Town of Canton

Municipal Vulnerability Preparedness (MVP) Community Resilience Building Workshop

Summary of Findings
February 2019

KLEINFELDER
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Town of Canton

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Overview:

The Town of Canton enrolled in the Municipal Vulnerability Preparedness (MVP) program to better understand vulnerability to climate change and its impact on the Town. The program is administered by the Massachusetts Executive Office of Energy and Environmental Affairs that awarded a $23,000 grant to implement the well-established Community Resilience Building Workshop (CRB) planning process. Upon completion of the planning grant process, the Town will achieve "MVP" designation by the Commonwealth and eligibility for future grants to implement projects identified.

The CRB process was carried out over several months, culminating in an intensive one-day workshop with community stakeholders, held on November 16, 2018 at the Canton Library. The workshop raised awareness, facilitated dialogue and experience-sharing, and generated ideas and momentum for building a more resilient Canton.

The workshop's objectives were to:

- Define local natural climate-related hazards of concern;
- Recognize existing strengths and vulnerabilities;
- Identify prioritized actions for the community; and
- Develop immediate actions to advance existing opportunities with a resiliency lens

The Canton Planning Department organized the workshop in collaboration with a Core Group established for the MVP program composed of different stakeholders, including the Town Planner, the Town Administrator, the Public Works Superintendent, the Town Engineer, the Building Commissioner, and the Police and Fire Chiefs (or their representatives). The Core Group selected Kleinfelder as the Town's state-certified MVP consultant to provide technical assistance on climate resiliency planning, workshop facilitation, and reporting. Later in the fall, the Public Health Nurse and members of the Sustainability Committee joined the Core Group.

Multi-stakeholder collaboration was critical to developing a holistic assessment of the community's climate risks and resiliency opportunities. Approximately 30 people participated in the workshop, including members of the Core Group, State and Town elected officials, Town department staff, representatives of various town committees, residents, non-profit organizations, and business owners. Workshop participants were assigned to small diversified teams for completing various tasks during the workshop.

1. Top Hazards and Vulnerabilities:

To start the workshop, Kleinfelder presented historical climate data and the best-available climate change projections related to the frequency, magnitude, and impact of each type of climate hazard in Canton. The presentation (Appendix A) referenced town-wide and regional-level climate change projections from the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, FEMA flood maps, and local knowledge from Town Staff. Hazards were overlaid with the Town's critical assets, as identified in two sources: The Town's 2018 Hazard Mitigation Plan and the Massachusetts Planning Council (MAPC) critical assets GIS layer.

Following the presentation, stakeholders participated in a full-group discussion about how each hazard had impacted Canton in the past and offered climate-related concerns about the future. Anecdotal stories were shared surrounding the 2010 extreme rainfall event and flooding around the Neponset River.

Facilitators reported that the three top hazards identified through meetings with the Core Group were flooding, wind and snow/ice. Workshop participants were asked to identify a fourth hazard for discussion in the latter parts of the workshop. Through this discussion, consensus amongst workshop attendees was reached to combine the hazards of extreme heat, drought, and brush fire under as a broad "heat-related" climate hazard.

Following the discussion on hazards, participants worked in small groups to identify infrastructural, societal, and environmental features related to these hazards. Features were categorized by their location, ownership, and whether they were a vulnerability, strength, or both. Participants used maps showing the location of community resources in relation to the FEMA flood zones, projected urban heat island zones, and storm surge and sea level rise floodplains. The maps and list of community resources are attached to this report for reference as Appendix B.

1.1 Top Hazards:

The four top hazards (not ranked) selected by workshop participants were:

- Flooding from extreme precipitation
- Heat (extreme heat, drought, brush fire)
- Wind
- Snow and Ice

The four top hazards chosen were identified as the hazards having the greatest direct impact on Canton in the recent past and at present. Of these, flooding was determined to be the highest priority hazard by the Core Group. Emergency communication systems, water quality, transportation, vulnerable populations, trees, municipal facilities, energy infrastructure, and dams were identified as at-risk assets. Extreme heat, while a historically infrequent hazard, was identified as a growing concern due to the recent drought's impact on water supplies and Sustainable Water Management Initiative (SWMI) requirements.

The Town has identified several historic flooding areas located on Dedham Street, Neponset Street, and Massapoag Brook (Frog Island). Areas susceptible to flooding in the past, are shown in a Flooding Map in Appendix B. Information to develop this flooding map was based on FEMA Flood Maps, the Town's Hazard Mitigation Plan, and discussions with members of the Core Group.

1.2 Vulnerabilities:

The list below summarizes the vulnerabilities as identified by participants during the MVP workshop. Vulnerabilities are identified by exposure to selected hazards and sorted by infrastructures (the built environment), ecosystems (water systems, trees and open space), and society (people and services)

- *Infrastructure*
    - ***Flood resiliency:*** Uncertainty on how existing emergency response plans consider climate change related hazards (such as flooding), including effects on critical infrastructure (such as collector roadways, bridges, dams, natural gas transmission mains, electric transmission and substations, communication cables/towers, drinking water treatment plants, drinking water wells, and water mains). Stormwater/sewer infrastructure may not be designed for future climate conditions. It should be noted that Emergency Responders have existing plans to mitigate, prepare for, respond to, and recover from flood-related hazards.
    - ***Heat:***
        - Excessive pavement in industrial areas contributing to urban heat island.
    - ***Wind:***
        - Impacts on power lines, trees, loss of electricity, and property damage
    - ***Snow/ice:*** Power lines and trees, commuter rail shutdown, deicers contaminating water bodies.
- *Ecosystems:*
    - ***Flooding:*** Impervious surfaces, industrial properties and contaminated run-off, trees (health, appropriate species, and understanding tree loss), pests contributing to public health issues and vegetation loss, development needs to consider climate change mitigation and adaptation, pesticide/herbicide used on golf courses, households storing pool chemicals in areas vulnerable to flooding
    - ***Heat:*** Trees species more vulnerable to drought, water quality brownouts and blackouts cause by high energy demand.
    - ***Wind:*** Trees
    - ***Snow/ice:*** Trees, contamination, deicers contaminating water bodies
- *Societal:*
    - ***Flooding, Heat, Wind, Snow/Ice: Emergency shelters,*** **and emergency communication** dependent on communication systems across multiple departments (Emergency Responders, Board of Selectmen, Management Information Systems), loss of power and dependency on cell phones, update evacuation senior housing, vulnerable population isolation, outdated buildings, lack of knowledge and understanding about extreme weather and climate change.

In addition, vulnerable facilities identified in the Canton Hazard Mitigation Plan were added to the list of vulnerable assets to consider:

- *Facilities:*
    - ***Flooding:*** Cole-Harrington Infant Toddler Center, York Brooke Christian Preschool, Bolivar Street Dam, Ponkapoag Pond Dam, Reservoir Pond Dam, Shepard Street Dam, Spillway @ The Viaduct, Washington Street Dam, Orchard Cove Senior Living Community, Senior Independent Living (Orchard Cove and Canton Point), Canton Public Library, Department of Public Works Garage, Fire Department

Station #2, Corrosion Control Facility Building, MWRA Water Connection, Springdale Pump Station, Wells #7, #10, #13, #2, #3, #5, #9, Paul Revere Heritage Site.

- ***Heat:*** Canton Village Condominiums, Orchard Cove Senior Housing, Hemenway Apartments (Canton Housing Authority), Lamplighter Village, Newell S Hagen, Rubin Court (Canton Housing Authority), Hellenic Nursing and Rehab Center, Blue Hills Regional Technical School, Massasoit Community College, Canton High School, Galvin Middle School, Dean S Luce Elementary School, JFK Elementary School, Lt Peter M Hansen Elementary School, Massachusetts Hospital School, Judge Rotenberg Educational Center, Blue Hill Montessori Preschool, Canton Community Kindergarten, Children's Garden Preschool, Cole-Harrington Infant Toddler Center, Cole-Harrington School Age Program, KinderCare Learning Center, Learning Circle Preschool, Yorkbrooke Christian Preschool, St John Church and School, Rodman Early Childhood Program.
- ***Wind:*** Blue Hill Montessori Preschool, Canton Community Kindergarten, Children's Garden Preschool, Cole-Harrington Infant Toddler Center, Cole-Harrington School Age Program, KinderCare Learning Center, Learning Circle Preschool, Yorkbrooke Christian Preschool, Cell Phone Towers, Cell Towers, Flag Poles, Comcast Cable Tower, Communication Tower, Fire Communication Tower, State Police Communication Tower, Fire Department (HQ), Fire Department Station #2, Rodman Early Childhood Program, Canton Public Library, Canton Town Hall, DPW Storage Facility, Police Department (HQ), Blue Hills Regional Technical School, Massasoit Community College, Canton High School, Dean S Luce Elementary School, JFK Elementary School, Judge Rotenberg Educational Center, Lt Peter Hansen School, Massachusetts Hospital School, Massasoit Community College, Saint John Elementary, William Galvin Middle School, Hemenway Apartments (Canton Housing Authority), Lamplighter Village, Newell S Hagen and Rubin Court Apartments (Canton Housing Authority), Senior Living: Orchard Cove, Canton Village, Canton Point, Cornerstone, Brightview, and Hellenic Nursing, Pecunit Street Water Treatment Facility, Neponset Street Water Treatment Facility, Tolman Street Standpipe, Randolph Water Storage Tank, Spheroid Water Storage Tank, Water Storage Tank, Well #7, Well #4.
- ***Snow/ice:*** Blue Hill Montessori Preschool, Canton Community Kindergarten, Children's Garden Preschool, Cole-Harrington Infant Toddler Center, Cole-Harrington School Age Program, KinderCare Learning Center, Learning Circle Preschool, Yorkbrooke Christian Preschool, Saint John Church and School, Blue Hills Reginal Technical School, Canton High School, Dean S Luce Elementary School, JFK Elementary School, Judge Rotenberg Educational Center, Lt Peter Hansen School, Massachusetts Hospital School, Massasoit Community College, William Galvin Middle School, Canton Center Commuter Rail Station, Canton Junction Commuter Rail Station, Cell Phone Towers, Cell Towers, Flag Poles, Comcast Cable Tower, Communication Tower, Fire Communication Tower, State Police Communication Tower, Bolivar Street Dam, Forge Pond Dam, Ponkapoag Pond Dam, Reservoir Pond Dam, Revere Street Dam, Shepard Street Dam, Hemenway Apartments (Canton Housing Authority), Lamplighter Village, Newell S Hagen and Rubin Court (Canton Housing Authority), Senior Living: Orchard Cove, Canton Village, Canton Point, Cornerstone, Brightview, and Hellenic Nursing, Fire Department Station #2, Rodman Early Childhood Program, Department of Public

Works Garage, Police Department (HQ), Electric Sub Station, Neponset Street Water Treatment Facility, Tollman Street Standpipe, Randolph Water Storage Tank, Spheroid Water Storage Tank, Water Storage Tank, Wells #2, #3, #4, #5, #9.

2. Climate Change Impacts, Challenges, and Strengths:

2.1. Climate Change Impacts

There was concern amongst workshop participants that the four main hazards will cause increasing damage and disruption in the community due increase in intensity caused by climate change. These climate-related hazards are discussed in greater detail below.

Flooding

Canton experienced notable impacts from climate hazards in recent years, especially heavy rainfall events (both short and long duration). Town officials indicated that they believe the Town's localized flooding challenges are due to lack of adequate drainage infrastructure. Many older roadways were constructed without proper drainage, while others have minimal stormwater systems that were designed to capture and convey smaller storm event as, for example the 10-year rainfall event. Roadways with inadequate drainage experience increased frequency and severity of flooding, either within the roadway or onto adjacent properties despite adequate maintenance of catch basins, culverts, drain pipes, and other stormwater structures. Improving drainage will require the installation of drainage infrastructure including stormwater infrastructures to convey and discharge increased volume of water in appropriate locations in addition to continued maintenance.

As heavy rainfall events become more frequent, existing flood management infrastructure will be under greater stress and will be less effective. Some residents also expressed concern that flood events could cause water quality contamination from household hazardous wastes and other sources of pollution.

Heat

During the heat wave in the summer of 2018, the Town responded to multiple heat-related emergencies. These extreme heat events can disproportionately affect vulnerable populations such as people with medical problems, the elderly, and young children.

Wind

Strong winds can occur during large storms such as nor'easters or hurricanes. The workshop participants expressed concern about the resilience of above ground utilities and power outages. Intense wind can cause fallen trees or branches, contributing to damage to above-ground infrastructure and potentially creating hazards in the right of way.

Snow/Ice

Canton's infrastructure, ecosystems and facilities are impacted by heavy snow and ice storms during winter months. Snow and ice storms also have a societal impact because of the impacts to roadways and public transportation. Residents of Canton expressed difficulty accessing the closest nearby hospitals in Milton and Norwood in weather emergencies, due to traffic backups and lack of alternative routes. Additionally, workshop participants identified that the roof of the Town's Ice Rink

(Metropolis Rink) collapsed in 2015, under the weight of snow and were concerned about the condition of other Town-owned structures.

2.2 Challenges

Workshop participants identified potential areas of concerns based on the climate change impacts and vulnerabilities discussed above.

Energy Infrastructure

The Town may be vulnerable to decreases in energy reliability due to the impacts of climate changes and changing patterns in energy use. Climate change will likely increase the number of days buildings require cooling and decrease the number of days buildings needed for heating. Additionally, increased frequency and intensity of winter storm events exacerbate the risks to above-ground infrastructure including electrical transmission lines, particularly related to fallen trees.

Additionally, workshop participants identified that lack of energy power supplies or backup generators at critical Town-owned facilities is a challenge. Facilities that serve vulnerable populations such as Canton Housing Authority Housing (state agency), private Senior Living communities, and the Senior Center (public) could be impacted by loss of power. Power loss could prevent key facilities from providing important public health and societal services to vulnerable populations and society. While the Town has some solar infrastructure, for example at the High School, the capacity is limited. The Town might be exposed to brownouts during peak demand in summertime or due to downed powerlines in winter snow/ice and wind storms.

The Town currently lacks the ability to require private utility owners to make proactive upgrades to electric infrastructure. Deficient infrastructure could increase risk of power outages that impact the Town, its residents, and its businesses. The Town is not currently a member of regional collaboration efforts to promote energy infrastructure resilience.

Dams

The Town of Canton has multiple dams which provide flood protection recreation, aesthetic, cultural, and waterfront benefits. Data from the Office of Dam Safety identified the following dams in Canton:

Identifier	Owner	Dam Name
MA00166	Town of Canton	Reservoir Pond Dam
MA00806	Town of Canton	Forge Pond Dam
MA00807	Town of Canton	Bolivar Pond Dam
MA01162	Town of Canton	Shepard Pond Dam
MA03104	Town of Canton	Old Shepard Street Dam
MA03105	Private	Revere Street Dam
MA03106	MBTA - MA Bay Transit Authority	Spillway Dam at Neponset St.
MA03107	DCR - Dept. of Conservation & Recreation	Ponkapoag Pond Dam
Note: The owner of MA00166 was updated to the Town of Canton based on information from the Town that the ownership of this dam was transferred		

The Office of Dam Safety classified all dams with the hazard code "significant risk," indicating that failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities. As of February 2017, Massachusetts Dam Safety Regulations were modified to require owners of Significant Hazard Dams to prepare and submit to MassDEP Emergency Action Plans (EAP) including a dam failure inundation map.

According to the Department of Public Works, the condition of dams has come to the forefront of the Town's attention in recent years, and the Town has accordingly made significant investments in the maintenance of dams. In 2018, improvements were made to both Reservoir Pond Dam and Old Shepard Street Dam to improve the structural integrity of the infrastructure. Participants identified that structural integrity of the dams continues to be a concern for the future. As infrastructure ages and precipitation patterns change, the structural integrity of the dams could require additional maintenance. Since some dams are owned by other parties, ensuring the structural integrity of these Dams is outside of the Town's direct control.

Transportation

Workshop participants identified numerous vulnerabilities in the transportation system with specific consideration to few key locations most vulnerable to identified hazards. The reliability of the transportation system is of concern because of the potential impacts on life safety and the economy. Flooding and snow storms increase roadway accidents, disrupt emergency response activities, and accelerate roadway degradation. Commuter rail continuity was also a concern for residents who rely on the regional transportation system to commute to work in Boston. It was also noted that many of the routes potentially exposed to flooding would impact people's commutes to and from Boston. It was reported that roadway drainage systems are not adequately sized or designed for future storms.

Communication System

Redundancy of emergency communication systems was a concern for many workshop participants. Current emergency communication requires citizens to opt-in, which could limit the reach or effectiveness of messaging in an emergency. Additional avenues of communication rely on the coordination between emergency responders, multiple Town departments, and State and Federal Agencies.

Water Quality

Water quality of surface waters, such as rivers, streams, and ponds were identified as an ongoing issue in Canton. Waterbodies receive runoff from the Town's drainage system. Water bodies adjacent to industrial sites were particularly vulnerable natural resources during extreme precipitation events. With increased rainfall, participants were concerned that pollution from roadway, residential storage of contaminants, and industrial site runoff would exacerbate existing issues. Participants mentioned that residents may lack education about how their actions impacts water quality. Participants also highlighted concerns about roadway salt treatments and leakage and overflows from sewer systems into the waterways.

Trees

Trees on both public and private property become more important for mitigating the impact of extreme heat, however they will face increasing environmental threats due to climate change.

Participants expressed concerns related to wildlife management and the risk of non-native species thriving in warmer conditions impacting the health of ecosystems.

Tree management was a primary concern for participants. Existing trees in poor health or planting the wrong types of trees unable to sustain projected climate change conditions can allow for greater risk to energy infrastructure, general safety issues if branches were to fall, and could create greater susceptibility to invasion species.

Vulnerable Populations

According to the last census and emphasized during the workshop, the Town has a large and growing population of elderly and foreign-born residents. These demographic groups disproportionately depend on bus transit, affordable housing, food delivery, translation of emergency messages and notifications in native language, and access to medical services. Increasing hazards may impact the continuity of these services. Vulnerable populations also face heightened health risks from hazard exposure (such as extreme heat or cold), disruptions to utility services, and increased heat/cooling cost burdens. Participants questioned whether the Town has a list of seniors in different programs, and senior facilities to prioritize for power restoration.

Municipal Facilities

Canton's municipal buildings were identified has being vulnerable to several hazards during the workshop. The reliability of roofs, particularly flat roofs, under more frequent extreme weather events was a concern to workshop participants.

Schools, hospitals, and residential health care centers (such as the Pappas Rehabilitation Hospital for Children and the Rotenberg Center) are critical facilities offering public health services to the community. The Town identified that some of these areas are susceptible to multiple hazards, including flooding.

Emergency responders and residents will require access to municipal facilities which serve as emergency shelters, and, adequate supplies and preparations will need to be made in advance of climate related hazards so that emergency response plans can be implemented.

2.3 Strengths and Assets:

By attending and participating in this workshop, residents of Canton demonstrated their commitment and activism which is an invaluable strength to the community. When planning for resilience in the face of extreme weather events, these qualities provide a strong basis. The following list captures the wide range of other strengths and assets identified by workshop participants:

- The community is interested in and committed to building resiliency, as demonstrated by the participation of a broad swath of stakeholders in the workshop. This community can provide support to on-going efforts and maintain the momentum for implementation of resiliency next steps.

- This community has well-connected residents who could be leveraged in an emergency to facilitate communication.

- The wetlands and interconnected ecosystem throughout the Town can be enhanced to contribute to resiliency.

- The Town has a dedicated staff working on stormwater infrastructure improvements.

- The Town's High School has an existing independent renewable source of energy with the potential to be to provide resiliency in electrical grid failure at a small scale.

Additionally, the Town is undertaking multiple planning efforts which could help mitigate the effects of climate related hazards. Some of these efforts include updates to the Town's Master Plan, Open Space and Recreation Plan, Emergency Management Plan (with support from Massachusetts Emergency Management Agency), and revisions to Flood Maps (with support from FEMA).

3. Top Recommendations to Improve Resilience to Hazards:

In the second part of the workshop, Kleinfelder presented case examples of community resilience actions potentially relevant to Canton. Participants then worked in small groups to generate lists of potential actions to reduce Canton's vulnerabilities and reinforce its strengths (Appendix C). They were asked to consider whether the actions address multiple hazards, are intermediate steps, or strengthen existing initiatives and cost. Next, they prioritized actions and differentiated them as short-term, long-term, and ongoing. As a final step of the Workshop, each group was asked to identify their top three recommendations to improve resilience to hazards in Canton.

3.1 Top Recommendations

The following list of top recommendations, which is intended to provide guidance to the Town on next steps, was presented to attendees at the Listening Session on January 28, 2019. A sign-in sheet from this session is included as Appendix D. Attendees of the Listening Session participated in a dot voting activity and were asked to identify three of these top priority actions that would best support community resilience in Canton. The number of votes each action received is indicated in parentheses. The action receiving the most votes, with 10, was a public education program on climate change and climate-related hazards. Participants indicated that this action, if implemented in Canton, should leverage existing educational materials. The list of high priority actions presented below is organized into categories (infrastructure, societal, and ecosystem) rather than by vote rank. Examples of other communities that have implemented similar actions are also provided, where information was readily available.

Category 1. Infrastructure Priority Actions

i. Town wide Drainage and Stormwater Infrastructure

Action A: *Implement stormwater infrastructure incentives and guidelines for improvement (0):*

- Include offsite mitigation and installation of green infrastructure in future projects.
- Develop new and retrofit drainage design guidelines that factor future climate change projections
- Develop a prioritized list of infrastructure projects that could be funded through new development
- Build partnerships between the Town and other regional organizations.

Action B: *Improve Long-term resiliency of dam infrastructure (1)*

- Conduct a dam condition assessment under consideration of future climate

Example:
MassPort Disaster and Infrastructure Resiliency Plan: The Massachusetts Port Authority (MassPort) prepared a climate preparedness plan for their facilities, which included a hazards analysis, vulnerability assessment, and resiliency action plan.
Source: http://www.massport.com/media/1149/massport-floodproofing-design-guide-revised-april-2015.pdf

Action C: *Proceed with a Town wide or Targeted Hydrologic/ Hydraulic drainage evaluation (4):*

- Identify most at-risk areas to flooding under future climate scenarios
- Assess targeted flood mitigation solutions for those areas

Action D: *Focus on a flooding risk assessment and pre-planning for projected flooding impacts including emergency energy supplies (6)*

- Identify evacuation routes impacted by hazards
- Provide generators for facilities that serve vulnerable populations or emergency shelters (including the senior center)

Example:
City of Medford: Medford is currently conducting a study to gain better understanding of drainage infrastructure in high priority areas with funding provided through the MVP Action Grant Program.
Source: http://www.newea.org/wp-content/uploads/2018/11/NEWEA_CSO18_AHunt.pdf

ii. Climate Change Risk and Vulnerability Assessment and Resiliency Guidelines

Action A: *Complete a comprehensive climate change risk and vulnerability assessment (1):*

- Use future climate projections, the Hazard Mitigation Plan, and related data to identify hazards and target strategies to reduce the vulnerability of critical assets or impacts to specific populations. To accomplish this, the Town could floodproof municipal buildings or complete a more detailed HMP for specific assets or areas. Some of the critical infrastructure in the Town is clustered and sometimes located in the floodplain. This plan could be for hardening specific assets or a specific area in Town for climate related hazards.

Action B: *Develop a resiliency plan for critical Town-owned buildings (2)*

- Conduct a survey for emergency services (cooling/warming; food shelters)
- Work with the Building Commissioner, Building Department, Building Renovation Committee, and/or the Board of Selectmen to identify what is cost effective for multiple uses and what exists in Town's inventory, and identifying back-up sites for emergency operations

Example:

Climate Change Vulnerability Assessment, City of Cambridge: The City of Cambridge conducted a Climate Change Vulnerability Assessment (CCVA) to understand risks posed by climate change the implications of making the community more resilient.
Source:
https://www.cambridgema.gov/CDD/Projects/Climate/climatechangeresilianceandadaptation.aspx

Action C: *Implement adaptation/resiliency strategies to harden critical buildings used for shelter and infrastructure that serves these facilities (2)*

- Develop a program for shelters at schools, especially Galvin School and High School
- Develop cooling and warming center on at the Library

Category 2. Societal

i. Interactions with the public

Action A: *Initiate an education program/campaign on climate change (10):*

- Use effective communication strategies, including the Town's website and social media, for public information related to preparedness
- Develop a program for education on awareness of climate change impact and possible preparedness measures; e.g. talk to your neighbors and help others

Example:
Somerville Climate Forward: The City's comprehensive climate change plan to set goals to prepared for the effects of and reduce the contribution to climate change.
Source: https://www.somervillema.gov/climateforward

Action B: *Improve the Town communication networks (1):*

- Identify strategies in partnership with kids for engaging families who do not speak English at home.
- Identify neighborhoods with vulnerable populations
- Reach to people through emergency messaging (opt-in vs all-in);
- Expand on set of tools available to Town staff and developing outreach material on messaging tools (Everbridge/Code Red alert)
- Expand social media use to communicate before/during/ after weather related emergencies.

