability: The propensity or predisposition to be adversely affected

Definitions from the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018

A *hazard* is the sun.

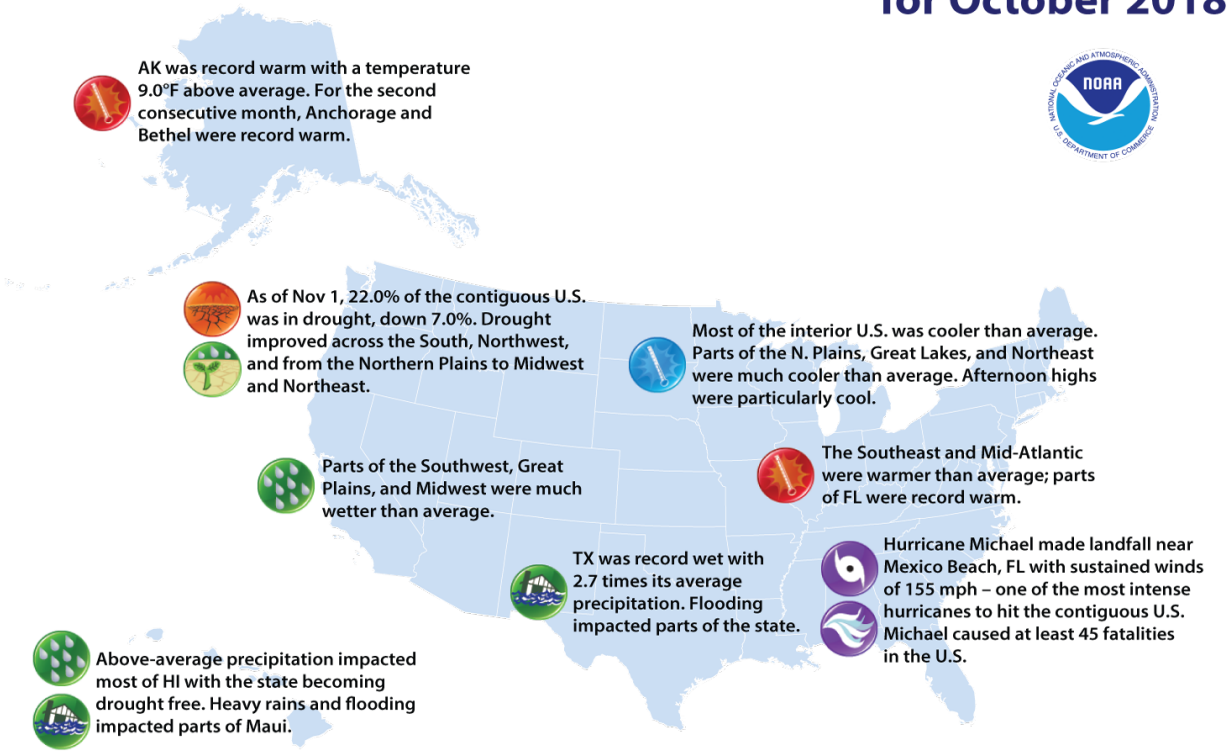
The *risk* is sunburn.

The *vulnerability* includes the length of *exposure* to the sun, how *sensitive* the skin is to it.

Overview of Climate Change - US

October 2018 was the 406th consecutive month with global temperatures above the 20th century average

U.S. Selected Significant Climate Anomalies and Events for October 2018



Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: http://www.ncdc.noaa.gov/sotc

Overview of Climate Change - MA

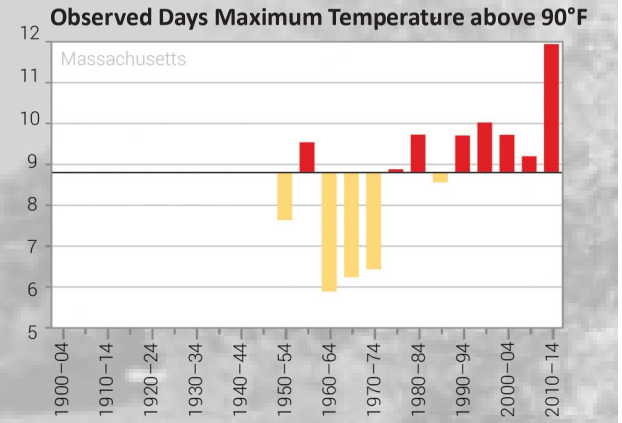
- MA Executive Office of Energy and Environmental Affairs created a clearinghouse of climate science maps, data, documents (resilientMA.org)

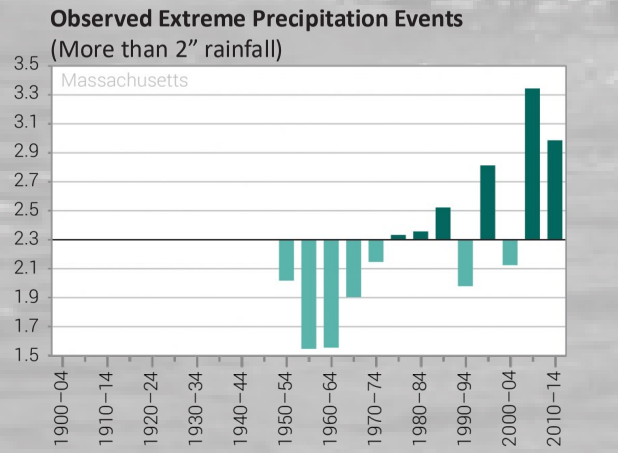
- Projections from Northeast Climate Adaptation Science Center (e.g., temperature, precipitation)
  - Based on the latest climate models included in the Coupled Model Intercomparison Project Phase 5 (CMIP5) – whose projections were summarized in the IPCC Fifth Assessment Report (2013)
  - "Downscaled" to major watershed basin (Boxford is in the Ipswich Basin)
  - Temperature projections are more certain than precipitation

Overview of Climate Change - MA

- Average annual temperatures increased almost 3°F between 1900-2014
- Number of days maximum temperature was above 90°F has been consistently above average since the 1990s
- All precipitation metrics have been highest during the most recent decade of data (2005–2014)

