TOWN of DANVERS
Community Resilience Building Workshop Summary of Findings

MAY 2020

Weston & Sampson

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1.0 INTRODUCTION

The Town of Danvers pursued the Municipal Vulnerability Preparedness (MVP) Planning Grant to expand the assessment of the Town's vulnerability to climate change and to identify priority action items that are well suited to advancing the MVP program's priorities. The MVP process in Danvers was multidisciplinary in nature as stakeholders represented each facet of the municipal government. The MVP Planning Grant was also leveraged as an opportunity to craft a coordinated vision and to identify future areas of collaboration.

MVP Objectives in Danvers

Increase the resilience of the community

Raise awareness of climate threats

Identify priority actions to move forward

Create implementation pathways

1.1 Land Use and Critical Facilities

Danvers' four tidal rivers and marina have been important components of the Town's physical, historical, and cultural landscape. The proximity and connection to water also makes Danvers vulnerable to flooding, rising sea levels, and intense coastal storms. Land uses along the waterfront range from residential, commercial, to industrial. Many of the parcels that were once a part of the working waterfront have been converted into residential homes.[1] Recent developments and infill have also increased the impervious surface area in Danvers and started to encroach on historic agricultural lands and wetlands. Promoting infill and climate resilient development to protect Danvers' remaining undeveloped land (25% of the total land area) will increase the Town's adaptative capacity.

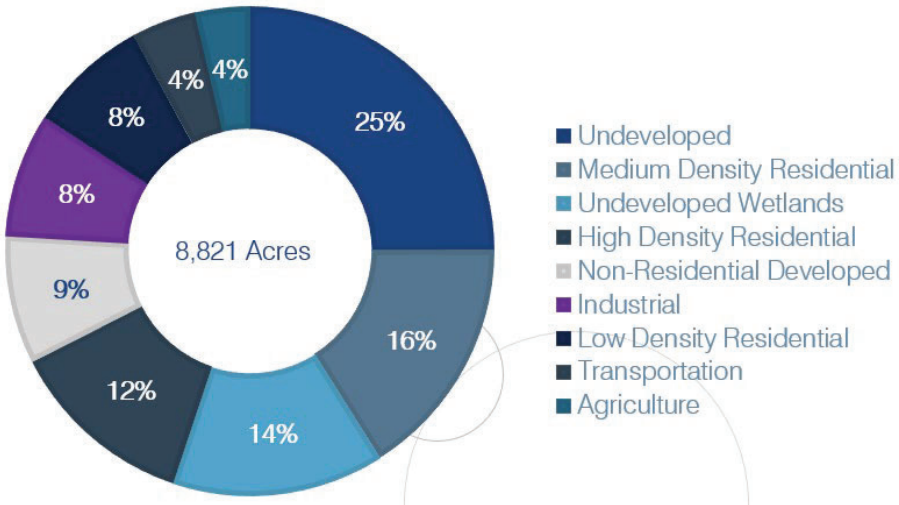


Figure 1. Land Use in Danvers (Town of Danvers and MAPC, 2019)

Using the Town's latest Hazard Mitigation Plan (updated in 2019) as a base, the planning process updated and confirmed a list of critical facilities (included in Appendix B: Community Resilience

[1] Town of Danvers and Metropolitan Area Planning Council (MAPC), "Town of Danvers Draft Hazard Mitigation Plan: 2019 Update," January 23, 2019.

Building Workshop Materials). These critical facilities were mapped against sea level rise projections, hurricane inundation, and the Federal Emergency Management Agency's (FEMA) flood maps. The resulting Hazard Map (included in Appendix B) was used as a reference for participants during the Community Resilience Building Workshop.

1.2 Demographics and Social Services in Danvers

Danvers is home to approximately 27,727 residents. Over forty percent of the population is under 18 or over 65, which is slightly higher compared to Massachusetts as a whole (37%). Nearly 3,500 students are enrolled in the public school system, which includes five elementary schools, one middle school, and one high school. Danvers is also home to private schools including Plumfield

Table 1. Vulnerable Populations (United States Census and American Community Survey, 2019)

Population	Danvers	Massachusetts
2010	26,493	6,547,790
2018	27,727	6,902,149
Age		
Under 18 years:	20.3%	20%
65+ years:	21.3%	17%
Education		
Bachelor's degree or higher:	41.2%	42.1%
Additional Information		
Median household income:	$79,795	$74,167
Persons in poverty:	6.3%	10.5%
With a disability:	7.9%	7.9%
Language other than English spoken at home:	8.8%	23.1%

Academy, St. Mary of the Annunciation, and St. John's Preparatory School. Danvers has one post-secondary school, the Essex North Shore Agricultural & Technical School. Youth and seniors are considered vulnerable populations during extreme weather events because of potential isolation, lack of access to resources, and need for additional care. People with a disability may also be

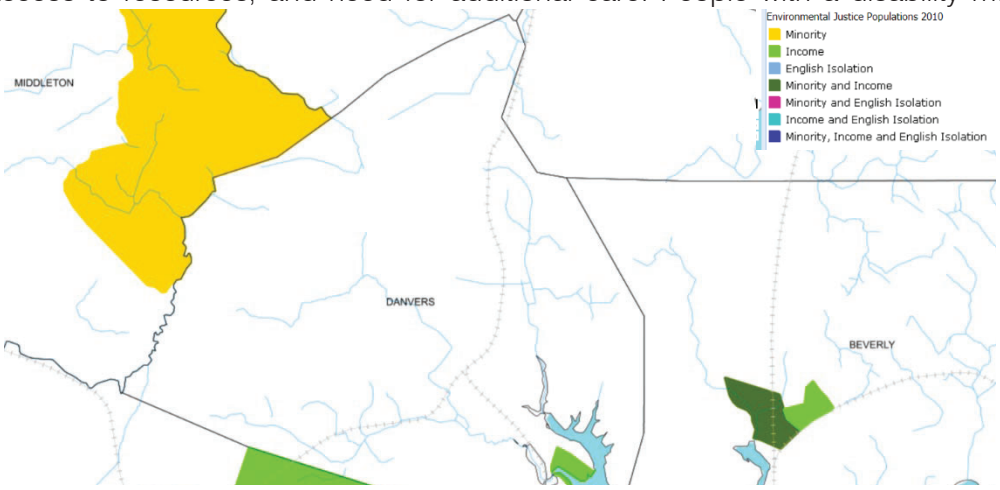


Figure 2. Environmental Justice Populations in 2010 (EOEEA, 2019)

vulnerable for similar reasons. Data has shown that residents over the age of 65 represent Danvers' highest increase in relative population growth.[2] Climate change planning efforts should consider the unique needs of this demographic, and the increasing demand that an aging population may put on the Town's emergency response personnel, public facilities, and other social services.

Residents with limited English-language proficiency are also considered vulnerable because emergency alerts and communications are less likely to be in their native language. For this reason, additional care should be taken to provide emergency communications in multiple languages. Low-income households that face financial burdens considered vulnerable because they may find it more difficult to prepare, adapt, or recover from extreme events. Although Danvers has a lower percentage of people living in poverty compared to the state (refer to Table 1), there is a neighborhood (or a block group) along the coast whose annual median household income is equal to or less than 65 percent of the statewide median ($62,072 in 2010) and is therefore considered an environmental justice community (please refer to Figure 2). There are several other environmental justice communities in this region, including Middleton, Beverly, and Peabody.

1.3 Background on Current Resilience Efforts

The Town of Danvers is involved in ongoing resiliency work related to zoning and regulations, public infrastructure, stormwater management, public safety, community outreach, and tree maintenance. Many of these actions were captured in the 2019 update of Danvers' Hazard Mitigation Plan and summarized in the table below.

Table 2. Summary of Existing Hazard Mitigation Measures (Town of Danvers and MAPC, 2019)

Hazard	Mitigation Measure	Update/comments
Flooding	Participation in the National Flood Insurance Program (NFIP)	Effective/205 policies in force
	Adopted the Massachusetts Building Code	Effective
	Floodplain District	Updated /Effective
	Stormwater Management Bylaw and Regulations	Effective
	Street sweeping	Effective
	Wetlands Regulations	Effective
	Subdivision and Zoning	Update with climate resilience and adaptation measures as needed
	Town cleans/inspects catch basins each year	Effective
	Public Education on Stormwater	Effective
	2017 Open Space and Recreation Plan-being updated in 2019.	Effective
	Existing Site-Specific Flooding Mitigation	Effective
Wind	Town tree-pruning management follows MGL Chapter 87	Effective
	State Building Code addresses wind standards	Effective for new construction

[2] LDS Consulting Group, "Town of Danvers Affordable Housing Production Plan," September 11, 2014. P10

Table 2. Summary of Existing Hazard Mitigation Measures (Town of Danvers and MAPC, 2019)

Hazard	Mitigation Measure	Update/comments
Winter-Related	Regular snow removal operations and roadway treatments	Effective
	Catch basin cleaning to maintain drainage	Effective
	State Building Code addresses snow load standards	Effective for new construction
Fire	Outdoor burning permits	Effective
	Subdivision review	Effective
Geologic	State Building Code addresses earthquake standards	Effective for new construction.
Multi hazard	Comprehensive Emergency Management Plan (CEMP)	Effective/Up to date
	Emergency Management Team (EMT)	Effective
	Health Department Emergency Preparedness with North Shore- Cape Ann Emergency Preparedness Coalition	Effective to include reference to natural hazards planning and response
	2002 Master Plan- being updated 2019	Add Climate Adaptation to next plan update

Conversations with Municipal leadership and community members revealed additional details related to the table above. The Town is fortunate in many ways to operate several municipal utilities (electric, water, and sewer), which gives the Town authority to protect some of its most critical facilities. Current resiliency efforts related to municipal utilities are summarized below:

- Due to the Town's work over the last fifteen years, most substations are new
- The Town cleans 1200 of its 5000 catch basins on an annual, revolving basis
- Storm drainage open channels, culverts, and pipes are designed for a 100-year storm

During the Community Resilience Building Workshop and Listening Session, participants shared additional examples of existing resilient strategies in Town:[3]

- Operations and Maintenance:
  - The Town coordinates its tree trimming program with the National Grid
  - A 50/50 mixture of sand and salt is used on roadways to address winter conditions
  - The River Committee has played a role in dredging project in the past
- Design Strategies:
  - There are permeable pavers in two locations in Danvers, including at 15 Kirkbride Drive near the Rehabilitation Center
- Public Outreach and Education:
  - The Town has a mosquito program, and shares information related to scheduled barrier sprays and techniques to prevent mosquito borne illness on its website[4]
  - The Town shares emergency notifications with residents using Blackboard Connect (recorded messages and automatic call system)

[3] Workshop Attendees, Community Resilience Building Workshop: Danvers, Massachusetts, December 5, 2019.
[4] Town of Danvers, "2019 Mosquito Season," Public and Environmental Health Division, October 1, 2019, danversma.gov/mosquito/.

    - The Town shares information through its website and social media platforms including Twitter, Facebook, and Instagram
- Emergency Shelters:
    - The Danvers High School and the Senior Center are used as shelters
- Regulations:
    - At least 30% of total development must remain open space
    - Floodplain District and Floodways protect lands in the Town of Danvers that are subject to seasonal or periodic flooding
    - Hawthorne West District maximum impervious lot coverage for new construction may not exceed 50% of the lot area
    - Transfer Development Program incentivizing stormwater recharge in strategic areas with density bonuses in other areas of the Town

2.0 PROCESS AND TIMELINE

The MVP planning process engaged municipal leaders, key stakeholders and the general public to inform the Summary of Findings Report.

2.1 Core Team Meetings

The Town recognized the need for robust engagement of all municipal departments and utilized a standing leadership meeting to convene its first Core Team meeting on October 10, 2019. The Core Team guided the process by reviewing and providing feedback on the materials that would later be used at the Community Resilience Building Workshop. The Core Team provided information about past hazard events and other input related to natural hazards and climate change impacts in Danvers. The narratives and ideas of the Core Team improved the project team's materials and brought the global phenomenon of climate change down to the local scale. Core Team members are listed in Section 7.1: CRB Workshop Participants. The Core Team also developed the invitation list for the Community Resilience Building Workshop described below and reviewed the final priority action items to ensure local priorities were captured.

2.2 Community Resilience Building Workshop

The objective of the Community Resilience Building (CRB) Workshop was to capture ideas from a diverse set of perspectives and to build a broad coalition of stakeholders to move climate resilience forward in Danvers. Municipal staff, town boards and committees, local organization, regional partners, state agencies, and adjacent towns were invited to participate in the CRB Workshop. The Town also advertised the opportunity for 10 residents to join the workshop. Approximately 50 participants were able to join throughout the day. The CRB workshop utilized a Risk Matrix to complete the objectives of the day in small groups. The CRB workshop's central objectives 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

The completed matrices are available in Appendix B: Community Resilience Building Workshop Materials. Additionally, a list of workshop participants is included in Section 7.1 of this report.

Figure 3. Danvers Community Resilience Building Workshop (Weston & Sampson, 2019)

2.3 Listening Session

As part of the CRB process, the Town convened a public listening session in partnership with the Board of Selectmen on March 10th, 2020. There were 20 people in attendance. To promote the event, an invitation was sent to the CRB workshop invitee list and were asked to promote the listening session through their own networks. Additional promotional materials were posted to social media and the Town's webpage. The listening session presented an overview of the planning process, climate impacts in Danvers, and the results of the CRB Workshop. The listening session began with an interactive presentation that used clickers to capture real-time feedback from attendees. The meeting closed with a Q&A session with the audience. The listening session was recorded live by Danvers Cable Access TV and was posted to their YouTube page. Team members recorded notes and input from attendees, which were incorporated into this report. The summary of the meeting and interactive polling is available in the Appendix. No comments were submitted during the public review period.

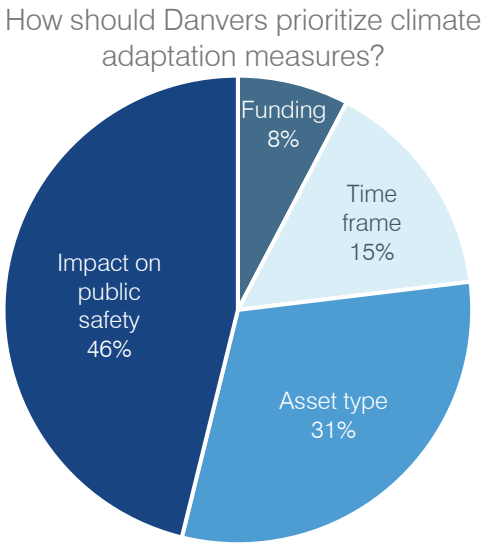


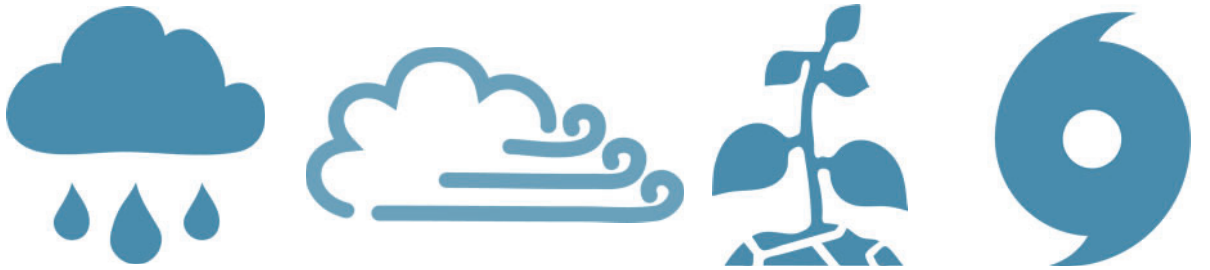
Figure 4. Polling Results from the Listening Session

3.0 TOP HAZARDS

During the CRB Workshop, participants discussed the Town's greatest threats under climate change in a large group format. The hazards initially introduced to start the conversation included flooding, wildfires, hurricanes, extreme wind events (including severe thunderstorms and tornados), drought, extreme temperatures and winter weather (including Nor'easters, ice storms, and severe storm storms). During a large group discussion, workshop attendees were able to narrow down these event types to four top hazards.

3.1 Top Hazards

Flooding, severe storms, drought, and coastal hazards emerged as the top areas of concern during the CRB Workshop. These hazards are discussed in more detail in the following sections. At the public listening session, attendees indicated that severe storms were of most concern.



Flooding | Severe Storms | Drought | Coastal Hazards

3.2 Current Concerns and Future Challenges

3.2.1 Flooding

Across the northeast, precipitation during heavy events increased by more than 70% between 1958-2010.[5] This change in precipitation patterns can lead to increased riverine and stormwater flooding. These conditions are expected to continue to worsen, with an anticipated 8% increase in extreme precipitation events by midcentury, and a 13% increase by 2100.[6] These changes will require incorporating climate change considerations (including future precipitation data) into the design of public infrastructure, which often have a lengthy design life and can be difficult to retrofit.

Stormwater flooding due to poor drainage, increased impervious surfaces, and undersized infrastructure is a growing concern. Danvers has documented known areas with undersized culverts, which include Ash and Purchase Streets, the High School Field, Upper Massachusetts Ave, and Upper Valley Road. The Town also experiences flooding near the Danvers Electric Property, Town Center, Porter River, Beaver Brook, Crane River, Waters River, and various pump stations. The Town has taken some steps to protect the Electric Light Station by installing manual deployable barriers that provide protection up to four feet. However, these barriers were breached during the Mother's Day Flood in 2006.[7]

[5] Massachusetts Executive Office of Energy & Environmental Affairs (EOEEA), "Climate Change Clearinghouse for the Commonwealth," Resilient MA, 2019, resilientma.org/.
[6] Massachusetts Executive Office of Energy & Environmental Affairs and Adaptation Advisory Committee, "Massachusetts Climate Change Adaptation Report," September 2011. P19
[7] Workshop Attendees, Community Resilience Building Workshop: Danvers, Massachusetts.

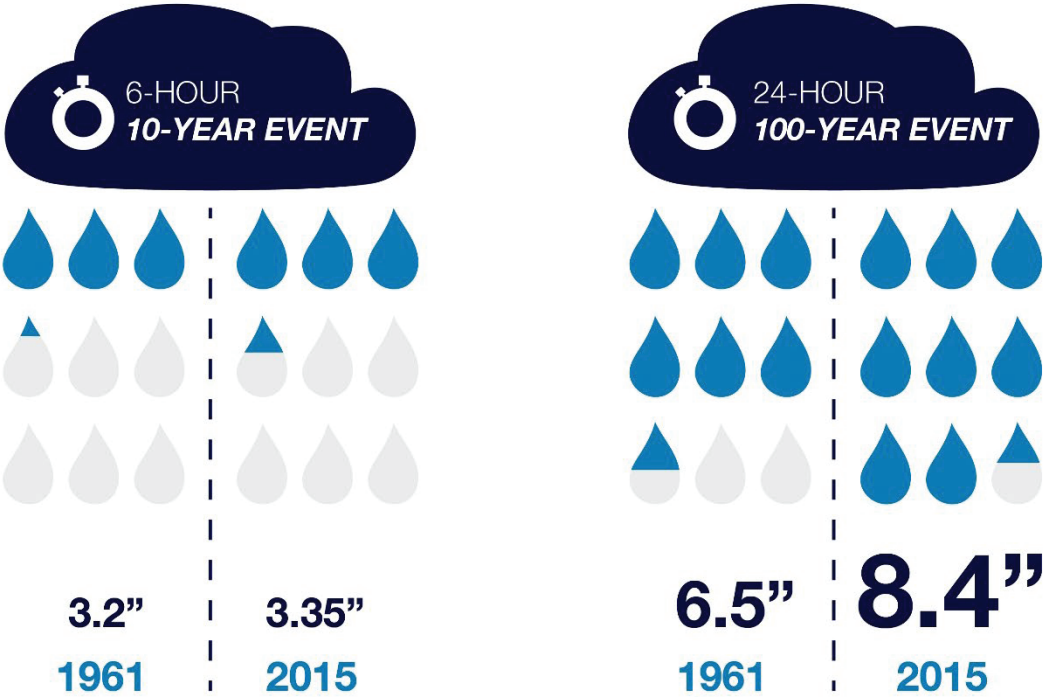


Figure 5. Changes in Precipitation (NOAA TP-40 [1961] and NOAA Atlas Volume 10 [2015])

Currently, there are five repetitive flood loss structures in Danvers. As of May 2013, the National Flood Insurance Program (NFIP) paid $328,504 for five claims.[8] As defined by the Federal Emergency Management Agency (FEMA), a repetitive flood loss structure is an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.[9]

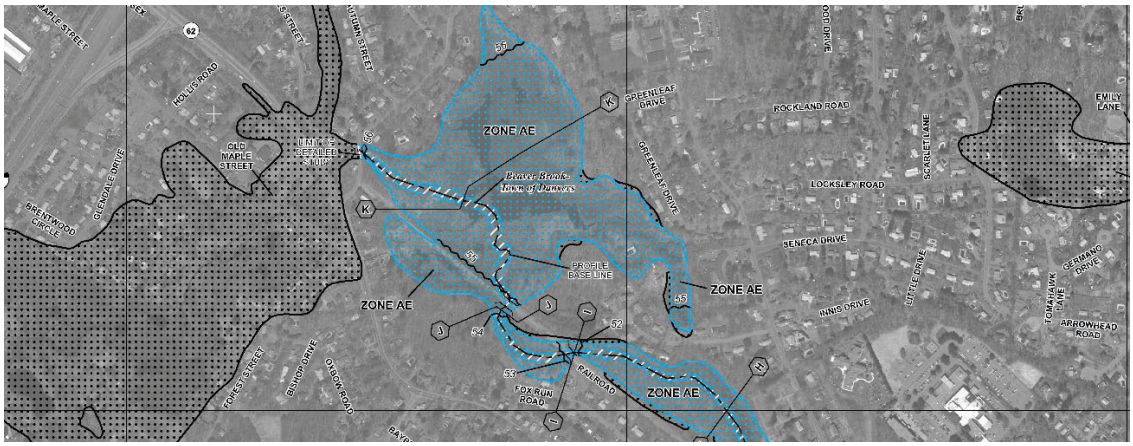


Figure 6. A portion of the FEMA Flood Insurance Rate Map (FIRM) for Danvers (FEMA, 2012)

[8] Town of Danvers and Metropolitan Area Planning Council (MAPC), “Town of Danvers Draft Hazard Mitigation Plan: 2019 Update.” P32.