Action C: *Create Partnerships (7)*

- Create partnerships between the Town and industrial property owners for property redevelopment to limit impact from climate change, mainly flooding of industrial properties and opportunities in reducing urban heat islands.
- Change regulations and zoning to require that major redevelopment meet standards to mitigate climate related hazards
- Research stormwater infrastructure incentives and develop strategic relationships with vendors or providers of environmental products (such solar panels vendors, tree nurseries, or green infrastructure vendors) leading to implementation of improvements. Example: vendors may

provide a feasibility study or optimization plans with special rates or other incentives for property owners to act

Category 3. Environmental

Action A: *Protect open space and water resources (3)*

- Develop a detailed study to assess possible impact of climate change on the Town wetlands.
- Implement regulatory controls or policy changes addressing climate change (ex: legal mechanisms to promote low-impact development, and protect open space areas).
- Protect wells from contamination on private properties abutting wetlands or that are part of critical watershed.

Action B: *Manage watershed across the region (4)*

- Contribute to regional initiatives on water quality and groundwater protection for example, Neponset Valley Watershed Association, Massachusetts Water Resources Authority (MWRA), Massachusetts Department of Environmental Protection (MassDEP)
- Study impacts of increased development and increased rates of summer drought on existing water supply (dependency on local wells versus MWRA)
- Contribute to regional initiatives for the protection of potable water, "what we drink"

Example:
Mystic River Watershed Association: Communities around the Mystic River have joined together to collaboratively act on climate resilience.
Source: https://mysticriver.org/the-work/#climateanchor

Action C: *Improve Hazardous Waste Collection (2)*

- Increase household hazardous waste collection days
- Educate about special measures; "what to do" for waste collection during flooding/heat
- Designate location for drop-offs (paints, tires, etc.) regularly during the year
- Identify and Eliminate pollution sources

3.2 Other Potential Actions

The following list captures the other potential actions identified by workshop participants, organized by priority (but not ranked). These recommendations were generated and prioritized in small group discussions. Additional high priority actions from the listening session are included in this section.

(Other) Highest Priority

- Develop more redundancy in the Town communication networks
- Update the regulations for the stormwater bylaws.
- Increase or facilitate more hazardous waste collection/drop-off points
- Install smart grids for complexes such as senior housing.
- Update the Town evacuation plan.
- Change design standards.
- Make schools warming centers and extend library hours to Saturdays for shelter/centers.
- Sign up residents for Town alerts, and encourage them to opt-in.
- Develop or update a plan to shelter or relocate those who are considered at-risk should a snow, ice, or heat emergency or electrical power outage occur.
- Complete an assessment of communication utilities.
- Proactive tree management.
- Implement groundwater reuse systems and encourage the use of rain barrels.
- Efforts to mitigate climate change and greenhouse gas emissions, such as transitioning to sustainable energy. This action could include regional collaboration (from Listening Session).
- Planning and zoning to ensure that development of of residential, commercial, and industrial spaces are in alignment with Town goals and minimize hazards (from Listening Session).
- Enhance the use of the Sustainability Committee to achieve the Town's goals (from Listening Session).
- Maintenance of Private Dams (from Listening Session).
- Expand study of climate-related hazards to improve understanding of how the Town's local actions are a part of global, regional, and state-wide trends and efforts, specifically from a public health and safety context (from Listening Session).

Moderate Priority

- Build an east-west road that would provide an alternate evacuation route.
- Create a more comprehensive mobility plan that would encourage the sidewalk update program to invest in redundancy (e.g. Sidewalks, bike lanes).
- Communication of the severity and duration of energy and power outages.

- Increase Canton's energy self-sufficiency.
- Invest in underground infrastructure.
- Advocate for regional resiliency of large gas transmission lines.
- Conduct a more detailed flood assessment including new flood maps.
- Conduct bridge inspections and assessments.
- Encourage residents to sewer their properties and educate on septic systems.
- Maintain emergency response equipment.
- School-based community service.
- Expand communication system to preserve economic/business continuity.
- Educate the public about groundwater, aquifers, wetlands, planning protection, and restoration.
- Update zoning bylaws to incentivize meaningful development.
- Organic de-icing before and after snow events.
- Remove standing water to prevent pests/disease.
- Update sub-division rules and regulations.
- Implement restrictions and easements for insects and pests, and animal control should spray areas containing pests.

Lowest Priority

- Communicate disruptions in service of commuter rail to residents.
- Encourage leadership discussions to promote programs and hire new staff to specialize in emergency response.
- Educate high-risk communities.
- Build a community garden at the Senior Center.
- Build a redundant emergency communication system for seniors, public housing, and assisted living facilities.
- Tap industrial properties to contribute to climate change resiliency (e.g. Solar panels, water management).
- Coordinate with power company to prevent disease and falling power lines.

4. Affiliation of Workshop Participants and Invitees

- Town Administrator - Charlie Aspinwall
- Board of Selectmen - Mark Porter
- Massachusetts State Representative - Bill Galvin

- Planning Department - Laura Smead
- Board of Health - Cindy Bonner
- Council on Aging - Robin Tobin
- DPW/Engineering - Barbara Reardon
- Library - Andrea Capone
- Sustainability Committee - Tim Calabrese
- Walk Bike and Hike Committee, Sustainability Committee, Planning Board - Patti McDermott
- School Committee (formerly Finance Committee) - Nichola Gallagher
- Historic Commission and Trustees of the Public Library - Emily Prigot
- Commission on Disability, Conservation Administrator - Heather Cahill
- Finance Committee; Master Plan Steering Committee, Economic Development Committee - Emilio Mauro
- Police Department – Lt. Patty Sherrill
- Fire Department – Deputy Chief Scott Johnson
- Emergency Management – Dennis Mitchell
- Building Commissioner – Ed Walsh
- Neponset Valley Watershed Association – Ian Cooke and Kerry Snyder
- Stormwater Task Force Member; Comprehensive Water Resource Management Plan; Canton Association of Business and Industry member - Mike Fabbiano
- Housing Authority Executive Director – Mark Roy
- Building Renovations Committee member – Maureen McDonough
- General Manager, Greater Boston - The Trustees of Reservations – Vidya Tikku
- Planning Board, Community Preservation Committee, Capital Planning Committee – Bob Panio
- Retired Meteorologist and former Board member – Jim Sims

Invited, Not in Attendance:

- *(Other) Board of Selectmen members*
- *Board of Health Director*
- *School Superintendent*
- *Conservation Agent (temporary)*
- *Director of Parks and Recreation*
- *Animal Control*
- *GIS Analyst*
- *Finance Director*
- *DPW Superintendent*
- *Council on Aging Director*
- *Assistant Town Engineer*
- *(other) Comprehensive Water Resource Management Plan Committee members*
- *Building Maintenance Technician*
- *Facilities Director, Schools*
- *(other) Sustainability Committee members*
- *(other) Planning Board members*
- *(other) Board of Health members*
- *(other) School Committee members*
- *(other) Historic Commission members*

- *(other) Conservation Commission members*
- *Open Space and Recreation Plan Committee*
- *(other) Commission on Disability members*
- *Water and Sewer Rate Policy Committee*
- *Playground and Recreation Commission*
- *(other) Community Preservation Committee members*
- *(other) Capital Planning Committee members*
- *(other) Finance Committee members*
- *(other) Walk, Bike, and Hike Committee members*
- *(other) Council on Aging members*
- *Youth Commission*
- *Zoning Board of Appeals*
- *Police Chief*
- *Fire Chief*
- *(other) Traffic Committee members(other) Master Plan Steering Committee members*
- *Neighboring Town Planners (TRIC)*
- *Metropolitan Area Planning Council TRIC Regional Coordinator*
- *Reservoir Pond Association members*
- *Massachusetts Emergency Management Agency*
- *Neponset Valley Chamber of Commerce President and CEO*
- *Canton Downtown Business Association members and leadership*
- *(other) Housing Authority Board of Directors*
- *Museum of American Bird Art and other Policy staff from Mass Audubon*
- *Water Resource Scientist, Nature Conservancy*
- *Massasoit Community College, Sustainable Massasoit Task Force leader*
- *Blue Hills Regional Tech Superintendent/Director*
- *Cornerstone at Canton Executive Director*
- *Green Communities Coordinator for Southeast Region*
- *MWRA Community Relations Manager*

<u>Workshop Project Team:</u>

Planning Department:

- Laura Smead (Town Planner)

Kleinfelder:

- Nathalie Beauvais (Facilitator, Project Manager)
- Kirsten Ryan (Facilitator)
- Indrani Ghosh (Facilitator)
- Robin Seidel (MVP Certified Provider)
- Andrew Goldberg (Facilitator)

Core Group:

- Laura Smead (Town Planner)
- Charlie Aspinwall (Town Administrator)
- Mike Trotta (DPW Director)
- Barbara Reardon (Town Engineer)

- Ed Walsh (Building Inspector)
- Kenneth Berkowitz (Fire Chief)
- Charles Doody (Police Chief)
- Cindy Bonner (Public Health Nurse)
- Sustainability Committee members: Rachel Forsyth, Tim Calabrese, Patti McDermott

Citation:

Town of Canton (2019), Community Resilience Building Workshop: Summary of Findings. Planning Department and Kleinfelder. Canton, Massachusetts.

References:

The Nature Conservancy & Community Resilience Building (No Date), Community Resilience Building Workshop Guide

Town of Canton (2018), Town of Canton Hazard Mitigation Plan 2018 Update, Prepared by GCG Associates, Inc.

Town of Canton (2018), Town of Canton Draft Open Space and Recreation Plan, Prepared by Weston & Sampson

Executive Office of Public Safety and Security (2003) Flooding Plan for the Town of Canton

MAPC (2018) GIS layers: Hot Spots and Critical Assets

MassGIS (2012), GIS Layer: Dams, Accessed from: https://docs.digital.mass.gov/dataset/massgis-data-dams

Acknowledgements:

Special thanks to:

- Massachusetts Executive Office of Energy and Environmental Affairs for providing the Town with grant funding to implement the CRB process.
- Massachusetts State Representative Bill Galvin for his leadership, support, and participation in the workshop.
- Board of Selectmen, Chair, Mark Porter and Town Administrator, Charlie Aspinwall, for their leadership support and active participation in the workshop.
- Town Planner, Laura Smead, for her passion, time, and dedication to the Town of Canton
- Core group members and workshop participants for investing their time, focus, and passion into the workshop and moving the identified priorities forward.
- Massachusetts Planning Council (MAPC) for providing data on the Town's critical assets and urban heat islands

Canton Community Resilience building Workshop

November 16, 2018

KLEINFELDER

Workshop Agenda

I.	Kick-off	9:00 am
II.	Hazards o Presentation and large group discussion	9:40 am
III.	Break	10:30 am
IV.	Community Strengths and Vulnerabilities o Presentation o Small group exercise o Small groups present findings	10:45 am
V.	Lunch	12:00 pm
VI.	Community Actions o Presentation o Small group exercise	1:00 pm
VII.	Break	2:45 pm
VIII.	Priority Actions o Small group exercise o Small groups present findings	3:00 pm
IX.	Summary and Closing	4:00 pm

Introduce Yourselves!

- **Name**
- **Affiliation**
  - *(department, organization, business, resident, etc.)*
- **One of your favorite things about Canton**
  - *(community value, place, thing, person, etc.)*

Ground Rules

1. Everyone must participate (and listen)
2. Everyone's input is equally valued
3. Disagree without being disagreeable
4. No side conversations
5. Stay on topic

II. HAZARDS

What are Canton's past, current, and future hazards?

Heavy Rainfall

Ice/Snow Storms

Wind

Extreme Heat

Brush Fires

Drought

KLEINFELDER

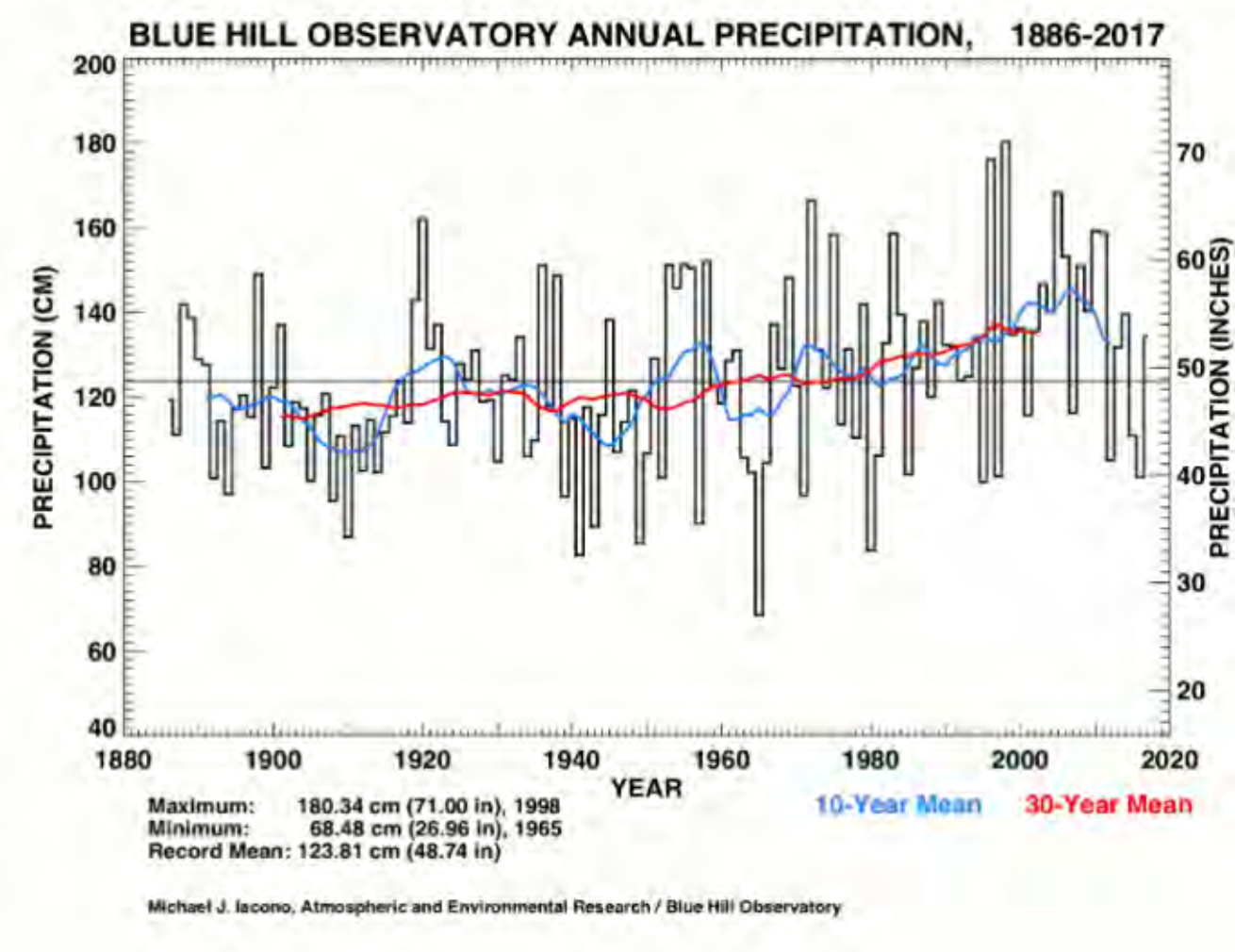
What is Climate Change?

Heavy Rainfall - Historic

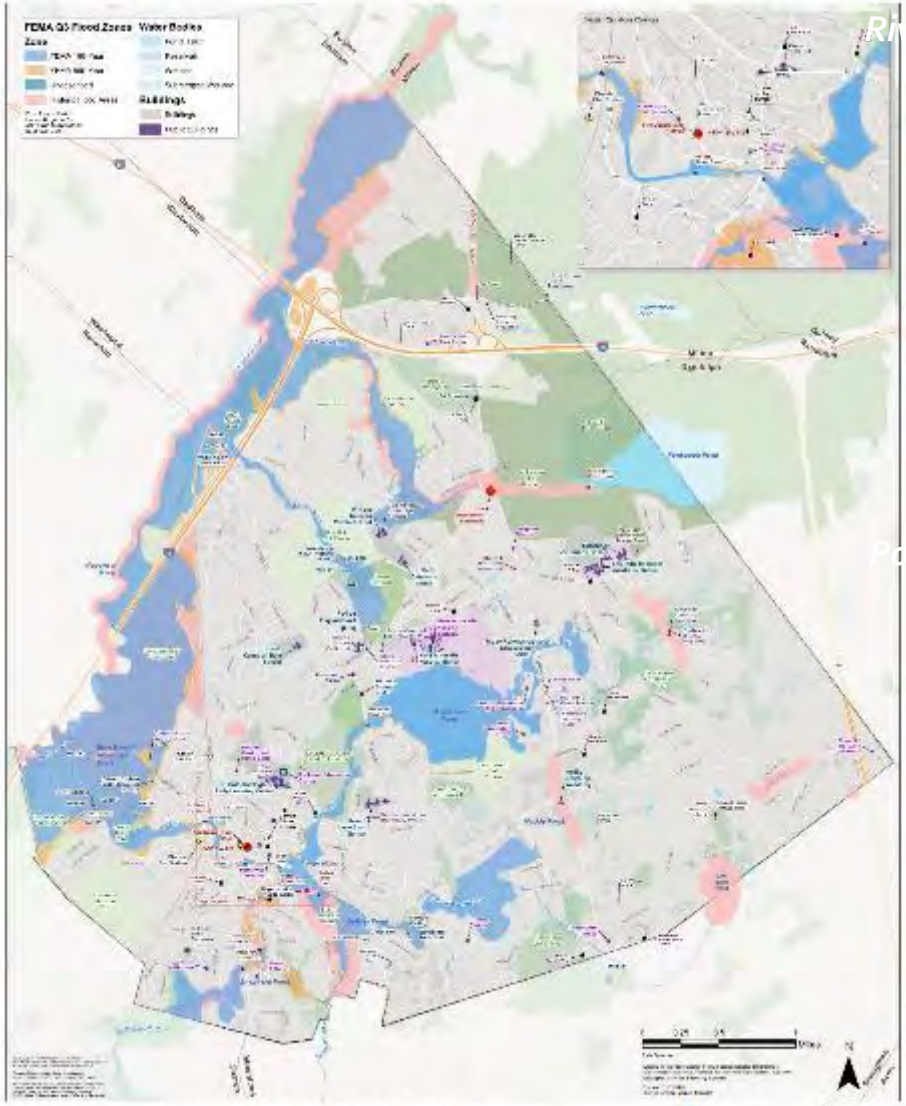
- Heavy rainfall already causes flooding in Canton.
  - March 2010
- Impacts: infrastructure, property damage, loss of life/injury, natural resources

Two types of rainfall flooding:

- Overbank flooding (Neponset River)
- Drainage flooding



Heavy Rainfall – Historic Riverine and Piped Infrastructure Flooding



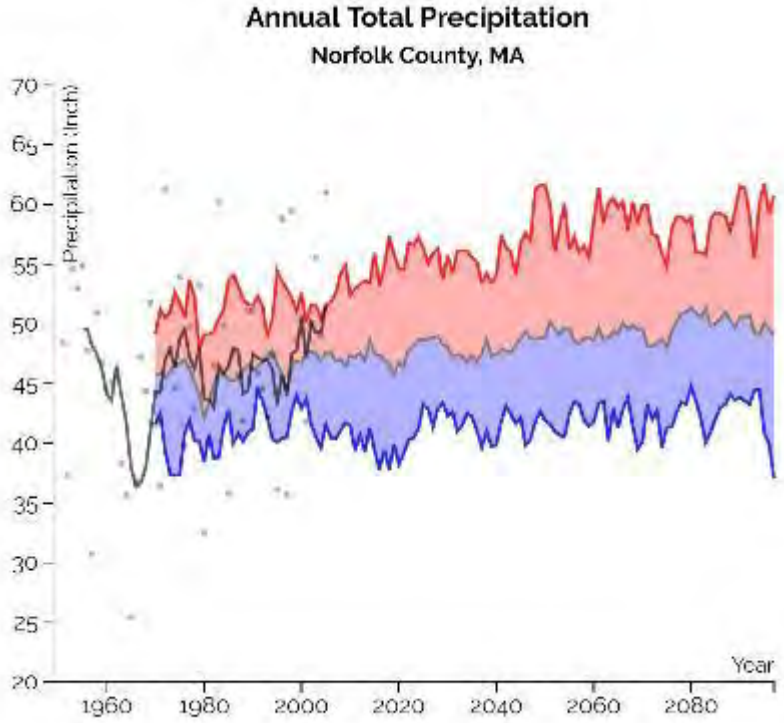
Canton Flood Risk Areas

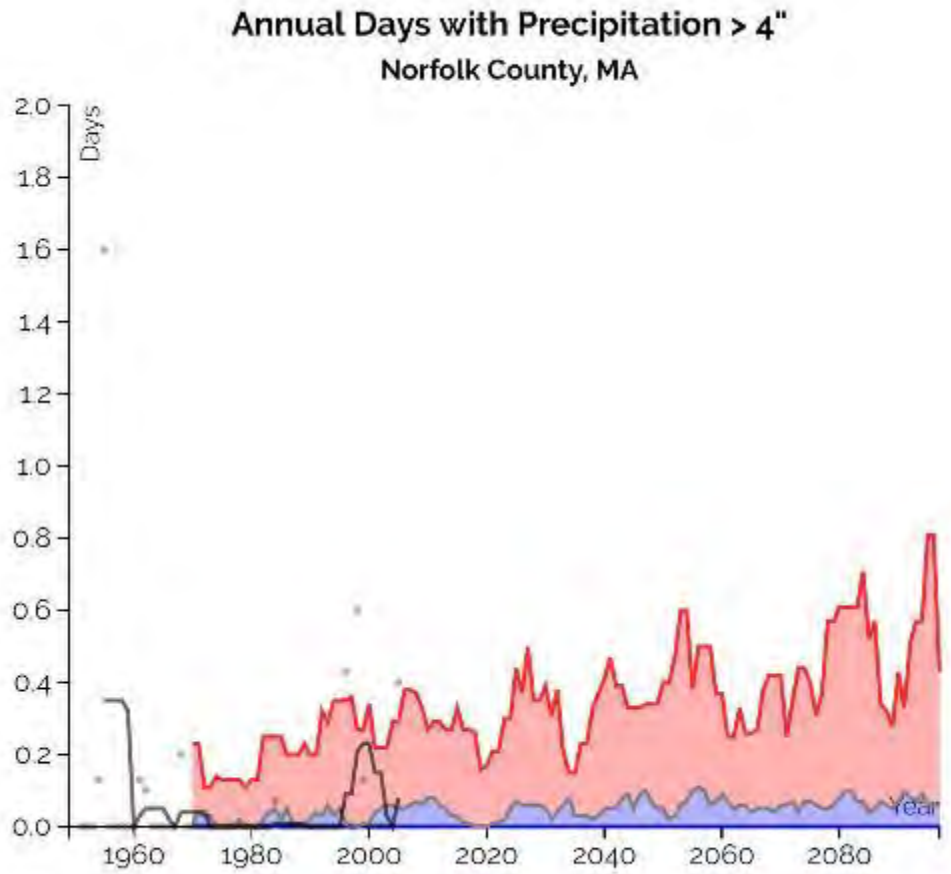
Private dam washout 2010

Neponset St

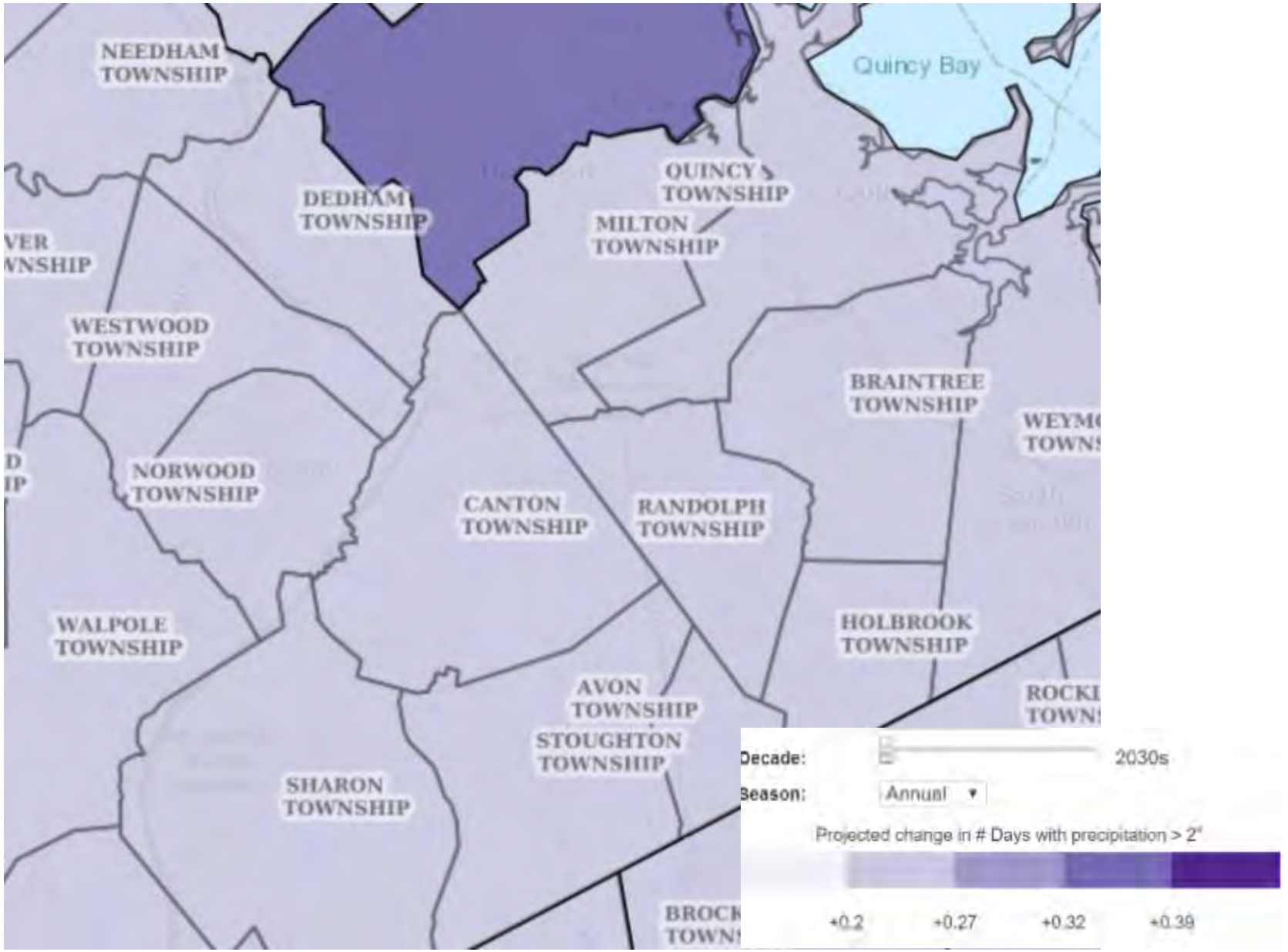
Heavy Rainfall – Future Projections

- Total annual rainfall will increase
- Heavy rainfall events will become more frequent