Source: NOAA Technical Report NESDIS 149-MA, 2017





Typical water levels

Howes Pond Dam on Mill Road

I-95 bridge over the Ipswich River

Mother's Day Flood 2006

Typical water levels

Gas distribution line suspended alongside the Towne Road Bridge over Fish Brook

Middleton Road, Thunder Bridge over the Ipswich River

Mother's Day Flood 2006

Mother's Day Flood
2006
Towne Road

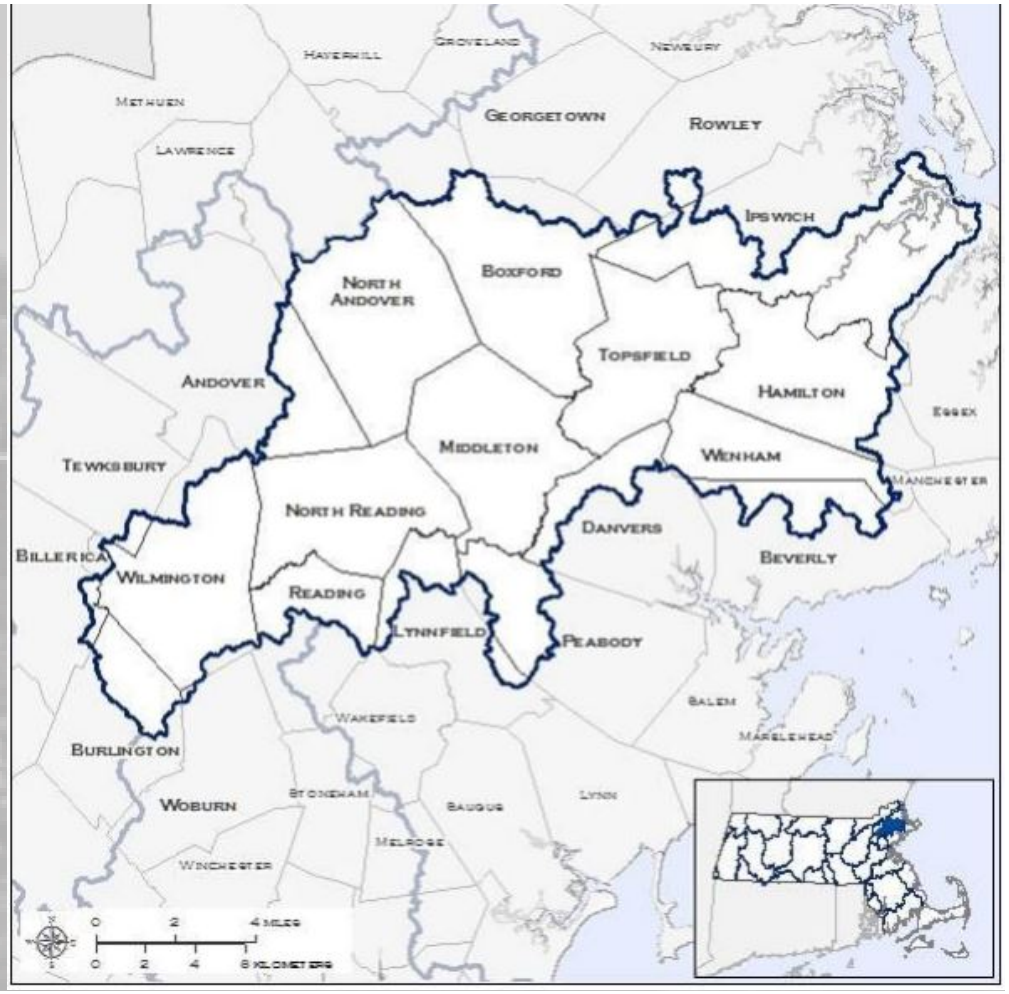
Middleton Road looking at
Thunder Bridge

Georgetown Road
October 2017

Herrick Road
March 2018

Source: Wendall Waters, Wicked Local

Overview of Climate Change – Ipswich Basin



Overview of Climate Change – Ipswich Basin

- Average, maximum, and minimum temperatures are expected to increase
  - Seasonally, maximum summer and fall temperatures are expected to see the highest projected increase
- Days with daily maximum temperatures over 90°F are expected to increase
- Days with daily minimum temperatures below 32°F are expected to decrease

	Baseline (1971-2000)	Mid-century (2050s)	End of Century (2090s)
Average annual temperature (°F)	49.5°F	+ 2.7 to 6.2°F	+ 3.6 to 10.8°F
Annual days max temperature >90°F	7 days	8 to 31 more days	12 to 69 more days
Annual days min temperature <32°F	130 days	18 to 42 fewer days	23 to 65 fewer days

Source: resilient MA, 2018

Overview of Climate Change – Ipswich Basin

- Number of days receiving precipitation over 1” are variable, fluctuating between loss and gain of days
- Annual and seasonal projections for total precipitation are also variable
- Annual and seasonal projections for consecutive dry days, or for a given period, are variable throughout the 21st century.

Hazard Characterization

- Merrimack Valley Region Multi-Hazard Mitigation Plan Update (November 2015)
  - High and moderate risk: floods, winter storms, power loss from storms, major storms (hurricane), drought, dam failure

- Other hazards of concern?
  - Average and extreme temperatures (cold and/or heat)
  - Invasive species
  - Landslide
  - Other severe weather (wind, thunderstorm)
  - Wildfire

(From *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*)

Small Teams – 3 Groups

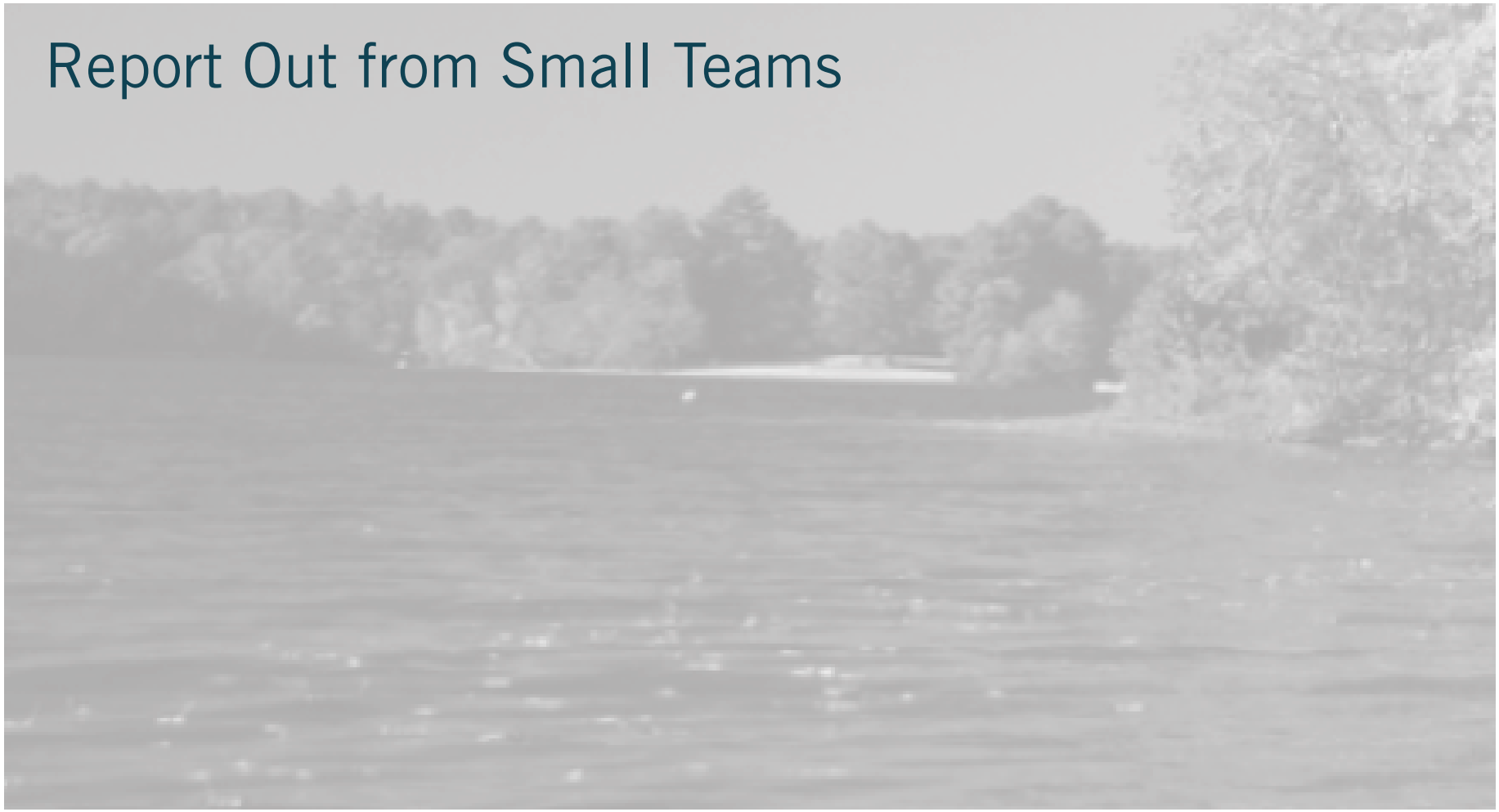
1. Team introductions: Name, organization/department

2. Identify a spokesperson and a scribe (not the facilitator)

3. Characterize the ***top 4 priority hazards*** in Boxford

4. Identify ***community vulnerabilities and strengths***
   - "Features" in each category of infrastructure, society, and environment.
     - List of key assets and infrastructure applicable to each category
     - Describe location for each asset and infrastructure
     - Identify ownership
   - Identify each "Feature" as a vulnerability or strength.