[9] Federal Emergency Management Agency (FEMA), “Definitions,” Government, 2019, fema.gov/national-flood-insurance-program/definitions#R.

3.2.2 Severe Storms

Extreme storms such as thunderstorms and Nor'easters can produce strong winds, snow, and ice, in addition to heavy rainfall. Extreme snow events, including blizzards and Nor'easters, are expected to become increasingly intense and produce heavier snowfall.

High winds and ice can cause power disruptions, accidents and difficult travel conditions, and property damage. The blizzard of 2013 left nearly 400,000 Massachusetts residents without power and these storms are among the most expensive and disruptive weather events in Massachusetts.[10] A blizzard in 2015 led to limited public transportation services in Danvers and the surrounding area for weeks after the event.[11] Public transit connections are especially important for low income residents who may not have access to a personal vehicle.[12]

The Town of Danvers has documented five severe wind events between 2013 and 2019. One summertime storm in June 2018 produced 50 MPH winds that downed trees and power lines, leading to roughly $10,000 in damage. Similarly, a series of thunderstorms in 2017 produced winds over 50 MPH that felled trees and caused power outages and another $10,000 in damage.[13]

Felled trees and power lines are a frequently cited concern in Danvers. Approximately 90% of the Town's electrical distribution is through overhead lines. These lines are vulnerable, especially those near town hall. A discussion during the Community Resilience Building workshop revealed that a recent snowstorm cut communications and closed Town Hall temporarily.

The Town of Danvers Department of Public Works released a Vegetation Management Plan that outlines five-year goals, objectives, guidelines, and methods for managing trees and dense vegetation and ensuring electrical service. This plan includes information related to removing trees that may fall onto electric lines and cause power outages and clearing vegetation that may block emergency access to roads or equipment. The report identifies environmental co-benefits of this week, including the removal of invasive species, and the ability of well-maintained low-lying plants to anchor soil in place and prevent erosion.[14]

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[10] Commonwealth of Massachusetts, Massachusetts Emergency Management Agency (MEMA), and Massachusetts Executive Office of Energy & Environmental Affairs (EOEEA), "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," September 2018, mass.gov/files/documents/2018/10/26/SHMCAP-September2018-Full-Plan-web.pdf.

[11] Town of Danvers and Metropolitan Area Planning Council (MAPC), "Town of Danvers Draft Hazard Mitigation Plan: 2019 Update."

[12] LDS Consulting Group, "Town of Danvers Affordable Housing Production Plan." P15

[13] Town of Danvers and Metropolitan Area Planning Council (MAPC), "Town of Danvers Draft Hazard Mitigation Plan: 2019 Update."

[14] Town of Danvers, Department of Public Works, and Electric Division, "Vegetation Management Plan 2016-2020," 2016.

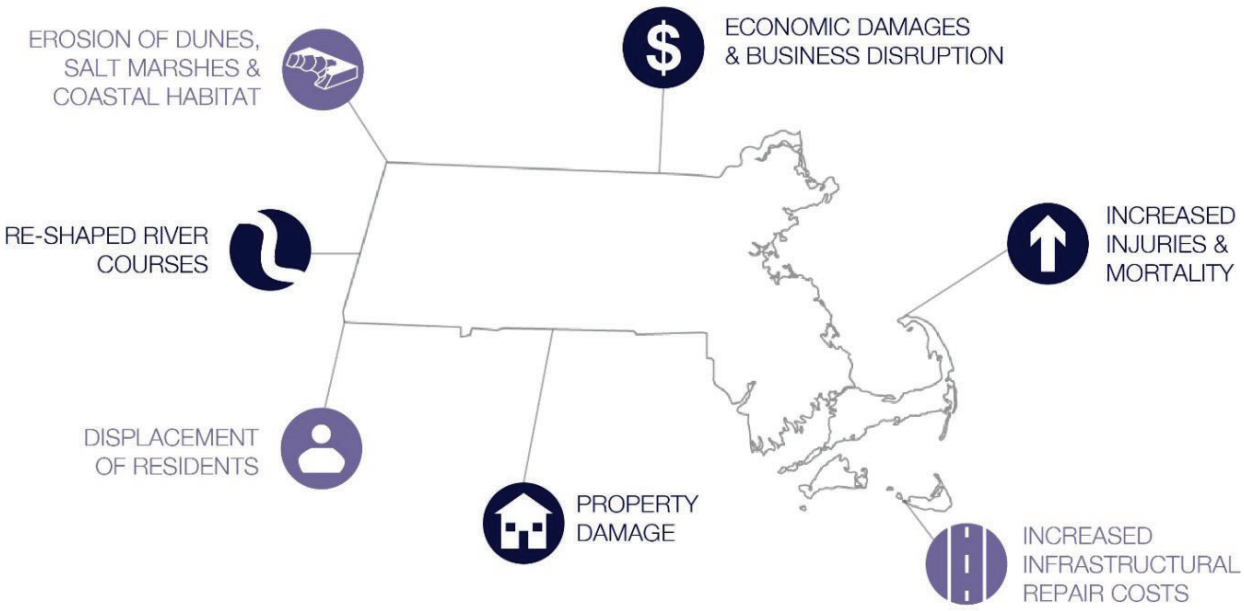

Figure 7. Impacts of severe storms (EOEEA, 2019)

3.2.3 Drought

Episodic droughts, or droughts lasting one to three months, are predicted to occur more frequently in the late summer and early fall. Under a high emissions scenario, the frequency of episodic droughts lasting up to three months could increase as much as 75% by 2100. Increasing temperatures combined with decreasing summer rainfalls could produce drought conditions like those experienced in the summer of 2016.[15] After the 2016 drought, six public water suppliers, including Danvers, came together to create the Ipswich River Basin Water Management Act Planning Grant Project in collaboration with the Massachusetts Water Works Association (MWWA). This project assessed existing conditions and future projections, water supply and demand, water management strategies, alternative water sources, and opportunities for regional solutions. Regional solutions are especially important for Towns like Danvers, as the Danvers' water supply also services Middleton. This study's final report included a model simulation that found that Danvers "cannot fully meet its water needs with local sources during droughts that are similar or great in intensity as the 1982 and 2002 droughts" (Kleinfelder 2018, 42). During previous droughts or times of limited water supply, Danvers has purchased water from the Salem-Beverly Water Supply Board (SBWSB). In the future, there may be a need to purchase water from the MWRA. The model simulation found that a connection to the MWRA system could meet Danvers water needs during a drought.[16]

Increasing temperatures and dryer conditions under droughts can also lead to increased wildfire risk. There is concern about wildfire risk in the areas near Danvers High School, Putnamville Reservoir, Choate Farm, and Whipple Street Woods.

[15] Massachusetts Executive Office of Energy & Environmental Affairs and Adaptation Advisory Committee, "Massachusetts Climate Change Adaptation Report." P19.
[16] Kleinfelder and Massachusetts Water Works Association (MWWA), "Ipswich Basin Water Management Act Planning Grant FY18 - BWR2018-01 Draft Report MassDEP Submittal," 2018.

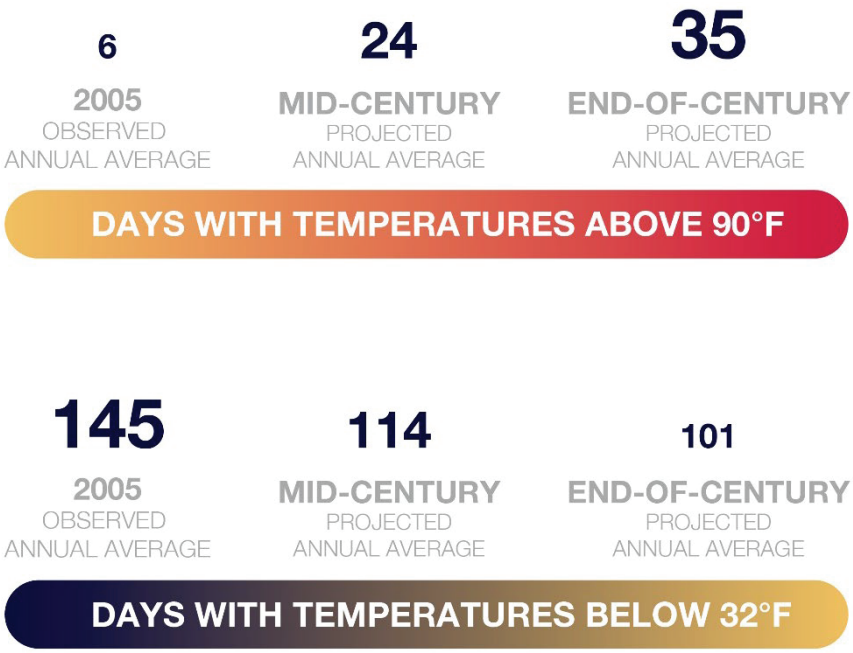

Figure 8. Extreme temperatures (EOEEA, 2019)

3.2.1 Coastal Hazards

Danvers is preparing for increasingly intense coastal storms such as hurricanes and Nor'easters, in addition to sea level rise. Nor'easters along the Atlantic coast are increasing in frequency and intensity and there has been an increase in North Atlantic hurricanes since 1970.[17] The most recent hurricane in this area was Hurricane Sandy in 2012. Figure 8 show the anticipated flood impact of four different levels of hurricane activity in Danvers and the surrounding region. Flooding and high winds from coastal activity can cause property damage, loss of economic productivity, and endangered lives.

The maps below show sea level rise and hurricane surge scenarios in the Danvers area. Please refer to the Hazard Map in Appendix B for more detailed information on anticipated local climate change impacts in Danvers, overlaid with the locations of critical facilities.

[17] USGCRP and U.S. Global Change Research Program, "Climate Science Special Report: Fourth National Climate Assessment (NCA4), Volume I," Chapter 9: Extreme Storms, 2017, science2017.globalchange.gov/chapter/9/.

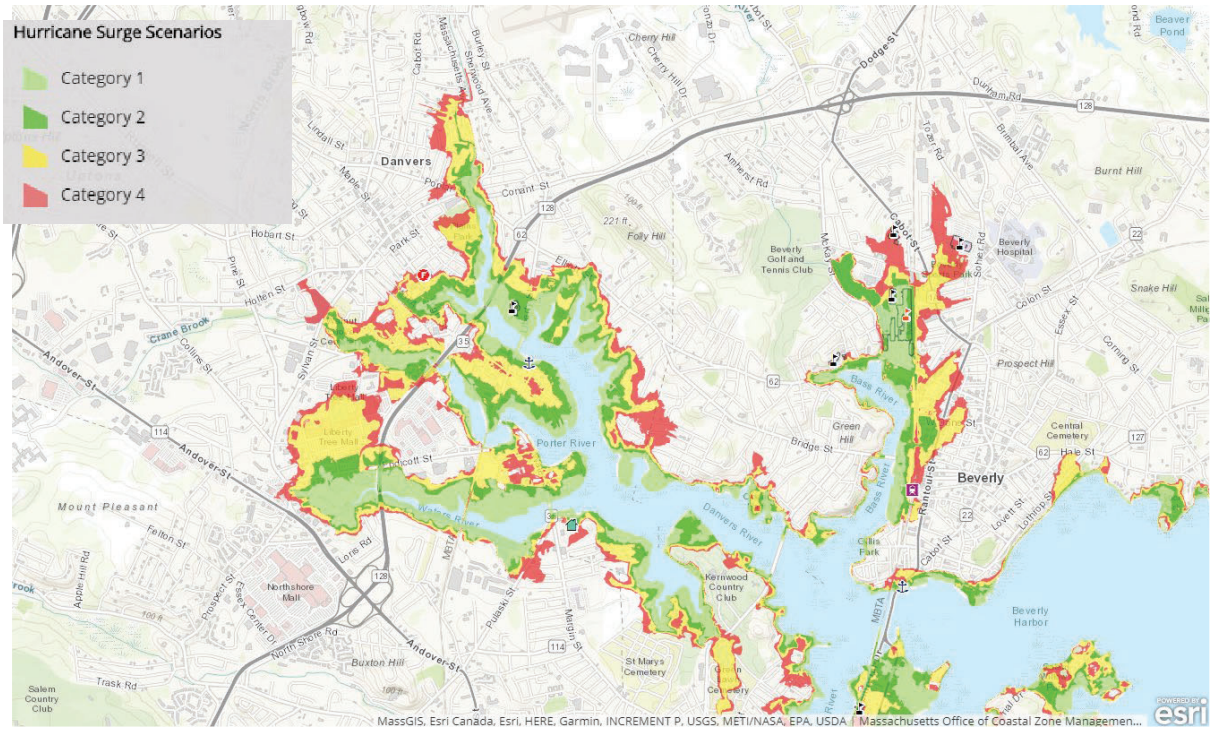

Figure 9. A map of Hurricane Surge Scenarios in the Danvers area (CZM, 2013)

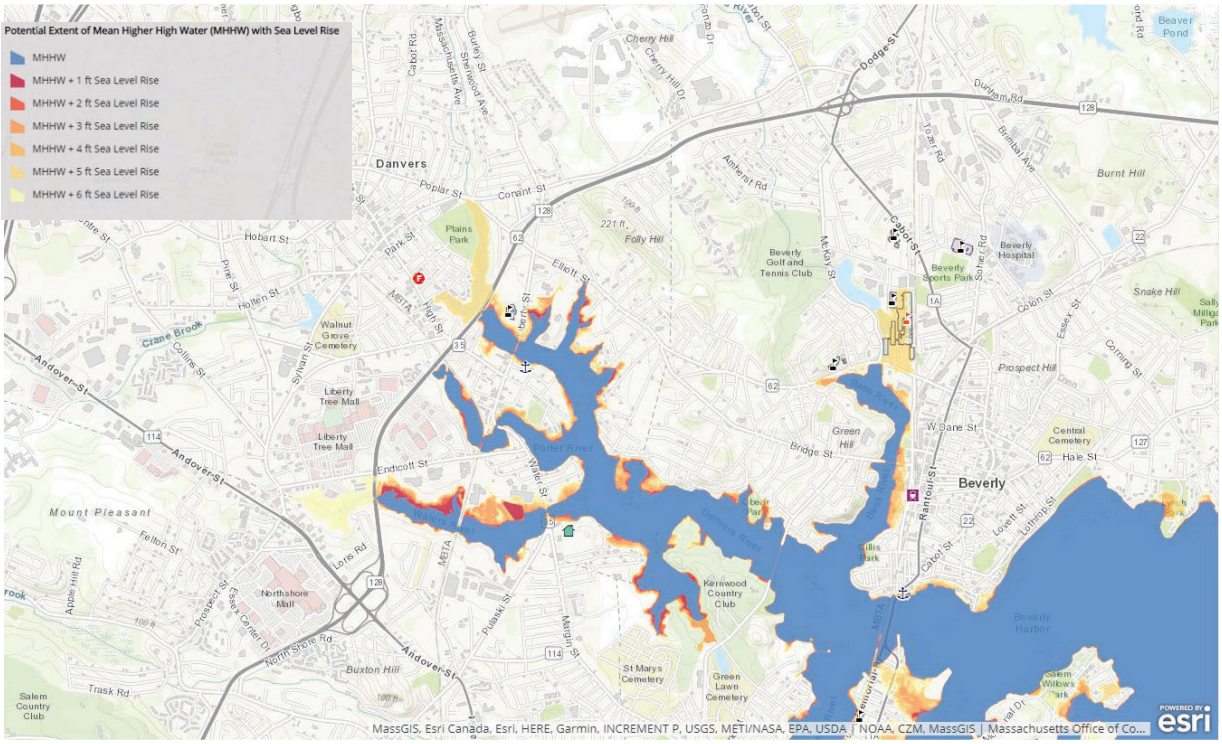

Figure 10. Potential Extent of Mean Higher High Water (MHHW) with Sea Level Rise (CZM, 2013)

Sea level rise projections are available for Boston and the changes are applicable to Danvers (please refer to Table 3). Erosion rates along the beaches and shorelines have already started to erode from

the change in sea level.[18] Impact to the area near Frost Fish Brook, Tibbetts Ave, John George Park and the marina are of major concern. Sea level rise can lead to increased coastal flooding, permanently inundated low-lying coastal areas, and increased shoreline erosion. As Boston is a regional economic hub, impacts to the City's businesses and trade, especially for towns like Danvers that receive goods from Boston and are home to commuters into Boston. Residents have already begun considering regional and national impacts from climate change. One discussion during the Community Resilience Building Workshop was the impact on Danvers if a hurricane in the south delays the shipping of goods to the Northeast.

Table 3. Boston Sea Level Rise Projections(ft)
(Northeast Climate Science Center, 2018)

Emission Scenario	2030	2050	2070	2100
Intermediate	0.7	1.4	2.3	4.0
Intermediate-High	0.8	1.7	2.9	5.0
High	1.2	2.4	4.2	7.6
Extreme	1.4	3.1	5.4	10.2

[18] Town of Danvers and Metropolitan Area Planning Council (MAPC), "Town of Danvers Draft Hazard Mitigation Plan: 2019 Update."

4.0 VULNERABILITIES

The workshop participants' major area of concern was ensuring public health and safety from coastal impacts and flooding. The need for infrastructure upgrades, improved communications to vulnerable populations, and protecting our environmental assets were highlighted during discussions. The specific examples of areas of concern were grouped within the following three categories: infrastructural, societal, and environmental. Many of the identified vulnerabilities were also categorized as strengths.

Figure 11. Danvers' Community Resilience Building Workshop (Weston & Sampson, 2019)

4.1 Infrastructure

Workshop participants identified those key infrastructural features in Danvers that are most vulnerable to natural hazards and climate change impacts or may be so in the future. They are:

- Flooding of roadways, especially MA-128, Tibbets Ave, MA- 1 and Interstate 95, Conant Street, Poplar Street, Locust Street area, and Valley Road
- IT and Communications lack redundancy and rely on electricity
- Dams and dikes in poor condition, like the Sylvan Street Dam at Mill Pond (Mill Pond Dam)
- Bridges at risk of flooding, such as the bridge leading to Well 1 in Middleton (owned by Danvers)
- Capacity and condition of emergency management buildings, Department of Public Works, and public safety locations
- Flooding of the Department of Public Works, truck storage area, Electric Light Headquarters, Conant Street Electric Substation among others, Fire Station-Engine 2, Walnut Grove Cemetery, and residents in the Tibbets Ave neighborhood.
- 90% of electrical distribution is overhead lines and vulnerable to impact of fallen tree limbs
- Culverts and stormwater infrastructure needs updated with climate science, especially Conant Culvert, Beaver Brook, Purchase/Ash Street, Woodvale Culverts (Coolidge, Dartmouth, and Wenham), Adams Street Culvert
- Impervious surfaces, including on the parking lots
- Water and Sewer Vulnerabilities
    - Pump Stations: Route 114 (water supply), Tibbets Ave (wastewater), Doty Street (South Essex Sewer District). Workshop participants shared that they had never had a critical failure of pump stations.
    - Wastewater needs a backflow system and to secure pumps

  - South Essex Sewer District Main Line needs to be assessed for vulnerabilities beyond the known potential for erosion at near Crane River
  - Decrease in water supply during summer months and need for water restrictions for homes and businesses or extra supply
  - Need to improve drinking water redundancy
- Coastline
  - Popes Landing Seawall should be elevated
  - Commercial and residential properties
  - Marina
  - John George Park

4.2 Societal

Workshop participants discussed the impact of climate change to vulnerable populations and essential services, which included:

- Need to increase outreach to seniors and youth
- Disabled residents who may be vulnerable due to isolation
- Need to ensure workforce is safe during commutes. Danvers has many commuters.
- Need to protect waterfront businesses and residents
- All businesses (including day cares and hotels) may not have an emergency response plan
- Housing Authority properties, assisted living facilities, mobile homes, apartments, motels, hotels, and nursing homes should be integral in emergency response planning. The elevators at Housing Authority properties do not work during power outages.
- Schools are not currently ready to shelter in place.
- Some shelters may require additional resources or equipment. For example, St. John's Preparatory School does not have buses.
- Communication infrastructure is vulnerable to extreme weather
- Public health threats from climate change
- Non-native English speakers may be less likely to receive communications in their language
- The Town may need additional resources for emergency response. For example, Danvers currently relies on private ambulances and there is a national shortage of paramedics. There is increased demand for emergency services each year. Responding to these calls decreases availability for staff to attend trainings and conduct regular inspections.