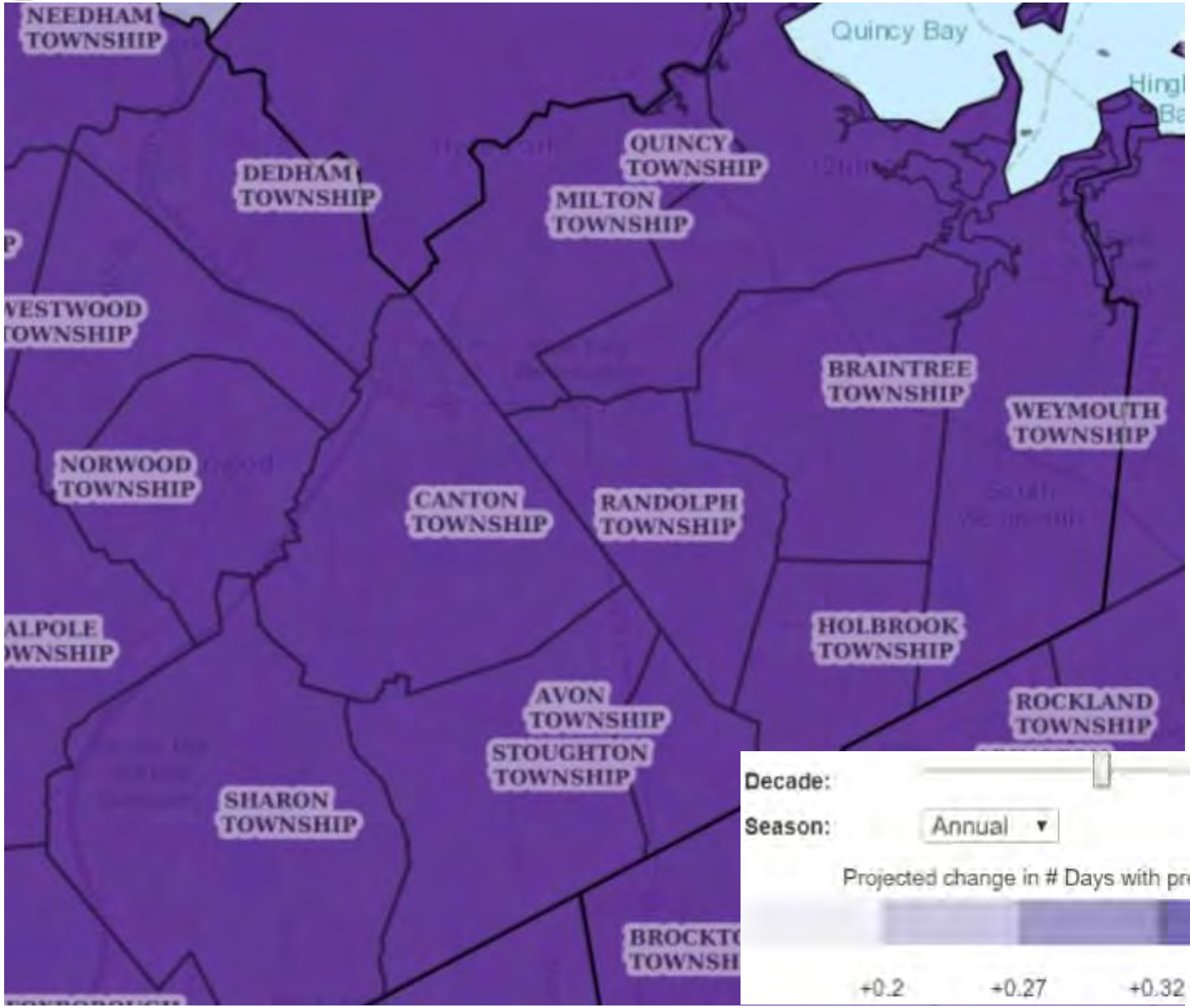




HEAVY RAINFALL - 2030

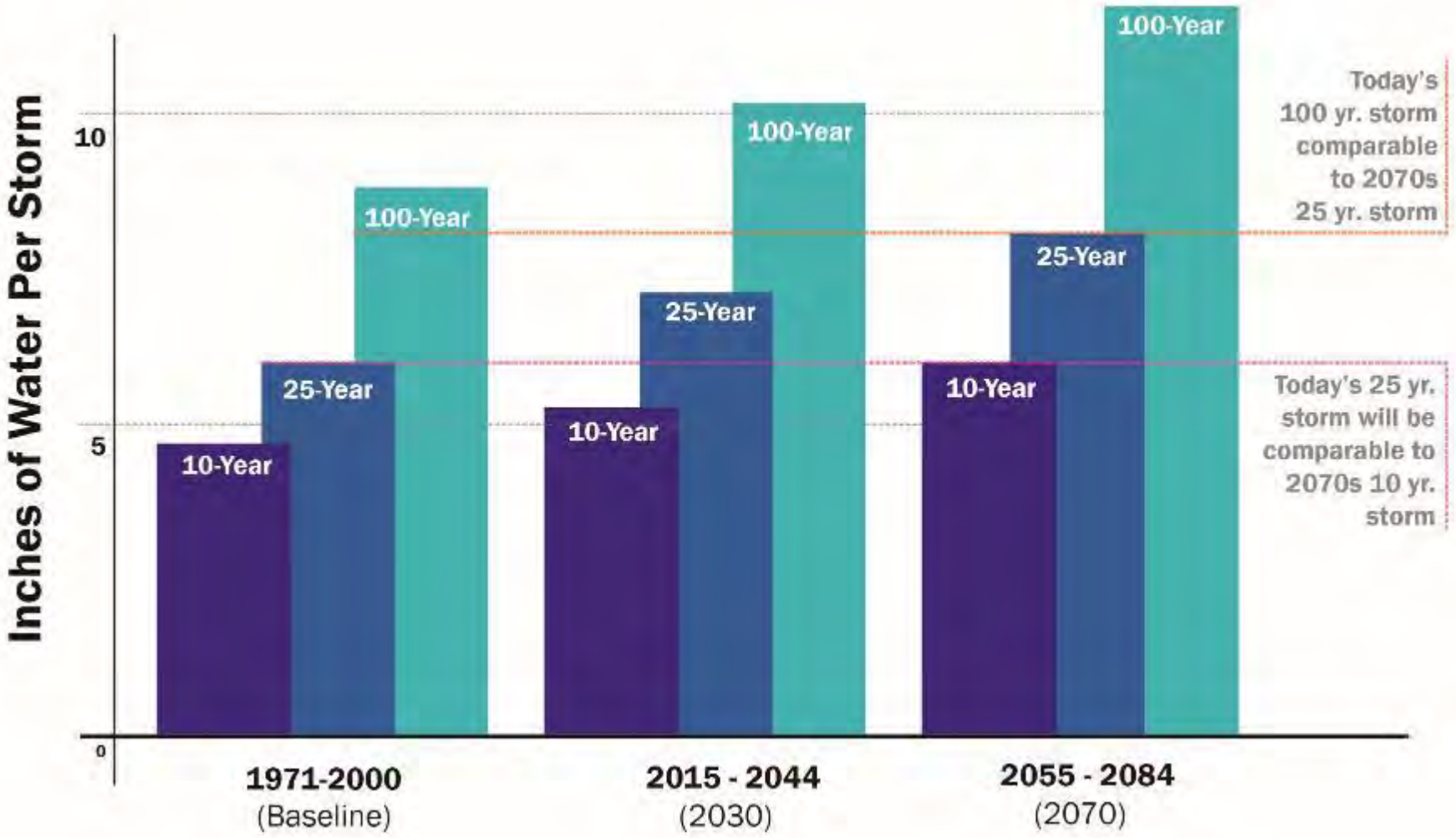


HEAVY RAINFALL - 2070



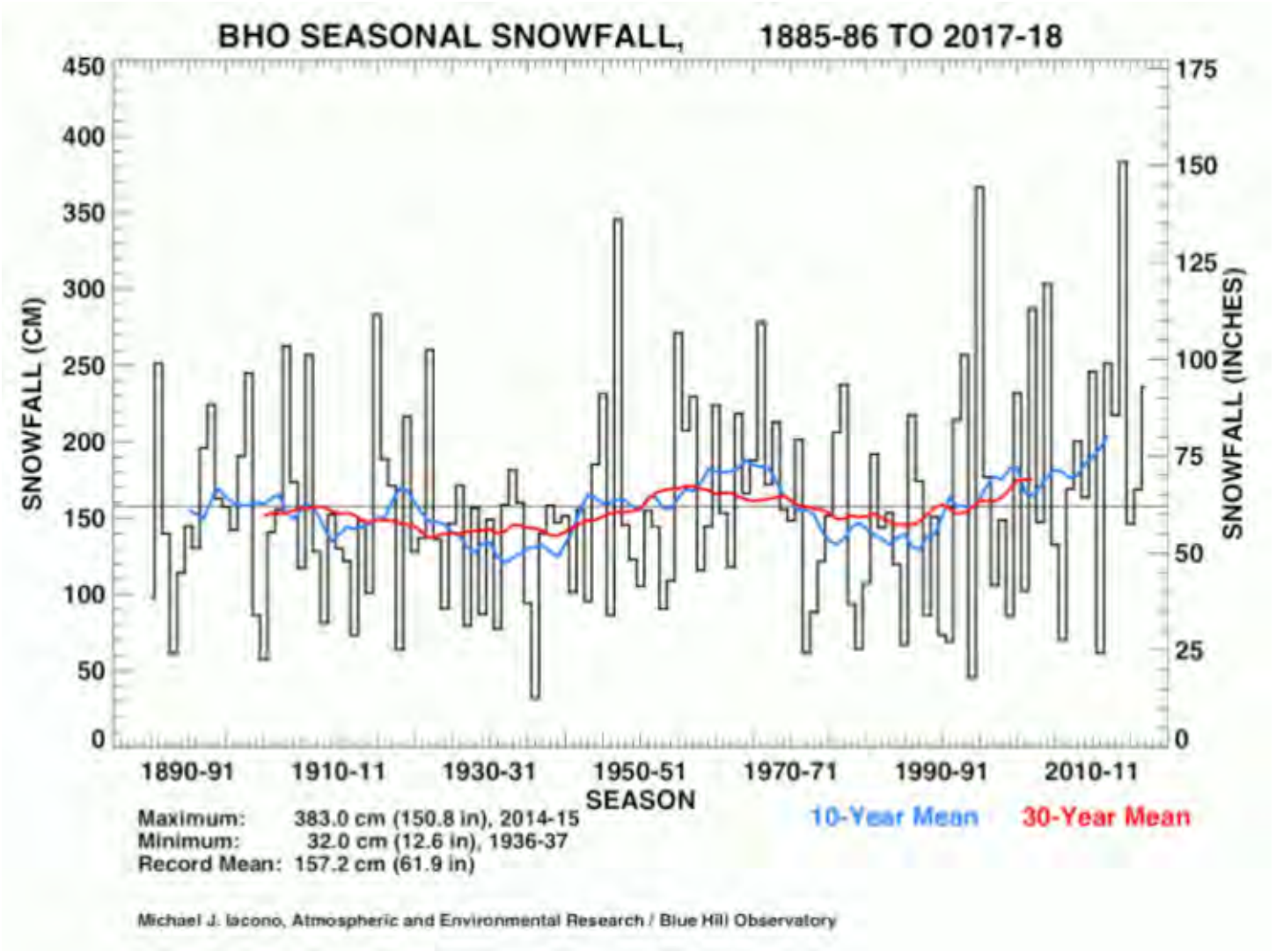
Source: resilientma.com, 2018

HEAVY RAINFALL



Source: Design storm projections for the Boston metro area based on Kleinfelder/ATMOS projections, Nov.2015, Kleinfelder for City of Cambridge.

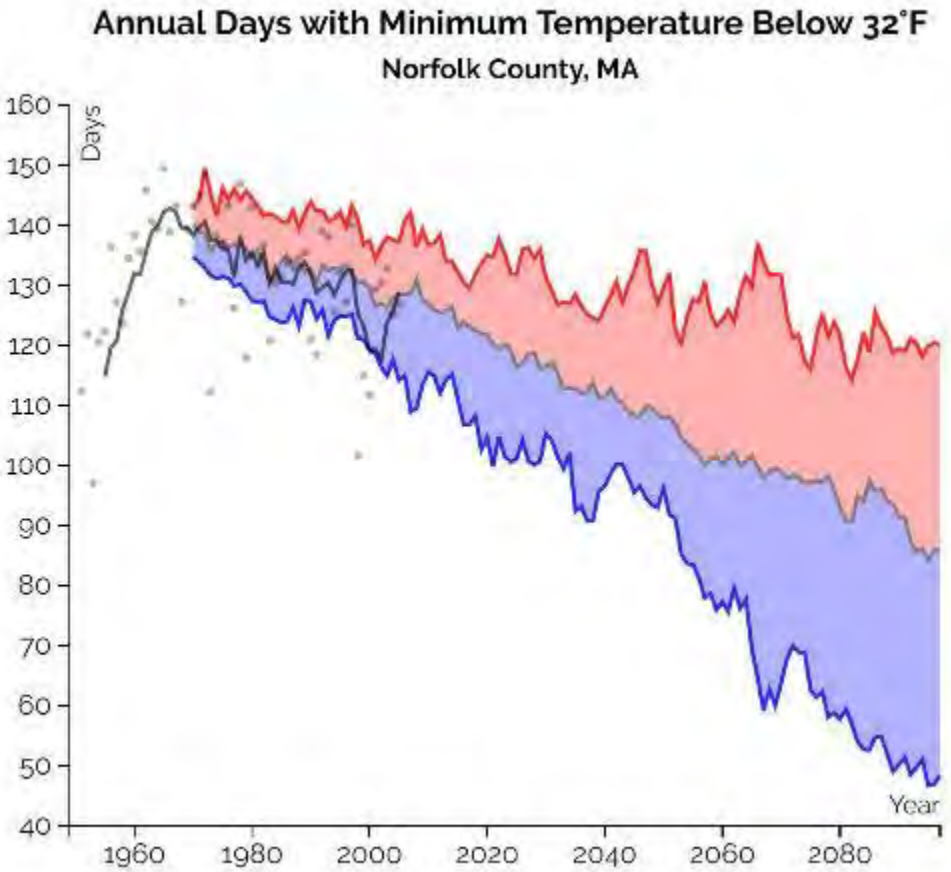
Snow/Ice Storms



Snow/Ice Storms

- We know how to handle snow!
- In Canton's region, there are historically about 119 days per year where temperatures reach below freezing.
- That number could be reduced down to 77 by the year 2050.
- Resulting in more precipitation falling as rain or freezing rain.