Report Out from Small Teams



Next Steps

Workshop #2

December 13, 8:30-noon

Meeting Room #1, Town Hall

- Develop and prioritize actions and clearly delineated next steps

- Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience across and within Boxford

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Municipal Vulnerability Preparedness (MVP) Workshop #2
Agenda

December 13, 2018

8:30 Registration

9:00 Welcome, Introductions, Workshop #1 Findings, and Workshop #2 Overview

9:20 Small Team Exercise Introduction

9:25 Small Team Discussion

- Introductions, identify person for report out
- Review hazards, vulnerabilities, and strengths identified in Workshop #1
- Identify actions to address Boxford's vulnerabilities and reinforce strengths for Infrastructure, Societal, and Environmental Profiles
- Prioritize actions

10:30 Break

10:45 Continue Small Team Discussion

11:00 Small Team: Report Outs

11:20 Determine Overall Priorities

11:45 Wrap up and Next Steps

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207.784.5100

123 MIDDLE STREET
PORTLAND, ME 04101
207.775.0053

33 JEWELL COURT, SUITE 101
PORTSMOUTH, NH 03801
603.626.1242

170 MILK STREET, SUITE 5
BOSTON, MA 02109-3438
617.426.5050

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Boxford Municipal Vulnerability Preparedness

Workshop 2

December 13, 2018

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Workshop Agenda

9:00 Welcome and Introductions

9:10 Review Workshop 1 and its Findings, Overview of Workshop 2

9:20 Small Team Exercise Introduction

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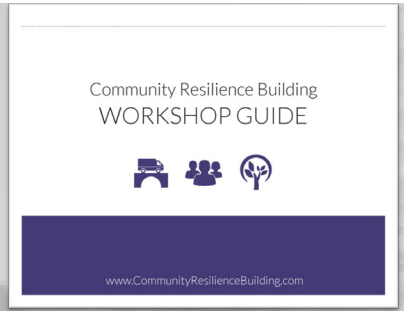

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.com

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Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S					Priority H-M-L	Time Short Long Ongoing
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Review of Terminology

- Natural hazard: Natural events that threaten lives, property, and other assets.
  - Often, natural hazards can be predicted
  - Tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area
- Risk: The potential for an unwanted outcome resulting from a hazard event, as determined by its likelihood and associated consequences.
- Vulnerability: The propensity or predisposition to be adversely affected.
  - A function of exposure, sensitivity, and adaptive capacity

Definitions from the *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*, 2018

A *hazard* is the sun.

The *risk* is sunburn.

The *vulnerability* includes the length of *exposure* to the sun, how *sensitive* the skin is to it.
The *actions* to address vulnerability of a sunburn include staying in the shade or wearing sunblock.

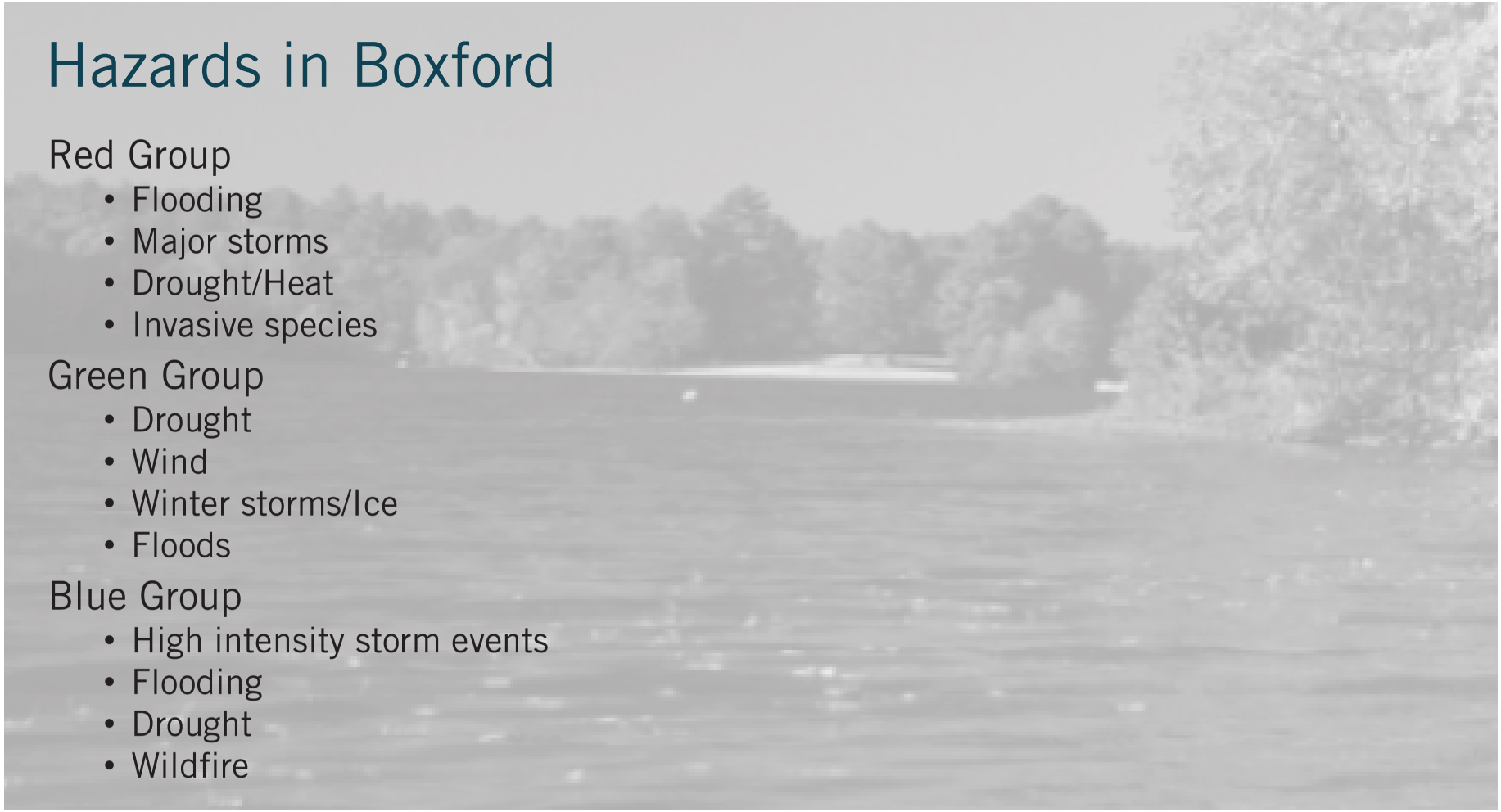
Overview of Climate Data - MA

- Summarized by the MA Executive Office of Energy and Environmental Affairs
  - resilientMA.org - clearinghouse of climate science maps, data, documents
  - "Downscaled" to major watershed basin (Boxford is in the Ipswich Basin)