4.3 Environmental

Workshop participants identified those key environmental features in Danvers that are most vulnerable to natural hazards and climate change impacts. They are:

- Erosion at Frost Fish Brook, Crane River, and along coast
- Cyanobacteria or algae blooms
- Danvers Harbor needs to consider protection from sea level rise and increased storm surge (both the natural coastline and the infrastructure)
- Water supply during drought
  - Conservation, storage and permitting to reduce water quality impacts
- Tree canopy damage from wind and invasive species
- Ipswich River and the impact of temperature and low flows on fish

- Storm debris
- Sewer infiltration and inflow lowers capacity of sewer system to function.
- Possible groundwater contamination from sewer pipe leaks
- Beavers on Beaver Brook, Rail Trail, Endicott Park, and Proctor farm cause flooding
- Electric fleet needs more infrastructure to be successful
- Wetlands and open space vulnerable to development
- Contaminated lands
- Increase in invasive species
- Wetland encroachment by development

5.0 CURRENT STRENGTHS AND ASSETS

Many workshop participants felt Danvers' greatest assets were the residents, volunteers, and staff that advance the Town's priorities and build the community's resilience. Danvers' infrastructure and environmental assets also contribute to the Town's ability to successfully weather shocks to the day to day system, like extreme weather.

5.1 Infrastructure

Workshop participants identified those key infrastructural features in Danvers that provide strength against natural hazards and climate change impacts. They are:

- Roadways provide transportation network
- Popes Landing Seawall provides some protection
- Electric Light Department and infrastructure
- Water supply and Water Management Act Conservation measures
- Department of Public Works facility and services
- Water and Wastewater infrastructure
- Public safety locations
- Emergency management buildings/DPW
- Police Station
- Fire Station
- IT and Communications

Figure 12. Danvers Water Supply (left, Town of Danvers) and Danvers Fire Truck (right, Danvers Fire Department)

5.2 Societal

Workshop participants identified those key societal aspects of Danvers that provide strength against natural hazards and climate change impacts. They are:

- Elderly population provides experience about previous hazard occurrences
- Youth offer energy and capacity to prepare, respond, and communicate
- Senior Center and schools provide an avenue for communication and a potential place to shelter.
- All of the nursing homes and assisted living facilities have generators
- Emergency response personnel (police, fire, ambulance) capacity and access to hospitals
- Workforce and businesses keep Danvers thriving
- Housing Authority properties, assisted living facilities, mobile homes, apartments, and nursing homes all provide a variety of housing types
- National Guard facilities and personnel. Danvers has not used the National Guard previously, but surrounding communities have.
- Faith-based and community organizations

5.3 Environmental

Workshop participants identified those key environmental features in Danvers that provide strength against natural hazards and climate change impacts. They are:

- Crane River possible flood storage
- Danvers Harbor
- Trees
- Wetlands and open space
- Farms (Essex Tech, Hogan Regional, Richardsons, Connors Farm, Clark)
- Electric Fleet
- The Rail Trail (a western expansion is planned)
- The Danvers Forestry & Grounds Division
- Endicott Park

Additionally, the Town released an Open Space and Recreation Plan in 2017 that includes an inventory of existing assets, an analysis of needs, and goals and objectives to help work toward thriving and active recreation and open space in Danvers.

6.0 TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

After identifying the Town's top hazards and listing vulnerabilities and strengths, workshop participants brainstormed possible actions to address climate change impacts. Participants considered various adaptation options carefully. One group discussion involved the distinction between retention and detention, and the different possibilities offered by a retention basin that holds water short-term and slowly releases it to reduce flooding, versus a more permanent detention strategy that allows water to either evaporate or infiltrate.

Figure 14. Images from the Community Resilience Building Workshop (Weston &Sampson, 2019)

Other strategies recommended during the workshop's group discussions include:

- Electrifying the town fleet and EV charging
- Hydroelectric strategies
- Assessment of dams in adjacent communities
- Assessing alternatives to green riprap strategies that have not worked well in Danvers

Participants ranked action items as a low, medium or high priority. Each group was then asked to report out the "highest high" priorities. A summary of findings from these group matrices is included below.

6.1 Highest High Priorities

- Wetlands and Waterbodies
  - Implement green infrastructure along the John George Bank, Marina, and the Danvers, Waters, Crane, and Porter Rivers. Assess flood pathway locations and options for floodwalls, stone revetment, erosion control, bank stabilization, and flood storage
  - Conduct dredging where possible along rivers and Mill Pond to increase flow capacity and address sediment deposition
  - Collect drainage information for areas surrounding Mill Pond, Beaver Brook, and Crane Brook and promote wetland restoration along brooks
- Regulations
  - Update zoning, bylaws, and regulations to incorporate climate change considerations and resilience

- Pump Stations
  - Conduct ongoing inspections and maintenance of pump stations
  - Study flood prevention options for vulnerable pump stations and elevate critical infrastructure where needed
  - Assess options and needs for redundant power supply at pump stations and install a backup generator at the Doty Ave Pump Station
- Culverts and Stormwater Infrastructure
  - Assess options for a stormwater enterprise fund
  - Study design strategies to improve drainage on Conant Street
  - Conduct a capture, storage, and outfall assessment of stormwater infrastructure
  - Integrate MS4 work with climate change planning efforts
  - Design detention and retention features in parks to handle flooding, including College Pond and Endicott Park
  - Assess opportunities for green infrastructure and Low Impact Development (LID) to increase the infiltration of stormwater for groundwater recharge.
  - Upsize culverts, elevate roads, and assess roadway drainage where needed, including the culverts on Elliot, Conant, and Poplar, the intersection of Ash and Purchase, and long River Street
  - Consider increasing bank height to address historic Mass Ave flooding caused by downstream culverts

- Roads and Bridges
  - Assess options for addressing flooding along vulnerable roads; including Route 128, Conant Street, Poplar Street, Tibbetts Ave, Liberty Street, I-95, and Route 62. Strategies could include underground flood storage and low impact development
  - Provide public education and municipal staff training regarding evacuation routes
  - Assess needs for plow equipment and signalization for heavy snowfall and extreme weather advisories
  - Apply for funding for permeable paving
  - Replace the bridge leading to Well 1, coordinate with Middleton and the State
- Electric Department and Infrastructure
  - Assess options for relocating the Electric Department building and update deployable barriers as a short-term action
  - Improve the access road to the Department of Public Works lower garage/Electric Light Department
  - Find elevated (flood-safe) areas for trucks, critical equipment, office space, and other storage needs
  - Protect transmission lines and electric infrastructure through proactive tree management plan or by relocating electrical lines underground
  - Elevate or relocate vulnerable substations and avoid siting future substations in flood zones
- Emergency Response
  - Build in redundancies and battery backup across communication infrastructure
  - Assess redundant power source and communication strategies for the Police Station

  - Update the Police's Emergency Response Plan
  - Assess resilient relocation options for the Fire Department
  - Increase staff, equipment, and training for emergency response personnel, including police, fire, and ambulatory services
  - Increase collaboration with Verizon and National Grid to fortify networks and infrastructure
  - Update school emergency plans and improve internal and external communication, tools, and planning efforts
- Water Supply
  - Assess options for water capture, conservation, storage, and permitting
  - Conduct public outreach and education related to water demand management and water conservation strategies
  - Protect existing water supplies and assess yield (public and private wells, Ipswich, Middleton Pond), while advancing the identification and connection to additional water supplies (expansion of existing supplies, Emerson Brook in Middleton, MWRA)
  - Install backflow prevention to protect potable water supply
  - Update aging water infrastructure
  - Maintain up-to-date information on existing private wells

6.2 High Priorities

- Rivers and Ponds
  - Address algae blooms and water quality
  - Assess the impact of temperature increase on local fish and wildlife
  - Minimize flooding and erosion along Frost Brook
  - Increase permeable surfaces near waterways
  - Re-evaluate existing dams and assess culverts with future rainfall data in mind
- Water Supply
  - Increase water rate price during the summer months and deploy outdoor water restrictions
  - Identify new water sources, expand reservoirs, and create a reservoir for water supply stability at Emerson Brook in Middleton
- Trees and the Town Forest
  - Encourage tree planting and other green infrastructure in new development
  - Hire an arborist to oversee pruning and in-house tree planting
  - Evaluate risk of critical facilities and equipment in areas with a higher degree of fire risk and develop a brush fire management plan
- Parks, Open Space, and Trails
  - Develop updated trail design, especially in flood prone areas
  - Design cooling features in parks, including tree planting for shade and splash pads
  - Increase public access and flood protection along the Harborwalk
- Electric Infrastructure
  - Provide incentives for electric vehicles and increase charging stations
  - Provide backup generators for critical facilities
  - Study options for renewable energy technologies

- Roads
  - Assess and update evacuation plans
  - Develop flood mitigation strategies to reduce flooding along Route 114 and Valley Road
- Vulnerable Populations (including elderly and disabled residents)
  - Provide accessible cooling and warming stations, along with necessary medical equipment and transportation
  - Equip the senior center as cooling center with backup power
  - Conduct informational programs at senior center, increase outreach as part of a senior assistance program, provide paper newsletter related to heating and cooling strategies, and provide senior discounts on utility rates
  - Assess alternative power source options (solar) and battery backups, shelter-in-place capabilities, and transportation needs at elderly housing, especially Tapley Manor.

6.3 Moderate Priorities

- Residents and Public Health
  - Residential neighborhoods near Tibbetts Ave:
    - Update zoning to incorporate climate change considerations
    - Evaluate resiliency of existing buildings and potential retrofitting strategies
    - Provide education and planning related to retreat
    - Require the disclosure of flood risk when selling a property
    - Provide public notifications related to extreme weather
  - Craft public health preparedness strategies and outreach plans related to public health issues such as mosquitos, heatstroke, and emerging health risks
  - Provide notifications to commuters through fixed evacuation route signs, electronic notifications, solar powered signage (or signage with portable generators)
  - Develop strategies to protect waterfront businesses
  - Identify a regional storm debris plan and identify locations. Find funding and equipment to deal with storm debris.
- Parks, Open space, and Waterbodies
  - Endicott Park:
    - Evaluate needed infrastructure upgrades
    - Develop forest management and invasive species management plans, including considerations for beaver controls and wildfire risk reduction
    - Conduct a hydrological assessment and long-term plans for the implementation of green infrastructure
  - Land acquisition for the protection of open space and wetlands
  - Promote the utilization of public open space and dual-purpose development
  - Promote wetland restorations and assess storage capacity and protection needs
  - Provide public education regarding runoff conservation and the enforcement of buffer protection. Update regulations to better protect rivers.
  - Implement green infrastructure for bank stabilization and erosion control along Frost Fish Brook
- Schools and Municipal Buildings
  - Assess flood risk and resilient design of schools
  - Retrofit Engine 2 to be capable of managing extreme events.

- Vulnerable Populations
  - Conduct outreach for low-income residents to sign-up for reverse 911 notifications
  - Provide emergency notification in multiple languages
  - Assess medical needs and supervision needs for youth residents below the age of twelve
  - Tailor a storm preparedness manual, public education, and evacuation procedures for disabled residents.
  - Provide back-up generators for private homes
  - Share the town-wide emergency management plan across organizations
  - Update the Council on Aging's list of elderly residents
- Sewer Infrastructure
  - Assess options for sewer backflow prevention
  - South Essex Sewer District (SESD) Main Line: increase regional collaboration, assess critical junctions, and design a revetment near Crane River to prevent erosion
  - Address issues related to infiltration and inflow into sewer lines and possible groundwater contamination from sewer leaks
  - Assess sewer demand and capacity
- Roads and Bridges
  - Increase porosity in areas along Endicott Street, Route-114, and Route-9.
  - Implement a fee to fund green infrastructure strategies.
- Dams
  - Assess options to repair or rebuild the dams, especially Meadow Mill

6.4 Other Priorities

- Wetlands, Rivers, and other Waterbodies
  - Increase the use of beaver deceivers near Beaver Brook, the Rail Trail, Endicott Park, and Proctor Farm. Increase public education about the risk posed by beavers
  - Elevate the Popes Landing Seawall and identify permitting solutions
  - Design floodable coastal and riverine parks
  - Conduct a feasibility study of living shoreline storm surge protection
- Electric Infrastructure
  - Conduct heating and cooling energy efficiency assessments
- Shelters and Hospitals
  - Assess potential protection of shelters and hospitals against hurricane conditions
  - Install air conditions at schools without it, including the elementary school
- Emergency Response
  - Use the Hogan Regional Center as an evacuation site and collaborate with MassDOT to fix I-95, which is an evacuation route
  - Provide backup power at grocery stores and private schools
  - Keep services for emergencies in active coordination and regularly test the Town's emergency equipment to make sure it works
  - Coordinate when needed with the National Guard
- Contamination
  - Assess options for remediation and use of superfund sites (old tanneries)

- Vulnerable Populations
  - Enlist student help with resiliency planning and develop project-based youth learning on smaller climate change projects
  - Conduct emergency response planning for mobile homes
  - Assess alternative power source options for group homes
  - Conduct resiliency planning and outreach related to daycares
  - Collaborate with faith-based groups and other community organizations
  - Provide backup generators and designated coordinators at high-density housing
- Residential and Commercial Development:
  - List critical businesses and promote emergency plan implementation at those businesses
  - Complete the ongoing emergency management plan for local hotels and motels. In March 2013, there were an average of 100 homeless families living in motels in Danvers each month.[19]
  - Assess needs and vulnerabilities related to fuel storage and industrial facilities
- Open Space, Trees, and Farms
  - Elevate the valley road in the Puthnamville Reservoir Area and protect the peach orchard from drought
  - Develop a management plan for invasive species
  - Increase public education related to lawn care and impact on water quality
  - Promote organic practices, limiting pesticides, and sustainable irrigation practices, including rainwater harvesting and collection systems at local farms (Essex Tech, Hogan Regional, Richardsons, Connors Farm, and Clark)
  - Assess options for geese control strategies

[19] LDS Consulting Group, "Town of Danvers Affordable Housing Production Plan." P11

7.0 ADDITIONAL INFORMATION

7.1 CRB Workshop Participants

The CRB Workshop participants represented the Core Team, Town Staff, Boards and Committees, Local Organizations, Adjacent Communities, and Regional and State Agencies.

7.1.1 Core Team

Name	Title	Affiliation	Attendance
Steve Bartha	Town Manager	Town of Danvers	x
Jen Breaker	Assistant Town Manager & Communications Director	Town of Danvers	x
Patrick M. Ambrose	Police Chief	Police Department	x
James Lovell	Police Captain	Police Department	x
Robert Pyburn	Fire Chief	Fire Department	x
P. James Brooks Jr.	Fire Captain	Fire Department	x
Aaron Cilluffo	Supervisor	Town of Danvers-Public Works-Water and Sewer Division	x
Rodney Conley	Director of Administration and Finance	Finance Department	x
Stephen King	Town Engineer	Town of Danvers-Public Works-Engineering Division	x
Josh Morris	Principal Planner	Planning and Economic Development Department	x
Christopher Sanborn	Director of Natural Resources, Harbormaster	Natural Resources, Harbormaster	x
Richard Maloney	Code Administration Manager/Building Inspector	Buildings	x
David Lane	Director	Town of Danvers-Public Works	x
Rich Souza	Operations Director	Town of Danvers-Public Works	x
David Mountain	Director	Danvers Recreation	x
Lisa Dana	Superintendent of Schools	Danvers Public Schools	x
Alex Lent	Library Director	Peabody Institute Library	x
Colby Cousens	Director	Technology Services	x
Sharon Clement	Program Engineer	Town of Danvers-Public Works	x
Clint Allen	Utility Director	Electric Division	X
	Assistant Director of Planning and Human Services	Planning and Human Services	
Aaron Henry	Director	Land Use and Community Services	
Peter M. Mirandi	Director	Health and Veteran's Services	
Pamela K. Parkinson	Director	Senior and Social Services	

7.1.2 Additional Town Staff, Boards, Committees, Local Organizations

Name	Title	Affiliation	Attendance
Rob White			x
Robert Amerault	Deputy Fire Chief	Danvers Fire Department	x
Phil Tansey	Fire Captain	Danvers Fire Department	x
Jeff Elie	Energy Efficiency Engineer	Town of Danvers-Public Works-Electric Division	x
Renee Hunter	Civil Engineer	Town of Danvers-Public Works-Civil Engineer Division	x
Mark L. Carleo	Assistant Director of Public Health	Town of Danvers	x
Nick Campion	Assistant Recreation Director	Town of Danvers	x
Travis Reardon	Grounds & Forestry Supervisor	Town of Danvers-Public Works-Forestry & Grounds Divisions	x
Chuck Farrell	Street Supervisor	Town of Danvers-Public Works-Street Division	x
Gail Bernard	Program Coordinator	Town of Danvers - DPW Administrative	x
Clint Allen	Assistant Utility Director	Danvers Electric	x
Keith Taverna	Assistant Superintendent - Finance and Personnel	Danvers Public Schools	x
Joseph L. Collins	Clerk, Board of Selectmen	Board of Selectmen	x
Daniel C. Bennett	Chair, Board of Selectmen	Board of Selectmen	x
Thomas M. Page	President	Danvers Historical Society	x
Cynthia Dunn	Executive Director	Danvers Housing Authority	x
Patricia A. Gentile	President	Northshore Community College	x
Peter Wilson	Chair	Conservation Commission	x
Paul McNulty	Chair	Rail Trail Advisory Committee	x
Lyla Harrod	Director	DanversCARES	x
Louie George	Member	River Committee	x
Joe St. Pierre	Facility Manager	Essex N.S. Agricultural & Technical School District	x
Joe Marino		Essex N.S. Agricultural & Technical School District	
Susan Little	Retirement Manager	Town of Danvers	
Alicia Linehan	Danvers Traffic Advisory Committee	Town of Danvers	
Jason McCarthy	Water Treatment Plant Manager	Town of Danvers-Public Works	
Leif Rochna	Building Division Supervisor	Town of Danvers-Public Works-Buildings Division	
Phil Genualdo	Equipment Division Supervisor	Town of Danvers-Public Works-Equipment Division	

Corey Grace	Town Accountant	Town of Danvers	
Peter Korpusik	Business Manager	Town of Danvers	
Pamels K. Parkinson	Senior and Social Services, Director	Town of Danvers	
Steve Poulos	Chief Assessor	Town of Danvers	
Mary Wermers	Assistant Superintendent - Teaching and Learning	Danvers Public Schools	
Kathleen Archembault	Zoning Board of Appeals Secretary	Zoning Board	
Gardner S. Trask, III	Member	Board of Selectmen	
David A. Mills	Member	Board of Selectmen	
William H. Clark, Jr.	Member	Board of Selectmen	
Diane M. Langlais	Member	Board of Selectmen	
David McKenna	Vice President	Danvers Historical Society	
Mary Beth Verry	School Committee, Chair	Danvers Public Schools	
Kerry Fouhey	Chairperson	Danvers Housing Authority	
Heidi T. Riccio	Superintendent-Director	Essex N.S. Agricultural & Technical School District	
John Somes	CEO	Danvers Community YMCA	
Brian Cranney	CEO	Cranney Home Services	
William Prentiss	Chair	Planning Board	
Ellen Graham	Chair	Preservation Committee	
Jamie Perkins	Chair	Open Space and Recreation Advisory Committee	
Matthew Mozur	Chair	Historic District Commission	
Tenley Bevins	Chair	Disability Commission	
Dutrochet Djoko		The Danvers Human Rights and Inclusion Committee	
		Danvers Community Council	
Jacki Shambaugh	President Elect	Danvers Rotary Club	
Geraldine Cosgrove	Chair	Council on Aging	
C.R. Lyons	Chair	Finance Committee Chair	
Aileen L'Abbe	Chair	River Committee	
Dan DeLorenzo	Member	River Committee	
Joan George	Member	River Committee	
Robert Moore	Member	River Committee	
Matthew Byrne	Member	River Committee	
Bill Fouhey	Member	River Committee	
Bill Nicholson	Member	River Committee	

Gardner Trask	Selectman	River Committee	
Brian Atherton	Sales & Marina Manager	Danversport Marina	
		Liberty Marina	
		Bunky's Marina	
		Hunt Nursing & Rehabilitation Center	
		Brentwood Rehabilitation & Healthcare Center	
		Seasons of Danvers	
		Twin Oaks Center	
		Brightview Danvers	
		Putnam Farm at Danvers	
Shelley Silverman		New England Homes for the Deaf	
Kelly Cragg	Owner, Managing Member	Danvers Indoor Sports Arena	
David Hanbury		Enbridge (Gas)	
Carly Veiga		The Brentwood Rehabilitation and Healthcare Center	
David Kagira		The Brentwood Rehabilitation and Healthcare Center	