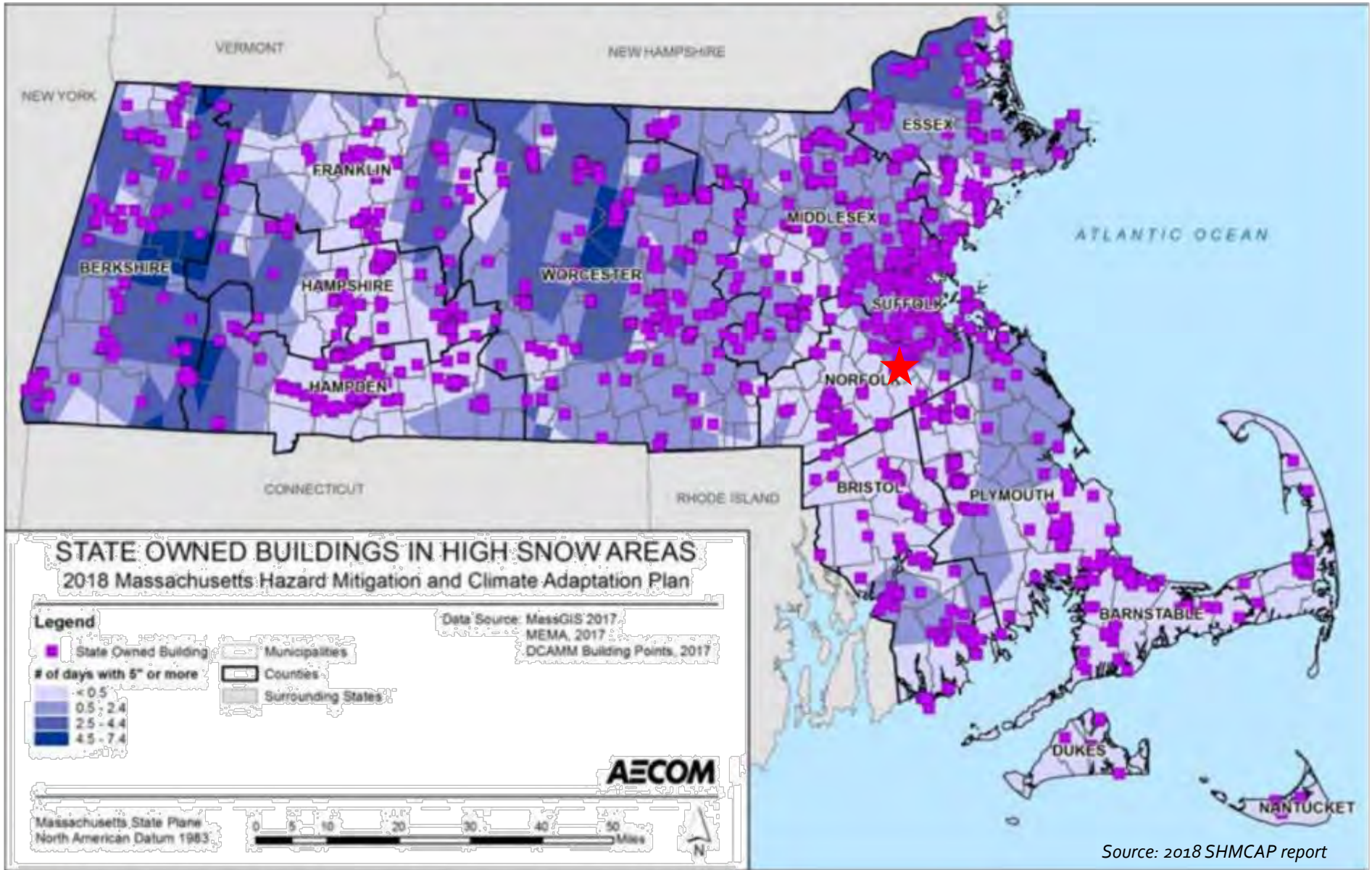
WBUR



Source: resilientma.com 2018

Snow/Ice Storms

Figure 4-64: Number of Days with 5 Inches of Snow or More



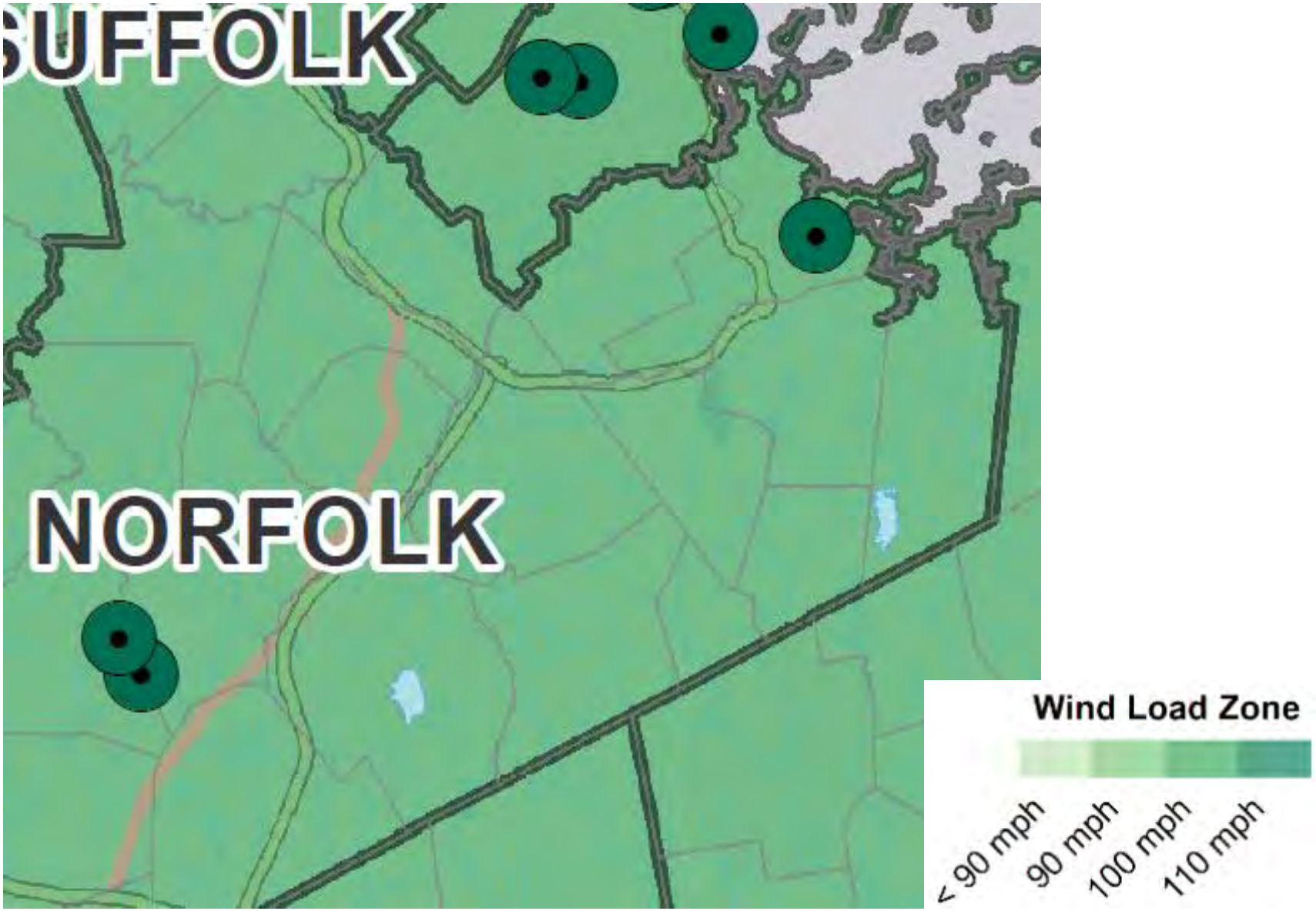
Source: 2018 SHMCAP report

Wind

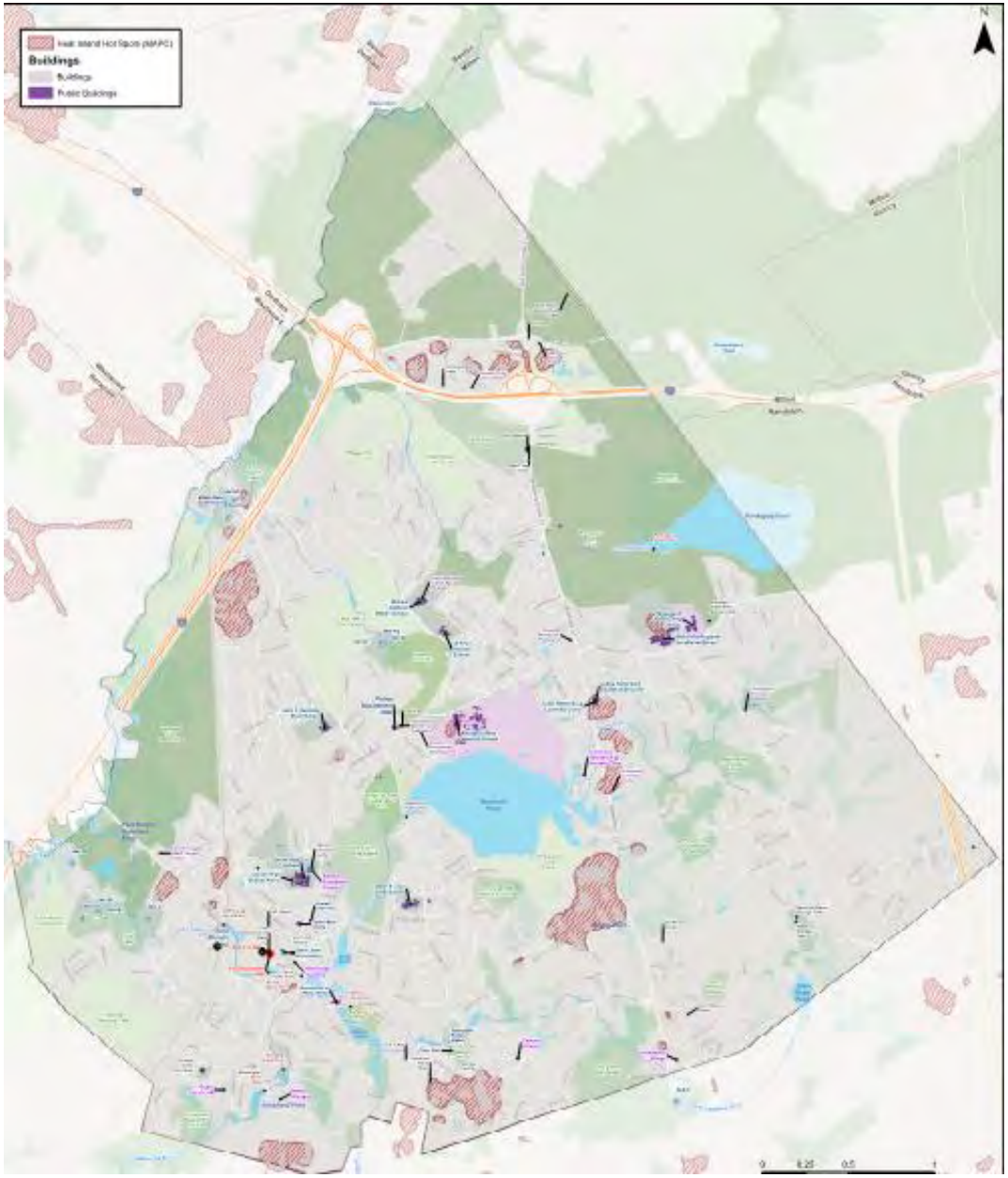
- Typically, damaging winds are classified as those exceeding 50-60 mph.
- Damaging winds can occur from microbursts, blizzards, tropical storms, etc.
- Impacts: town resources, infrastructure, private and public property.

Source: Joanne Rathe/Globe Staff

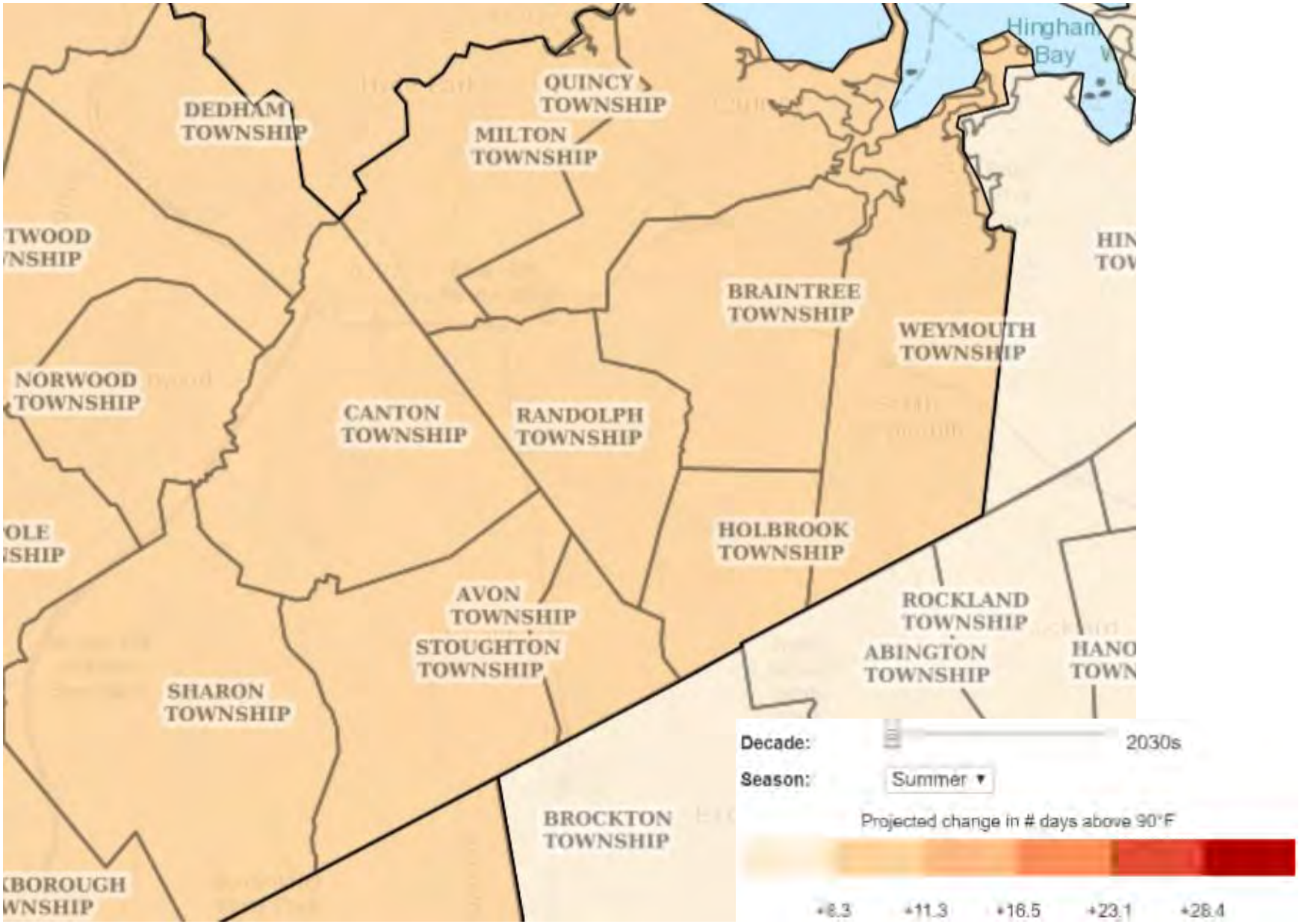
WIND



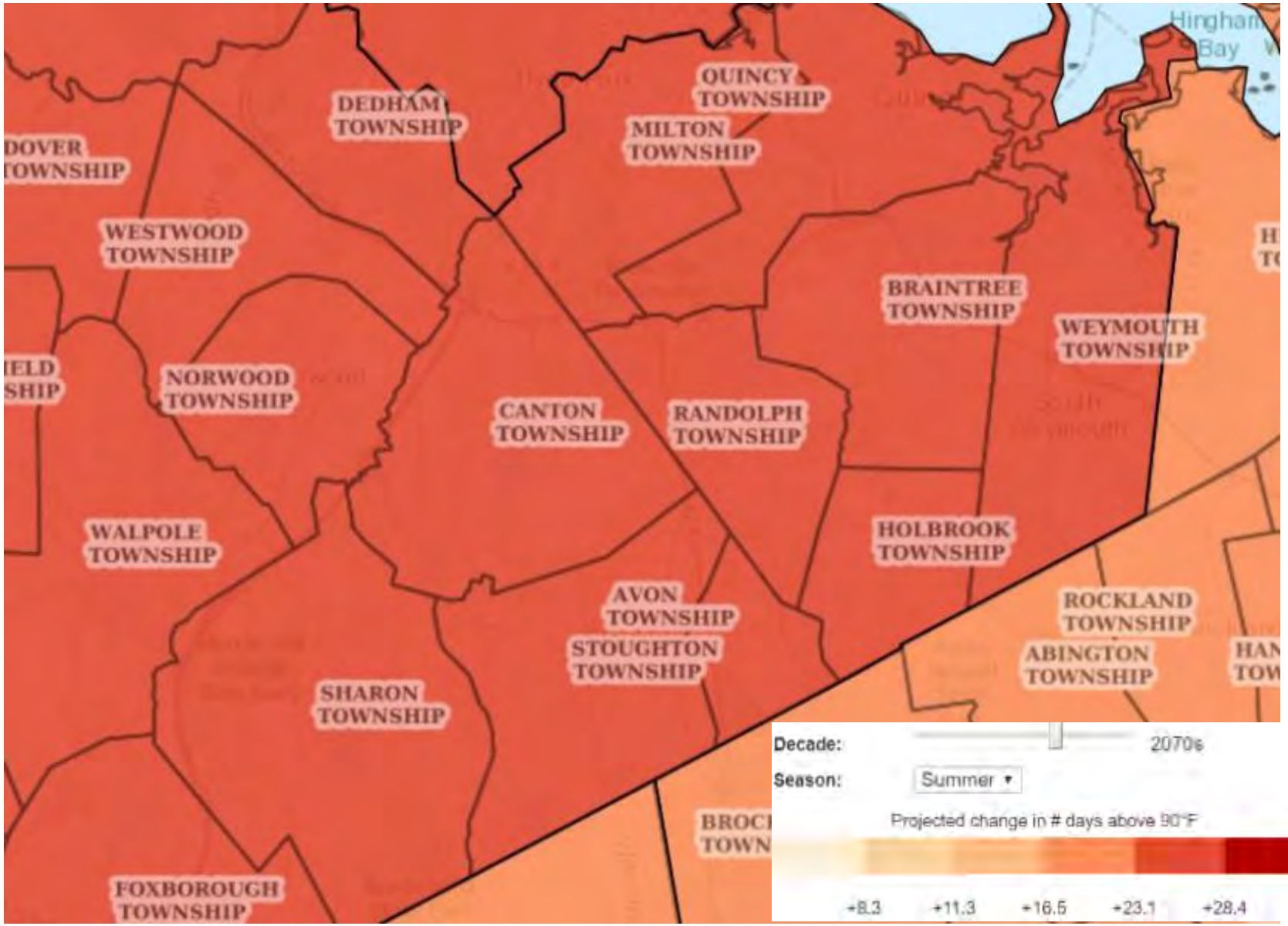
Extreme Heat – Present Hot Spots



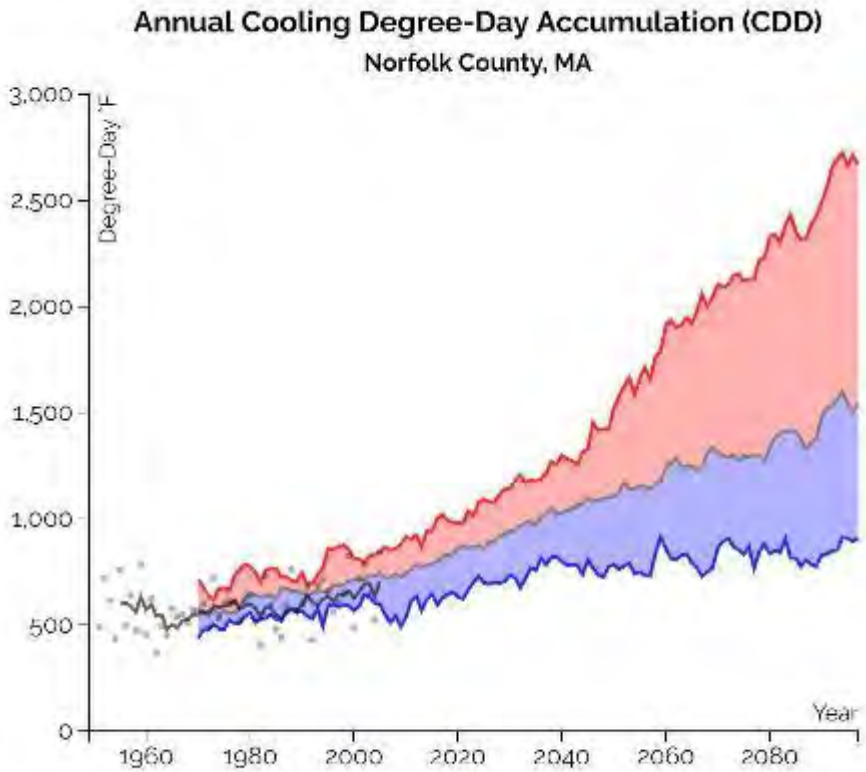
EXTREME HEAT -2030

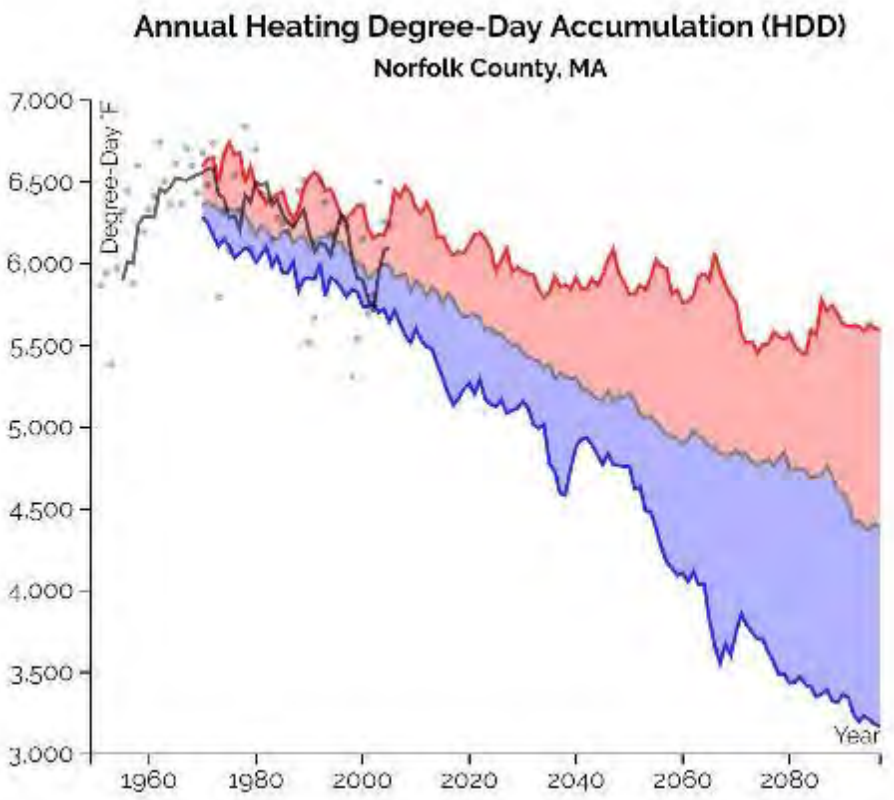


Extreme Heat - 2070



Extreme Heat – Energy Demand



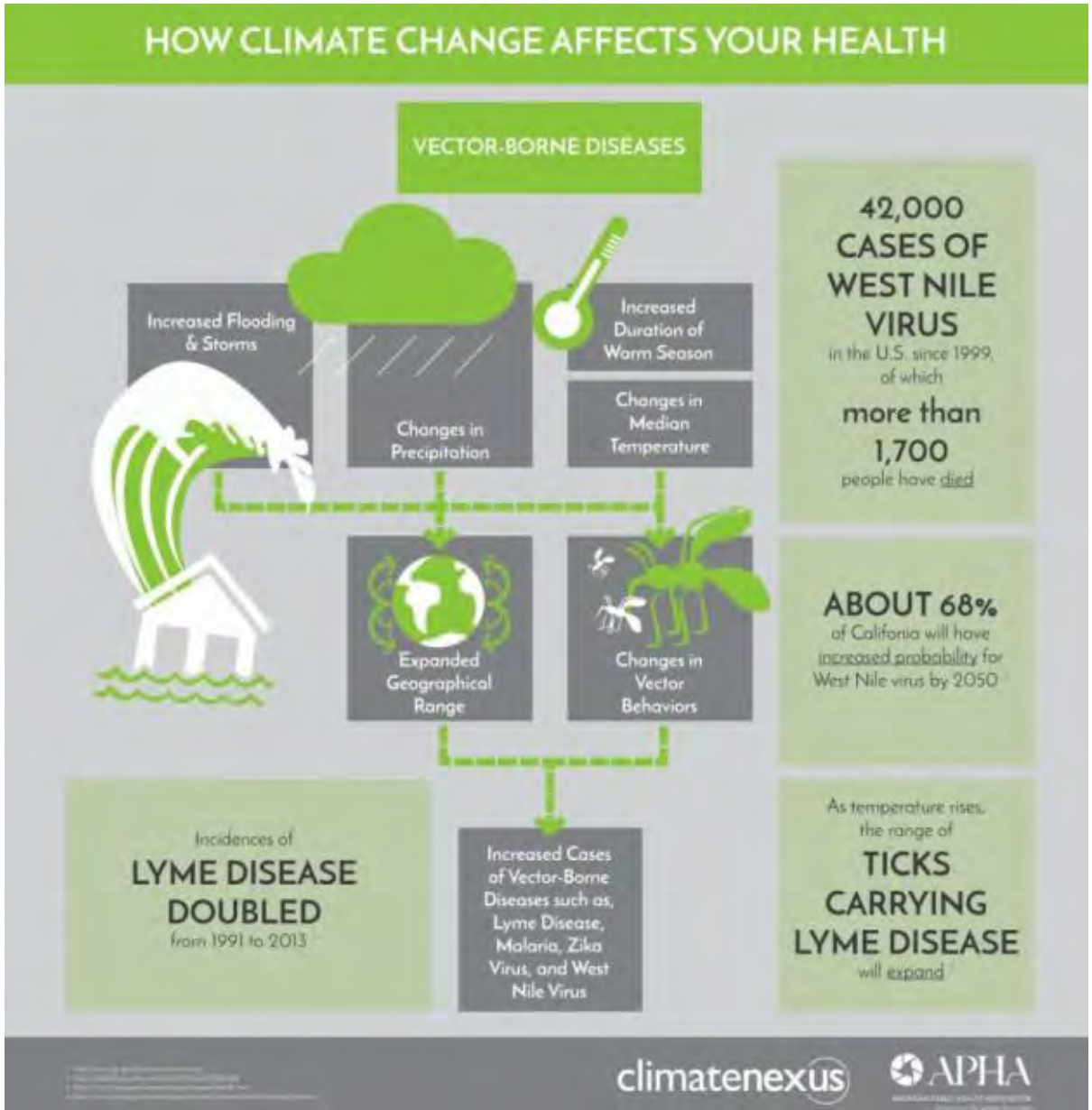


There will be more days required for cooling buildings than for heating by 2070.

Extreme Heat – Public Health

Human health issues:

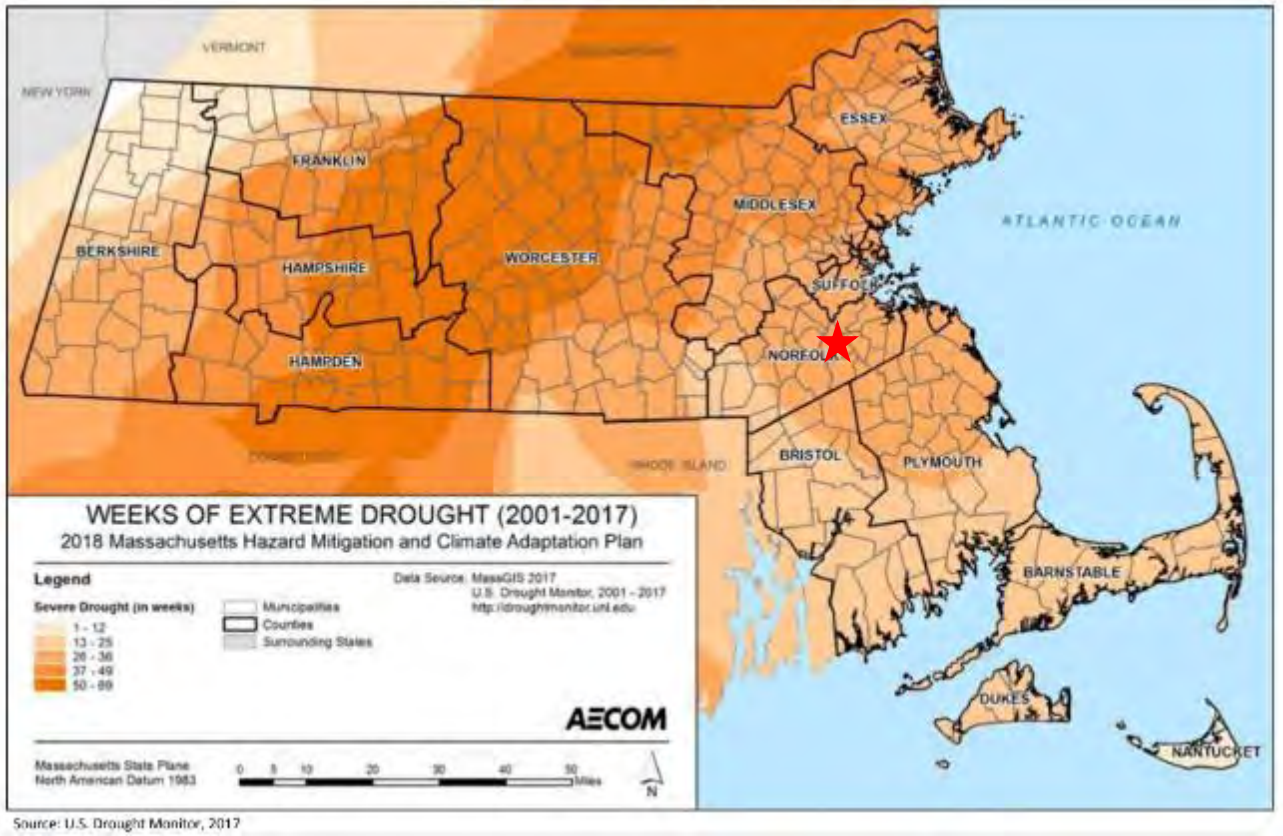
- Heat-related illness and mortality
- Air quality, asthma
- Vector-borne diseases



DROUGHT

- More rainfall in large events could mean longer gaps with no rainfall locally.
- Could impact natural resources:
  - Trees
  - Water quality
  - Aquatic organisms
  - Aquifers / Canton's wells

Figure 4-8: Weeks of Severe Drought (2001-2017)