- Temperature projections
  - Average, maximum, and minimum temperatures are expected to increase
  - Days with daily maximum temperatures over 90°F are expected to increase

- Precipitation projections
  - Precipitation will be more variable
  - "Extreme" precipitation events are likely to occur more often

Hazards in Boxford



Red Group
- Flooding
- Major storms
- Drought/Heat
- Invasive species

Green Group
- Drought
- Wind
- Winter storms/Ice
- Floods

Blue Group
- High intensity storm events
- Flooding
- Drought
- Wildfire

Vulnerabilities and Strengths in Boxford

Infrastructural Feature	Vulnerability and/or Strength (V and/or S)
Lack of access (Roads, Forests)	V
Power outages (utilities, communication)	V
Centralized shelter	V
Municipal infrastructure (repeaters, generators)	S
Roads south of Fish Brook	V
Masco	V
Dams	V
Private wells	V
Electric distribution	V
Transportation (roads, culverts, bridges)	V/S
Natural gas distribution	V/S
Stormwater	V

Vulnerabilities and Strengths in Boxford

Societal Feature	Vulnerability and/or Strength (V and/or S)
Communication (methods)	V/S
Capitalizing on community/isolation	V/S
Lack of public transit	V
Lack of services/goods	V
Masco-shelter	V
Senior housing (existing and new)	V/S
Private homes (income influences vulnerability)	V/S
Subdivisions	V/S
Elderly population	V/S
Emergency Response Systems/time lines	S

Vulnerabilities and Strengths in Boxford

Environmental Feature	Vulnerability and/or Strength (V and/or S)
Clean water	V/S
Fire ponds – dry/flood	V/S
Flooding	V
Disease-bearing insects	V
Trees	V/S
Beavers	V/S
Ticks	V
Endangered species	V/S
Mosquitos	V
Invasive vegetation/Changing vegetation	V
Moths (winter and gypsy)	V

Small Teams – 3 Groups

1. Identify a spokesperson and a scribe (not the facilitator)

2. Review the top 4 priority hazards and community vulnerabilities and strengths in Boxford from Workshop 1

3. Identify ***actions to address community vulnerabilities and reinforce strengths***

4. ***Prioritize actions*** and ***identify timeframe*** for each action
   - Identify the top 4 priority actions for the report out

Prioritizing and Urgency

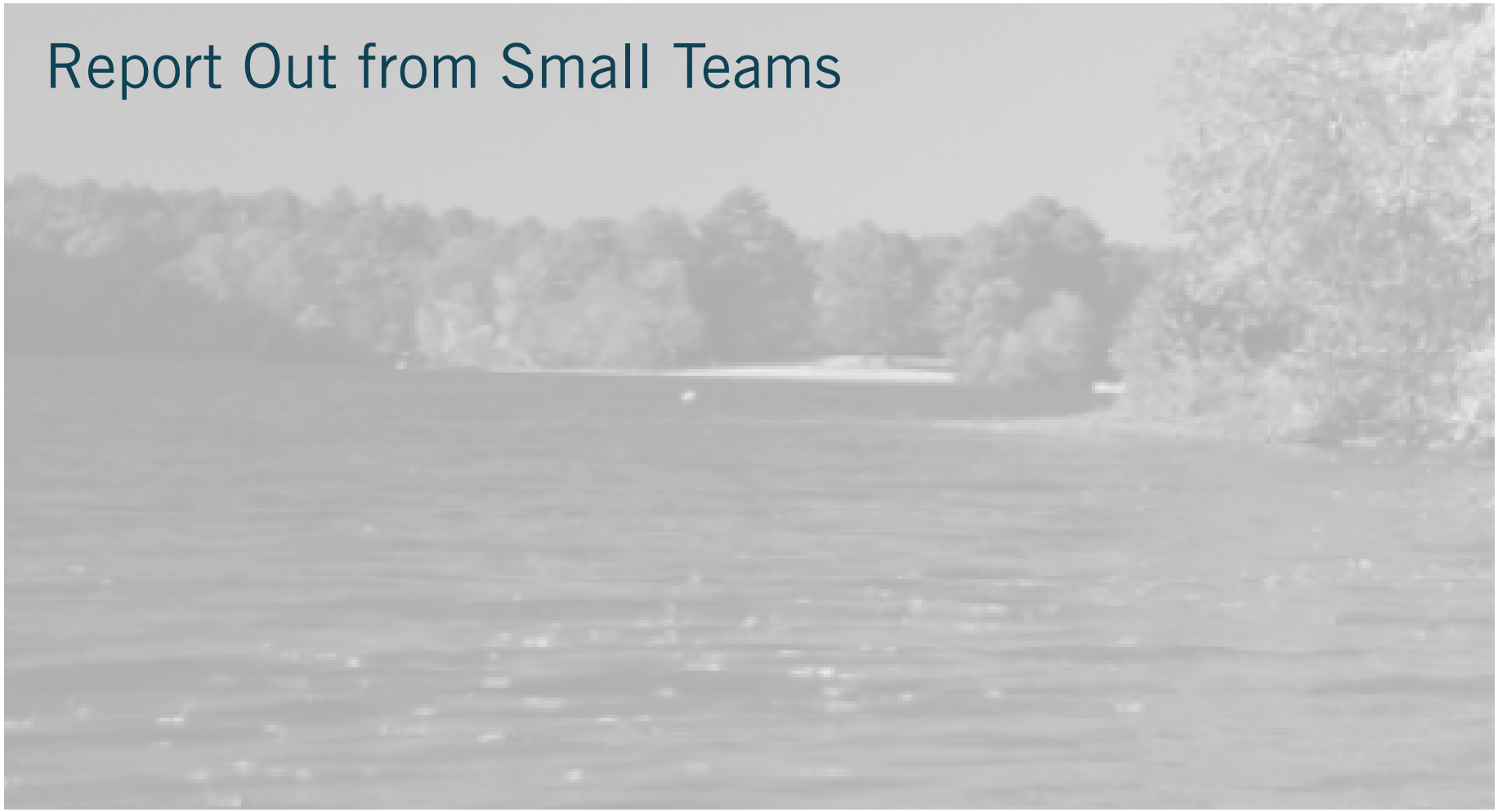
Prioritization Considerations

- Funding availability and terms
- Agreement on outstanding impacts from recent hazard events
- Necessity for advancing longer-term outcomes
- Contribution towards meeting existing local/regional planning objectives

Example Timeframes

- Current projects to reduce flooding is an ***ongoing (O)*** action
- Ensuring evacuation procedures are updated annually is a ***short-term (S)*** action
- Elevating a road or replacing a bridge are ***long-term (L)*** actions

Report Out from Small Teams



Identify Top Priority Actions

- Review the top actions identified by all of the small groups
- Place your dots next to the actions you feel are the highest priority for Boxford

Next Steps

- Develop Master Risk Matrix and MVP Findings Report
- MVP Listening Session
- Become an MVP Community