7.1.3 Adjacent Communities

Name	*Title*	*Affiliation*	*Attendance*
Bill Tyack	DPW Director	Town of Wenham	
David Knowlton	DPW Director	City of Salem	
Greg Krom	Water Superintendent	Town of Topsfield	
Ken Gibbons	Superintendent	Town of Middleton	
Paul Goodwin	Deputy Superintendent	Town of Middleton	
Michael Collins	Beverly DPW Director	City of Beverly	
Robert Labossiere	Peabody DPW Superintendent	City of Peabody	

7.1.4 Regional and State Agencies

Name	Title	Affiliation	Attendance
Barbara Warren	Director	Salem Sound Coastwatch	x
David Michelson	Chief Engineer	South Essex Sewer District	x
Joan Lovely	State Senator	Massachusetts Senate	x

Kathryn Melanson	EPA Region 1 Communications Coordinator	U.S. Environmental Protection Agency	x
Theodore Speliotis	State Representative	Massachusetts House of Representatives	x
Alan Peterson	Program Lead, Targeted Brownfields Assessment	U.S. Environmental Protection Agency	
Beth Francis	President & CEO	Essex County Community Foundation	
Chris Garby	Fiscal & Operations Manager	MA Office of Coastal Zone Management	
Dennis Deziel	Region 1 Administrator	U.S. Environmental Protection Agency	
Don Preston	Executive Director	Northshore Habitat for Humanity	
Ed Markey	Federal Senator	US Senate	
Elizabeth Warren	Federal Senator	US Senate	
Eric Worrall	Northeast Regional Director	MA Department of Environmental Protection	
Jo Ann Simons	CEO	Northeast Arc	
Katelyn Rainville	Representative	Army Corps of Engineers	
Kathryn Glenn	North Shore Regional Coordinator	MA Office of Coastal Zone Management	
Kathy Aruda	Right of Way Agent	Enbridge (Gas)	
Marc Draisen	Executive Director	MAPC	
Margot Mansfield	Coastal Hazards Specialist	MA Office of Coastal Zone Management	
Megan Podeszwa	Outreach Coordinator	Salem Sound Coastwatch	
Patricia Bowie	Coastal Resiliency Specialist	MA Office of Coastal Zone Management	
Priscilla Geigis or Dan Driscoll	Deputy Commissioner for Conservation and Resource Stewardship	MA Department of Conservation and Recreation	
Rachel M. Maniates	Manager of Programs & Events	Northshore Chamber of Commerce	
Sarah White	Hazard Mitigation Unit Supervisor	MEMA	
Seth Moulton	Federal Representative	US House of Representatives	
Terrence Kennedy	Governor's Councilor	Commonwealth of Massachusetts	
Victor Santana	Construction Supervisor	National Grid	
		Mass General / Northshore Center for Outpatient Care	

		Lahey Outpatient Center, Danvers	
		Lyons Ambulance Services	
		Northshore Mall	
		Liberty Tree Mall	
		Cherry Hill Corporations	

7.2 Citation

Town of Danvers. (2020). Community Resilience Building Workshop Summary of Findings. Prepared by Weston & Sampson.

7.3 CRB Workshop Project Team

Key Staff:

- Stephen King, Jr., P.E., Town Engineer, Town of Danvers
- Sharon Clement, Program Engineer, Town of Danvers
- Core Team Members as noted above

Facilitators from Weston & Sampson:

- Amanda Kohn
- Steve Roy
- Lindsey Adams
- Adria Boynton
- Deanna Lambert
- Martha Duffield
- Alexandra Gaspar

7.4 Acknowledgements

We'd like to recognize the Core Team members and the Town Manager, Stephen Bartha, for leading by example throughout the MVP planning process. A special thanks to the Massachusetts Executive Office of Energy and Environmental Affairs for providing the grant funding to conduct the MVP process and to the Nature Conservancy for providing the Community Resilience Building Guidebook. Additional thanks to all the participants and to the Workshop Project Team for a successful event and to the Peabody Essex Library for generously providing the space.

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Workshop Attendees. Community Resilience Building Workshop: Danvers, Massachusetts, December 5, 2019.

APPENDIX A

Core Team Meeting Materials

Town of Danvers

Municipal Vulnerability Preparedness Planning Grant Project

Core Team Meeting Agenda

Town Hall
Thursday, October 10, 2019
10:00 am – 11:30 am

Introductions	5 minutes
Project Overview	10 minutes
Core Team Role	5 minutes
Community Resilience Building Workshop and Review of Materials	45 minutes
Data Sources	5 minutes
Workshop Participants	15 minutes
Wrap Up and Next Steps	5 minutes

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Town of Danvers

Municipal Vulnerability Preparedness Planning Grant Project

Core Team Meeting Notes

Town Hall
Thursday, October 10, 2019
10:00 am – 11:30 am

- This meeting was attended by 22 members of the Core Team
- Infrastructural features discussed:
    - Dams
    - Wastewater Treatment Facility
    - High School
    - Stormwater flooding at sewer pump stations
    - Operations that flood frequently
- Flooding and erosion are concerns
- Beaver Park – stormwater
- Hurricanes are a concern for redevelopment along the coast
- YMCA near wetland
- Disaster Recovery Plan – Comms → Complete
- Changes in temperature - change in programming for youth
- EOC/Emergency Shelters - high school and middle school
- Senior Center – cooling
- Please refer to Appendix B for a copy of the Community Resilience Building Workshop presentation, which was vetted by the Core Team

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APPENDIX B

Community Resilience Building Workshop Materials

TOWN OF DANVERS

Municipal Vulnerability Preparedness Planning Grant Project

Community Resilience Building Workshop

Peabody Institute Library, Gordon Room, 15 Sylvan Street
Thursday, December 5, 2019
8:30 am – 4:30 pm

8:30 am – 8:45 am	Registration and Refreshments
8:45 am – 9:00 am	Welcome and Introductions
9:00 am – 9:15 am	MVP Workshop Purpose and Overview
9:15 am – 10:00 am	Data Resources and Overview of Science
	Risk Matrix
10:00 am – 10:15 am	Large Group Exercise #1 – Identify Top Hazards
10:15 am – 10:30 am	BREAK
10:30 am – 10:50 am	Small Group Exercise #1 – Infrastructure Features
10:50 am – 11:10 am	Small Group Exercise #2 – Societal Features
11:10 am – 11:30 am	Small Group Exercise #3 – Environmental Features
11:30 am – 12:00 pm	MVP Community Actions Presentation
12:00 pm – 1:00 pm	Lunch
1:00 pm – 1:45 pm	Small Group Exercise #4 – Infrastructure Actions
1:45 pm – 2:30 pm	Small Group Exercise #5 – Societal Actions
2:30 pm – 3:00 pm	Small Group Exercise #6 – Environmental Features
3:00 pm – 3:15 pm	BREAK
3:15 pm – 4:15 pm	Large Group Exercise #2 – Prioritization Process
4:15 pm – 4:30 pm	Wrap-up and Closing Remarks

Municipal Vulnerability Preparedness Planning Grant Project
Thursday, December 5, 2019 8:30 am – 4:30 pm

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Table Number	Name	Sign
1	Christopher Sanborn	
1	Chuck Farrell	
1	David Kagira	
1	Joe St. Pierre	
1	Kate Melanson	
1	Pamela K. Parkinson	
1	Robert Pyburn	
2	Sharon Clement	
2	David Lane	
2	Joan Lovely	
2	Lyla Harrod	
2	Mary Wermers	
2	Nick Campion	
2	Peter Wilson	
2	Stephen King	
2	Steve Bartha	
3	Patrick M. Ambrose	
3	Aaron Henry	

Cathy Ellsworth

Weston & Sampson

Municipal Vulnerability Preparedness Planning Grant Project
Thursday, December 5, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
3	Lisa Dana	
3	Susan Little	
3	Gail Bernard	
3	Clint Allen	
3	Peter Korpusik	
3	David McKenna	
4	Jen Breaker	
4	James Lovell	
4	Rodney Conley	
4	Peter M. Mirandi	
4	Steve Poulos	
4	Daniel C. Bennett	
4	Joe Marino	
4	Paul McNulty	
4	David Hanbury	
4	Kathryn Glenn	
5	Aaron Cilluffo	

Municipal Vulnerability Preparedness Planning Grant Project
Thursday, December 5, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
5	Josh Morris	
5	Richard Maloney	
5	Jason McCarthy	
5	Phil Genualdo	
5	Keith Taverna	
5	Louie George	
5	Patricia Bowie	
~~6~~	~~David Lane~~	
6	David Mountain	
6	Alex Lent	
6	Mark L. Carleo	
6	Joseph L. Collins	
6	Shelly Silverman	
6	Victor Santana	
6	Barbara Warren	
1 ~~7~~	Richard Reney	
~~7~~ 6	Cynthia Dunn	

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Municipal Vulnerability Preparedness Planning Grant Project
Thursday, December 5, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
7	David Michelson	(afternoon only)
7	Travis Reardon	Travis Reardon
7	Carly Veiga	
7	Josh Morris	
7	Rich Souza	
7	Colby Counsens	
7	P. James Brooks Jr.	
	Rob White	
	Robert Amerault	Robert Amerault
	Phil Tansey	PTansey@DanversMA.gov
1	Jeff Elie	Elie jelie@danversma.gov
	Renee Hunter	
1	BILL BATES	OFFICE OF REP. TED SPELIOTS WILLIAM.BATES@MAHOUSE.GOV
1	Barbara Warren	Salem Sound Coastwatch
3	Matt Mogavero	office of Sen. Lovely

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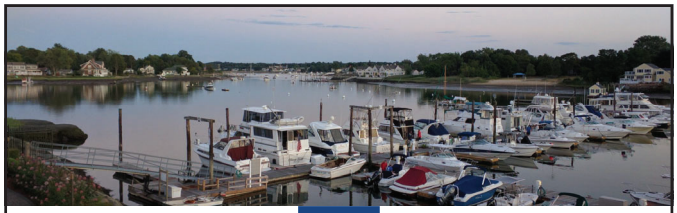

TOWN OF DANVERS

Community Resilience Building Workshop

Thursday, December 5th, 2019

Weston & Sampson Photo: Danversport. Photo by the Town of Danvers, Town Website, 2016. 1

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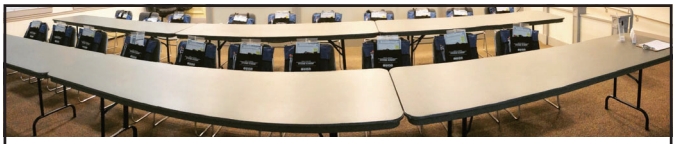

WELCOME W&S

Amanda Kohn
Steve Roy
Lindsey Adams
Deanna Lambert
Adria Boynton

Weston & Sampson Photo: Town Meeting in the Town Hall Community Room. Photo by the Town of Danvers, Twitter, 2018. 2

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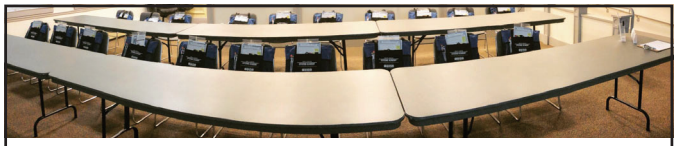

WELCOME CORE TEAM

Steve Bartha	Aaron Henry	Rodney Conley	Peter Korpusik
Patrick Ambrose	Chris Sanborn	Clint Allen	Alex Lent
David Lane	David Fields	Richard Souza	Colby Counsens
Robert Pyburn	Peter Mirandi	Phil Tansey	Lisa Dana
Richard Maloney	David Mountain	James Lovell	
Jen Breaker	Pamela Parkinson	Robert Amerault	
Stephen King	Sharon Clement	Cory Grace	

Weston & Sampson Photo: Meeting Room. Photo by the Town of Danvers, Twitter, 2019. 3

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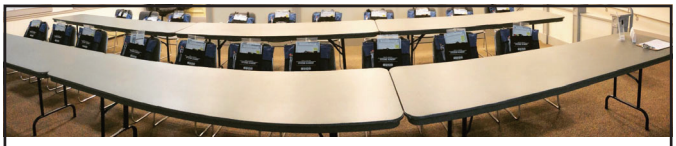

WELCOME PARTICIPANTS

Your name
Organization/Relationship to Danvers
Favorite thing about Danvers

Weston & Sampson Photo: Town Meeting in the Town Hall Community Room. Photo by the Town of Danvers, Twitter, 2018. 4

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MVP Principles

A community-led, accessible process that

- Employs local knowledge and buy-in
- Utilizes partnerships and leverages existing efforts
- Is based in best available climate projections and data
- Incorporates principles of nature-based solutions
- Demonstrates pilot potential and is proactive
- Reaches and responds to risks faced by EJ communities and vulnerable populations

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MVP Process/ Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaptation actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant

MVP Action Grant

Implement priority adaptation actions identified through planning process

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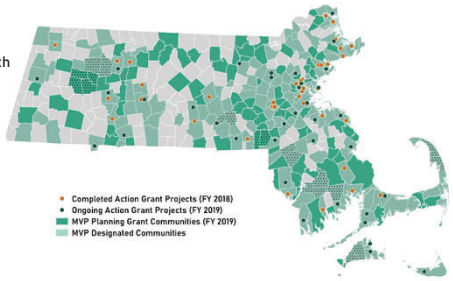
Three Years of MVP

MVP Designations
71% of the Commonwealth
249 communities

Action Grant Projects
FY 18: 37
FY 19: 36

Total Awards
$17M+ in planning and action grants to date



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MVP Action Grants: Project Types

- Vulnerability and Risk Assessment
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency
- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies
- Mosquito Control Districts

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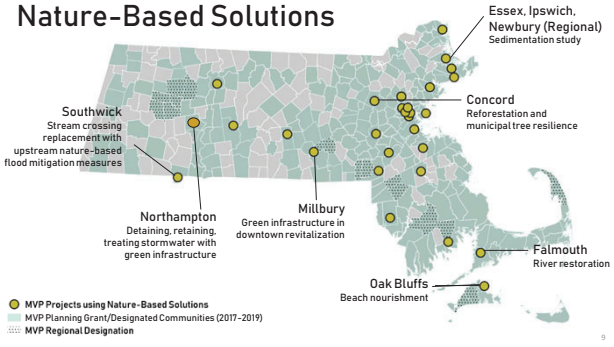
Nature-Based Solutions



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Example Action Grant Projects

Land Acquisition for Resilience

Mattapoisett

Purchasing 120 acres of forest, streams, freshwater wetlands and coastal salt marsh as conservation land to prevent development in vulnerable areas

Data utilization
Proactive

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Example Action Grant Projects

Nature-Based Flood Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques

Millbury

Utilizing green infrastructure like stormwater planters, bioretention bump outs, rain gardens, and other measures like porous pavers and pervious pavement to reduce heat island effects and stormwater runoff into the Blackstone River.

Nature-based solutions

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Example Action Grant Projects

Local Bylaws, Ordinances, Plans, and Other Management Measures
Redesigns and Retrofits

Boston

Developing its first ever resilient building code so that development in the future floodplain is prepared for at least three feet of sea level rise, the likely scenario by late century.

Proactive
Pilot potential

Retrofitting a major waterfront park into a legacy park that uses nature-based solutions to address climate vulnerabilities while providing important access to recreation for residents.

Nature-based solutions
Community co-benefits

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Example Action Grant Projects

Redesigns and Retrofits

Salisbury

Increasing the resilience of the neighborhood of Ring's Island by raising its access/egress roads and by improving tidal flushing through culvert replacements

Vulnerable communities

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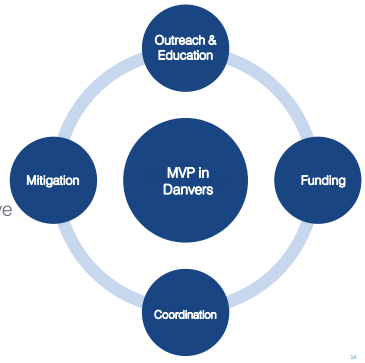
MVP GOALS IN DANVERS

- Increase resilience of community
- Raise awareness of climate threats
- Identify priority actions to move forward
- Create implementation pathways



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WORKSHOP OUTLINE

PRESENTATION:
- Overview of Science & Data
- Characterization of Hazards

- BREAK

INDIVIDUAL TABLES:
- Identify Community Features

- LUNCH

INDIVIDUAL TABLES:
- Identify and Prioritize Actions

- BREAK

LARGE GROUP DISCUSSION:
- Determine Overall Priority Actions

Photo: Danversport Marinas.com, 2017

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MVP Resources

mass.gov/municipal-vulnerability-preparedness-program
& resilientma.org

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DATA RESOURCES

- Massachusetts Climate Change Projections, 2018
- Massachusetts State Hazard and Climate Adaptation Plan, 2018
- Massachusetts Climate Change Adaptation Report, 2011
- Danvers Hazard Mitigation Plan, 2019
- Input from Municipal Officials

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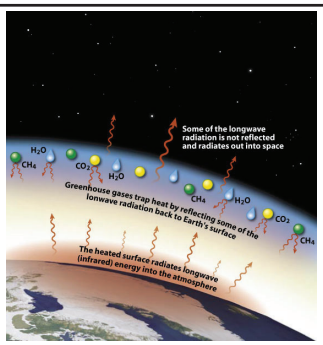
GREENHOUSE GASES (GHG)

- Naturally occurring
- Act as a blanket
- Examples: carbon dioxide and methane

Climate mitigation ensures there is less to adapt to and is a key component of our community's resilience



Smithsonian Environmental Research Center. "Too Much of a Good Thing." http://forces.si.edu/atmosphere/02_04_07.html

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MASSACHUSETTS GHG GOALS

- Established by the Global Warming Solutions Act (GWSA) of 2008
- 25% reduction in GHG emissions by 2020
- 80% reduction in GHG emissions by 2050
- 1990 is the baseline year

Source: Commonwealth of Massachusetts. 2019. "Global Warming Solutions Act 10-year Progress Report," 10.

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FIGURE 3 | TRENDS OF GROWTH IN GSP, VMT, AND POPULATION WHILE GHG EMISSIONS ARE DECREASING AND ENERGY USE HAS BEEN STABLE

Source: Commonwealth of Massachusetts. 2019. "Global Warming Solutions Act 10-year Progress Report," 10.

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HAZARDS IN DANVERS

Flooding

Wildfires

Hurricanes

Severe Thunderstorm
Wind
Tornado

Drought

Extreme Temperatures

Nor'easters
Ice Storm
Severe Snowstorm

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EXTREME TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

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EXTREME TEMPERATURES IN MASSACHUSETTS

6	24	35
2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE

DAYS WITH TEMPERATURES ABOVE 90°F

145	114	101
2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE

DAYS WITH TEMPERATURES BELOW 32°F

Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "ResilientMA Datagrapher." Massachusetts Climate Change Clearinghouse. Resilientma.org/datagrapher/?c=Temp/state/tx90/ANN/MA/
Notes: Mid-century projected annual averages use a 2040-2069 time range. End-of-century project annual averages use a 2080-2097 time range.