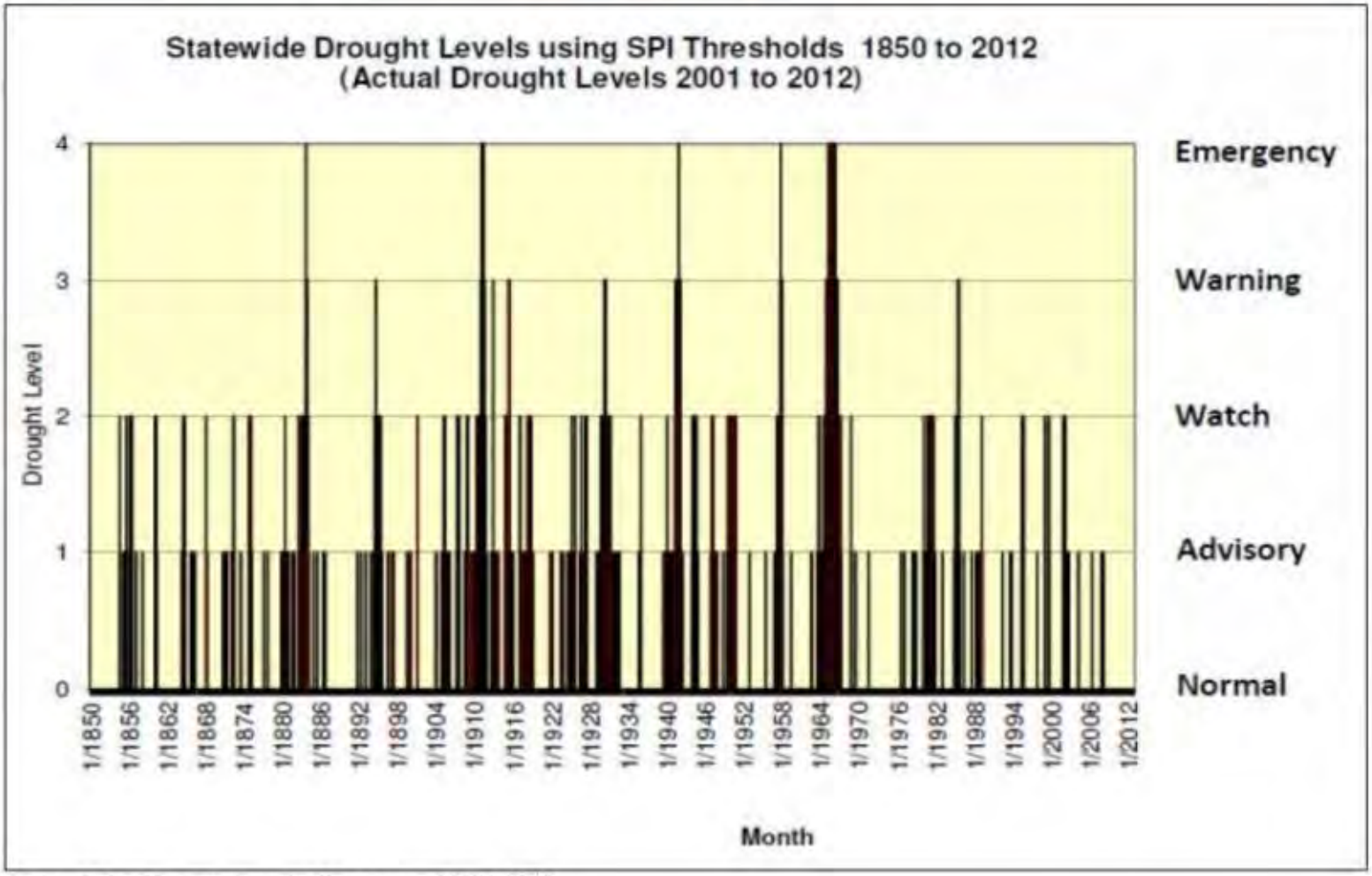


Source: U.S. Drought Monitor, 2017

Source: 2018 SHMCAP report

DROUGHT

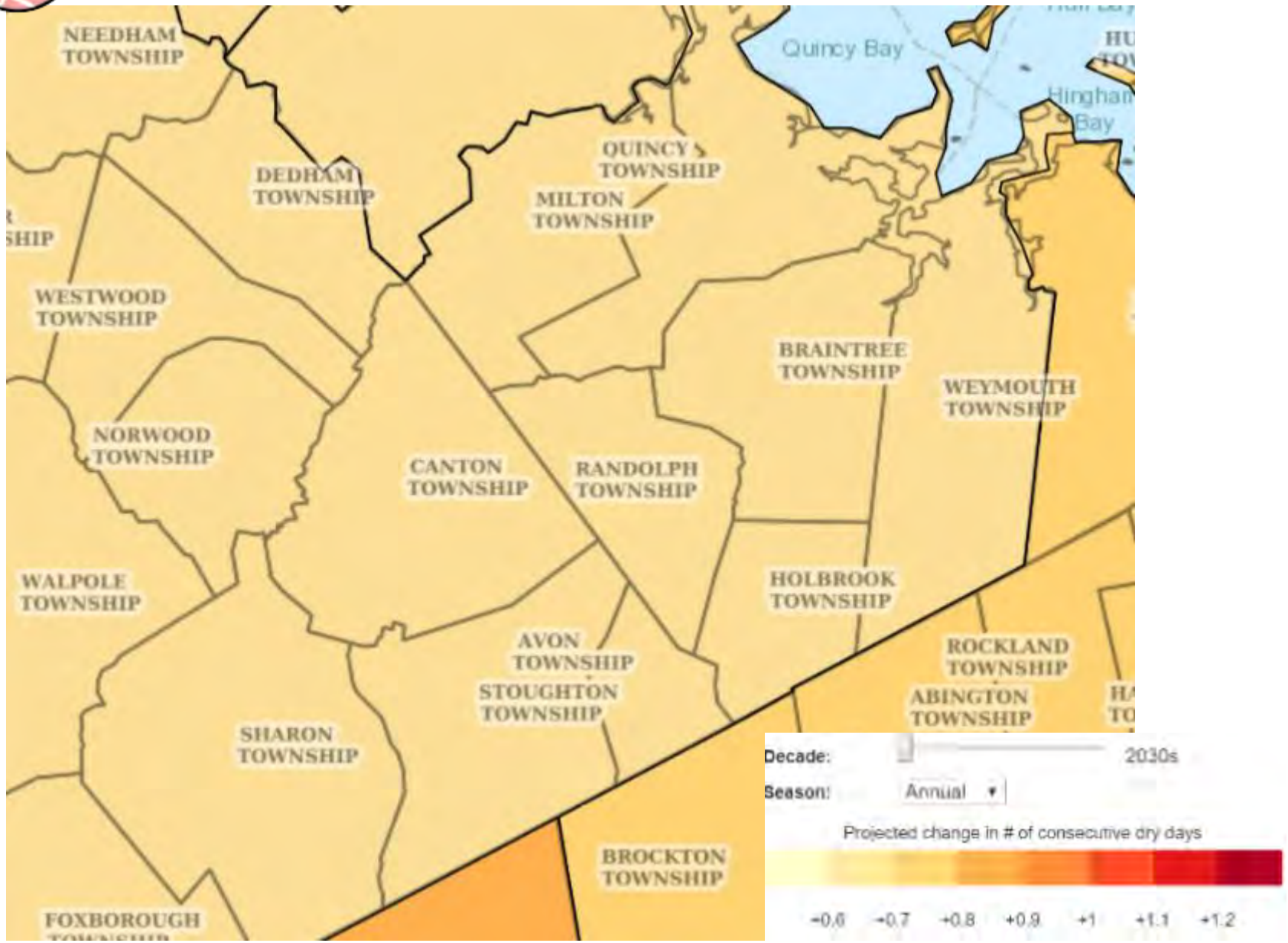
Figure 4-10: Statewide Drought Levels Using Standardized Precipitation Index (SPI) Thresholds, 1850-2012



Source: Massachusetts Drought Management Plan, 2013

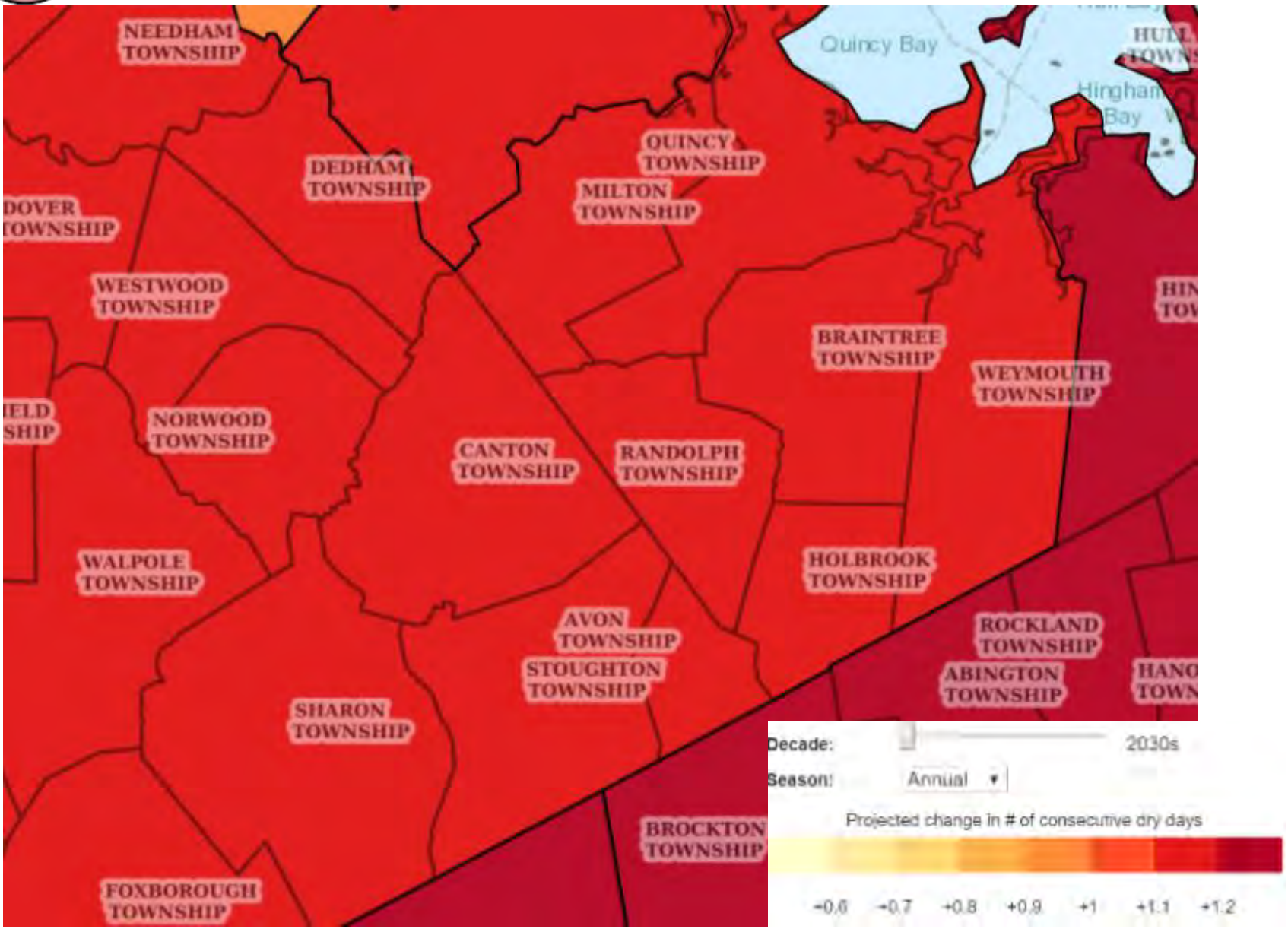
Source: 2018 SHMCAP report

Drought – Consecutive Dry Days 2030



Source: 2018 SHMCAP report

Drought – Consecutive Dry Days 2070



Source: 2018 SHMCAP report

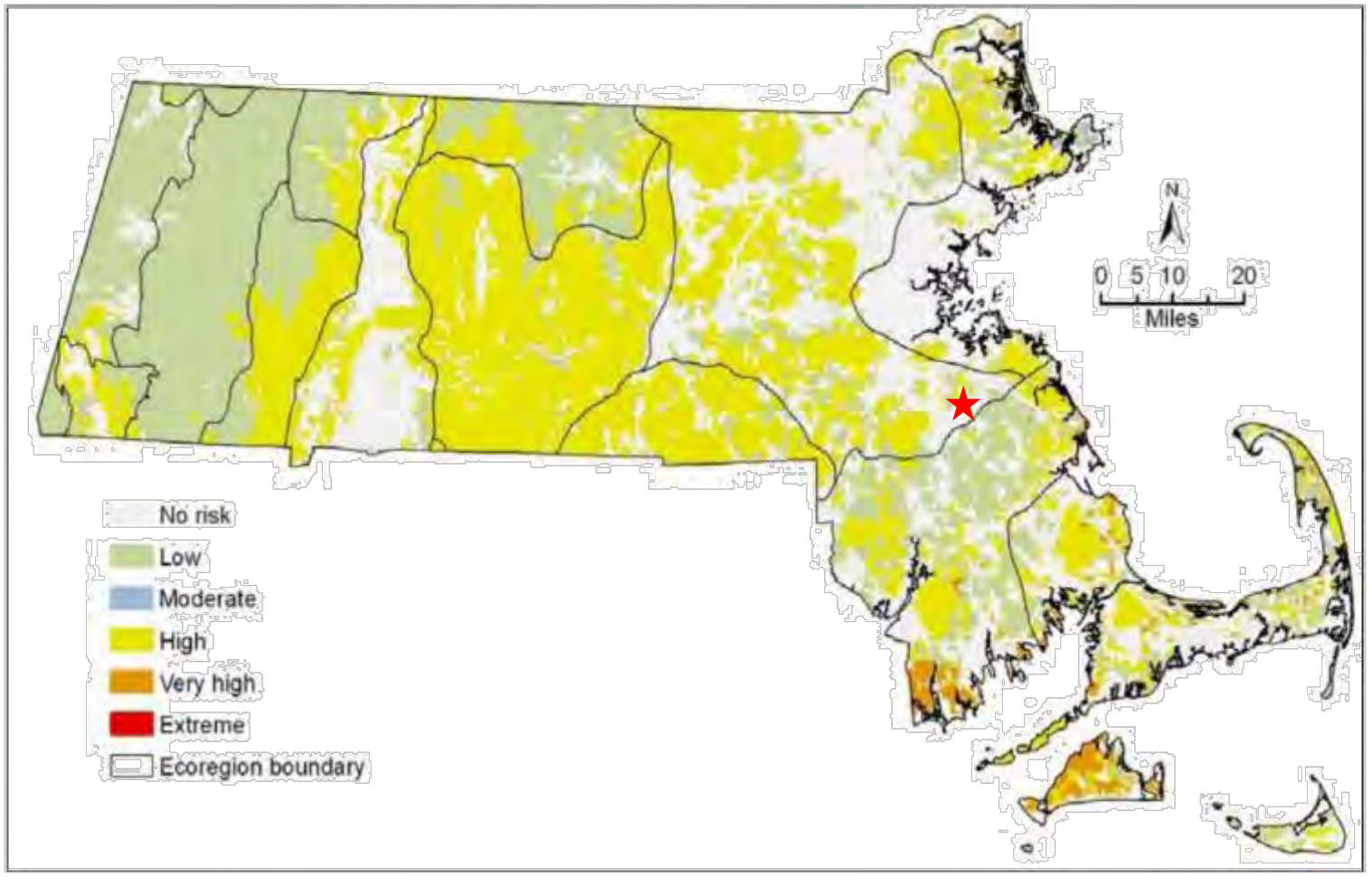
Brush Fires

- Like wind, brush fires are typically a result of dry ground conditions and drought.
- Approximately 90% of wildfires in Massachusetts are caused by humans, the other 10% by lightning.
- Impacts: natural resources, infrastructure, private and public property.

Source: CBS Boston c/o Dustin Fitch)

Brush Fires

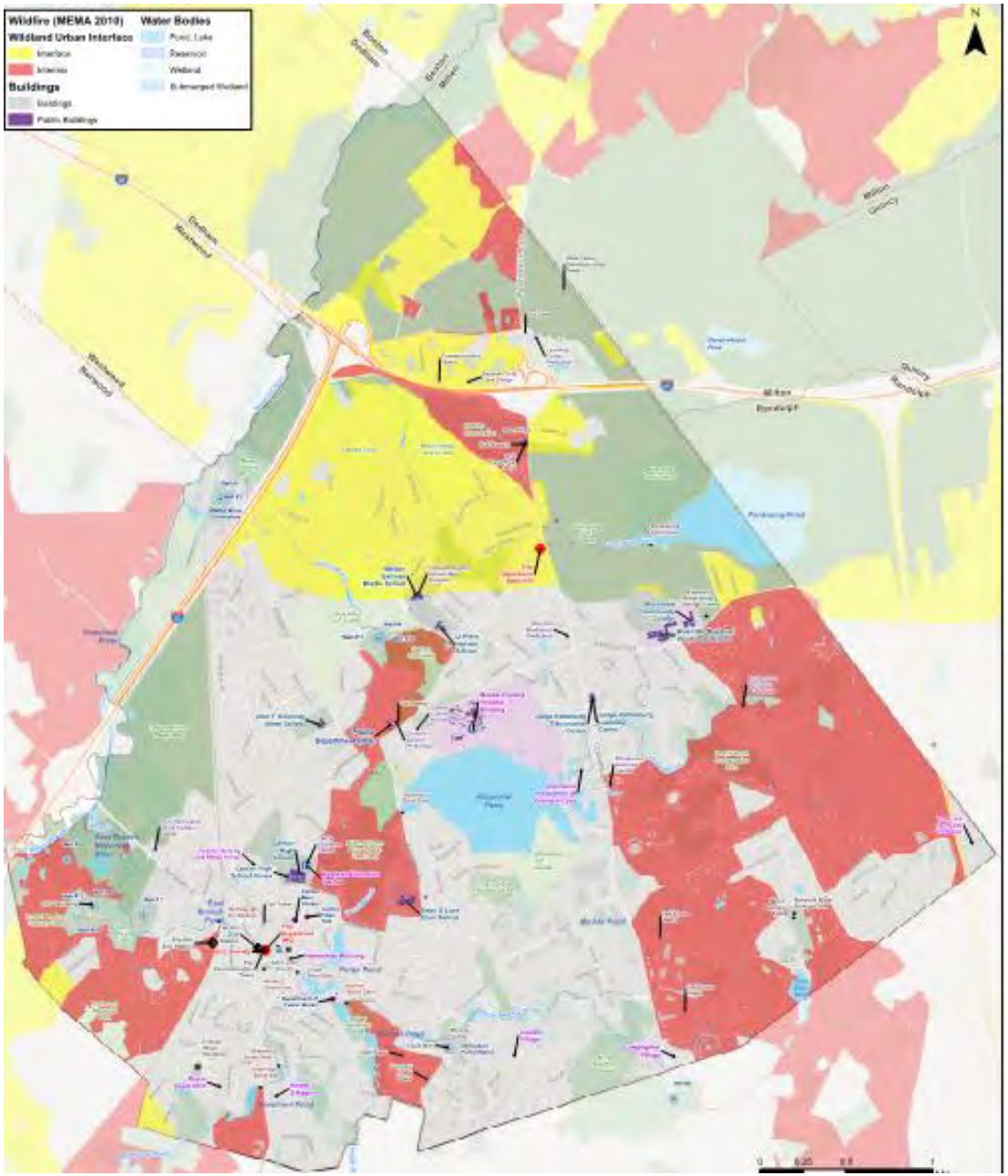
Figure 4-58: Wildfire Risk Areas for the Commonwealth of Massachusetts



Source: Northeast Wildfire Risk Assessment Geospatial Work Group, 2009

Source: 2018 SHMCAP report

Brush Fires

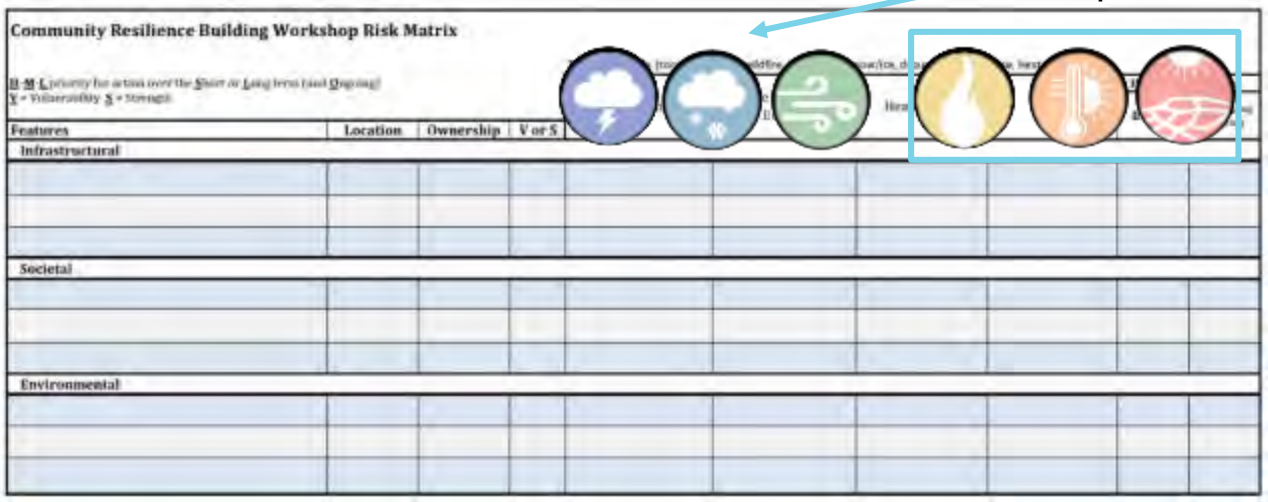

Wildfire (MEMA 2010)
Wildland Urban Interface
Interface
Intermix
Buildings
Buildings
Public Buildings
Water Bodies
Pond, Lake
Reservoir
Wetland
Bi-Annual Wetland
N

II. VOTE FOR YOUR 4TH HAZARD

AND PROVIDE A REASON

- What hazards have impacted your community in the past/present?
  - Where, how often, and in what ways?
- What is exposed to climate threats now and in the future?
- What have been the impacts to operations and budgets, planning and mitigation efforts?

Fill in Top 4 Hazards on Risk Matrix



Community Resilience Building Workshop Risk Matrix

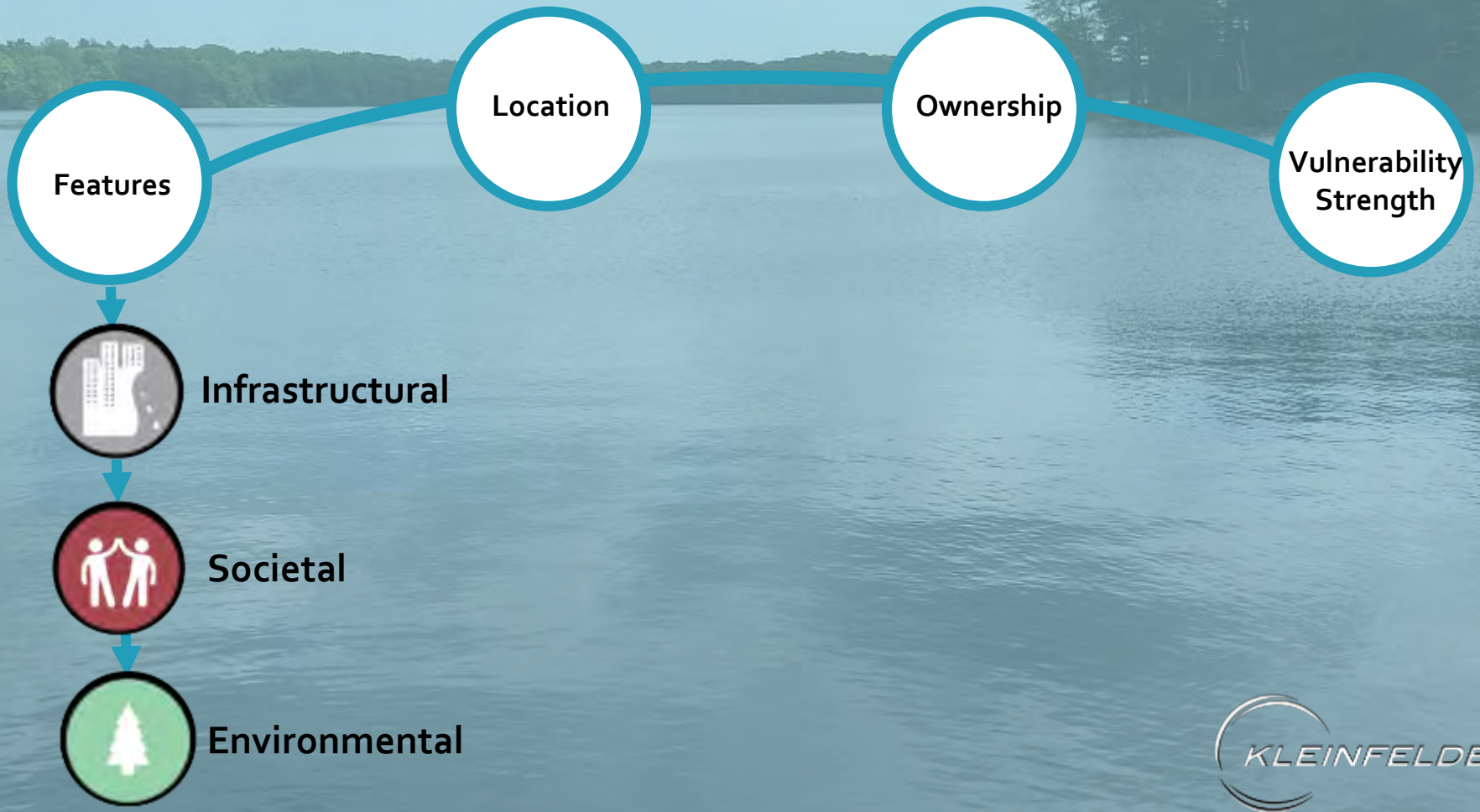
Features	Location	Ownership	V or S
Infrastructural			
Societal			
Environmental			

III. Break – 15 mins

Canton Community Resilience building Workshop

IV. Strengths & Vulnerabilities

What are Canton's infrastructural, societal, and environmental strengths and vulnerabilities?