- Pursue funding for priorities and projects
- Monitor and update goals

APPENDIX C: COMMUNITY RESILIENCE BUILDING WORKSHOP PARTICIPATORY MAPPING

Existing Conditions: Critical Facilities and FEMA Zones

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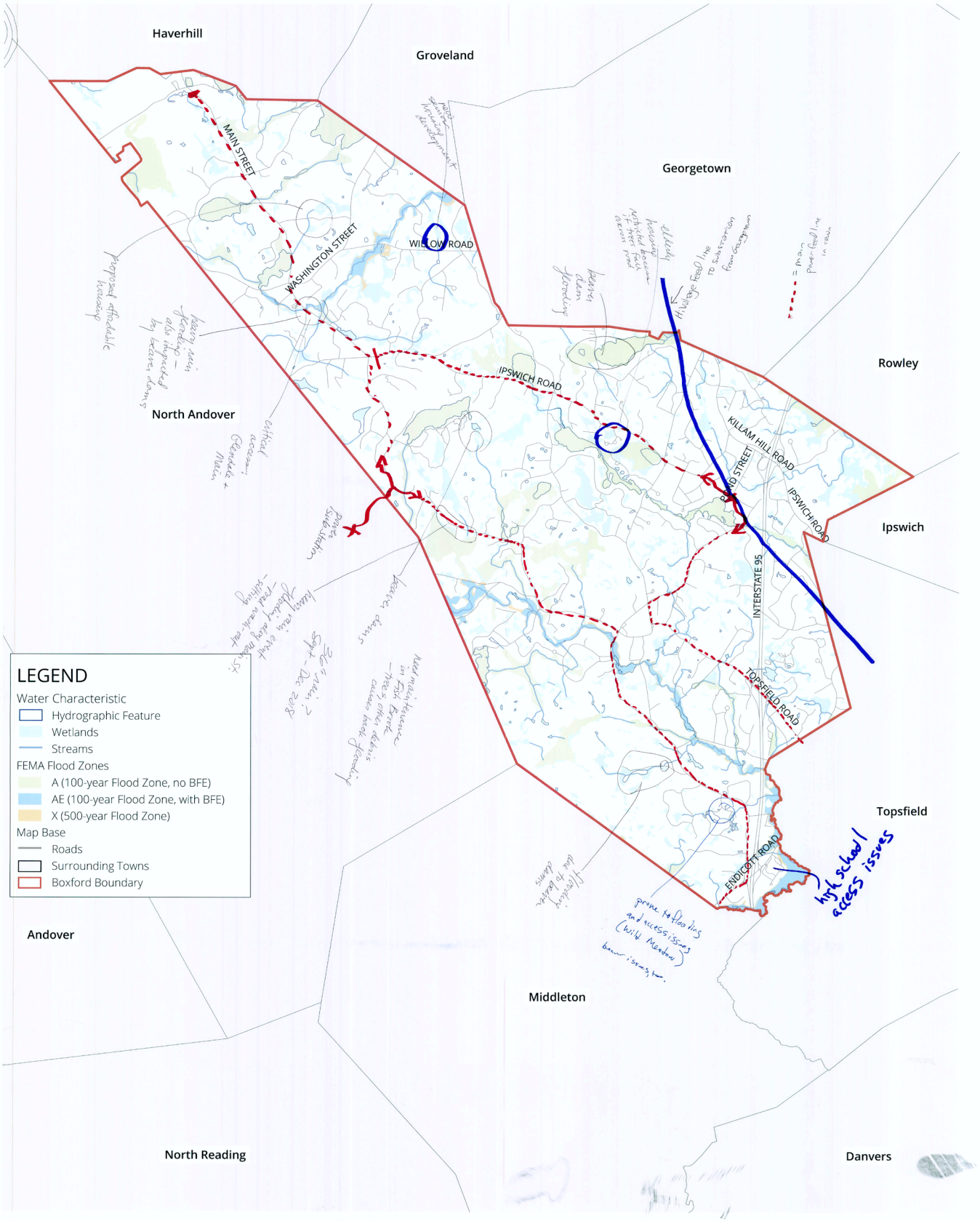
Boxford MVP Workshops

December 2018

Existing Conditions: Water, Wetlands, and FEMA Zones



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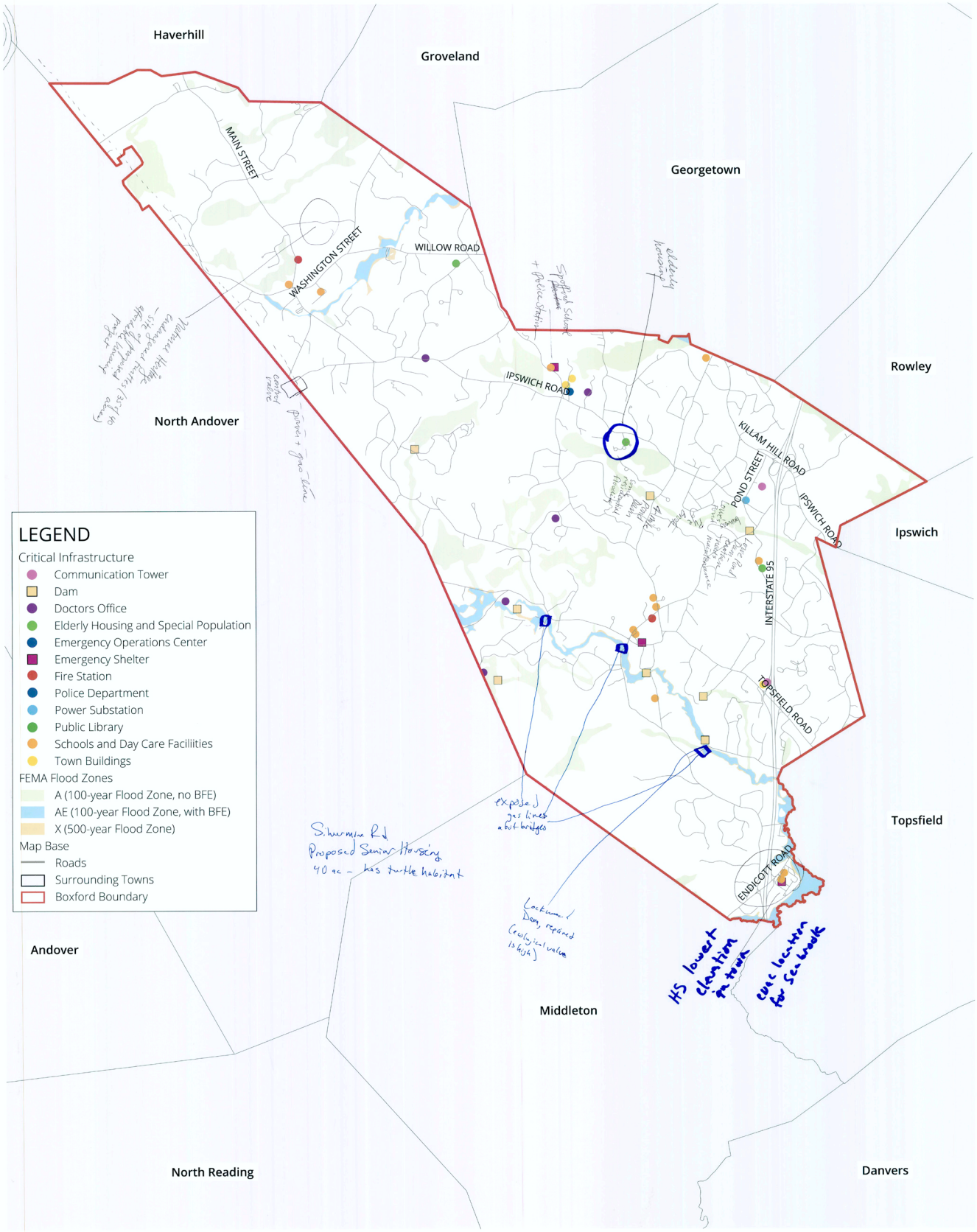