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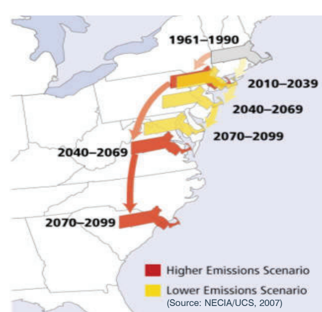

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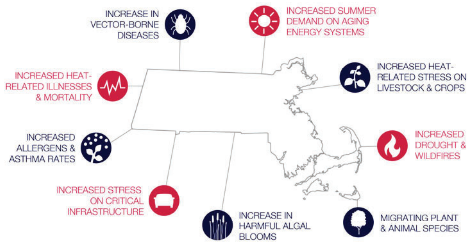
IMPACTS OF RISING TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE



Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "Rising Temperatures." Massachusetts Climate Change Clearinghouse. http://www.resilientma.org/changes/rising-temperatures

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CHANGES IN PRECIPITATION

MORE **INTENSE & FREQUENT** EXTREME RAIN EVENTS

PRECIPITATION DURING **HEAVY EVENTS** IN THE NORTHEAST **INCREASED BY MORE THAN 70%** BETWEEN 1958-2010

Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "Changes in Precipitation." Massachusetts Climate Change Clearinghouse. Resilientma.org/changes/changes-in-precipitation

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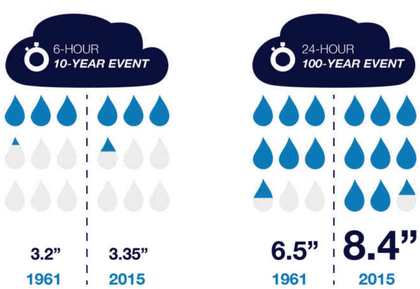
CHANGES IN PRECIPITATION



Sources: NOAA TP-40 (1961) and NOAA Atlas Volume 10 (2015)

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EXTREME PRECIPITATION

8%
Increase in extreme precipitation events by midcentury

13%
Increase in extreme precipitation events by 2100

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FLOODING

ZONE	ANNUAL CHANCE	FLOODPLAIN
A, AE, A1-A30	1% ANNUAL CHANCE	100-YEAR FLOODPLAIN
X	0.2% ANNUAL CHANCE	500-YEAR FLOODPLAIN

"By 2050, Boston could experience the current 100- year riverine flood every two to three years on average"

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FLOOD PRONE AREAS

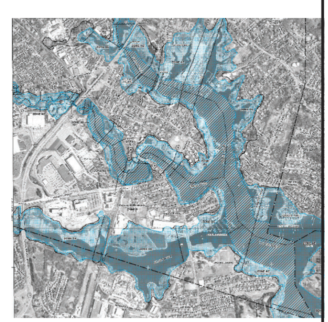
Danvers Electric Property
Town Center
Porter River
Beaverbrook Area
Crane River
Waters River
Pump Stations

REPETITIVE FLOOD LOSS STRUCTURES

5 repetitive loss structures, all are residential[2]

As of May 2013, the NFIP paid out **$328,504** for **5 claims**.[2]

Defined as an NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978[1]



Above: a portion of the FEMA Flood Insurance Rate Map (FIRM) for Danvers

1. Federal Emergency Management Agency (FEMA). 2019. "Definitions." Accessed August 29, 2019. Fema.gov/national-flood-insurance-program/definitions#R
2. MAPC. 2019 Danvers Hazard Mitigation Plan . p.32

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STORMWATER FLOODING

Areas with:
- Poor drainage
- High amounts of impervious surface
- Undersized culverts

Areas with undersized culverts:
- Ash and Purchase Streets
- High School Field
- Upper Massachusetts Ave
- Upper Valley Road

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Boston Sea Level Rise Projections (ft)

Increased coastal flooding

Permanently inundated low-lying coastal areas

Increased shoreline erosion

Emission Scenario	2030	2050	2070	2100
Intermediate	0.7	1.4	2.3	4.0
Intermediate-High	0.8	1.7	2.9	5.0
High	1.2	2.4	4.2	7.6
Extreme	1.4	3.1	5.4	10.2

(Source: Northeast Climate Adaption Science Center)

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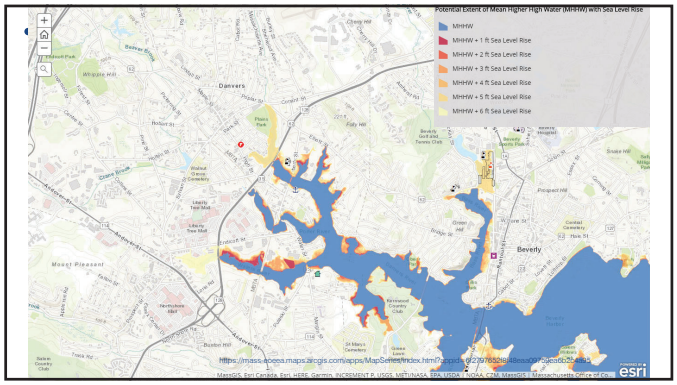

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COASTAL SURGE + EROSION

Frost Fish Brook
Tibbetts Ave
John George Park

"Rising sea levels have led to increased rates of erosion along beaches and coastlines"

Danvers Hazard Mitigation Plan

(Image Source: Google Maps, Sept 2018)

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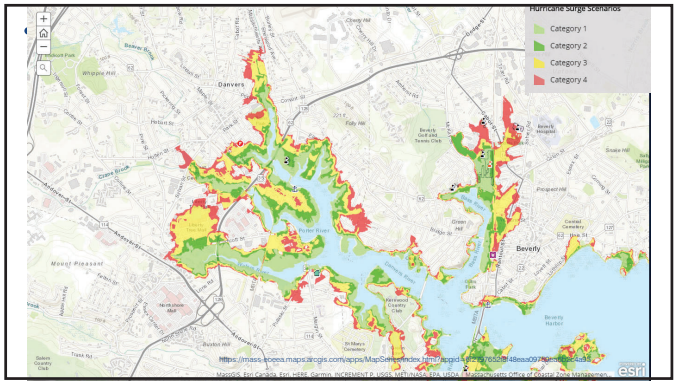

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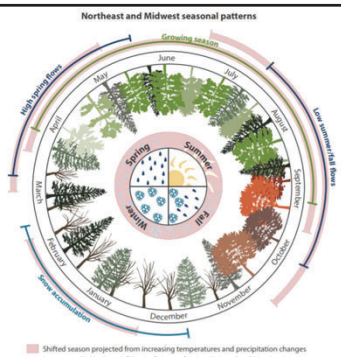

2016

The most notable recent drought event was in

The occurrence of droughts **lasting 1 to 3 months** could go up by as much as **75% over existing conditions** by the end of the century, under the high emissions scenario

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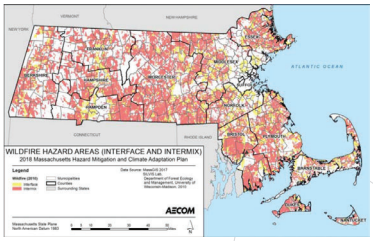
WILDFIRE

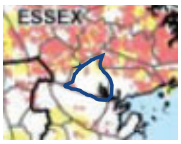


Area near Danvers High School

Area near Putnamville Reservoir

Choate Farm

Whipple Street Woods



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WINTER STORMS

The blizzard of 2013 left nearly **400,000 Massachusetts residents without power**

"Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities."

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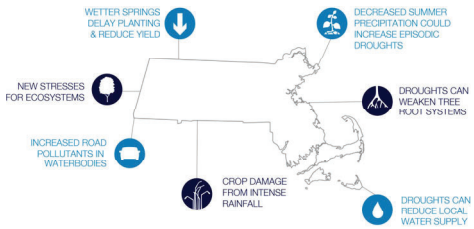
IMPACTS OF CHANGING PRECIPITATION

HIGHER AVERAGE ANNUAL PRECIPITATION
INCREASED BY ABOUT 10% IN THE NORTHEAST INTHE LAST 50 YEARS



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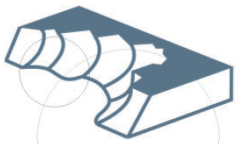
EROSION

Caused by riverine flow & stormwater

Increased precipitation, including winter rains, could increase erosion

Drier soils will reduce resistance to erosion



(Source: MA Climate Change Adaptation Report, 2011)

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HURRICANES AND EARTHQUAKES

HURRICANE

Sandy
was the most recently identified hurricane according the last HMP

Upward trend in North Atlantic hurricane activity since 1970

Nor'easters along the Atlantic coast are increasing in frequency and intensity

EARTHQUAKE

30-40
Earthquakes occur in New England each year, although most are not felt.

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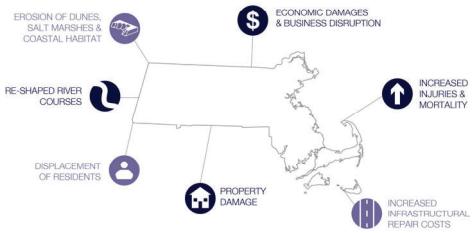
IMPACTS OF EXTREME WEATHER

STORMS ARE BECOMING MORE INTENSE AND DAMAGING



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RISK MATRIX

Photo: Danvers Police Station. Photo by the Danvers Herald, 2019.

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RISK MATRIX

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

Features	Location	Ownership: V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)						PRIORITY	TIME
Infrastructural										
Societal										
Environmental										

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IDENTIFY HAZARDS

Photo: Snowstorm. Photo by the Town of Danvers, Twitter, 2017.

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RISK MATRIX: HAZARDS

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

Features	Location	Ownership: V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)						PRIORITY	TIME
Infrastructural										
Societal										
Environmental										

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Hazard	Frequency	Severity
Flooding	High	Serious
Dam Failures	Very Low	Serious
Hurricane/Tropical Storms	Medium	Serious
Tornados	Very Low	Serious
Thunderstorms/Severe Weather	High	Minor
Nor'easter	High	Minor
Winter-Blizzard/Snow	High	Minor
Winter-Ice Storms	Medium	Minor
Earthquakes	Very Low	Serious
Landslides	Very Low	Minor
Brush Fires	High	Minor
Extreme Temperatures	Medium	Minor
Drought	Low	Minor
Coastal Hazards	High	Serious

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Source: Danvers Natural Hazards Plan, 2018

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15 MINUTE BREAK!

Photo: Plowing in Danvers. Photo by the Danvers Herald, 2018.

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RISK MATRIX: FEATURES

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

H-M-L priority for actions 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				

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RISK MATRIX: FEATURES

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

Features	Location	Ownership: V or S
Infrastructural		
Societal		
Environmental		

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RISK MATRIX: FEATURES

FEATURES	LOCATION	OWNERSHIP	VULNERABILITY OR STRENGTH
Infrastructural	Town wide	State	Vulnerability
Societal	Multi- vs. Single-neighborhood	Town	Strength
Environmental	Specific location	Private	Both
		Shared	

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FEATURES IN DANVERS

Photo: Fire Truck. Photo by the Danvers Fire Department, Twitter, 2019

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INFRASTRUCTURAL FEATURES

Police Department

Photo by the Danvers Police Department

Fire Department

Photo by the Danvers Fire Department

Water Supply

Dams

Curtis Pond Dam. Photo by the Ipswich River Watershed Association

Roadways

Photo by the Salem News

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SOCIETAL FEATURES

Population	Danvers	Massachusetts
2010	26,493 residents	6,547,790
2018	27,727 residents	6,902,149
Age		
Under 18 years:	20.3%	20%
65+ years:	21.3%	17%
Education		
Bachelor's degree or higher:	41.2%	42.1%
Additional Information		
Median household income:	$79,795	$74,167
Persons in poverty:	6.3%	10.5%
With a disability:	7.9%	7.9%
Language other than English spoken at home:	8.8%	23.1%

Source: U.S. Census Bureau, 2013-2017 ACS Estimates

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SOCIETAL FEATURES

SCHOOL SYSTEM

- 3,464 students are enrolled in the public school system
- Public school system includes **5** elementary schools, **1** middle school and **1** high school
- Other schools include:
  - Plumfield Academy
  - St. Mary of the Annunciation
  - St. John's Preparatory School

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ENVIRONMENTAL FEATURES

Whipple Hill

Danvers Swampwalk

Streams

- Crane Brook
- Frost Fish Brook
- Beaver Brook

Wetlands

Coastline

Open Space

Connors, Clark, Choate & Folly Hill Farms

Photos: Town of Danvers, 2018.

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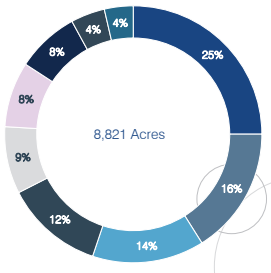
LAND USE



- Undeveloped
- Medium Density Residential
- Undeveloped Wetlands
- High Density Residential
- Non-Residential Developed
- Industrial
- Low Density Residential
- Transportation
- Agriculture

Weston & Sampson

1. Danvers Hazard Mitigation Plan, 2018.

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LUNCH

Photo: Choate Farm. Photo by the Town of Danvers, 2018.

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ADAPTATION STRATEGIES

Photo: Danvers Department of Public Works. Photo by the Town of Danvers.

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EXISTING HAZARD PROTECTION

- Adopted the Massachusetts State Building Code
- Tree trimming program and coordination with National Grid
- Cleans 1200 of its 5000 catch basins on an annual, revolving basis
- 50/50 mixture of sand and salt is used on roadways
- At least 30% of total development must remain open space
- Enforced the local stormwater bylaw, local wetlands bylaw, the Massachusetts Wetlands Protection Act
- Subdivision Rules and Regulations contain several requirements that address flood hazard mitigation as well as other hazards
- Storm drainage open channels, culverts, and pipes are designed for a one-hundred-year storm
- Flood Plain District and Floodways protect lands in the Town of Danvers that are subject to seasonal or periodic flooding
- Hawthorne West District maximum impervious lot coverage for new construction may not exceed 50% of the lot area
- Disaster Recovery Communications Plan
- Emergency Shelters and Cooling Stations

Weston & Sampson

Source:

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COMMUNITY ACTIONS

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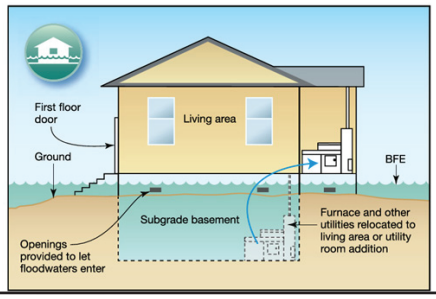
WET FLOODPROOFING



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RAISED BUILDINGS

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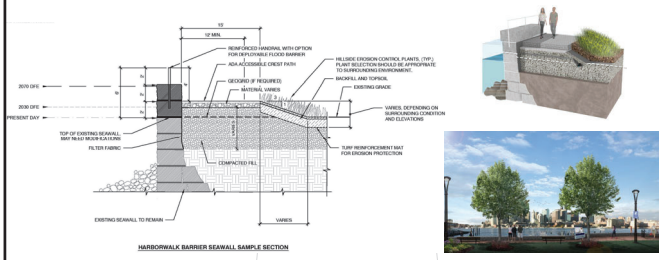
FLOOD WALLS



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DEPLOYABLE FLOOD BARRIER

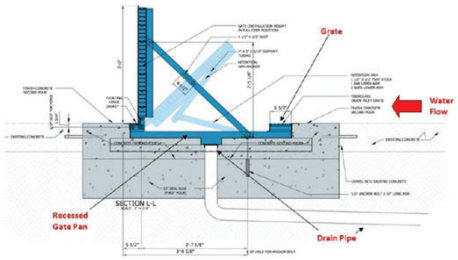

FIGURE 1 | A FloodBreak barrier gate diagram

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PREVENTING SEWER BACKFLOW

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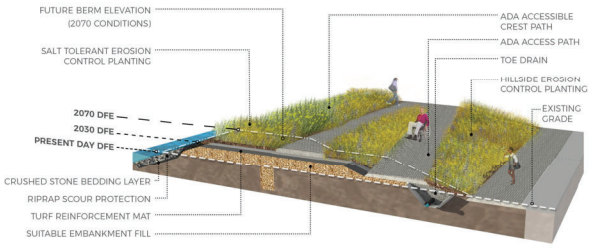
VEGETATED BERM



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MULTI-PURPOSE FLOOD STORAGE

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FLOOD STORAGE

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LOW IMPACT DEVELOPMENT (LID)

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POROUS ASPHALT & PERMEABLE PAVERS

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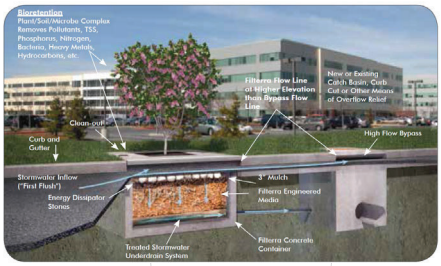
STREET TREES & TREE BOX FILTERS



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STREET TREES & TREE BOX FILTERS

Rain Garden in a median strip of a townhouse project. Please note the depressed curb and grate inlet structure

73

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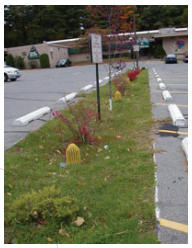
STORMWATER DETENTION & RETENTION



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CULVERT WIDENING TO IMPROVE HABITAT & FLOW

75

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CLOUDBURST STREETS

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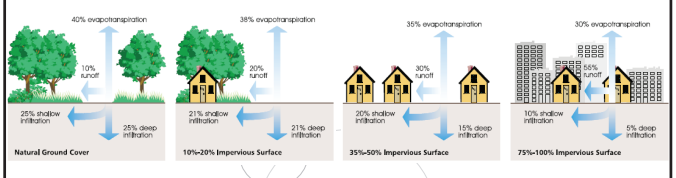
REDUCE IMPERVIOUS AREAS



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GREEN ROOFS

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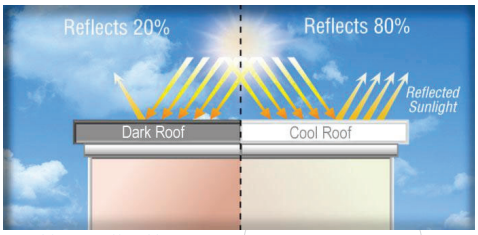
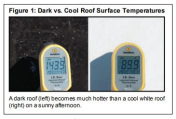
COOL ROOFS



Source: Heat Island Group at Lawrence Berkeley National Laboratory



A dark roof (left) becomes much hotter than a cool white roof (right) on a sunny afternoon.

Source: U.S. Department of Energy Guidelines for Selecting Cool Roofs

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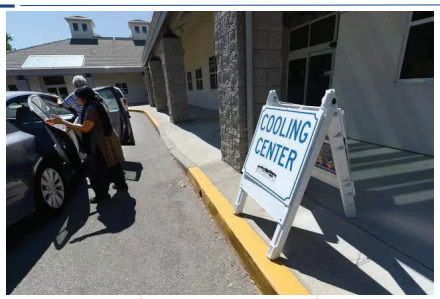
COOLING CENTERS



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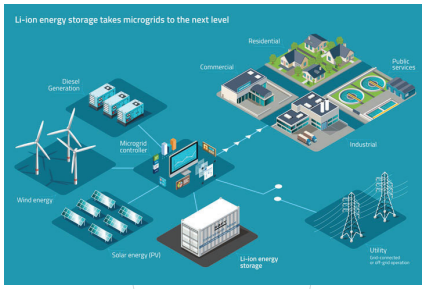
RENEWABLE MICRO-GRIDS



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LANDSCAPE DESIGN TO ACCOMMODATE WATER

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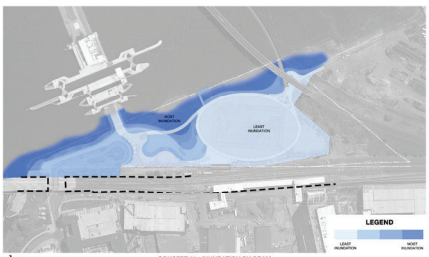
LANDSCAPE DESIGN TO ACCOMMODATE WATER



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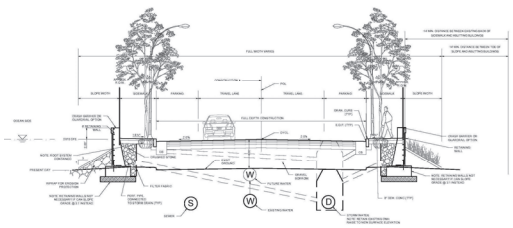
RAISED ROADWAYS



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RETROFITTED FLOODPROOF DOORWAYS

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RE-EVALUATE LOCAL REGULATIONS & POLICIES

86

86

DEFINE COMMUNITY ACTIONS

Photo: Danvers Senior Center. Photo by the Town of Danvers, 2017.

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15 MINUTE BREAK!

Photo: Old Danvers State Hospital, 2017, https://allthatsinteresting.com/danvers-state-hospital

88

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IDENTIFY PRIORITY ACTIONS

Photo: Police car on Westford Road. Photo by the Town of Danvers, 2017, Twitter.

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WRAP-UP & CLOSING REMARKS

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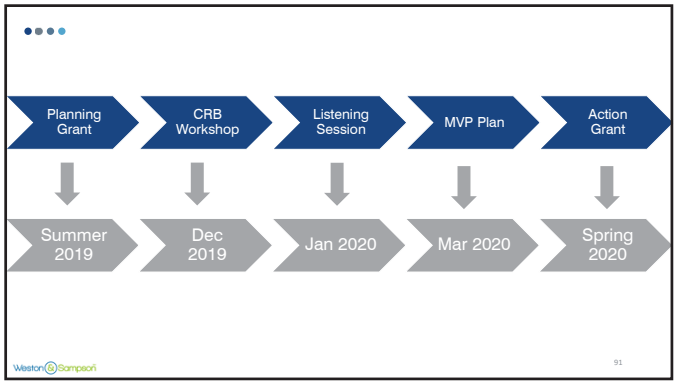
Planning Grant
CRB Workshop
Listening Session
MVP Plan
Action Grant
Summer 2019
Dec 2019
Jan 2020
Mar 2020
Spring 2020
Weston & Sampson
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THANK YOU
Weston & Sampson

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CRITICAL FACILITIES and VULNERABLE POPULATIONS

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

- Is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

Critical facilities in the Town of Danvers have been identified with help from knowledgeable Town staff, MassGIS data, and existing Town and Regional Plans.

Critical facilities and vulnerable populations have been broken into four categories: Emergency Response, Non-Emergency Response, Dangerous/Hazard Materials and Facilities, and Facilities and Populations to Protect.

Category 1 – Emergency Response Facilities

Emergency response facilities that are necessary for the Town in the event of a disaster.