INFRASTRUCTURE

Examples of infrastructure include:

- Bridges
- Roads
- Municipal Buildings
- Emergency Operations
- Schools
- Dams
- Utilities – overhead & buried
- Wells
- Drainage pipes

INFRASTRUCTURE

Shepard Pond Dam, Photo credit: Stephens Engineering

Society

Combination of factors and forces that affect the susceptibility of various groups within a community to harm, as well as their ability to respond positively after extreme events.

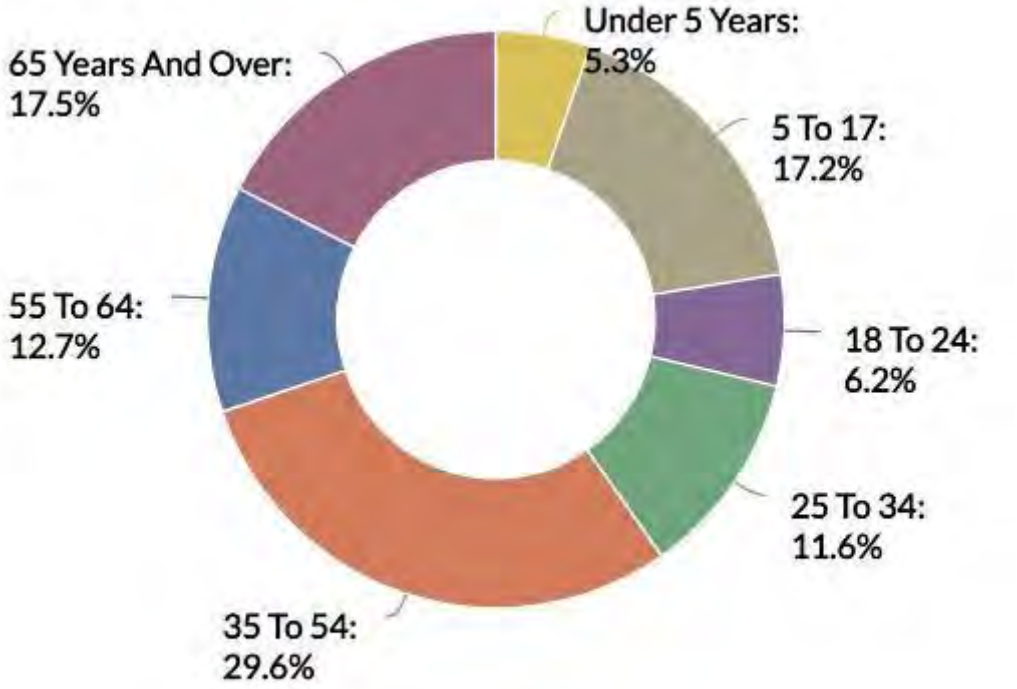
"The death toll was the result of distinct dangers in Chicago's social environment: an increased population of isolated seniors who live and die alone"– Eric Klinenberg

Society

Combination of factors and forces that affect the susceptibility of various groups within a community to harm, as well as their ability to respond positively after extreme events.

2016[1]	23,352
2020	24,225
2025	25,299
2030	26,272
2035	27,073

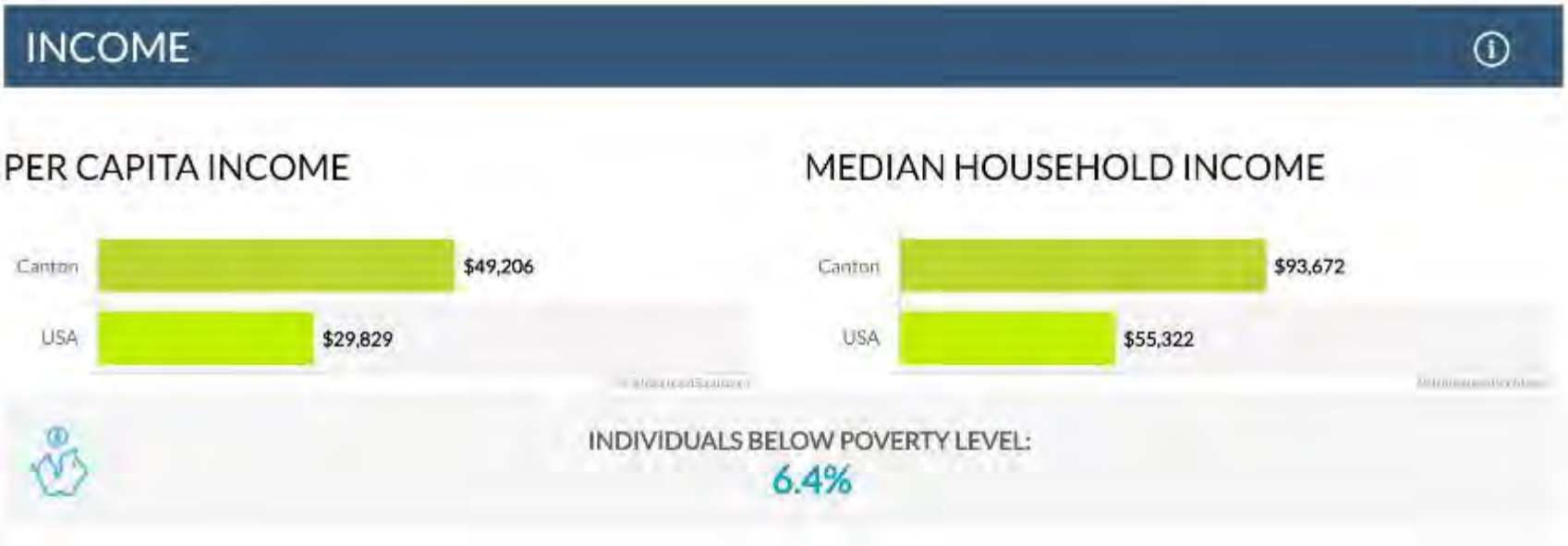
[1] Population from U.S. Census Bureau



Canton Stats : Age and Population

SOCIETY

Vulnerable populations, post-incident are most likely to be effected by lack of access to recovery services, displacement, injury, illness, loss of employment, and property damage.



Canton Stats : Income

Society

Get to know your neighbors!

Hansen Elementary students are Boston Strong at recess on May 23. (Moira Sweetland photo)

Photo source: Canton Citizen

Canton Stats : Foreign Born Residents

FOREIGN BORN CANTON RESIDENTS:

14.1%

Environment

Benefits of natural systems include:

- Flood storage
- Recreation and tourism
- Cooling during heat waves
- Biodiversity conservation
- Water filtration
- Mobility

Vulnerabilities

- Water quality and quantity
- Invasive species
- Damage from extreme weather

Photo: Canton Citizen

Reservoir Pond, photo by Town of Canton Engineering staff

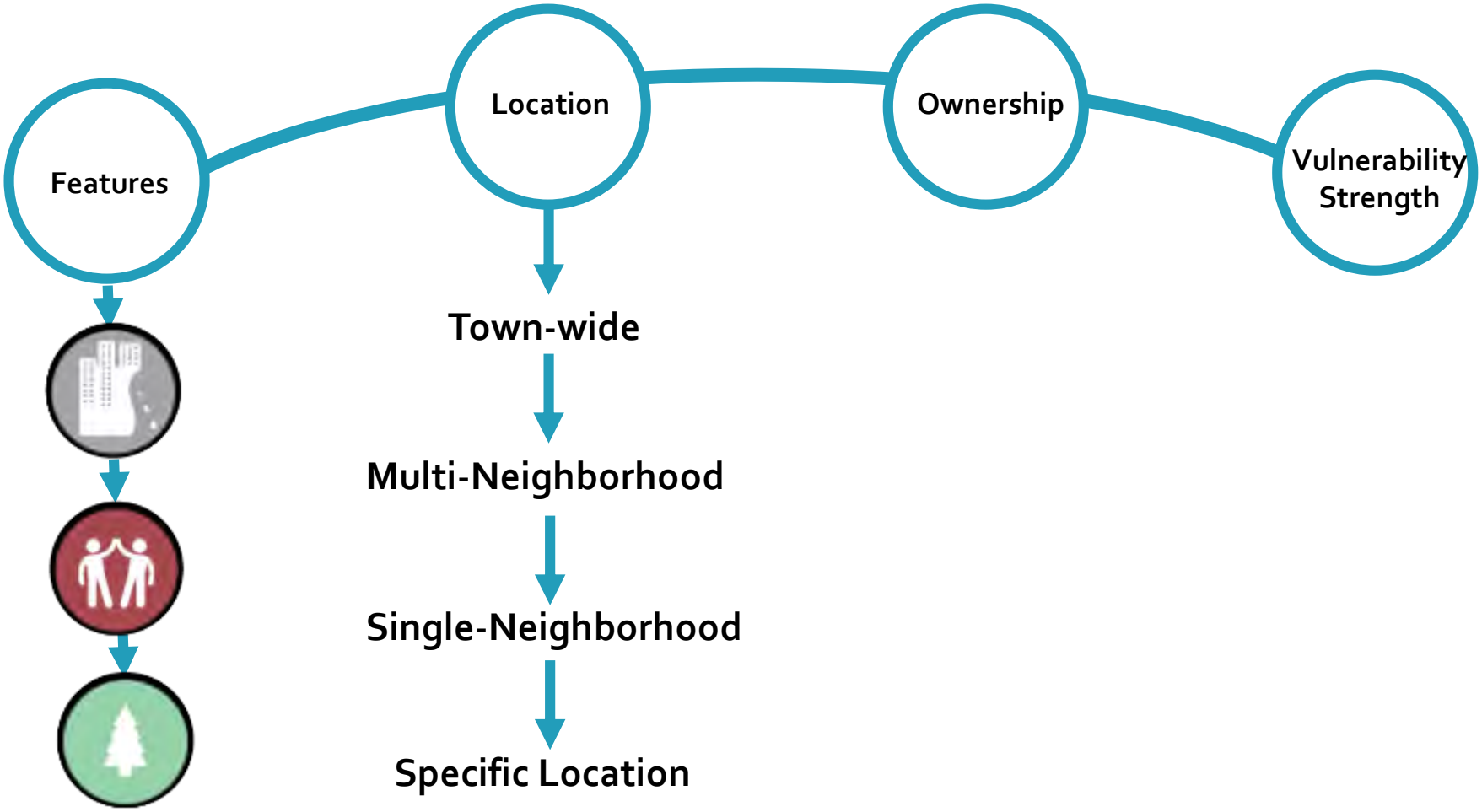
Environment

Environmental Challenges:

- Erosion
- Invasive plant material
- Chronic flooding
- Sedimentation
- Ground and Surface Water Pollution
- Impaired Water Bodies

IV. Resilience & Vulnerabilities

What are Canton's infrastructural, societal, and environmental strengths and vulnerabilities?



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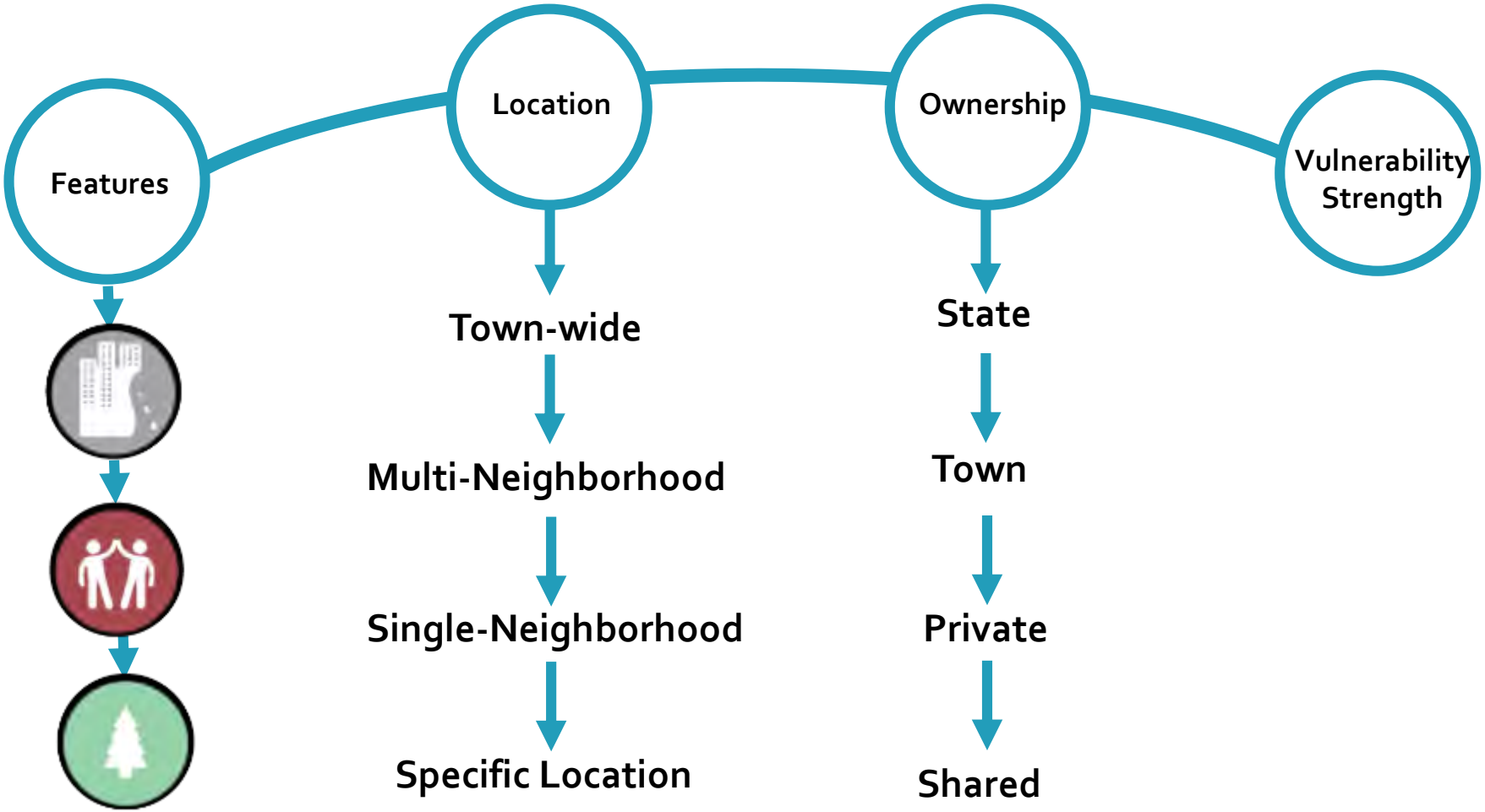
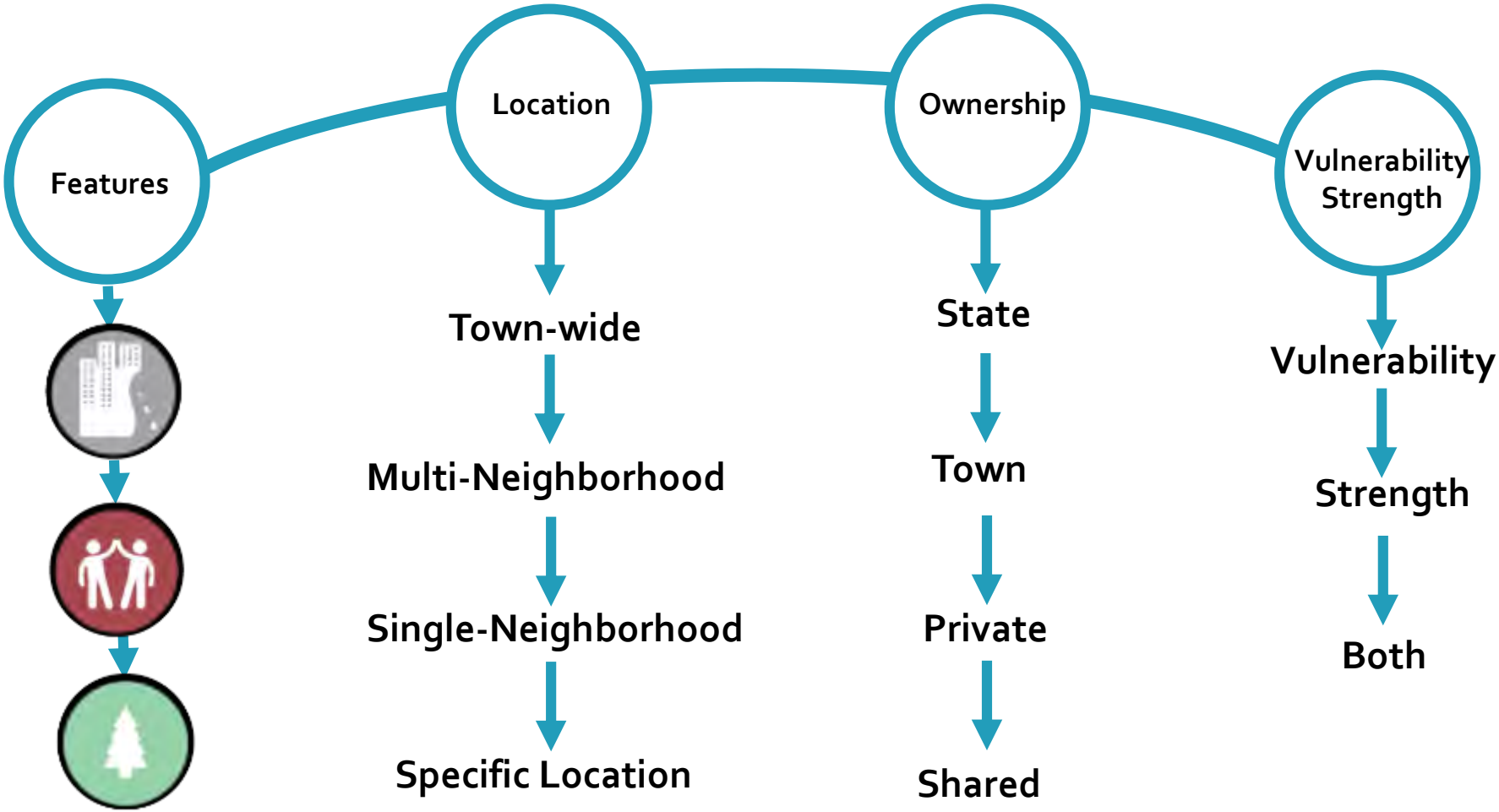
What are Canton's infrastructural, societal, and environmental strengths and vulnerabilities?



IV. Resilience & Vulnerabilities

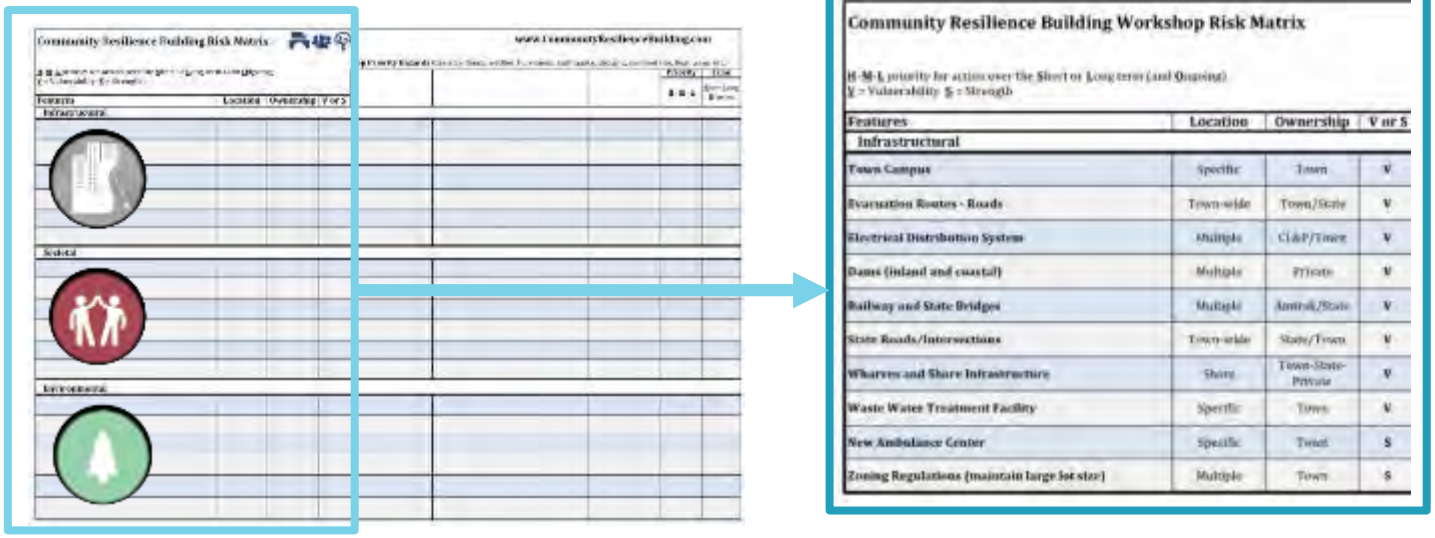
What are Canton's infrastructural, societal, and environmental strengths and vulnerabilities?



IV. Resilience & Vulnerabilities

Small Group Exercise

- What infrastructure, societal features, or important natural resources are exposed to current and future hazards?
- What makes them vulnerable?
- What makes them resilient?
- What are the consequences if the existing vulnerabilities are not addressed?