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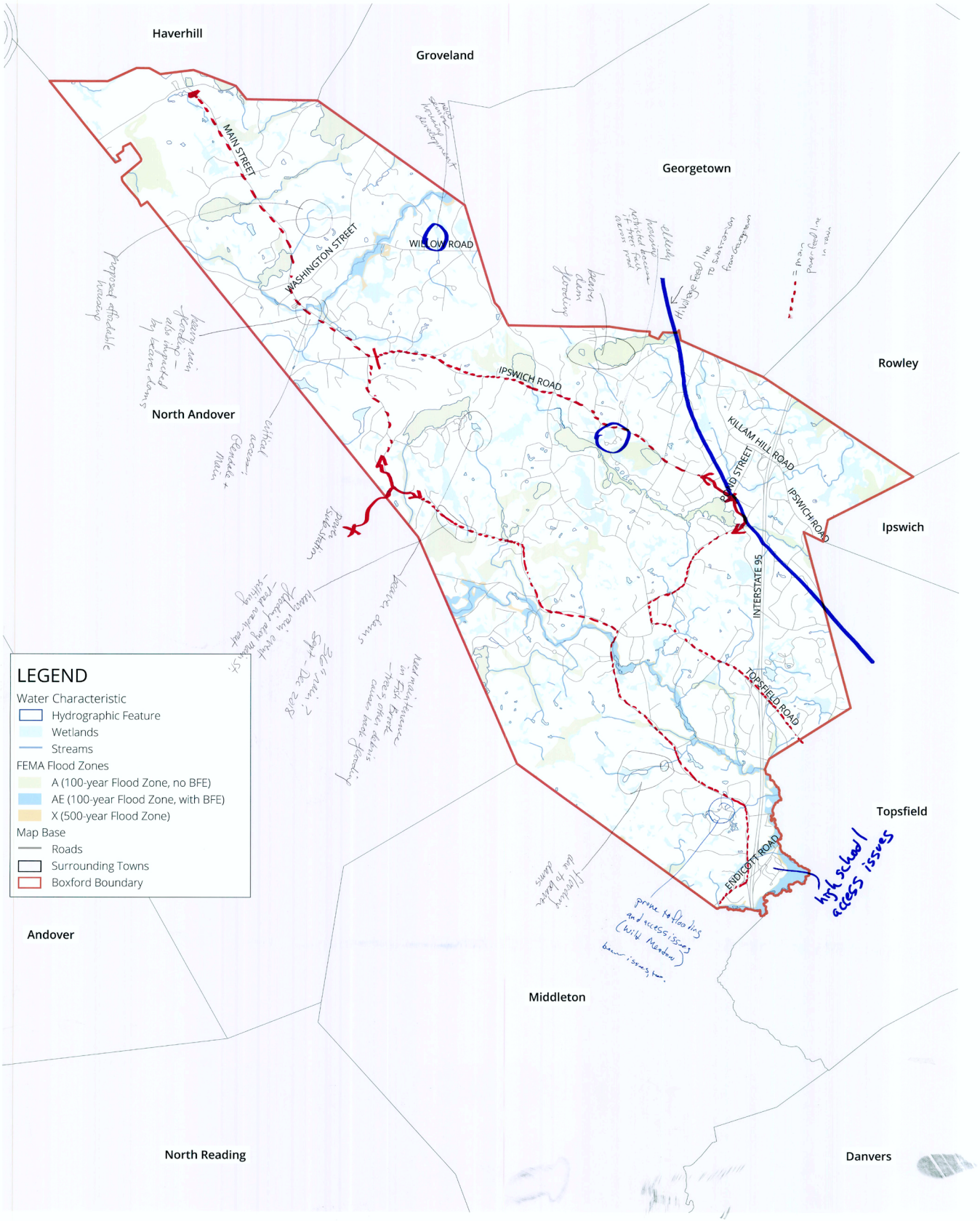

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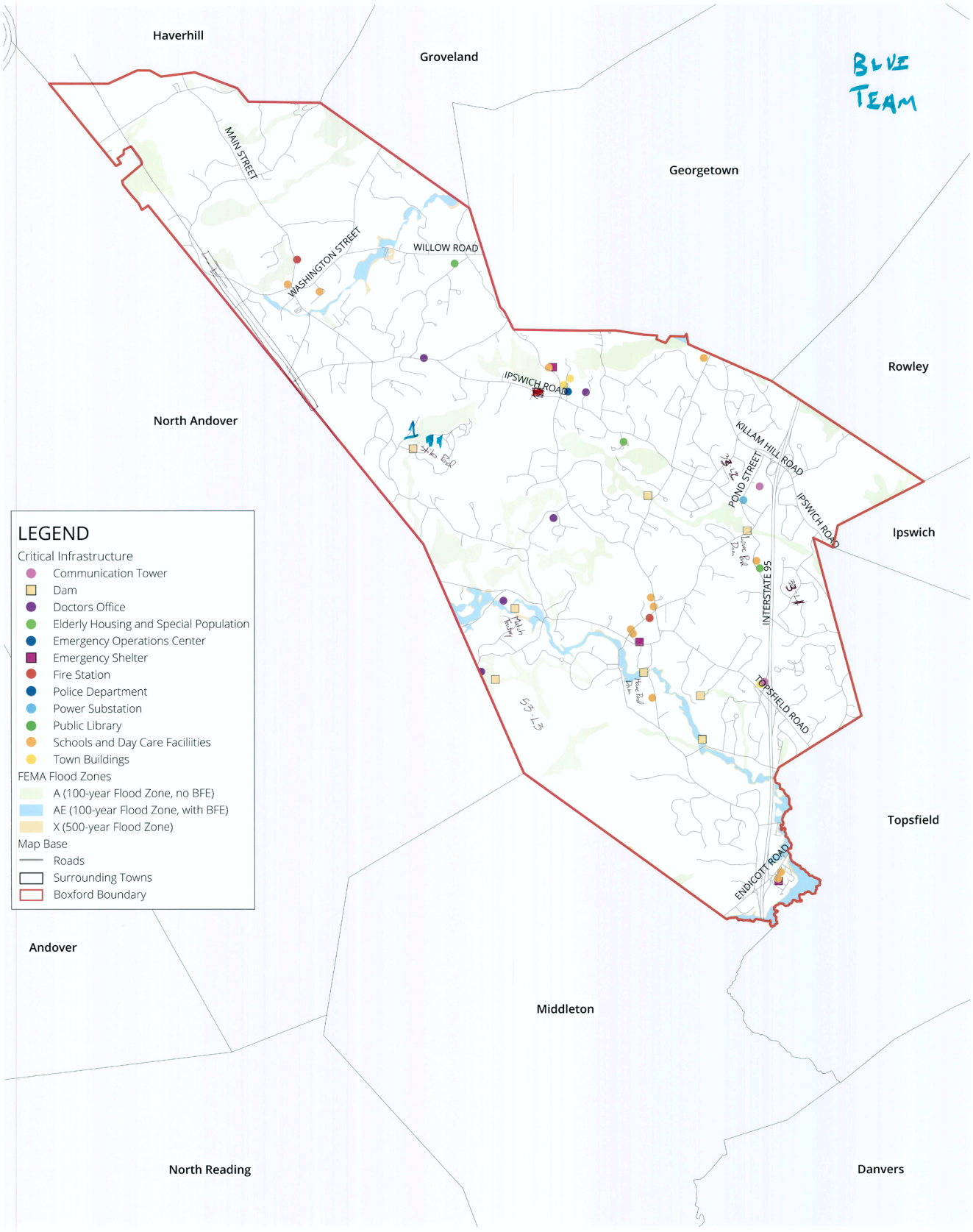