1. Police and Fire Department

Police Department	120 Ash Street
Fire Department Headquarters	64 High Street
Fire Department – Engine 2	350 Maple Street

2. Town Facilities

Department of Public Works	2 Burroughs Street
DPW Garage	95 Hobart Street
DPW Facility	99 Hobart Street
DPW Buildings Division	Porter Street
Business Division (IT Networks)	2 Burroughs Street
Danvers Electric (Control Room)	1 Burroughs Street

3. Emergency Shelters

Danvers High School	60 Cabot Road
Senior Center	25 Stone Street

4. Lyons Ambulance Service — 135 Maple Street

5. Primary Evacuation Routes
   - Route 1
   - I-94
   - Route 128
   - Route 62
   - Route 35
   - Route 114

6. Critical Bridges, Intersections, and Sites

Category 2 – Non-Emergency Response Facilities

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

1. Town Facilities

Town Hall	1 Sylvan Street
Northeast Massachusetts Regional Library	175 Andover Street
Peabody Institute Library	15 Sylvan Street

2. Natural Resources

Putnamville Reservoir
Frost Fish Brook
Porter River
Crane River
Danvers River
Crane Brook
Norris Brook
Beaver Brook
FEMA National Flood Hazards
DEP Wetlands
Open Space & Conservation Land

Category 3 – Dangerous/Hazardous Materials and Facilities

1. Dams

Mill Pond Dam
Putnamville Reservoir West Dike
Putnamville Reservoir Dam
Salem Reservoir Dam
Putnamville Reservoir East Dike
Ferncroft Road Dam
Meadow Dam
Culvert at Mill Pond
Putnam Reservoir South Dike

2. Landfill

Danvers Landfill	3 East Coast Road
Danvers Andover Street Landfill	104 Andover Street

3. Electric Substation

Station 42	32 Bow Street
Conant Sub	55 Conant Street

Pond Sub	54 Holton Street
Cabot Sub	60 Cabot Road

4. Water Pump Station
   - Summer
   - Putnam Fire
   - Well 2
   - Well 1
   - Lakeview Fire
   - Hawthorne Ave
   - Ferncroft Village
   - Lakeview Service
   - Putnam Service

5. Sewer Pump Stations
   - North Street
   - Makushin Lane
   - Naumkeag Row
   - Summer Street
   - Greenleaf Drive
   - Tibbetts Ave
   - Doty Ave
   - Endicott Street
   - Southside Road
   - Briarwood Drive
   - West Street
   - Endicott Street
   - Water Street (2)
   - Locust Street
   - Liberty Street
   - Andover Street
   - Water Street
   - Popes Lane

6. Underground Storage Tanks

Hunt Hospital	75 Lindall Street
Varian Extrion Div.	1 Ferncroft Road
GTE Products Corp.	10 Endicott Street
Arthur Liacos	19 Water Street
Sears Central Service #770124	74 Andover Street
John M. Ross & Son Inc	50 Buxton Road
Devoncon Corp	30 Endicott Street
Danvers Dodge Inc	107 Andover Street
Wakefield Distribution Systems	249 North Street
New England Telephone Co	63 High Street
Mass DPW	485 Maple Street

Barron Chevrolet	90 Andover Street
Bame Realty Trust	507 Maple Street
J.R. Sousa & Sons Inc.	29 Andover Street
Exxon #3-8486	136 Endicott Street
New England Telephone Co	76 Ash Street
Town of Danvers	95 Hobard Street
Essex Oil Co	112 Water Street
North Shore Auto Brokers Inc	99 Andover Street
Shell Oil Company	431 Newbury Street
Mobil 01PFJ	Locust ST & Maple Street
Wingaersheek	18 Cherry Hill Drive
Exxon #3-8980	160 Andover St
Shell Oil Co.	79 High Street
Sunoco #0002-8613	140 Andover St
Danvers Mobil	89 Holten Street
Danversport Yacht Club	161 Elliott Street
Maryin D. Goldberg	435 Newbury Street
Cumberland Guld #118726	313 Newbury Street
GTE Products Corp.	75 Sylvan Street
Merrimack Valley Distruct Co.	50 Prince St
Bursaw Oil Bulk Storage	27 Cherry Street
Waterlac Industries	120 Andover Street
Mobil #01-332	156 Endicott Street
Danvers State Hospital	450 Maple Street
Melvin G. Nelson	128 Water Street
Shell Oil	156 Andover Street
Shell Oil	149 Endicott Street
Gibbs	100 Maple Street
Betterncourt Auto	8 Bridge Street
Sullivan & Sauchuk Motors Inc.	95 High Street
North Shore Radiological Assoc.	344 Andover Street
Port Marine, Inc.	10 Harbor Street
Budget Car & Truck Rental	8 Purchase Street
Town of Danvers Electric Division	2 Burroughs St
Town of Danvers Polic	120 Ash Street
High Street Sunoco	60 High Street
Al Nife & Son	11 Collins Street
Merrimack Valley District Co.	50 Prince Street
Essex Ag. & Tech Institute	562 Maple Street
Arnel Co Inc. & Tech Inst.	126 Water Street
Danvers Group Inc	100 High Street

7. Fuel and Hazardous Materials
   140 Andover St
   112 Water St
   156 Endicott St
   79-81 High St
   149 Endicott St
   11 Newbury St
   420 Newbury St
   100 High St
   97 Maple St
   100 Maple St
   89 Holton St
   250 Newbury St
   60 High St
   160 Andover St
   76 Newbury St
   425 Newbury St
   95 High St
   75 Wenham St
   97 Maple St
   8 Bridge St

Category 4 – Vulnerable Populations and Community Facilities

1. Housing Authority Properties
   154 Water St
   2 Rogers Rd
   49 Coolidge Rd
   21 Summer St
   14 Stone St
   238 Conant St
   9 Summer St
   240 Conant St

2. Housing Housing/Assisted Living

Senior Center/Adult Day Care	Stone Street
Senior Housing	Tapley St
Senior Housing	Rice Street
Senior Housing	Porter Street
Senior Housing	7 Charter St
Senior Housing	Perry Terrace
Atrium at Veronica Drive	1 Veronica Drive
Brighton Gardens of the Northshore	220 Conant St
Heritage at Danvers	9 Summer Street
Harborside Healthcare Cedar Glen	44 Summer Street
Harborside Healthcare Twin Oak	63 Locust Street
New Eng. Home for the Deaf	154 Water Street

Hunt Nursing Home	90 Lindall Street
Radius Healthcare	56 Liberty Street

3. Mobile Home Parks
   200 North St

4. Youth Services

Danvers Community YMCA	34 Pickering Street
Danvers Indoor Sports Arena	150 Andover Street

5. Schools

Danvers High School	60 Cabot Road
Highlands School	190 Hobard Street
Great Oak Elementary School	76 Pickering Street
Holton Richmond Middle School	55 Conant Street
Ivan G. Smith Elementary School	15 Lobao Drive
Willis E. Thorpe School	1 Avon Road
Riverside Elementary School	95 Liberty Street
Essex North Shore Ag & Tech School	565 Maple Street
St Mary of the Annunciation	14 Otis Street
Plumfield Academy	123 Dayton Street
St. John's Preparatory School	72 Spring Street
Danvers Special Education Division	64 Cabot Street
Children's Montessori Center	12 Bradstreet Ave
Great Beginnings Learning School	28 Water Street
Fox Hill School	81 Water Street
Great Oak Elementary School	76 Pickering Street

6. Urgent Care

North Shore Urgent Care	104 Endicott Street
Lahey Health Urgent Care	480 Maple Street

7. Water Access

Harbormaster office/Boat Launch	10 Harbor Street
Town Marina	8 Harbor Street

8. Daycare
   308 Andover St
   5 Hutchinson Dr
   6 Southside Rd
   31 Bates St
   132 North St
   323 Locust St
   28 Water St
   55 Poplar St
   5 Electronics Ave
   487 Locust St
   12 Bradstreet Ave

46 Cherry St
140 Commonwealth Ave
16 Sylvan St
69 Holton St
562 Maple St
47 N Shore Ave
81 Water St

9. Pharmacy, Grocery, and Supplies Stores
   240 Independence Way
   1 Maple Street
   55 Brooksby Village Drive
   107 High Street
   139 Endicott Street
   11 Newbury Street
   47 Elm Street
   311 Newbury Street
   301 Newbury St
   73 Holten St
   37 High St
   1 Hobart St #1
   139 Endicott St
   300 Andover St
   55 Brooksby Village Drive
   240 Independence Way
   182 North St
   17 Elm St

10. Hotels/Motels
    275 Independence Way
    50 Dayton St
    50 Ferncroft Rd
    225 Newbury St
    238 Andover St
    65 Newbury St
    59 Newbury St

11. Census Tracts with 25% of people who are >65

12. Census Tracts with 25% of people who are <18

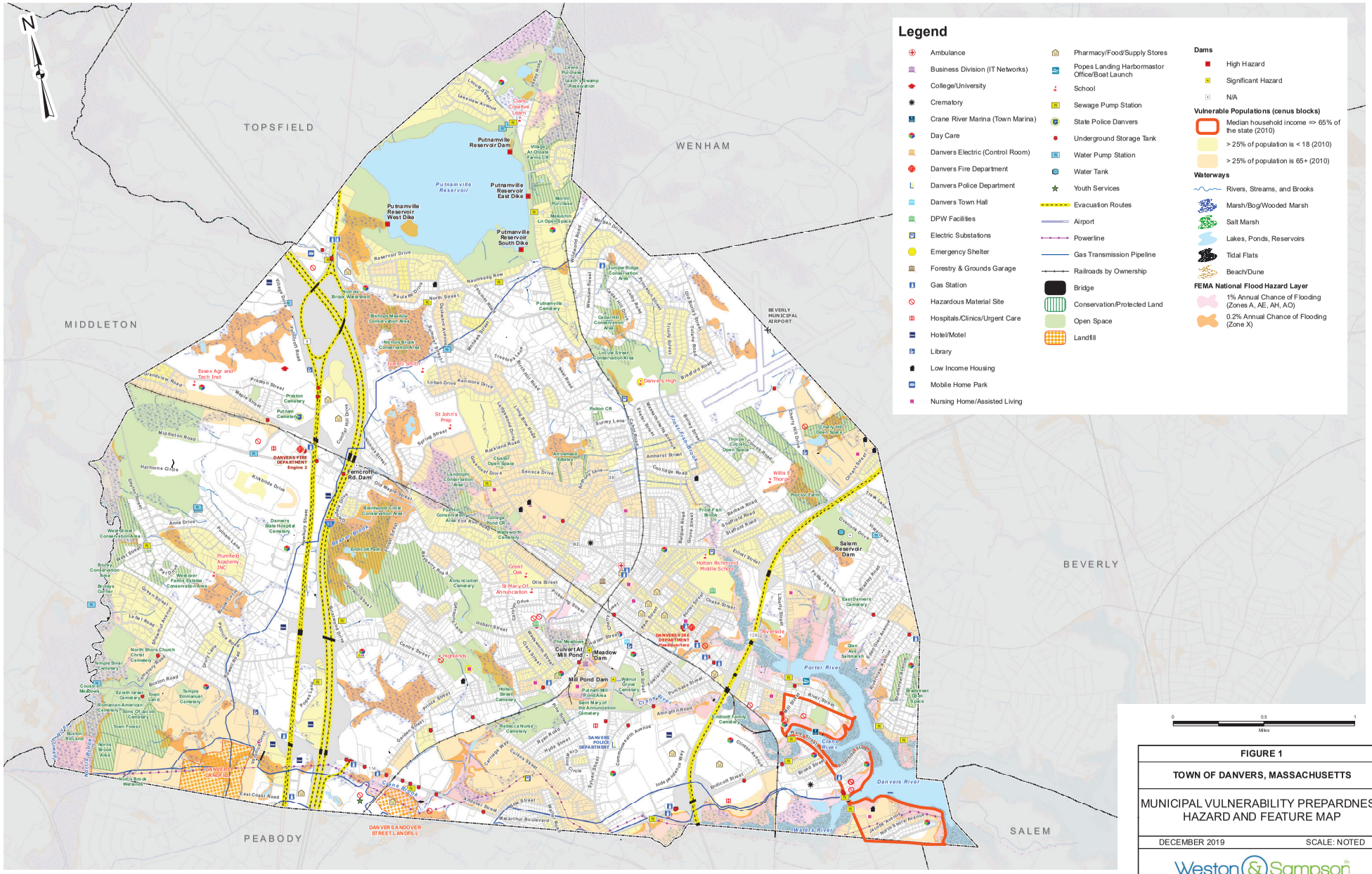


FIGURE 1

TOWN OF DANVERS, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

DECEMBER 2019 SCALE: NOTED

Weston & Sampson

Danvers CRB Workshop Notes
December 5, 2019

Questions during presentation:
How does this process translate to the large scale, federal level? What if there is a hazard in another state that affects us up here – how are we able to manage this? – for example, if there is a hurricane in the south and we are not able to get goods shipped up here.
Amanda answered that this is why the program is very beneficial, because we are preparing ourselves for hazards within Massachusetts and are not competing with other states, as is what happens with FEMA grants.

Are MVP Grants only for municipalities?
The money is funneled through a municipality, but the project can involve private entities and groups, but way of match and projects done on public/private land.
What is the difference between retention and detention?
Retention basin holds water short term and slowly releases it to reduce flooding, detention is more permanent and the water is either evaporates or infiltrates

Input from Stakeholders:

- Salem Sewer District – Powerpoint
- Mother's Day flood
- Haven't used National Guard previously but surrounding communities have
- Need to update emergency operations plan
- Could look at where we want sewer to go
- Never had a critical failure of pump stations
- Beverly Middle School – impervious surfaces on parking lot and play fields
- Commercial district/Marina has significant threats from SLR and storm surge.
- Show rail trails on maps. Western expansion is planned
- Dredging of channels is needed from sediment deposition and shoreline erosion
- Several Dams need attention
- Electrifying the town fleet and &EV charging is a major issue
- Danvers water supply is in Middleton
- The Town's Electric Light facility has been flooded
- Conant Street culvert and drainage is a problem
- Need enterprise fund/stormwater utility
- Zoning/bylaw updates are needed.
- The future of Lebel's Grove on Ipswich River
- Hydroelectric strategies?
- Assessment of Dams in adjacent communities if they impact Danvers
- Danvers housing authority properties – elevators don't work when power goes out

Hazards in Danvers:
Flooding
Drought
Severe Storms and Extreme Temperatures
Coastal Hazards

Town has many GIS layers – fiber optics, communications, substations. Reach out to Renee Hunter.

Existing mitigation measures:

- Mosquito program in town
- Currently rehabbing Swan pond in Reading
- Emergency valve SESD removed
- Impervious surfaces in Danvers: behind EOC, 102 Center Street – Honeycomb, Hotel
- There are permeable pavers in two locations in Danvers. One location is 15 Kirkbride Drive near the Rehabilitation Center.
- Doty Ave pump station, microgrid
- Most substations are new – Town has done work in last 15 years
- Current public outreach:
    - Blackboard connect
    - Robo calls
    - Website, social media
    - How to reach the elderly?

Notes on critical facilities:

- Only show active hazardous material sites
- Vulnerable pump stations are circled on group 2(?) map: downtown/electric, near school
- Update addresses for housing authority properties
- Green alternatives to rip rap have not worked well in Danvers

Features in Danvers
<u>Infrastructure</u>

- Strength:
    - Roadways provide transportation network
    - Popes Land Seawall provides some protection
    - Electric Light Department and infrastructure
    - Water supply
    - Water and Wastewater infrastructure
    - Public safety locations
    - Emergency management buildings/DPW
    - Police Station
    - Fire Station
    - IT and Communications

- Vulnerability:
    - Flooding of roadways
        - 128
        - Tibbits/Tibbots/Tibbets (sp) Ave
        - Route 1/95 Intersection
        - Liberty St flooding--- is this a roadway or park (based on action for Table 6)
    - IT and Communications
    - Dams and dikes
    - Bridges
    - Pump Stations
    - Emergency management buildings/DPW
    - Public Safety Locations
    - Residential flooding on Tibbets (sp) Ave
    - Truck storage and Electric Light Headquarters floods
    - A few electric light substation are vulnerable to flooding
    - Popes Land Seawall needs elevated
    - South Exxex Sewer District Main Line needs to be assessed for vulnerabilities beyond the known potential for erosion at near Crane River
    - Culverts and stormwater infrastructure- Beaver Brook, Purchase, Ash
    - Water supply: wells at risk, in need of redundancy
    - Wastewater needs a back flow system and to secure pumps
    - Fire Station subject to flooding
    - Coastline
        - Commerical and Residential
        - Marinas
        - John George Park
        - Crane
- **Notes:**
    - Communications
        - Snow storms – cut communications, close town hall (most recently)
    - Water and Sewer
        - Yearly water restrictions for homes and businesses
        - Emerson Brook land in Middleton (water supply)
        - WW infrastructure
        - Reservoirs
        - Route 114 – Pump
        - Pump Station: Tibbets Street, Conant Street
        - Water and sewer pumps
        - Water sources in Middleton – Well 1, Well 2, reservoir
        - Bridge leading to Well 1 in Middleton (owned by Danvers)
    - Storm surge in Middleton
    - Culverts
        - Purchase/ Ash Street
        - Woodvale culvert

        - Adams Street Culvert
    - Walnut Grove Cemetery
    - Fuel Storage
    - Electric
        - 90% of electrical distribution is overhead lines
        - Electric/light building
        - Electric – Mill Pond
        - Electric light station: manual floodwall panel (deployable barriers). Max height 4 feet, breached during mother's day flood
        - Electric transformers (N Grid, Bowe Street)
        - Transmission lines are vulnerable – especially line near town hall
        - Power lines – impacted by trees
        - 8 substations in town
    - Roads:
        - Conant, Poplar, Locust intersection
        - Route 95
        - Valley Road
    - Bottom of 1 Burroughs Street
    - Sylvan Street dam at Mill Pond (Mill Pond Dam)
    - Engine 2 Building
    - Regional transportation center
    - Town uses private ambulances

<u>Societal</u>

- Strengths
    - Elderly population provides experience about previous hazard occurrences
    - Youth offer energy and capacity to prepare, respond, and communicate
    - Senior Center and schools provide an avenue for communication and a potential place to shelter.
    - Emergency response personnel (police, fire, ambulance) capacity and access to hospitals
    - Workforce and businesses keep Danvers thriving
    - Housing Authority properties, assisted living facilities, mobile homes, apartments, and nursing homes all provide a variety of housing types
    - Endicott Park
    - National Guard facilities and personnel
    - Faith-based and community organizations
    - Department of Public Works facility and services
- Vulnerabilities
    - Need to increase outreach to seniors and youth
    - Disabled residents who may be vulnerable due to isolation
    - Need to ensure workforce is safe during commute
    - Need to protect waterfront businesses and residents

- All businesses (including day cares and hotels) may not have an emergency response plan
- Housing Authority properties, assisted living facilities, mobile homes, apartments and nursing homes should be integral in emergency response planning
- Schools are not currently ready to shelter in place
- Communication infrastructure is vulnerable to extreme weather
- Public health threats from climate change
- Non-native English speakers may be less likely to receive communications in their language

- **Notes:**
  - Elderly
    - Elderly Housing
    - 7 – 8 nursing homes/assisted living (all have generators)
    - 2 Alzheimer's facilities, live-in facilities
  - Danvers Housing Authority- multiple buildings
  - Public Safety Department
  - Faith-Based/Community organizations
  - Public works department
  - Riverfront communities
  - Apartment buildings subject to flooding
  - Hospital
  - Assisted living/nursing homes
  - Many commuters
  - Non-english speaking residents (2,400)
  - Schools are prepared to handle emergencies and to provide shelter
    - St johns prep (doesn't have busses)
  - Demand for emergency services: Increases each year, call response decreases availability for training and inspections
  - National shortage of paramedics

<u>Environmental</u>

- Strengths
  - Crane River possible flood storage
  - Danvers Harbor
  - Trees
  - Wetlands and open space
  - Farms (Essex Tech, Hogan Regional, Richards Ons, Connors Farm, Clark)
  - Electric Fleet
- Vulnerabilities
  - Frost Fish Brook – erosion and bank stabilization
  - Crane River erosion and algae
  - Danvers Harbor needs to consider protection from sea level rise and increased storm surge (both the natural coastline and the infrastructure)

- Water supply during drought
  - Conservation, storage and permitting to reduce water quality impacts
- Trees' possible impact on downed power lines and impact of invasive species
- Ispwich River—impact of temperature and low flows on fish and possible floods
- Storm debris
- Erosion of streams and coastline
- Ground water contamination from sewer
- Beavers on Beaver Brook, Rail Trail, Endicott Park, and Proctor farm cause flooding
- Electric Fleet and need to build more infrastructure
- Wetlands and open space vulnerable to development
- Contaminated lands
- Invasive species
- Coastline

- **Notes**
  - Putnamville Reservoir – owned by salem-beverly water
  - Rivers/Brooks
  - Endicott Park – has flooding issues. beavers
  - Schools/Fields
  - Open Space
  - Water Supply (Ipswich River)
  - Impervious Area
  - Muddy Boo/wetlands
  - Sandy Beach
  - Danvers has a forestry department