Community Resilience Building Workshop Risk Matrix

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

Features	Location	Ownership	V or S
Infrastructural			
Town Campus	Specific	Town	V
Evacuation Routes - Roads	Town-wide	Town/State	V
Electrical Distribution System	Multiple	CL&P/Town	V
Dams (inland and coastal)	Multiple	Private	V
Railway and State Bridges	Multiple	Amtrak/State	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

V. Lunch – 1 Hour

Canton Community Resilience building Workshop

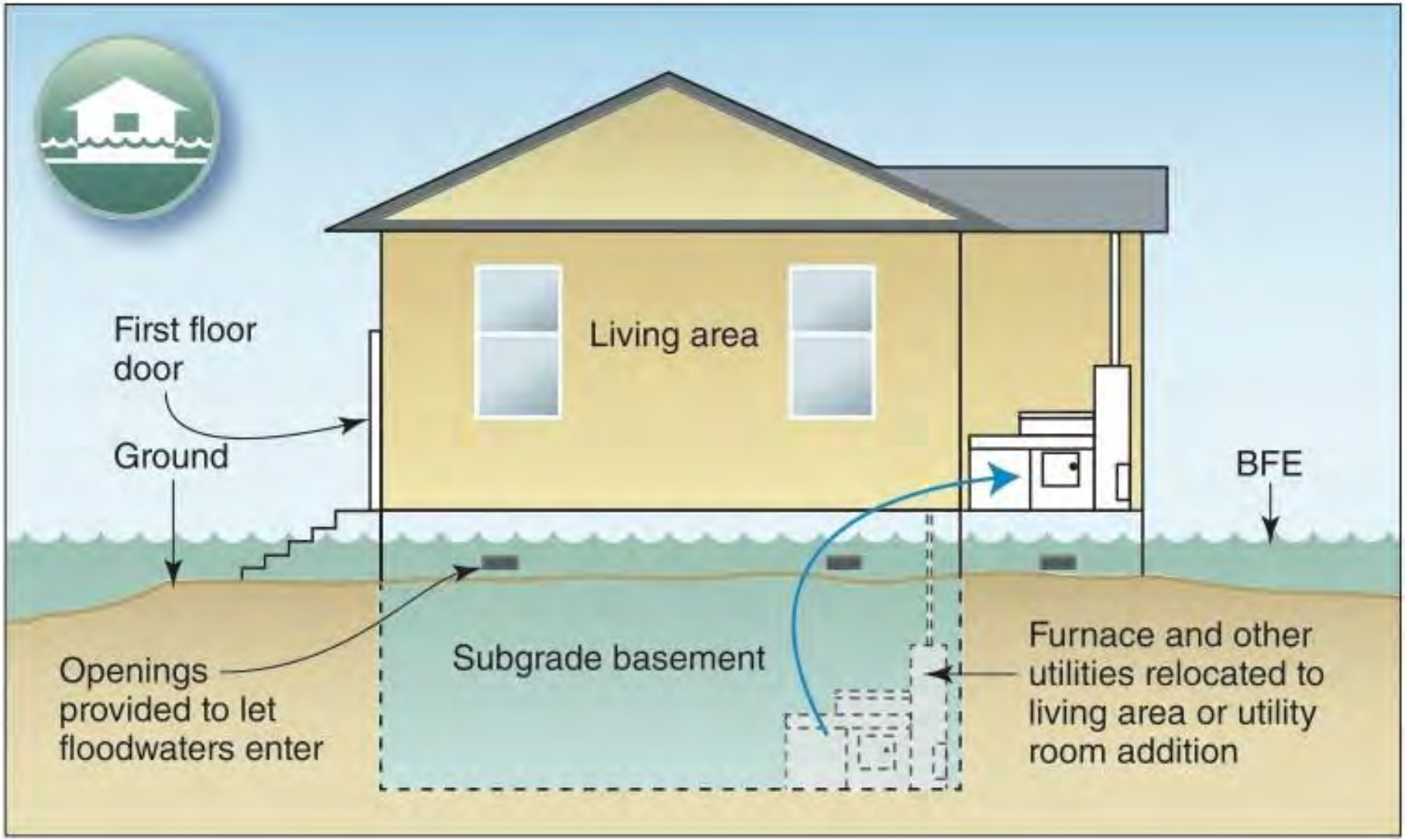
VI. COMMUNITY ACTIONS

Case Studies

KLEINFELDER

Wet Floodproofing

Community Action



RAISED BUILDINGS

Community Action

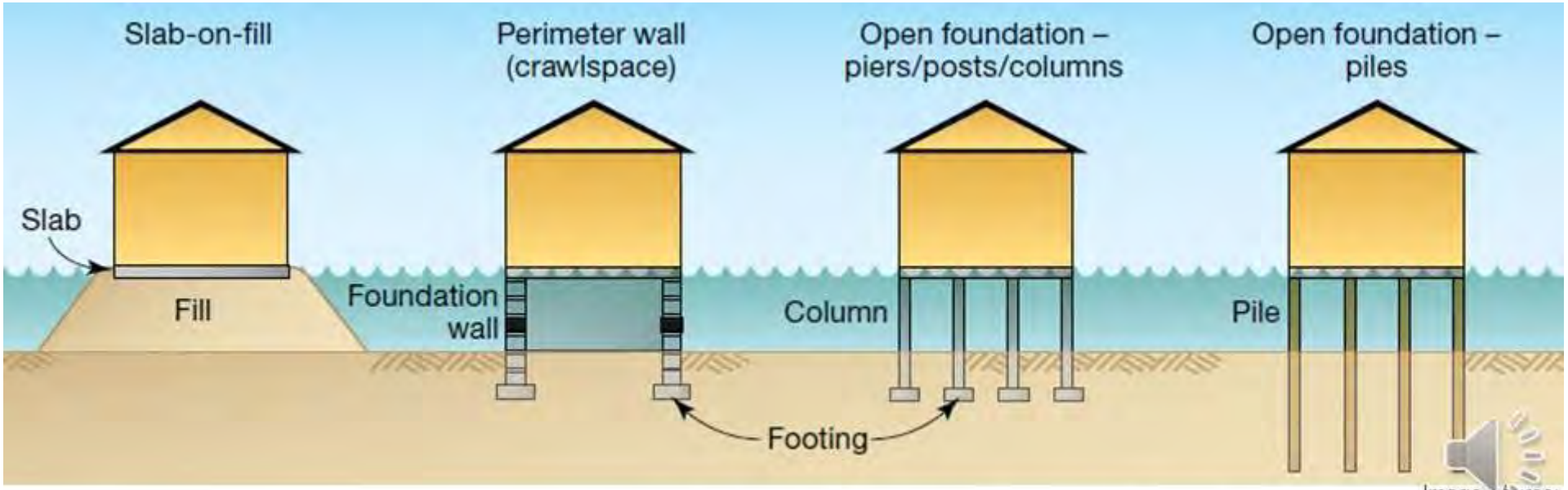


Image source:
FEMA Quick Reference Guide: Comparison of Select NFIP & Building Code Requirements

Decorative Flood Walls

Community Action

Source: ABC News, KAAL TV

Source: FloodBreak

Source: Terrascapes Landscape Design

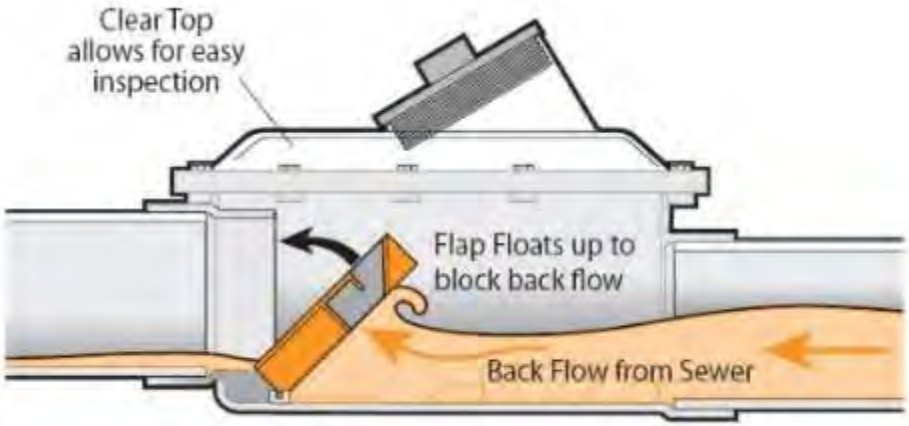
Demountable Flood Panels

Community Action

Preventing Sewer Backflow

Community Action

Backflow Preventer Valve



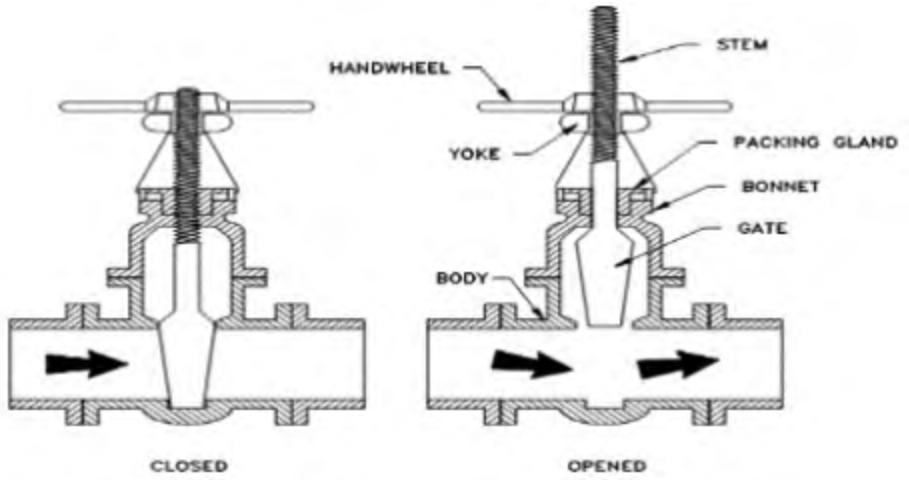
Pros:

- Closes automatically

Cons:

- Flap can get stuck (fail)
- Requires maintenance

Sewer Shutoff Valve



Pros:

- Reliable

Cons:

- Someone has to close it

Berms with Benefits

Community Action

PROTECTING FRESH POND

[Source: CCPR, 2017]

Evaluate building a vegetated berm at elevation 23.15 feet CCB* along the Fresh Pond Golf Course. This strategy could effectively protect the Fresh Pond Reservoir for up to the 2070 100-year sea level rise / storm surge flooding.

*Cambridge city-base datum

[Source: CCPR, 2017]

Evaluate building a flood wall at elevation 22.5 feet CCB South of the railroad track along the Alewife Quadrangle. Building a flood wall at this location can protect the Fresh Pond Reservoir, as well as the Alewife Quadrangle neighborhood.

Green Infrastructure

Community Action

Benefits of LID

- Flow Control
- Detention
- Retention
- Filtration
- Infiltration
- Treatment

Source: Garbini & Garbini Landscape Architecture, Inc.k

Permeable Pavement

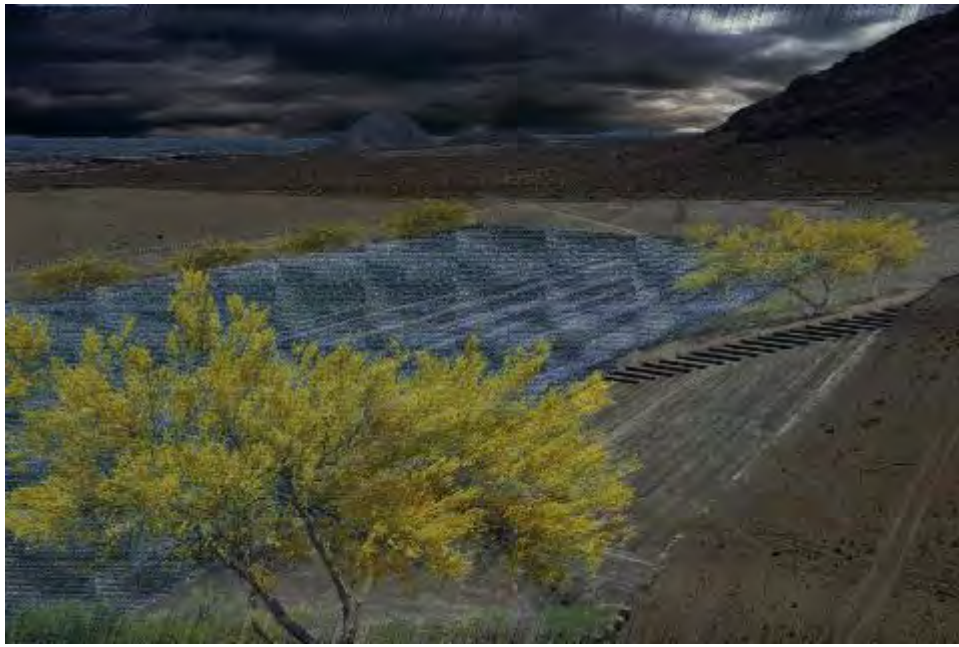
Community Action

Source: Green Planet Ethics

Dual-Use Flood Storage

Community Action

Athletic Field



Flood Storage

Dual-Use Flood Storage

Community Action

Canal Streets

Explore innovative options for managing stormwater

Open Spaces

North Point Park

Multi-Benefit Water Infrastructure

Community Action

Single Purpose

Multi-Benefit

Multi-Use Levees

Community Action

Flood Protection

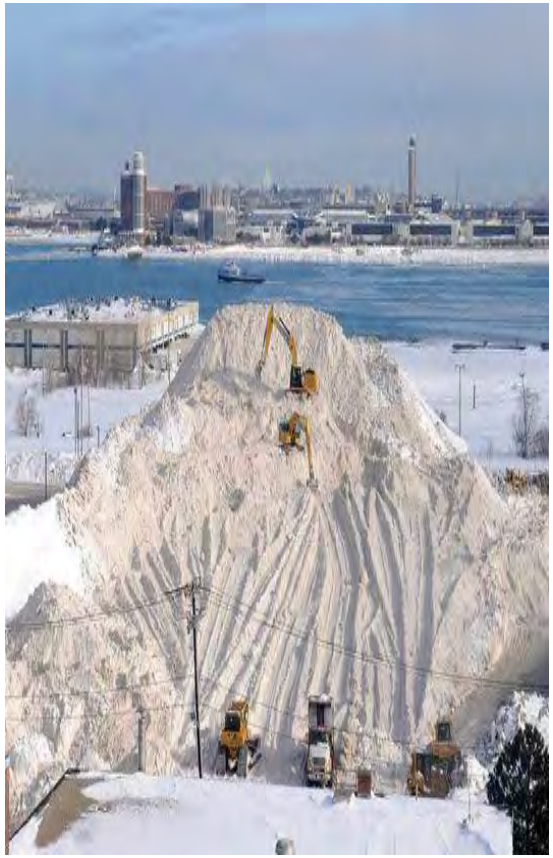
Mobility

PREPARE
Community Action

Equipment

Contracts

Storage



CLEAR COMMUNICATION
Community Action

DEICING ROADS
Community Action

Equipment

15 million tons of deicing salt are used each year in the United States

Alternative Options

Community Action

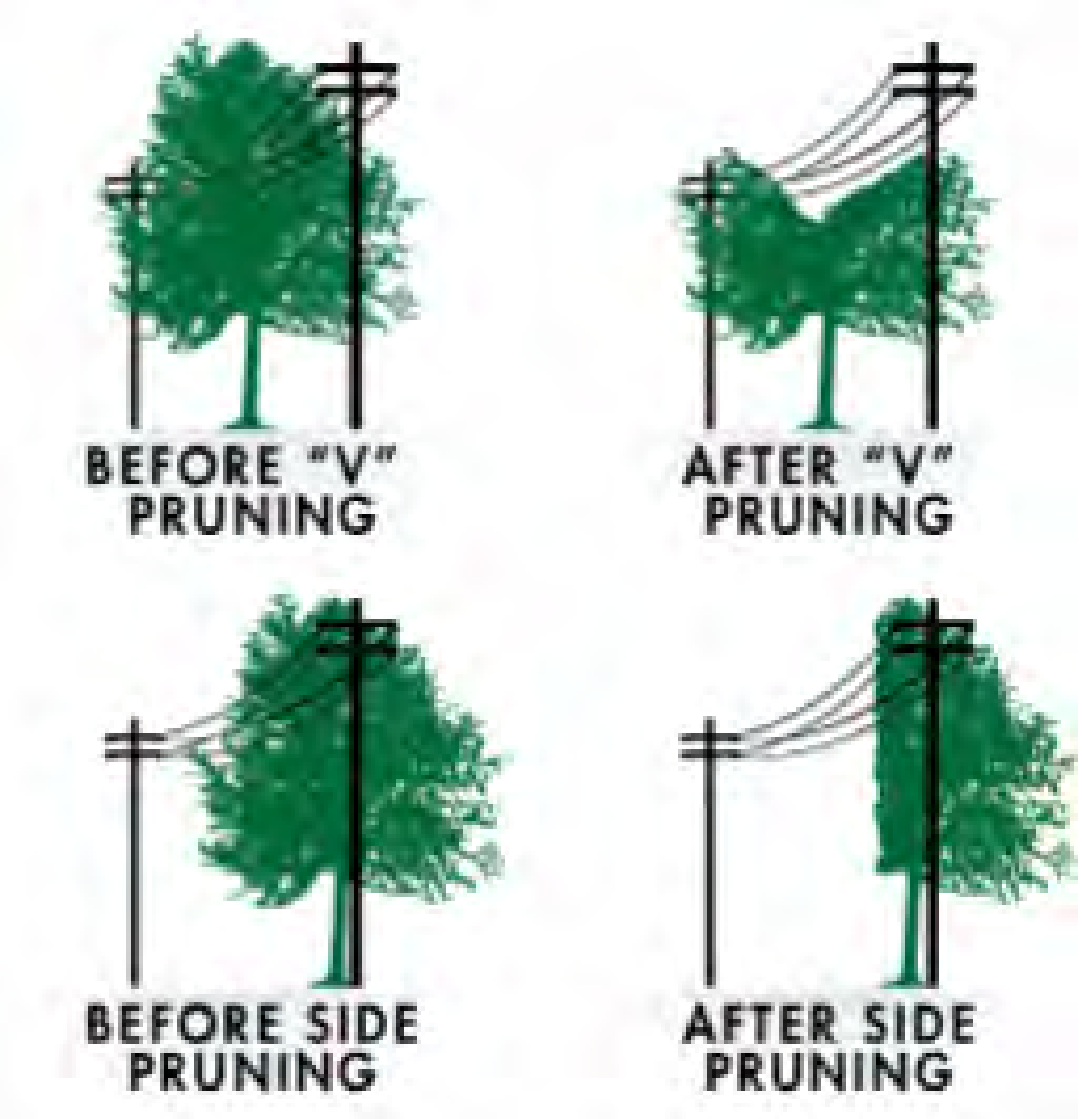
Other options?

SNOW & ICE
Community Action

What would Dwight Schrute do?

STAY ON TOP OF MAINTENANCE

Community Action



Reduce Pavement

Community Action

Reduce Asphalt with:

- Infill development
- Native Landscaping
- Solar power canopy devices

Source: Almaden Solar

Source: Tree Link News

Reduce Pavement

Community Action

Reduce Asphalt with:

- Infill development
- Native Landscaping
- Solar power canopy devices

Source: Almaden Solar

Source: Tree Link News

Cooling Centers

Community Action

Cooling centers are:

Air-conditioned public facilities where people may go for relief during periods of extreme heat.

ALTERNATIVE ROOFS

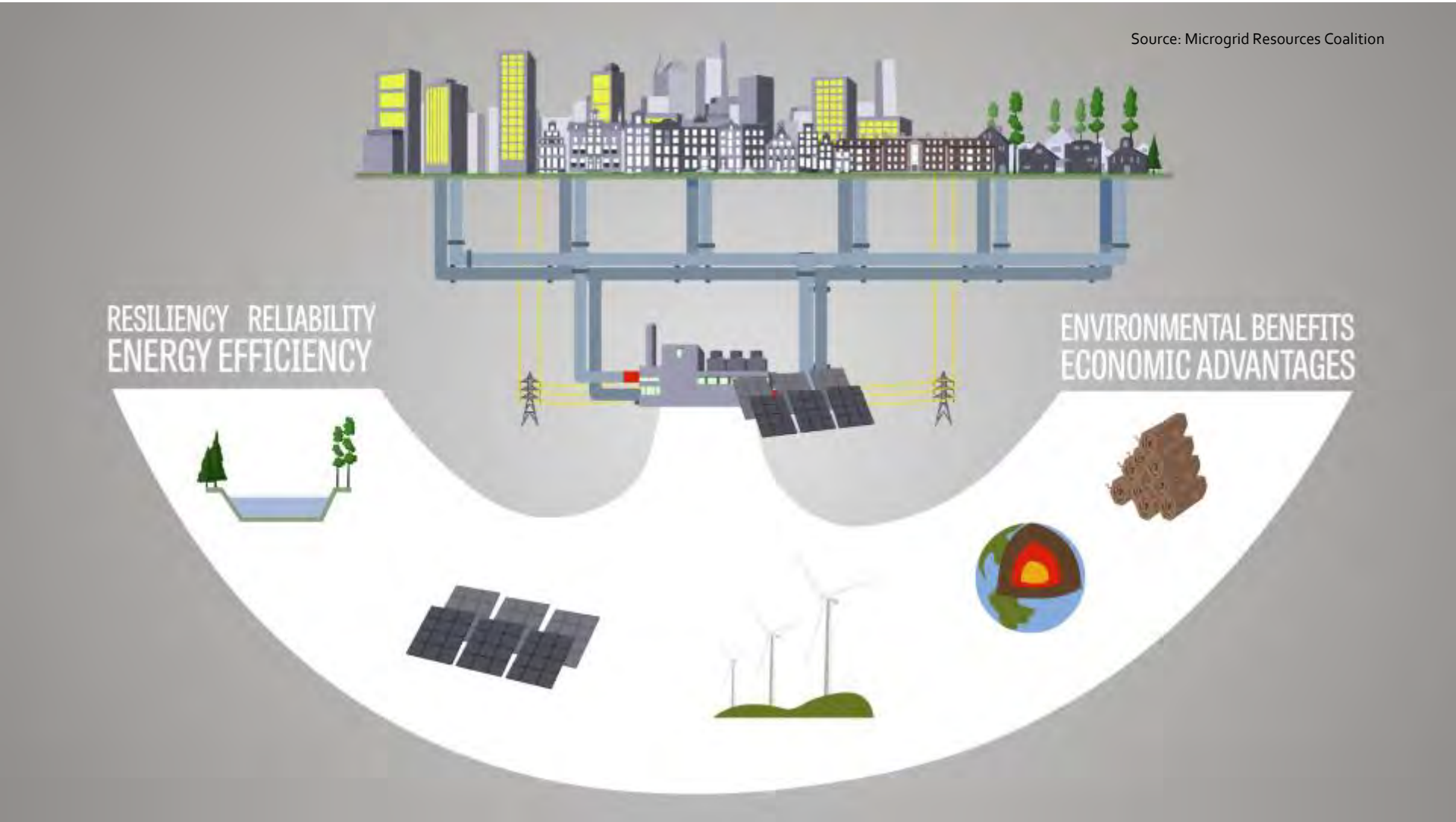
Community Action

White Roofs

Green Roofs

Renewable Micro-Grids

Community Action



VII. Water Restriction Advisory

Community Action

Drought Action Level Response signs are located around the Town of Harwich. These signs, as well as our website, are updated when an action level is active.