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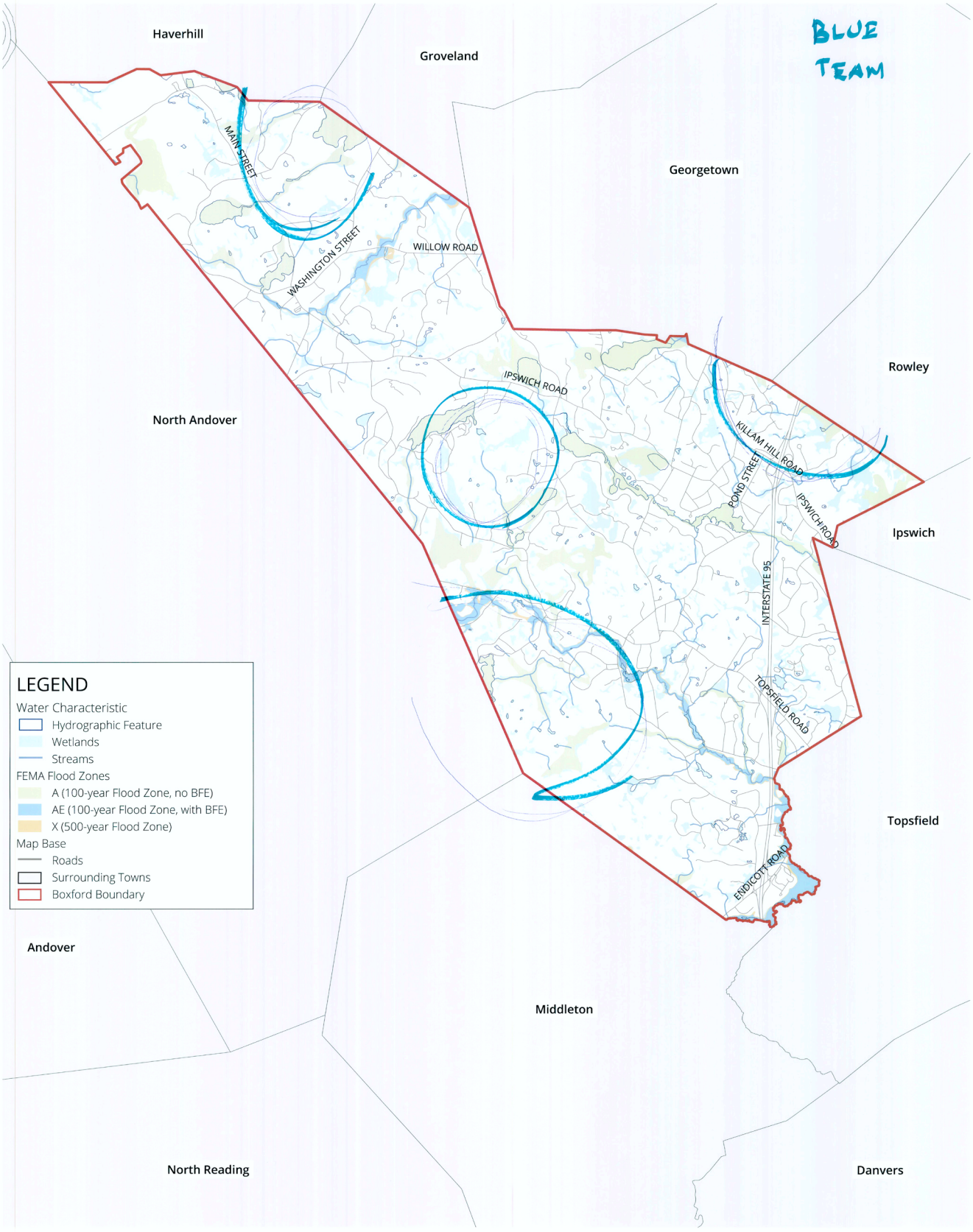

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Boxford MVP Workshops

December 2018

APPENDIX D: BOXFORD COMMUNITY RESILIENCE BUILDING WORKSHOP MATRICES AND TOP PRIORITY ACTIONS

RED TEAM

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING	MAJOR STORMS	DROUGHT/ HEAT	INVASIVE SPECIES	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Lack of Access (Rds, Bridges)		public	V	ID HOT SPOTS..	ACTION PLAN .. FIX PROBLEMS (CULVERT/BRIDGE) (WIDEN TRAILS)				S/L
Power Outages (Util/Comm.)		Util./ private	V	BURY POWER LINES.	TREE MAINT RDSIDE - TOWN/NAT GRID			H	S/O L
Centralized Shelter		town	V	EVALUATE: LOCATIONS + FACILITIES MULTIPLE CENTERS	COOL SHELTERS			M	
Municipal Infra (repeaters/generators)		town	S	SOLAR/BATTERIES/GENERATOR (TOWN/PRIVATE)				H	S/L
Dams		private	V	ID + EVALUATE CONDITION				L	
Private septic + wells		private	V/S						
Societal				RECHARGE ZONES!					
Communication about methods.		public/ personal	V	EDUCATION →	→ EVALUATION OF	IMPACT			
Methods of Communication		private/ public	S	– RESOURCE availability	(DP Comm)	Other Communities		H	
Capitalizing on Community/Education		town + private	V/S	– ID vulnerable people/homes – Census/Text Polls/Cable/website	social media → multiple channels				O
Lack of Public Transit		town/reg.	V	Add'l COA Driver for bus				M	S
Lack of shops/stores/services/goods		resident	V	school bus animal/vehicle collisions					
Volunteer-driven		private/ town	V/S	Staff shelters				M/H	S/O
Environmental				ID/Train/Educate/Evaluate Existing.					
Clean water		town/ private	V/S	SALT RUN-OFF — DRAINAGE Δ I-95	=			M	O/L
Fire ponds – dry/flood		town	V/S			Replace w/ tanks		L	L/O
Flooding – DEVELOPMENT		both	V	Cluster zoning/flood plain regs				M	O
Ticks/Disease bearing insects		"	V	EDUCATION/COMMUNICATION/ MESSAGING			Opt-In-to Spray		S
Trees		both	V/S				Cankers vs Shade	H	S/O
Habitat – Great Pond		both.	V/S						