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	Severe Storms	Drought	Coastal Hazards	Priority H - M - L	Time S Long O
Infrastructural									
Roadways (128, Tibbits Ave)	128, RT 62, Tibbots	State + Town	V/S	Large Culverts, Elevate Roads Public education for evacuation routes (and staff training) ----> Across all hazards			Elevate Roads	H	L
Residential Neighborhoods near Tibbots Ave	Along Tidal Rivers	Private + Public	S	Update Zoning (Evaluation of Buildings) + Building code, Education and planning for retreat, disclose flood risk when selling		Public Notifications (There is chance of over-notifications)	Design Resilient Piers to survive winter weather	M	O
Low living area near Brook, trucks stored electric dept. headquarters	Two Burrows	Town	V/S	Relocate, Update Deployables (Short Term), Improve access road to lower garage	Relocate	Relocate	Relocate	H	S (Already started planning)
Popes Landing Seawall	8 Harbor St.	Town + State	V/S	Elevate, Permitting solutions, Short-term costal retention			Long term retreat, Purchase flood risk land, Design floodable costal/ Riverine parks	L	L
SESD (South Essex Sewer District) Main Line (Sewer)	Port Area	Regional Utility	V	Regional collaboration, Assess critical junctions, revetment near Crane River to prevent erosion	revetment near Crane River to prevent erosion	revetment near Crane River to prevent erosion		H	O
Substations + Transmission Lines / Electric Infrastructure	Town Wide	N. Grid + Town	V/S	Consider climate change tree assessment in emergency planning, improved tree management plan, Don't site substations in flood zone, elevate or relocate vulnerable stations, collaborate with Verizon and N. Grid			Design guidance for tree siting in new development	H	O
Societal									
Elderly Population	Town Wide	Town + Private	V/S	Informational programs at senior centers, Widespread outreach senior assistance program, paper newsletter for heating/cooling- discounts on utility rates			Education, notification, transportation, staff training (+ Town employee	H/M	O
Students + Children	Town Wide	Public + Private	V	Local group on climate adaptation	Work with student groups at college, Student help with resiliency project			L	O
Disabled Residents	Town Wide	-	V	Storm preparedness manual, Public education (evacuation procedures), Better transportation plan, Back-up generators for public facilities and private homes			Town wide emergency management plan shared across orgs	L/M	O
Emergency Response Personnel (Police, Fire, Ambulance)	Town Wide	-	S	More staff, equipment, training, shortage of paramedics				H	O
Workforce	Town Wide	-	V/S	Fixed evacuation route signs, electronic signature (notification), portable generators or solar powered signage, protect waterfront business				M	O
									O
Environmental									
Crane River	←	Erosion Issues - Private + Public	V/S	Seawalls, stone revetment, corrosion control, flood storage	Seawalls, stone revetment, corrosion control, flood storage		Address algae blooms Water quality + storm water management	H	O
Danvers Harbor	←	Private + Public	V/S	Seawalls, stone revetment, corrosion control, flood storage				H	O
Water Supply (Middleton pond, Ipswich river, Public/Private wells)		Public	V			Decrease water rate price in summer or based on usage		M	O
Trees (near power lines)	Town Wide	Public + Private	V/S		Design and planning for new development, hire an arborist			M	O
Beavers (Beaver Brook, Rail Trail, Endicott Park, Proctor farm)	←	Public + Private	V	More beavers deceivers Public education about the risk			Pruning/In house tree planting	L	O
Wetlands	Town Wide	Public + Private	S					L	O
Farms (Essex Tech, Hogan Regional, Richards Ons, Connors Farm, Clark)		State + Private	S	Promote organic practices, limit pesticides		Sustainable irrigation practices (rainwater, harvesting and collection systems)	Purchase underdeveloped wetlands, public education on benefits and restrictions	L	O

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	Extreme Weather	Drought	Coastal Hazards		Priority H - M - L	Time S Long O ngoing
Infrastructural										
Storm Water, Culverts, Infrastructure	Townwide	Town	V	Stormwater Enterprise Fund Conant St Drainage, Zoning/Bylaws	Hydraulic model of sewer system	Capture/Storage Assessment MWRA - agreements	Outfall asessment, MS4 Support		H	O
Coastline, Marinas, Commerical Residential	Water front	Mixed	V		Seawalls, Land aquision		Outfall Asessments Dredging Seawalls		H	O
Pump Station, Utility Infrastructure, Dams	Townwide/Regional	Mixed	V	Pump Station (Raise and Replace), Dam (Rebuild)	Backup Power/ Generator, PV Systems (Senior Center and OPS center)	Interconnections Beverly - Pumps/meters	Relocate infrastruction, eliminate		H	O
Municipal Buildings (Electric School- Riverside)	Townwide	Town	V	Electric Building (Public Work Asessment Two Burroughs	Cooling centers		School- Flooding asessment/designs		H	Medium
Parks, Openspace, Trails	Townwide Rail	Mixed	V/S	Trail Design, Flooding, New Trail Design	Flood Storage, Tree planting, Shade, Cooling center, Splash pad	Forest management, Tree clearing	Harbor walk, Public acess, protection	Climate action plan	H	O
Roads, Sidewalks, Parking	Townwide	Town/Mixed	V	Asess Drainage, Upgrade Reg Changes	Plowing equipment signalization		Raising roads		H	O
Societal										
Senior Center	Stone St	Town	V/S		Back up power, shelter				M	L
Housing Authority, Assisted Living, Mobile Homes, Nursing	Multiple Locations	Mixed	V/S	emergency response planning	Emergency Response Planning extreme Weather				M	S
Schools	Townwide	Town	V/S	Asess for Shelter	Asess for Shelter				H	S
Hospitals	Multiple Locations	Private	S	Communications Update Em ops plan	Communications Update				H	S
Endicott Park	Park	Town	S	Infrastruction Upgrades Beaver controls		Forest management, invasive species management			M	O
Communications	Townwide	Town	V	Infrastructure vulnerable populations communication plan					H	S
Envionmental										
Electric Fleet		Mixed	V/S	Incentives for EVs, more charging stations					H	S
Water Supply- Conservation, Storage, Permitting		Town/Regional	V	Infiltrate stormwater for recharge, LID encourage	Outreach on demand management	Capture / Storage Assessment conservation wells-protect, assess yield			H	O
Open Space, Wetlands		Mixed	V/S	Manage/Expand Draining Projects			Acquistion		H	O
Contaminated Lands		Mixed	V	Asessment for Remediation capping/reuse	Asessment for Remediation				M	O
Invasive Species		Private/Town	V	Forest management plan + implementation	Forest management plan + implementation	Forest management plan + implementation			M	O
Coastline		Mixed	V	Protect existing infrastructure (Marina/Substations)			Prioritization of facilities on the coast		H	S

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

Features	Location	Ownership	V or S	Flooding	Severe Storms	Drought	Coastal Hazards	Priority H - M - L	Time S Long O
Infrastructural									
Pump Stations	Most near water body	Town	V	Flood proof for electric/energy us Elevate critical electronic pieces	disconnecting sanitary SW from system		Generator at Doty Ave Pump Station	H	S/O
Roads (Recently changed Rd mix)	Town Wide	Town + Private (Mass DOT)	B	128 - Road elevation (H). Mass Ave flooding caused by down stream culverts. Could uncrease bank height (M) Funding for paving (M) Elliot and Poplar - Elevation + culverts (H)				H	O
Culverts	Town Wide (500 +)	Mass DOT	V	Beaver Brook Culverts - Rightsizing Purchase and Ash				M	O
Schools-Town Buildings	7 schools 14 mg buildings	Town	B	Move Electric Light College Pond/Endicott Park Storage Assessment of Opportunities for stormwater nature-based	Improve communication - internal and external -> better tools and planning Update emergency plan		Marina banks need protection	M	S
Electric Facilities	Town Wide	Town, Verizon, National Grid	B	Substations -> fortify and marriers - possibly relocation	fortify - stronger poles and lines, underground			H	S/O
Water Supply	Town Wide/Middleton	Town	B	wells at risk -> barriers. Lift and elevate equipment		conservation program -> current water banks need to plan alternate sources -> expand reservoirs		H	S/O
Societal									
Shelters - High School(Essex Tech), Middle School and summer programs are at schools +Northshore CC without airconditioning - reroute bus stops	Specific	Town + State	S		Air conditioning at elementary schools (L - L)		Riverside -> assessment of protection to Hurricane	M	L
Youth	Town Wide		B	Project based learning on smaller II projects working with students to get involved in planning more				H	O
Senior, People who are disabled + facilities	Town Wide	Facilities (Private)	V		Equip senior center as cooling center (M - L)		Need backup power Evacuation and back-up plan	H	S
Essential Services (Food, Transportation, Airport)	Town Wide	Town + Private	B		95 - encourage/work with MassDOT to fix (Evac Route) - Need backup power at grocery store and private schools		keep services for emergencies active coordination	L	L
National Guard	Specific	State	S					L	L
Low-Income	Town	HA- State	V		Cooling centers Tapply Manor out of electric for days Need backup generators - self sufficiency solar facilities	outreach sign up for reverse 911		H	O
Environmetal									
Town Forest	Specific	Town	V	Beaver Management	Management plan - including to reduce wildfire hazard -> need fire loop route/road			L	L/O
Ipswich River- Water Supply	Specific	Public	V	Flood mitigation to reduce at 114 and valley rd	Assessment of impact of temps on wildlife/fish	evaluate options for stormwater recharge		H	O
Tree- Tree Company	Town Wide	Private + Private	B		Keep implementing tree management plan	manage invasive species +		M	O
Storm Debris			V	ID Regional storm debris plan and location	Find funding to deal with storm debris		Regional equipment to deal with storm debris	H	L
Banks- Erosion		Private + Public	V	Streams in residential neighborhoods that flood (stabilization)	Armor banks -> hard and soft scape -> john george bank		Dredge plan and addressing silts (currently every 30 years)	H	S
Ground Water (Sewer) Contamination	Town Wide	Private + Public	V	Separate sanitary sewer from stormwater address drainage at cemeteries				L	L

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

Features	Location	Ownership	V or S	Flooding	Severe Storms	Drought	Coastal Hazards	Priority H - M - L	Time S Long O ngoing
Infrastructural									
Water Supply (Danvers River, Mill Pond Area)	Town Wide	Town	V/S	Back flow System	Reduce Aging Infrastructure	Connecting to other water supply	backflow system	H	O
Flood- Prone Roadways	Town Wide	Town + State	V	Redesign Roadways to account for climate change (Culverts, Vegetation, ect.)				M	S,L,O
Electric Grid		Town	V/S	Back up generators for critical facilities (across all hazards) Renewable energy (across all hazards)	Trim Trees			H	O
Local Bridges	Town Wide	Town + State	V	*See flood prone roadways on map* monitor/inspection				L	O
Pump Stations (Water and Sewage)		Town	V/S	protection of infrastructure and power regulations for new homes backflow system				H	O
Public Safety Locations (Police, Fire, etc.)	Town Wide	Town	V/S	Assess public safety buildings, consider additional rescue equipment ensure all facilities have backup generators				H	S/O
Societal									
Low-Income	Town Wide		V	transportation options education sessions shelter options cooling/warming stations				H	O
At Risk Population (Elderly/Disabled)	Town Wide		V	cooling/ warming stations transportation medical needs				H	O
Youth (0-12 yrs)	Town Wide		V	medical needs and supervision backup generators				H	O
High-Density Housing	Town Wide		V	backup generators designated coordinators				H	O
Non-English Speaking	Town Wide		V	emergency notification in multiple languages				H	O
Critical Business	Town Wide	Private	V/S	emergency plan implementation define list of critical businesses				M	S/O
Environmetal									
Town Forest, Lebal Grave	Town Wide	Town	V/S	general maintenance/keep trees trimmed ensure access in case of fire				L	O
Frost Brook	Town Wide	Town	V/S	ongoing maintenance to prevent flood and erosion consider redesign of culverts				M	O
Danvers River (Crane+Porter)	Town Wide	Town	V/S	erosion control (permenant) dredging sea wall				H	S/O
John-George Park	Town Wide	Town	V/S	multi-purpose flood storage underground storage erosion controls - underground desalination				M	L
Puthnamville Reservoir Area	Town Wide	Town	V/S	raise valley road		protect peach orchard from drought		L	L
Mill Pond Area	Town Wide	Town	V/S	increase pervious area dredge Mill Pond re evaluate the dam system culvert system for getting water to the ocean goose control				H	L

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

Features	Location	Ownership	V or S	Flooding	Drought	Extreme Weather	Coastal Hazards	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
1 Burroughs/El. Light		Town	V/S	Asess Relocation area, Reahb basement areafor office space/storage		Asess Relocation area, Reahb basement area for office space/storage		H	S/L
Drainage Info	Mill Pond Area, Beaver Brook, Crane Brook	Town	V	Dredge Mill Pond, wetland restorations in Brooks, Town-wide hydro. Stud				M/S	S/L
Emer. Management Bldg. /DPW	Engine 2	Town	V/S	Asess Relocation area, Reahb basement areafor office space/storage, Rehab engine 2 to be capable of managing events				H	L
Emerson Brookland in Middleton (Future water storage)		Town	S		Create resevior for H2O supply stability			H	S
Elderly Housing	Tepley Manor	State / Fed DHA	V	Drainage asessment/hydraulics in problem areas		Alternative power/heat source asessment, Shelter capacity/transport. asess		M	L
Wastewater info.	Tibbots	Town	V/S	asess elevations to reduce flood issues, maximize I/I removal		Alternative power source asess, cooling centers		M/L	L
Societal									
Elderly Population	Town Wide	Private	V	Drainage improvements, LID in nearby areas		Alternative power source asess, cooling centers		H/M	S/L
Public Safety Dept.		Town	S					H	S
Faith-Based/ Community Orgs.	Town Wide	Private	S	Shelters (Design plan)	Water reuse, Require reuse in new const./ retrofit existing inf/ sewer fee			M	L
Public Works Dept.		Town	S	Facility upgrades, Modernize vehicle storage indoors				H	S/L
Riverfront Communities	Port/ East Danvers	Town/Private	V	Maintain outlets/culvets, Keep clear, Max capacity, Reducing sedementation			Bank protection, dredging, clean contaminated areas	H	O/S/L
Group Homes	Town Wide	Private/State	V			Alternative power source assess, cooling centers		L	L
Environmetal									
Rivers/Brooks	Town Wide	Town	V/S	Culvert improvements, Dredge, Wetland restoration			Bank protection, Stabilize	H	O/S/L
Open Space	Town Wide	Town/Private	S	Increase utilization, Purchase properties for open space, Dual puprose development				M	O/S/L
Riverfront Parks	River St	Town	V/S	Maintian culverts nearby			Bank protection, Stabiliz	H	O/S/L
Water Supply (Ipswich River)	Middleton line/ Well 2	Town/Middleton	V/S		Maintain existing eval. New sources, Increase storage capacity, maintain			H	O/S/L
Impervious Areas	Endicott St, Rt 114, Rt 9	Private	V	Adopt new LID, Regulations		Retrofit existing/new lots for LID, fee for new improv.		M	S/L
Wetlands	Town Wide	Private	V/S	Wetland restorations, Assess maximization for storage/protection				M	L

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

Features	Location	Ownership	V or S	Flooding	Drought	Severe Storms and Extreme Weather	Coastal Hazards	Priority H - M - L	Time S Long O Ongoing
Infrastructural									
Police Station	Ash St.	Town	S			ERP Communication power source, (duplicate energy) (Kirkbridge HS, ES Towers)		H	S
Elec/Business Div/IT	Burroughs	Town	V	Move IT infrastructure Additional flood protection/ assessment to relocation for electric Mill pond gate management				H	S/O
Fire Station	High St.	Town	V/S	Relocation Option				M	L
Liberty St		Town	V	LID - underground storage				L	L
Rte 1/ 95 Intersection		Town/State	V	assessment and evacuation plans and hydrological study beaver dams				M	O
Marina Town, Crane, John George Park		Town/Private	V	check emergency equipment for gas, etc. to make sure it works erosion at waterfront, river, marina longevity				L/M	O
Societal									
Senior Population/ Housing	Multiple	Private	V	Tie into town plans Rice street		Backup power, evacuation to HS/Communications		H	O
Schools	Multiple	Town/Private	V/S	Riverside - Holton Richmond Middle School				L	O
Day Care	Multiple	Private	V	Great Beginning - planning, awareness, communication, outreach plan				L	O
Endicott Park		Town	V/S	Hydrological study/assessment, LID Long term plans Historical study				M	O
Health Issues (Mosquitos, Heatstroke, New Diseases)	Town Wide	All	V	Public health preparedness, communication, outreach plans				M	O
									O
Environmetal									
Erosion (Construction, Rivers)	Multiple	Town/Private	V	Bylaws and regulations; river assessment of erosion Evaluate construction erosion management for more severe storms				M	O
Energy Efficiency Asessments (Heating and Cooling)	Multiple	Town	V	Improve efficiencies, investigate renewable options				H	O
(Arsenic/Chromium) Superfund Crane River	Crane River	Private	V	being cleaned up now - federal funding				L	O/S
Middleton Pond (Algae Blooms)	Middleton	Town	V	is current ozone treatment scalable for future bloom frequency education of local residents, lawn care communication				L	O
Rivers (Protection/Water Quality)	Multiple	Town	V	education runoff conservation		enforcement of buffer protection (regulatory option/update)		M	O
SESD (Health, Societal, Envionmental)		Town/State	V						
Trees	Multiple	Town/Private	V	LID Options					

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

Features	Location	Ownership	V or S	Flooding	Drought	Severe Storms and Extreme Temps	Coastal Hazards	Priority	Time
								H - **M** - **L**	**S**hort **L**ong **O**ngoing
Infrastructural									
Pump Stations- Water and Sewer/ Water Supply	Multiple	Town	V/S	Tving Sewers, Lining, Inspections (ongoing), Study for prevention of flooding with pump stations	Replace bridge leading to Well 1 - Danvers, Middleton, state	redundant power at pump stations		Bridge -H Pumps-M	S L/O
Communications	Multiple	Town	V/S	Buld in redundancies and battery backups across communication infrastruture. Public safety and electric are priorities (radio communication)			(Monitoring and control)	H	O
Tibbots Ave Flooding	Waterfront (Danvers River)	Town,Private	V	Underground Storage Retention		Flooding impact study		L	L/O
Transformers and Substations		Town	V/S		generators to mitigate airconditioners - solar power and battery backups			L	O
Culverts	Town Wide	Town	V	Culvert Asessment looking at future/ Bylaw update projected rainfall				H	O
Dams and Dikes	Multiple	Town	V	Dam asessment and repair (meadow dam and culvert at Mill Pond		railings/safety precations at dam or caution sign		H	L/O
Societal									
Seniors (Senior Housing, Nursing, Home for Deaf, Assisted Livin	Multiple	Town, Private	V	Coucil on aging elderly list of locations	solar panels and battery backups at senior housing (state owned)			H	O
Children (Schools)	Multiple		V/S		solar panels and battery backups at high school (emergency shelter) shelter at smith school			M	L/O
Hogan Regional Center (Hospitals and Rehab Center)		Private, State		Use as evacuation site		additional shelter to house Hogan and Rehab (currently have agreement with Hogan)		M	L/O
Emergency Response Personnel (Police, Fire, Ambulance)		Town						L	
Business				Flooding feasibility study in Danvers Port? Where it floods, How to prevent			Flooding feasibility study in Danvers Port? Where it floods, How to prevent	L	
Hotels/Motels			V/S			additional shelter emergency management plan (in progress, not complete)		L	
Environmetal									
Frost Fish Brook		Town	V	Bank stabilization with green infrastructure, erosion control/Maintenance				H	L/O
Fuel Storage and Industrial Facilities (Tranzene and ITH1 Polymers Adhesives)		Private	V						
Daversport (Flooding, Habitat)	Danversport		S/V				Seawall? Living storeline surge protection feasibility study	M	L//O
Parks, Recreation Fields, Open Space (Trails)	Multiple		S/V	Plains Park detention/retention basin to handle existing flooding				M	L
Beavers (Rail Trails)	Railtrail		V	College Pond Culvert cleaning and rail trail				L	O
Vector Bourne Diseases	Town Wide		V	outreach for mosquitoes and ticks				M	O