HARWICH WATER DEPARTMENT

DROUGHT ACTION LEVEL RESPONSES

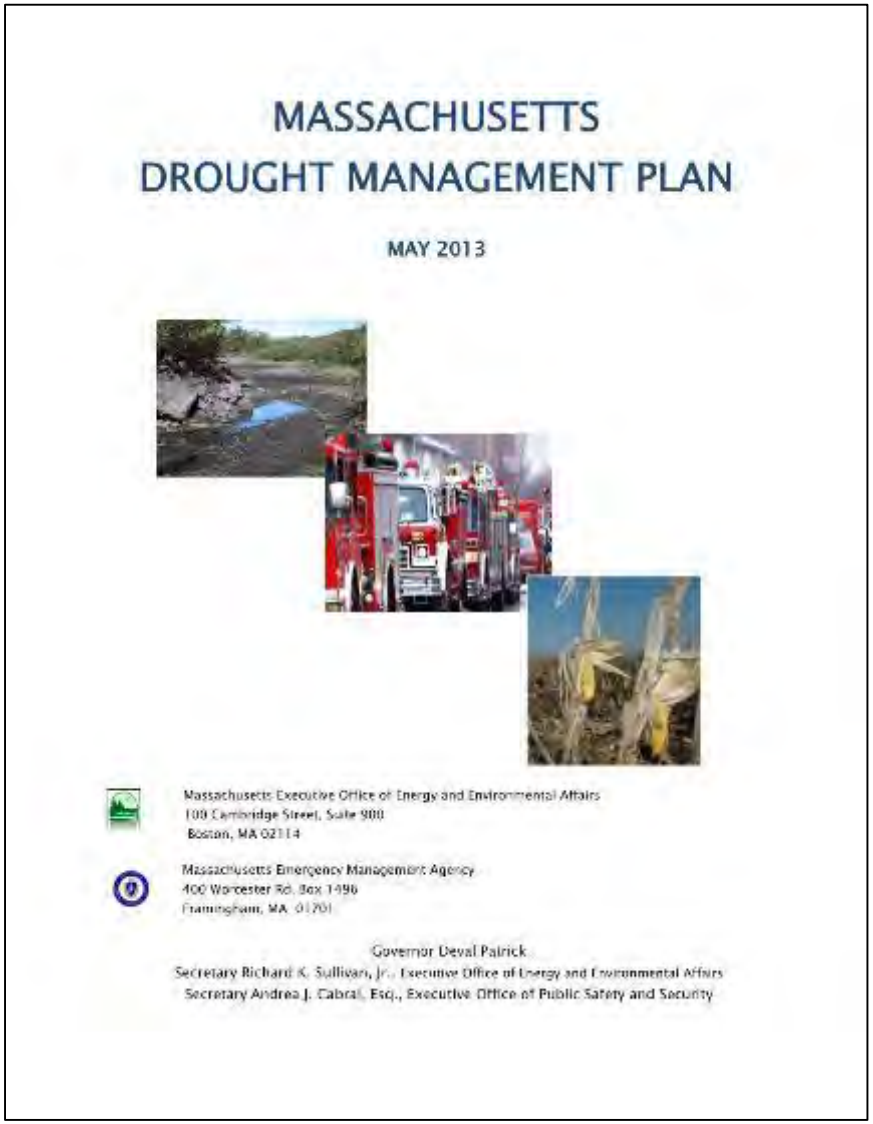
ACTION LEVEL	RESPONSE	FREQUENCY OF MONITORING
NORMAL	NORMAL WATERING CONDITIONS	
ADVISORY	VOLUNTARY WATER RESTRICTIONS ODD/EVEN DAYS	
WATCH	MANDATORY: ODD/EVEN LAWN WATER & OFF-PEAK HOURS	
WARNING	MANDATORY: 2 DAY PER WEEK OUTDOOR USE & OFF-PEAK HOURS	
EMERGENCY	MANDATORY: BAN ON ALL NON-ESSENTIAL OUTDOOR WATER USE	

Learn More ▸

Source: Harwich Water Department

VII. Drought Management Plans

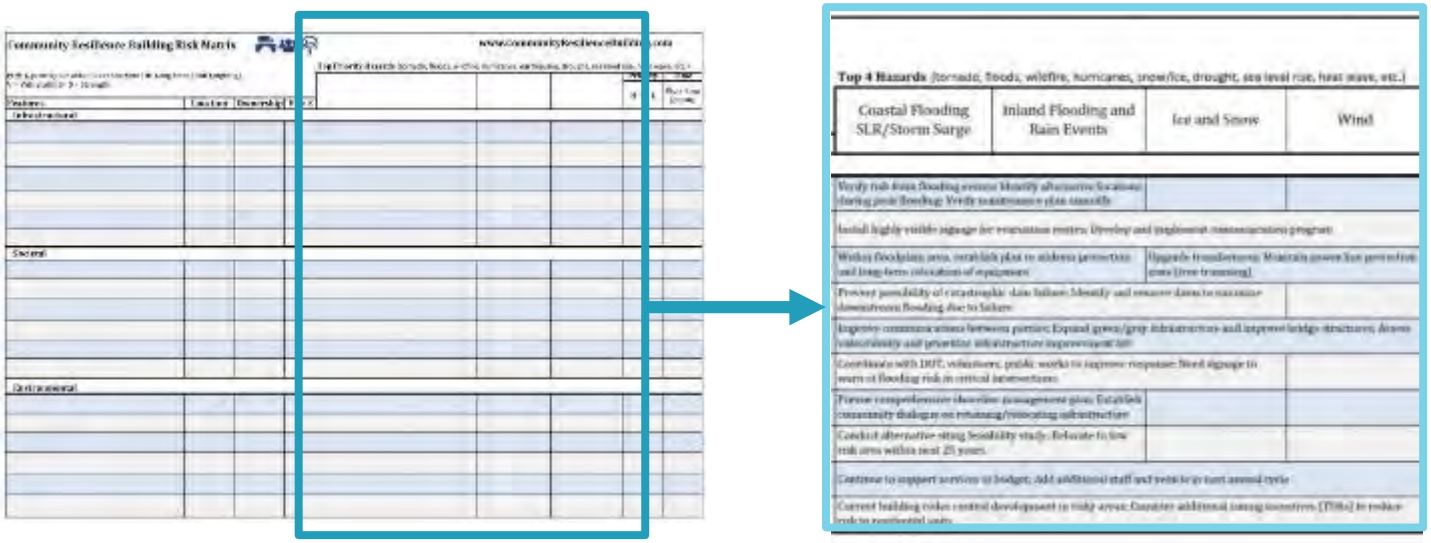
Community Action



VI. Community Actions

Small Group Exercise

- What actions will reduce vulnerabilities or reinforce strengths?
- Do they address single or multiple hazards?
- Are there intermediate steps to implement the actions?
- Are there existing programs, plans, or projects that the actions could strengthen?



VII. Break – 15 mins

Canton Community Resilience building Workshop

VIII. Priority Actions

Factors to consider:

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

VIII. Priority Actions

Small Group Exercise

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									

Priority H-M-L	Time Short Long Ongoing
H	S
H	S
H	O-L
H	L
M	S
M	L
L	S
L	L
	Ongoing
	Ongoing

VIII. Priority Actions

- Group 1
  - Strategies
- Group 2
  - Strategies
- Group 3
  - Strategies
- Group 4
  - Strategies

IX. Summary and Closing

- Reflections
- Next Steps
- Ways to stay involved

THANK YOU!!!!

The Kleinfelder Team

Robin Seidel

Nathalie Beauvais

Indrani Ghosh

Andrew Goldberg

Kirsten Ryan

Appendix B
Workshop Hazard Maps

FEMA Q3 Flood Zones

Zone

- FEMA 100-Year
- FEMA 500-Year
- Undescribed
- Historic Flood Areas

From Town of Canton
Hazard Mitigation Plan
(2018) and Town feedback
as of 10/31/2018

Water Bodies

- Pond, Lake
- Reservoir
- Wetland
- Submerged Wetland

Buildings

- Buildings
- Public Buildings

Inset: Canton Center

Canton Flood Risk Areas

0 0.25 0.5 1 Miles

N

Data Sources:

MassGIS, Canton Master Plan, Massachusetts Emergency Management Agency, Federal Emergency Management Agency, Metropolitan Area Planning Council

Drawn: 11/13/2018
Cartographer: Aaron Doucett

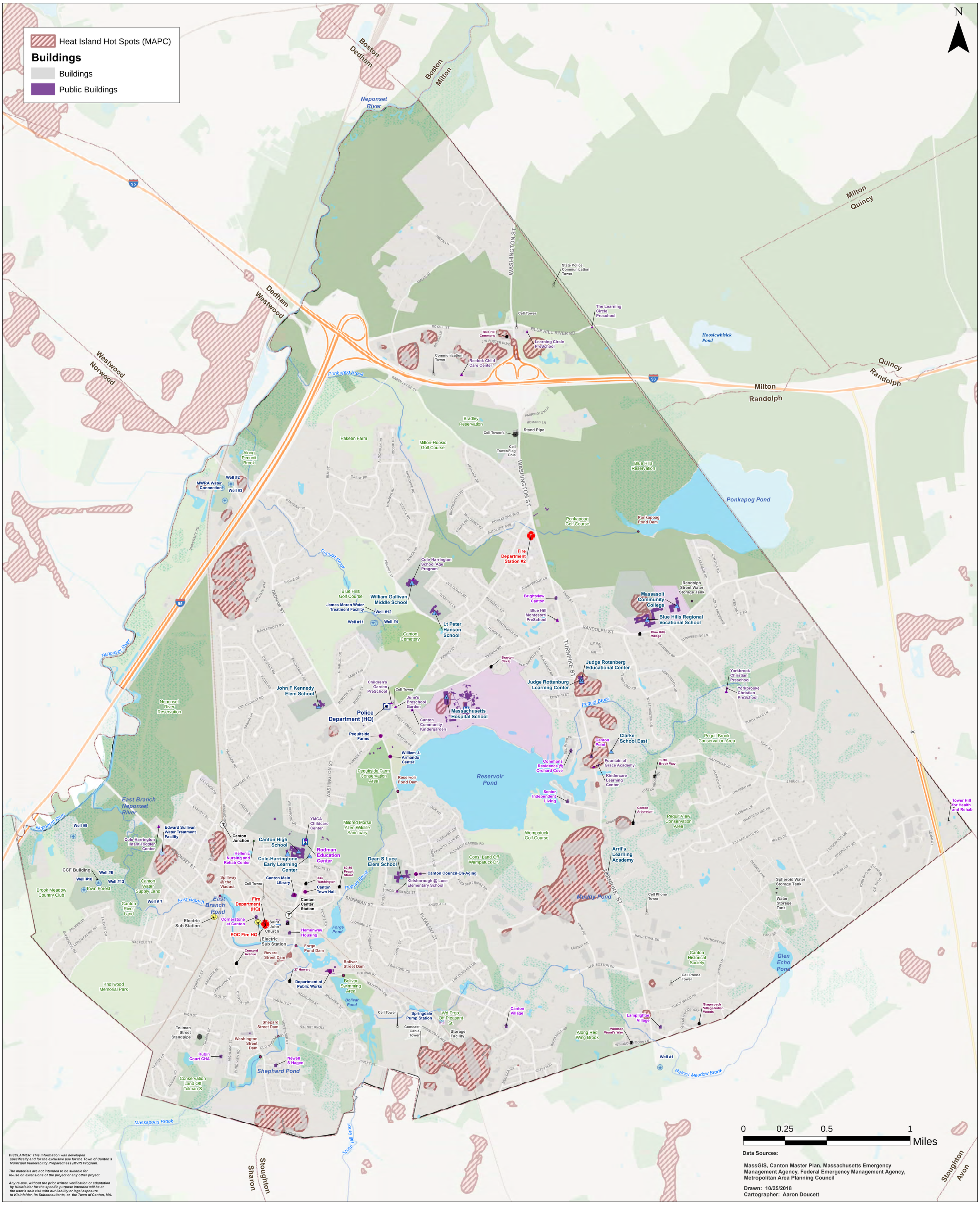
DISCLAIMER: This information was developed specifically and for the exclusive use for the Town of Canton's Municipal Vulnerability Preparedness (MVP) Program.

The materials are not intended to be suitable for re-use on extensions of the project or any other project.

Any re-use, without the prior written verification or adaptation by Kleinfelder for the specific purpose intended will be at the user's sole risk with out liability or legal exposure to Kleinfelder, its Subconsultants, or the Town of Canton, MA.

Town of CANTON Massachusetts

KLEINFELDER Bright People. Right Solutions.



Canton Heat Island Hot Spots (MAPC)

Wildfire (MEMA 2010)

Wildland Urban Interface

- Interface
- Intermix

Buildings

- Buildings
- Public Buildings

Water Bodies

- Pond, Lake
- Reservoir
- Wetland
- Submerged Wetland

N

0 0.25 0.5 1 Miles

Data Sources:

MassGIS, Canton Master Plan, Massachusetts Emergency Management Agency, Federal Emergency Management Agency, Metropolitan Area Planning Council

Drawn: 11/15/2018
Cartographer: Aaron Doucett

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Canton Wildfire Risk Areas

Town of CANTON Massachusetts

KLEINFELDER Bright People. Right Solutions.

Appendix C
Workshop Risk Matrices

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

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

Features	Location	Ownership	V or S	Flooding	Snow/Ice	Wind	Heat/Drought	Priority (H - M - L)	Time (Short Long Ongoing)
Infrastructural									
Stormwater Infrastructures	All Town - Dam important	Town	V and S	Stormwater MP - Needs to be communicated. Built improvements ($$$), Dam Improvements ($$$)	Stormwater MP - assessment of existing conditions ($), scale approach, politics on how each component - what are by-laws? ($)		At risk of being contaminated - wells for potable water, redundancy with MWRA, maintain redundancy ($)	H	S/O
Roadways (No bypass road redundancy - no access to hospitals in Canton)	Pleasant Street, Washington Street, Neponset	130 (state). others are Town.	V	1. Build to East-West Road. Need alternate evacuation route ($$$)		2. Sidewalk update program (phase $$). Invest in more comprehensive mobility plan that will provide redundancy (eg. Sidewalk, bike lane) ($$)	1. renovate - M, 2. M	M	1. L (alt evacuation here), 2. L (comprehensive mobility
Communication (all towers/cable) (IT)	Across Town	Private utilities	V	1. Provide shared self-contained infrastructure report support. (for example, public solar recharging stations in shopping mall, on public street, lobby, senior housing. 2. Assessment of communication				H	O (strategic alliance with provider with utilities)
Energy/Power (animals, electricity and gas)	Town	Private	V	Communication of severity and duration ($). Energy self sufficiency to be increased? ($$). Solar farm - exist already. How about wind?				M	S/O (partnership with town industrial, cell service providor /renewable)
Commuter Rail (Extreme snow shut it down)	train station	MBTA	V	Communication on all long disruptions. (Contingency Plan more problematic) ($)					
All buildings - design standards and regulations for buildings and stormwater (eg. Schools, fire station, public facility)	High Schools (strengths)		V/S	Municipal Buildings Assessment (or state) ($) - to inform emergency/backup systems ($$). Smart grid for complexes such as senior housing				H	S (Design standards and regulations)
Societal									

Senior Housing - snow/ice/heat/electrical power shortage) (48 hour threshold - get funding for growth) Shelter or relocation to family - not walking. At risk - Disabled/English as second language - list people at risk/GAP	3 Senior Complex ($$$ vs. $)	Housing Department Authority (Start DHCD - diverse/private with services)	V	Cable local TV - "What to do if" video ($). Need for education for emergency and how to prepare ($). Everyone has cell phones - solar recharging point of emergency package ($$). Evacuation plan needs to be updated ($).				H	O (education and evacuation info)
Homelessness	by train stations	gap (first responder, mental health, town)	V					H	S
Schools heat days and snow days	Town	Town							
Mobility/Accessibility = no sidewalk (relates to infrastructural - All buildings row)									
Disease - skin cancer. Air quality (asthma)									
Environmental									
Moths - limited to type of trees ? Mosquitoes - Lyme disease, west nile virus									
Urban Forest (relates to Infrastructural - Energy/Power (animals) row)	According to species?	Public and Private	V/S?	Greening of Canton - less impervious surfaces near trees could address heat and flooding				H	S (tree management plan)
Interface with anumals (squirrels, fox, coyotes, bird, deer, turkey)		Animal Control and first responder							
Increased flooding and repeated mold and increase in radon	Flood-prone areas (basement)	Mixed	V						
Contamination of water risk rises with increased stress/drought and extreme heat				Industrial properties to be tapped to contribute to CC resiliency - eg. Solar panel, water management - incentives in MP?					

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

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

Features	Location	Ownership	V or S	Flood	Snow/Ice	Wind	Heat/Drought	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Stormwater Infrastructure (Public and Private) - Sizing and maintenance	Town wide	Public/Private State/Municipal (everywhere)	V&S	Updated SW by land regulations for new development (moving target and continuous revision). Use updated design criteria for now Offsite stormwater mitigation (identified tanks) ($$). Advocate for rain barrels ($). Ground water reuse systems.	Use of organic-based deicers	X	Town-specific drought mitigation plan	H	ongoing, short (mean duration), long (existing retrofits)
Electrical Energy (substations, above ground lines (60/40), solar array (fields). High school has solar.	Town wide	Private (land leased from Town)	V&S	Advocacy ($), microgrids ($$$), mini-hydroelectric power supply ($$)	underground infrastructure ($$$), tree maintenance ($)	… collaboration efforts for critical infrastructure ($)	efficiency. Offset peak demand by usage. Recommended	M	Short. Long. Long.
Gas (large transmission lines)	Cobbs Corner Town	Private	V	advocacy for regional resiliency ($)		X	energy usage, … drains. Redundant energy ($$)	M	short
Roads (emergency/evac routes) (scenic routes) Rt 138	Neponset, Dedham, Randolph, Pleasant	Town/State	V	More detailed flood assessment (new flood maps). Pervious pavement.	Use of organic-based devices		use of light-color painting materials ($$)	M	O, S (new), L (existing)
Bridges	I95/Bolivar Street	Town/State	V/S	Bridge assessment and inspection ($$)	Use of organic-based deicers		?	H	L
Dams	Townwide	Town/State	V/S	Update dam assessment considering future climate		X		H	O-M
Viaduct		State	V			X		L	L
Societal 1) Hardening power HVAC & hardening schools (eg. Elementary) 2) buddy system, …, expanded communication (emergency communication) of existing services)									
Historic Sites/Properties	Town wide	Private/Non-profit	V/S	Hardening/Flood ($$$)	Upgrading, maintenance of equipment ($$)	Proactive management ($)	School-based community service	M	O
Schools (Pappas Rehab, Rottenberg Center)	Washington St, Randolph, Rt 138	Public/Private/ State/Local	V/S	Flood Proofing ($$$-$)		redundant power systems better ($$)	School-based community service (related to outreach/buddy system)	H	O-S
Senior center/community	see map	state/local public	V/S	Changing design standards*/redundant power ($)	Outreach/buddy	coordination between town departments	Outreach/buddy system ($) (related to school based community service)	H	S
Library	Washington	Public	V/S	Changing design standards*/redundant power ($)	Filling out contacts/community gaps ($-$$)		Backup power for emergency communication ($$)	H	S
Economic/Business Continuity Impacts	Clusters (Rt 138, Washington)	Private Ownership w public impact	V	Systems (solar, battery), emergency shelters	expanded communication system (hi-tech/low-tech)		Update emergency management plan for natural disasters	M-L	L
Senior/Public Housing/Assisted Living	Map	Public	V	Redundant emergency communication system ($-$$)			Senior center - community garden. Use of green/blue/white roofs ($$-$$$)	M/L	O-S (public housing), L (Private assisted)

Day care, pre schools ***	Map	Most private	V					M/L	
Environmental									
Trees (heritage trees, loss of land/habitat/trails) Tree around reservoirs	Townwide (Bradley)		V/S	Develop urban forest management plan. Updating sub-division rules/regulations	Pro-active tree management	Pro-active tree management	Develop urban forest management plan. Updating sub-division rules/regulations	M, H	S, O
Open Space (golf courses, blue hill)	Town	Town/Private		selecting legal mechanisms (eg. Right of first refusal)	Pro-active tree management	Pro-active tree management	Develop urban forest management plan. Updating sub-division rules/regulations	H	S
Insects/Microbes/Pests Migration (Deer)	Town	T		restrictions/easements. Pest management. Regional advocacy	wil be less		will be less	H, M	O, L
Groundwater/Aquifers Large Under Golf	Town Wide	Town	S (high-vol)/V (drought/water supply - 60% town wells)	Develop urban forest management plan. Updating sub-division rules/regulations. Public education. Updating zoning bylaws to incentivize meaningful development - more green space. Legal mechanisms for potential open space	Organic de-icing	X	Develop urban forest management plan. Updating sub-division rules/regulations	M	O
Surface Water/wetlands encroaching and loss (Neponset River, Res)	Town	State/Town	V/S	selecting legal mechanisms (eg. Right of first refusal). Public education.	Organic de-icing	X	Develop urban forest management plan. Updating sub-division rules/regulations	M	O-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)
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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	Flooding	Snow/Ice	Wind	Heat-Related	Priority H - M - L	Time Short Long Ongoing
Infrastructural (new dev/retrofit)									
Drainage age,capacity/design,policies,projections	All town Dedham, York		V	Make MAP BMPS, structures ($$$)	Update Concord rules			H	S;O
Dams/culvert crossing flood control/failure	See map for flood	Town/State/Private	V/S	Repairs ($$)	Dam Removal?			M	O;L
Drinking water (redundancy in storage, treatment, system sources contamination)			V/S	WTP Resiliency and MWRA. Service to Glen Echo		Policies/Enforcement	Communication on water ban ($), cons. Education ($)	M	O;L
Sewer/Septic maintenance/function	Glen Echo/Turnpike		V	Encourage sewerage, educate on septic				L	O;L
Transportation (trains, roads, evac rts, traffic)	Neponset St, Highway/Feeders	Town & State	S	Elevate ($$$), evac plans	Tree maintenance	Tree maintenance	Senior center Van	M	L
							ID seniors at risk	H	S
Societal Know your neighbors/neighborhood partnerships (future problem solvers)									
Vulnerable Pop (Hospital, Sen. Living, Nursing home, ESL/non-English)*			V&S				Senior center cooling, town pool	M	S;O
Emergency Response (Existing plans, prop access, all hazard)			S	Have a plan, prepare materials	Educate high risk communities	Encourage leadership discussions to promote programs and hire staff		L	O
Schools & Buildings (library, roofs, skating rink)			V/S	Ensure access, retrofits and prep	Services; insp & maint generator and warming center	Retrofits.Library hours extend to saturdays for shelter/centers	Library hours extend to saturdays for shelter/centers	H	
Disaster recovery regional support			S						
Emergency Communication via local tv news, social media, rev. 911, canton kiosk, cell phone, em. Reports/ code red			S/U	encourage opt-in. sign up residents for town alerts.		Education/sign up campaign at town hall		H	S/O
Recreation - Reservoir Pond									
Environmental									
Wetlands (Resources for flooding/storage)			S	Education and Planning protection and restoration ($$)				M	L
Pests/Disease Vectors (West Nile, Ticks and Lyme)				Remove standing water (policies? Management % pub land?)		Pest/Animal Control Spraying	Edu. Bat house. Eagle scouts proj.	M	L
Chemical hazards	Garages. Plym. Rubber			Edu. Esp. HHW outreach/consistency				L	O
Watershed - water quality; temp; algae	Res			Proper SW Mgmt. GW prot.	Alt de-icing. Pervious pvt.		Water quality protection. Pesticide/herbicide golf course management	H	O;L
Trees/Vegetation (disease, heat protection, falling power lines)							power comp. coord		O;L
Pollution (water, food, air)								M	L/O
Superfund/Cleanup/Env area of containment								L	L/O

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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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	Flooding	Heat	Wind	Snow/Ice	Priority H - M - L	Time Short Long Ongoing
Infrastructural (green building in town master plan)									
Neponset Street			V, S	Floods, evacuation route	promote/incentivize green building	M,S			
Paul Revere flood mgmt structure		town?	V/S	Can release water, needs to be maintained	via PB regs, retrofit mini buildings - resiliency checklist PB review				
Wells are in flood zone (flooding up to Dunkins)		town	V/S	Power outage/water availability					
138 Turnpike near Dan Road, Shepards pond flooding Rockland		MADOT	V/S	flooding/major transit route					
DPW site - Bolivar Street/Forge Pond			S,V	Vulnerability and flooding					
Water Dept - near Prest. Elm Green Lodge University floods			V, V	Vulnerability and flooding					
Societal									
Vulnerable population	Townwide	Town Neighbors	Both	Ed programs - continue/formalize - add other topics					
Education - lack of pub preparedness	Townwide	Schools, health dept, em services	Vuln	Proactive messaging - health fair/visits to FD srctr - expand topics - IT - M,S. Emergency messaging - Improve everbridge - not used - H,S. More staff. Generators - H,S.					
Unprepared senior housing	specific	state, council on aging	Vuln						
Comm/Info Network Chain	Townwide	Town Administration	Both	By voting district?					
Apartment Building with Residents not attached to Canton	Town/Specific	Private management, condo associations, state	Both	Reach out to property management establish emerg plan					
Stronger IT related to Em	Specific	Town	VS	Pre planning with EOC Cert. Need redundancy/training. Emergency messaging - P/O townwide					
Environmental (schools/town buildings - assessing buildings (town) for current emergency shelter and possible future adaptations/mult purpose)									
Water quality/Sediment	Regional	Town DEP Private	V	Understand risks/hydraulics (flood mgmt study)					
Contamination during flooding	Regional	Town DEP Private	V	Household haz storage education - proactive & reactive. Businesses with flooding vulnerability - inventory/mitigate				M	S/O
Wildlife	Regional	Town	V	1 animal control person full time. DCR Resources - utilize? Collaborate?					
Recreation	Townwide	Town	VS						
Wetlands	Town	Town	VS						
Trees	Town	Town	VS			Town arborist DPW (other responsibilities) Inventory/Management Plan for trees?		L	L,O

Appendix D
Listening Session Sign-in Sheet

Canton Vulnerability Preparedness Listening Session Sign-in

Facilitators: Laura Smead (Town Planner) and Kleinfelde

Date: January 28, 2019

Place/Room: Canton Public Library, Community Room

Time: 7:00PM

	PRINT NAME	AFFILIATION
1.	Heather Cahill	Conservation Administrator, resident
2.	Ed Walsh	Building Commissioner
3.	Scott Johnson	Deputy Chief, Fire Department
4.	Regen Milani	Conservation Agent
5.	Anne Holden	Resident
6.	Cindy Bonner	Resident
7.	Jennifer Wexler	Resident
8.	Meredith McLoughlin	Resident, Master Plan Steering Committee
9.	Emilio Mauro, Jr.	Financial Committee/ Master Plan Steering Committee/ Economic Development Committee
10.	Lisa Lopez	Canton Community Preservation Committee
11.	Kirsten Ryan	Kleinfelder
12.	Barbara Reardon	Town Engineer
13.	Alyssa O'Mara	Resident
14.	Christine Smith	Resident
15.	Andrew Goldberg	Kleinfelder
16.	Laura Smead	Town Planner
17.	Emily Prigot	Library Trustees
18.	Anonymous	Resident
19.	Anonymous	Resident
20.	Anonymous	Resident