Green Team

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H-M-L priority for action over the **S**hort or **L**ong term (and **O**ngoing)
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Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Drought/Fire	Wind (SE)	Winter Storms/Ice	Floods	Priority H-M-L	Time S Long O ngoing
Infrastructural			V/S	communication - neighbors; Maintenance - State			maintenance - state	H	S
Roads South of Fish Brook		town owned	V		prioritize access	NGrid - elect. Debris - DPW; inc. communication			
Main Street and Near Ipswich R/Fish Brook		town owned	V				clear debris (trees, etc) Maintenance - ConCom	H	ongoing
Mason (limestone)	SE Boxford	regional school district	V/S				Elizabeth/Washington St. culvert replacement	M	S
Dams	4 mile Pond, Lockwood, Lowes Pond	Town owned / Private	V	possibly update bylaws to allow communication of water status; public education - conservation	outside town water	regional partners; pub. education & work w/ state re: salt on 95; potential communication of ice-breaking programs	re-establish Streams committee; dam maintenance	H	O
Private Wells	throughout	Private	V					M/L	O
Culverts	Bothwell St, Bald Pate Rd, etc. throughout	Public / NGrid	V/S		explore small power systems (solar, wind), work w/ N.Grid for restoration		replacement	M	O
Societal			O						O
~~Mason - Public~~	~~SE Boxford~~	~~regional school district~~	~~V~~						
4-mile Village (Sr. Housing)	Ipswich Rd	private	V/S						
New Senior Housing Site near Rt 1 Wild Meadow Area	North & East Boxford	private			require info/planning for new units	wells (generators, toilets, water quality)		H	O
Isolated populations	throughout	private	V		communication update listings			H	O
Communication System	throughout		V/S	start neighborhood helping neighbor program	ham radio program?			H	O
Environmental									
Trees	Lake shore Rd, etc throughout	public/private	V/S	pine issue tree training/maintenance	hardwoods encouraged NGrid, community education	minimize		H	O
Beavers	throughout	public/private	V/S				beaver deceiver	M	O
Ticks	"	"	V	tick tubes - effectiveness?				M	O
Protected & Endangered Species Habitats	North South area		V/S	Continue to encourage access to trails in Boxford - trails group				L	O

BLUE TEAM

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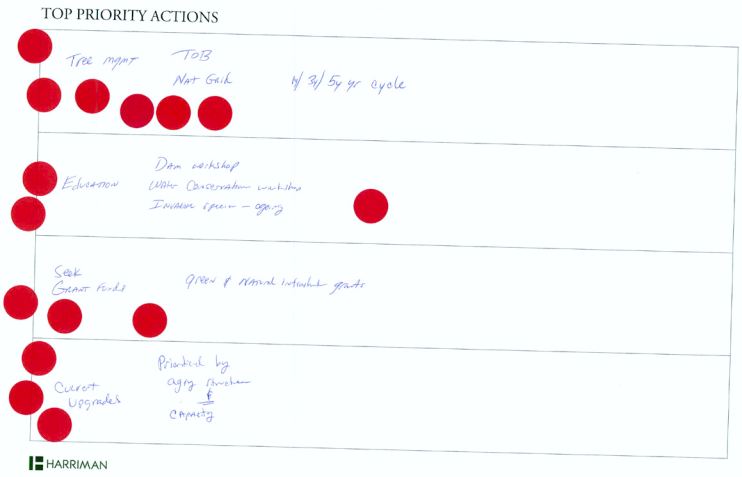
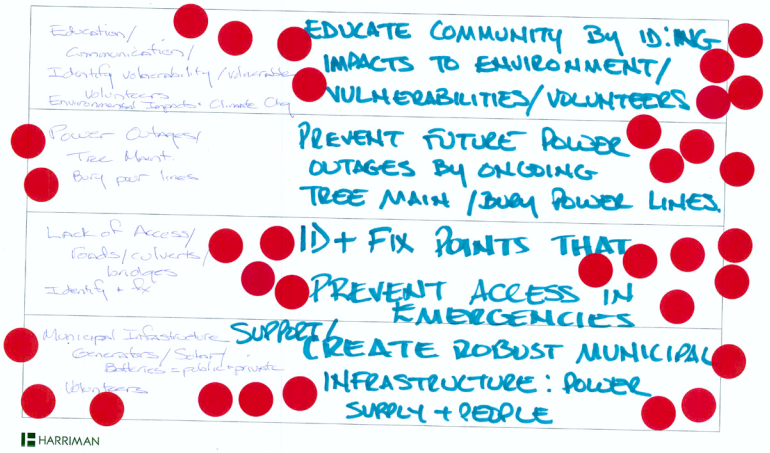
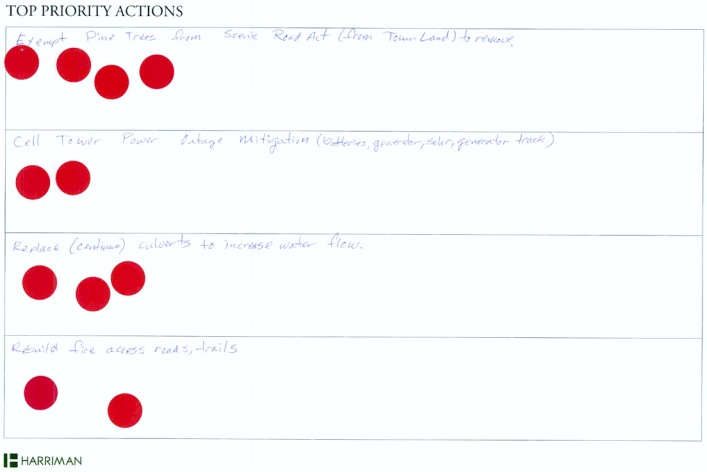
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	HIGH INTENSITY STORM EVENTS	FLOODING	DROUGHT VERY LOW RISK	WILD FIRE	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
ELECTRIC DISTRIBUTION	Everywhere	NGRID	V	TREE/VEG. MANAGEMENT NG.				H	1/3/5 YR
TRANSPORTATION ROADS, CULVERTS, BRIDGES	Everywhere	Town / State	V/S		CULVERTS / DAM MGMT			H	
DAMS - MGMT EDUCATION	various locations	Town / private	V		DAM MGMT. STAFF TO CLEAR DAMS/CULVERTS.			M	IMMEDIATE EDUCATION
PRIVATE WELLS, SEPTIC SYSTEMS	Everywhere	Private / town	V/S		HEAD DEPLETED SIPHN. UPSTREAM SEPTIC.	OLDER WELLS CHEM. COMPOSITION - EDUCATION		M	IMMEDIATE EDUCATION
NATURAL GAS DISTRIBUTION	Ipswich / marn	NGRID	S/V		LINES ALONG BRIDGES				
STORM WATER SWALES/DETENTION BASINS	everywhere	Town	V		CULVERTS / DAMS AGING INFRASTRUCTURE			H	
Societal									
PRIVATE HOMES (INCOME INFLUENCES VULNERABILITY)	everywhere	Private	V/S	NETWORK OF GENERATOR POWER;		GREEN & NATURAL SOLUTIONS	INFRASTRUCTURE - MEMA GRANTS	L	
SUBDIVISIONS	various locations	Private	V/S		WATER		FEMA EPA	M	
ELDERLY POPULATION	subset / various locations	Town / private	V/(S)	DATABASE & OUTREACH					
Emergency Response Systems/time lines	west / least.	Town	S					H	CONTINUOUS
MASCO Regional SCHOOL	south east corner	Regional / town	S						
Health outbreak (tri-town response)	Central	Regional / town	S						
Environmental									
TICK POPULATION	town wide	town/state	V						
Mosquitos	town wide	"	V						
Invasive Vegetations (changing vegetation)	town wide	"	V	ASH BORER - CUT TREES PRE-EMTIVELY - SHIFT IN ATTITUDE IN PUBLIC AND COST			EDUCATION		
Moths (winter + gypsy)	town wide	"	V						

Top Priority Actions







TOTAL
6
3
3
3
8
6
10
9
4
2
3
2

APPENDIX E: PUBLIC LISTENING SESSION NOTICE