APPENDIX C

Participant Risk Matrices and Annotated Hazard Maps

TABLE 1

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	SEVERE STORMS	DROUGHT	COASTAL HAZARDS		Priority H-M-L	Time Short Long Ongoing
Infrastructural										
ROADWAYS 128, TIBBOTS AVE	128, RT 62 TIBBOTS	STATE + TOWN	V/S	LARGE CULVERTS ELEVATE ROADS PUBLIC EDUCATION FOR EVACUATION ROUTES (AND STAFF TRAINING)			ELEVATE ROADS		H	L
RESIDENTIAL NEIGHBORHOODS NEAR TIBBOTS AVE	ALONG TIDAL RIVERS	PRIVATE + PUBLIC	V	ATE ZONING (ELEVATION OF BUILDINGS) + BUILDING CODE EDUCATION + PLANNING FOR RETREAT DISCLOSE FLOOD RISK WHEN SELLING	PUBLIC NOTIFICATION (THERE IS RISK OF OVER-NOTIFICATION)		DESIGN RESILIENT PIERS TO SURVIVE WINTER WEATHER		M	O
LOW LYING AREA NEAR BROOK, TRUCKS STORED ELECTRIC DEPT. HEADQUARTERS	TWO BURROWS	TOWN	V/S	RELOCATE UPDATE DEP ES (SHORT-TERM) IMPROVE ACCESS TO LOWER GARAGE					H	S (ALREADY STARTED PLANNING)
POPES LANDING SEAWALL	8 HARBOR ST.	TOWN + STATE	V/S	ELEVATE PERMITTING SOLUTIONS SHORT TERM COASTAL RETENTION			LONG TERM RETREAT PURCHASE FLOOD RISK LAND DESIGN FLOODABLE	COASTAL/RIVERINE AREAS	L	L
S. ESSEX SEWER DISTRICT SESD MAIN LINE (SEWER)	PORT AREA	REGIONAL UTILITY	V	REGIONAL COLLABORATION ASSESS CRITICAL JUNCTIONS REVETMENT NEAR CRANE RIVER TO PREVENT EROSION					H	O
SUBSTATIONS + TRANSMISSION LINES. ELECTRIC INFRASTRUCTURE	TOWN WIDE	N.GRID + TOWN	V/S	NSIDER CLIMATE CHANGE EMERGENCY PLANNING NT SITE SUBSTATIONS IN FLOOD ZONES	TREE ASSESSMENT IMPROVED TREE MANAGEMENT PLAN COLLABORATE W/ VERIZON + N.GRID			DESIGN GUIDANCE FOR TREE SITING IN NEW DEVELOPMENT	H	O
			L	ELEVATE OR RELOCATE VULNERABLE STATIONS						
Societal										
ELDERLY POPULATION	TOWN WIDE	TOWN + PRIVATE	V/S	INFORMATIONAL PRO MS AT SENIOR CENTERS WIDESPREAD OUTREAC PAPER NEWSLETTER	NIOR ASSISTANCE PROGRAM FOR HEATING/COOLING DISCOUNTS ON UTILITY RATES			EDUCATION, NOTIFICATION, TRANSPORTATION STAFF TRAINING (+ TOWN EMPLOYEES)	H/M	O
STUDENTS + CHILDREN	TOWN WIDE	PUBLIC + PRIVATE	V	LOCAL GROUP ON CLIMATE ADAPTATION	WORK W/ STUDENT GROUPS AT COLLEGE STUDENT HELP W/ RESILIENCY PROJECT			EDUCATE KIDS (+ PARENTS) ABOUT SUSTAINABILITY MVP WORKSHOP AT A HIGH SCHOOL	L	O
DISABLED RESIDENTS	TOWN WIDE	/	V	STORM PREPAREDNESS MAN PUBLIC EDUCATION RE: EVACUATION PROCEDURES	BETTER TRANSPORT PLAN BACK UP GENERATORS FOR PUBLIC FACILITIES AND PRIVATE HOMES			TOWN WIDE EMERGENCY MANAGEMENT PLAN SHARED ACROSS ORGS	L/M	O
EMERGENCY RESPONSE PERSONEL POLICE, FIRE, AMBULANCE	TOWN WIDE	/	S					MORE STAFF, EQUIPMENT, TRAINING SHORTAGE OF PARAMEDICS	H	O
WORKFORCE	TOWN WIDE	/	V/S	FIXED EVACUATION ROUTE SIGNS, ELECTRONIC SIGNAGE (NOTIFICATION) PORTABLE GENERATORS OR SOLAR POWERED SIGNAGE PROTECT WATERFRONT BUSINESSES					M	O
Environmetal										
CRANE RIVER	←	STATE (CH. 91) EROSION ISSUES - PRIVATE + PUBLIC	V/S	SEAWALLS, STONE REVETMENT EROSION CONTROL FLOOD STORAGE				ADDRESS ALGAE BLOOMS WATER QUALITY + STORMWATER MANAGEMENT	H	O
DANVER'S HARBOR	←	PRIVATE + PUBLIC	V/S	↓				↓	H	O
WATER SUPPLY MIDDLETON POND, IPSWICH RIVER, PUBLIC/PRIVATE WELLS		PUBLIC	V			INCREASE WATER RATE PRICE IN SUMMER OR BASED ON USAGE			M	O
TREES NEAR POWER LINES	TOWN WIDE	PUBLIC + PRIVATE	V/S		DESIGN + PLANNING FOR NEW DEVELOPMENT HIRE AN ARBORIST			PRUNING/MAINTENANCE IN-HOUSE TREE PLANTING	M	O
BEAVERS BEAVER BROOK, RAIL TRAIL, ENDICOTT PARK PROCTOR FARM	←	PRIVATE/PUBLIC	V	MORE BEAVER DECEIVERS PUBLIC EDUCATION ABOUT THE RISK					L	O
WETLANDS	TOWN WIDE	PUBLIC + PRIVATE	S					PURCHASE UNDEVELOPED WETLANDS. PUBLIC EDUCATION ON BENEFITS + RESTRICTIONS	L	O
FARMS ESSEX TECH, HOGAN REGIONAL, RICHARDSONS, CONNORS FARM, CLARK		STATE + PRIVATE	S	PROMOTE ORGANIC PRACTICES LIMIT PESTICIDES.		SUSTAINABLE IRRIGATION PRACTICES RAINWATER HARVESTING + COLLECTION SYSTEMS			L	O

#2

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	EXTREME WEATHER	DROUGHT	COASTAL HAZARDS		Priority H-M-L	Time Short Long Ongoing
Infrastructural										
Stormwater, Culverts, Infrastructure	Townwide	TOWN	V	SW ENTRANCE POND CONANT ST DRAINAGE ZONING/BYLAWS	HYDRAULIC MODEL OF SW SYSTEM.	CAPTURE/STORAGE/MGMT MWRA - INTERCONNECTION	OUTFALL ASSESSMENT DPW SUPPORT		H	O
COASTLINE / MARINAS / COMMERCIAL RESIDENTIAL	WATERFRONT	MIXED	V	DRAINAGE / ASSESSMENT BANK STABILIZATION MULTIPURPOSE RESILIENT APPROACH	SEAWALLS LAND ACQUISITION.		OUTFALL ASSESSMENT DRAINAGE SEAWALLS		H	O
PUMP STA / UTILITY INFRASTRUCTURE / DAMS	Townwide / Regional	MIXED	V	PS - RAISE / REPLACE DAM - REBUILD	BACK UP POWER / GENERATOR PW SYSTEMS - SERVICE CENTER OPS CENTER	INTERCONNECTION, PUMPS/WATER	RELOCATE INFRASTRUCTURE ELIMINATE		H	O
MUNICIPAL BLDGS. ELEC. SCHOOL - RIVERSIDE	Townwide	Town	V	ELEC / PUBLIC WORK ASSESS TWO BOROUGHS	M COOLING CENTERS	X	SCHOOL - FLOODING DESIGN		H	MEDIUM
PARKS / OPEN SPACE / TRAILS	Townwide RAIL	MIXED	V/S	TRAIL DESIGN/FLOODING NEW TRAIL DESIGN	FLOOD STORAGE / TREE PLANTING / SHADE, COOLS CONTROL SPLASH PAD	FOREST MGT. TREE CLEARING	HARBOR WALK PUBLIC ACCESS / PROTECTION	CLIMATE ACTION PLAN	H	O
ROADS / SIDEWALKS / PARKING	Townwide	Town / MIXED	V	ASSESS DRAINAGE / ROAD CHANGES	PL EQUIPMENT SIGNAGE	/	RAISING ROADS		H	O
Societal										
SENIOR CENTER	SAINT ST	TOWN	V/S		BACKUP POWER, SHELTER				M	L
HOUSING AUTHORITY / ASSISTED LIVING / MEDICAL HOME / NURSING	MULTIPLE LOCATIONS	MIXED	V/S	LIVING RESP PLANNING	EMERGENCY RESP PLANS COMMUN. OUTR.	COORDINATION			M	S
SCHOOLS	Townwide	TOWN	V/S	ASSESS FOR SHELTER	→				H	S
HOSPITALS	MULTIPLE	PRIVATE	S	COMMUNICATIONS UPDATE EM OPS PLAN	→				H	S
ENDICOTT PARK	PARK	TOWN	S	INFRASTRUCTURE UPGRADES FINANCIAL CONTROLS	→	FOREST MGT INVASIVE SPECIES MGT.			M	O
COMMUNICATIONS	Townwide	TOWN	V	TECHNOLOGY VULNERABILITY PREP COMMUNICATION	→				H	S
Environmetal										
ELECTRIC FLEET		PRIVATE/MIXED	V/S	INCENTIVES FOR EV'S, MORE CHARGING STATIONS					H	S
WATER SUPPLY - CONSERVATION / STORAGE / FARMING		TOWN / REGIONAL	V	INFILTRATE STORMWATER FOR RECHARGE, LED ENCOURAGE	OUTREACH ON DEMAND MGT.	CAPTURE/STORAGE/ADVANCE CONSERVATION WELLS - PROTECT, ADAPT, MGMT			H	O
OPEN SPACE / WETLANDS		MIXED	V/S	MANAGE / EXPAND DRAINAGE PROJECTS				ACQUISITION	H	O
CONTAMINATED LANDS		MIXED	V	ASSESSMENT FOR REMEDIATION / CAPPING / REUSE	→				M	O
INVASIVE SPECIES		PRIVATE/TOWN	V	FOREST MANAGEMENT PLAN + IMPLEMENTATION					M	O
COASTLINE		MIXED	V	PROTECT EXISTING INFRASTRUCTURE (MARINA, SUBSTATION)			PRIORITIZATION PLAN OF FACILITIES ON COAST		H	S

Table 3

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	Extreme Weather	Drought	Coastal Hazards		Priority H-M-L	Time Short Long Ongoing
Infrastructural	14 Total	Public Private Regional								
Pump Stations	7 Most V. near waterbody	Town	V	Flood proof for electric/energy use; elevate critical electronic pieces	Disconnect/safety SW from system		Generator @ Dog & Ave Pump Station		H	S/O
Roads	Town-wide	Town + State Mass DOT	B	Elevation (H) mass Ave flooding caused by down stream culverts → could increase height; Funding for pavers, increase Culverts Bank (M)					H	O
Culverts	Town-wide 500+		V	Beaver Brook Culverts; Purchase + Ash		Rightsizing + culverts (H)			M	O
Schools - Town Buildings	7 schools 14 mg buildings	Town	B	Move Electric Light Assessment of apps for storm water nature-based	Improve communic; Update Emergency Plan internal + external		Marina banks need protection → better tools + plan		M	S
Electric Facilities	Town-wide	Town Verizon Nat Grid	B	Substations → Fencing + barriers - Passive	Fortifi - Stronger poles + wires, underground	relocation			H	S/O
Water Supply	Town-wide Middleton	Town	B	Wells @ risk → Barriers + lift + elevate equipment		Conservation Program by current; Need to plan (alternate source) → expand reservoirs → reverse plumbing			H	S/O
Societal										
Shelters < High School - Middle School Essex Tech	Specific	Town + State	S		Air conditioning @ elementary schools (L-L)		Riverside → assessment of protection to hurricane		M	L
Youth	Town-wide	—	B		Project-based learning on smaller GI projects to get involved in planning more				H	O
Senior - People who are disabled		Facilities Private	V		Equip Senior Center as Cooling Center (M-L)		(2) Need back-up power	Need back-up power Evacuation + Transportation Plan	H	S
Essential Services - Food Transportation Airport		Town/Private	B		FS - Encourage/work w/ MassDOT to fix (Evac Route) — Need backup power @ opening store + Sprinkle schools			Trap services for emergences active Coordination	L	L
National Guard Armory	Specific	State	S						I	I
Low-income	Town	HA - State	V		Cooling Centers	Outreach sign up	for reverse 911		H	O
					Supply Manner out of electric for days → need back up generators - self/sufficiency → star facilities					
Environmetal										
Town Forest	Specific	Town	V	Beaver management	Management plan - wildfire hazard	including to reduce → Need fire lane	route/road.		L	L/O
Ipswich River - Water Supply	Specific	Public Town	V	Flood mitigation to reduce @ 114 and ~~towns~~ St Valley Rd	Assessment of impact of temps on wildlife/fish	Evaluate options for storm water recharge			H	O
Tree - Tree Canopy	Town-wide	Private public	B		Keep implementing Tree Management Plan	Manage invasive species +			M	O
Storm Debris	—	—	V	FD Regional storm debris plan + location; Regional equipment	Find funding to deal w/ Storm debris	to deal w/ Storm	debris		H	L
Banks - Erosion		public private	V	Streams in residential neighborhoods that flood (stabilization)		(4) Armor banks → Hard + Soft scape - John Leonard Park/Marina		Dredge plan + addressing silts (currently every 30 years)	H	S
Groundwater - Contamination	Townwide	+	V	Seperate Sewer from stormwater drainage @ cemeteries					L	L

Sewer

Oct - Storms → Police used generator for a day w no glitch

Table 4

Community Resilience Building Risk Matrix

www.CommunityResilienceBu

Water Supply
Danvers River
Mill Pond Area

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 ris

Features	Location	Ownership	V or S	Flooding	Severe Storms	Drought	Coastal Hazards		Priority H-M-L	Time Short Long Ongoing
Infrastructural										
~~Mill Pond Area~~ Water Supply	Town-wide	Town	V/S	backflow system	replace aging infrastructure	connecting to other water supply	backflow system		H	O
Flood-prone roadways	Town-wide	Town/ State	V	redesign roadways to account for climate change (culverts, vegetation, etc.)					M	S/O
electric grid		Town	V/S	back-up generators for critical facilities renewable energy	trim trees				H	O
local bridges	Town-wide	Town/ State	V	* see flood prone roadways *					L	O
pump stations (water + sewage)		Town	V/S	monitor/inspections protection of infrastructure/power backflow system	regulations for new homes				H	O
public safety locations (police, fire, etc.)		Town	V/S	assess public safety buildings - consider additional rescue equipment ensure all facilities have back-up generators					H	S/O
Societal										
low-income	Town wide		V	transportation options education sessions shelter options cooling/warming stations					H	O
at risk populations (elderly, disabled)			V	" * transportation * medical needs					H	O
youth (0-12yrs)			V	" + supervision back up generators					H	O
high-density housing			V	" designated coordinator					H	O
non-english speaking			V	emergency notification in multiple languages					H	S
critical businesses		private	V/S	emergency plan implementation define list of critical businesses					M	S/O
Environmetal										
Town forest/level grave		Town	V/S	general maintenance/keep trees trimmed		ensure access in case of fire			L	O
Frost brook			V/S	ongoing maintenance to prevent flood + erosion consider redesign of culverts					M	O
Danvers River (Crane + Porter)			V/S	erosion control (permanent) dredging sea wall					H	O/S
~~Area~~ John George Park			V/S	multi-purpose flood storage underground storage erosion control	underground desalination				M	L
Putnamville Reservoir Area			V/S	raise valley Rd.		protect beach orchard from drought			L	L
Mill Pond Area			V/S	increase pervious area dredge Mill Pond re-evaluate the dam system culvert system for getting water to ocean geese control					H	L

Table 5

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	Drought	Extreme temps + Severe Storms	"Coastal" Hazards		Priority H-M-L	Time Short Long Ongoing
Infrastructural										
1 Burroughs/El. light		Town	V/S	Assess relocation area. Rehab basement area for office space/storage					H	S/L
Drainage Inf.	Mill Pond Area, Beaver Brook, Cedar Brook	Town	V	Dredge Mill Pond, wetland restorations in Brooks, Town-wide hydro study					M/H	S/L
Emer. Management Engine 2 Bldg. /DPW	Engine 2	Town	V/S		Rehab Eng. 2 to be capable of managing events				H	L
Emerson Brook land in Middleton (future water storage)		Town	S		Create reservoir for H2O supply stability				H	S
Elderly Housing	Tepley Manor	State / Fed DHA	V	Drainage assessment / hydraulics in problem areas		Alternative power/heat source assessment, Shelter capacity/assess. Transportation			M	L
Wastewater Inf.	Tibbets	Town	V/S	Assess elevations to reduce flood issues. Maximize I/I removal		Alternative power source assess.			M/L	L
Societal										
Elderly Pop.	Town-wide	~~Townwide~~ Private	V	Drainage improvements / LID in nearby areas		Cooling centers			H/M	S/L
Public Safety Dept.		Town	S						H	S
Faith-based/community Orgs.	Town-wide	Private	S	Shelters-designated plan	Water reuse/gray H2O/ require reuse in new const./ retrofit existing inf./ $ fee				M	L
Public Works Dept.		Town	S	Facility upgrades/modernize, vehicle storage indoors					H	S/L
River front Communities	Port / East Danvers	Town / Private	V	Maintain outlets-Keep clear, max capacity, reducing sedimentation, culverts			Bank protection, dredging, clean contaminated areas		H	O/S/L
Group Homes	Town-wide	Private/State	V			Cooling centers			L	L
Environmetal										
Rivers / Brooks	Town-wide	Town	V/S	Culvert improvements, dredge, wetland restoration					H	O/S/L
Open Space	Town-wide	Town/ Private	S	Increase utilization, purchase properties for open space, dual purpose development					M	O/S/L
Riverfront Parks	River ST	Town/ Private	V/S	Maintain culverts nearby			Bank protection/Stabilize		H	O/S/L
Water Supply (Ipswich River)	Middleton line / well 2	Town/ Middleton	V/S		Maintain existing, eval. new sources, increase storage capacity, maintain inf.				H	O/S/L
Impervious Areas	Endicott ST / RT114 / RT 1	Private	V	Adopt new LID/regulations		Retrofit existing/new lots for LID, fee for new imperv.			M	S/L
Muddy Boo / Wetlands	Town-wide	Private	V/S	Wetlands restorations, Assess maximization for Storage / Protection					M	L

Table 6

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	DROUGHT	SEVERE STORM & EXTREME TEMP	COASTAL HAZARDS		Priority H-M-L	Time Short Long Ongoing
Infrastructural WATER DISTRIBUTION (SOURCE + MULTIPE)			V							
POLICE STATION (ERP)	ASH ST.	TOWN	S			ERP (COMMUNICATION, POWER SOURCE, DUPLICATE ENERGY)			H	S
ELEC / BUSINESS DIV / IT	[redacted]	TOWN	V	X MOVE IT INFRASTRUCTURE ADDITIONAL FLOOD PROTECTION MILL POND GATE MANAGEMENT		/ ASSESSMENT TO RELOCATION FOR ELEC			H	S/O
FIRE STATION	[redacted] ST.	TOWN	V/S	X RELOCATION OPTION		X			~~H~~ M	L
LIBERTY ST		TOWN	V	X LID - UNDERGROUND STORAGE					L	L
RTE 1 / 95 INTERSECTION		TOWN / STATE	V	X ASSESSMENT + EVACUATION PLANS + HYDROLOGICAL STUDY BEAVER DAMS					M	O
MARINA (TOWN - CRANE - JOHN GEORGE PARK)		TOWN / PRIVATE	V	X CHECK EMERGENCY EQUIPMENT FOR GAS, ETC TO MAKE SURE IT WORKS EROSION @ WATERS RIVER, MARINA LONGEVITY		X			L/M	O
Societal										
SENIOR POPULATION / HOUSING	[redacted]TIPLE	PRIVATE	V	TIE INTO TOWN PLANS X-RICE STREET		* BACK UP POWER, EVACUATION TO H.S. / COMMUNICATIONS			H	O
SCHOOLS	MULTIPLE	TOWN / PRIVATE	V/S	X-RIVERSIDE HOLTEN RICHMOND MIDDLE SCHOOL		*			L	O
DAY CARE	MULTIPE	PRIVATE	V	X / GREAT BEGINNING - PLANNING, ALL HAZARDS, COMMUNICATION					L	O
ENDICOTT PARK	[redacted]	TOWN	V/S	X HYDROLOGICAL STUDY / ASSESSMENT, LID - LONG TERM PLAN HISTORICAL STUDY					M	O
HEALTH ISSUES (MOSQUITOS, HEATSTROKE, NEW [redacted])	TO[redacted] WIRE	ALL	V	PUBLIC HEALTH PREPAREDNESS, COMMUNICATION, OUTREACH	X PLAN	X			M	O
Environmetal										
EROSION (CONSTRUCTION RIVERS)	MULTI[redacted]	TOWN / PRIVATE	V	X BYLAW + REGULATION; RIVER EVALUATE CONST. EROSION MGMT		~~X~~ WORKSHOP FOR MORE	X ASSESSMENT OF EROSION SEVERE STORMS		M	O
ENERGY EFFICIENCY ASSESSMENT (HEATING + COOLING)	MULTIPLE	TOWN	V			X IMPROVE EFFICIENCY, INVESTIGATE RENEWABLE OPTIONS			H	O
SUPERFUND (ARSENIC / CHROMIUM) (EPA)	CRANE RIVER	PRIVATE	V	X BEING CLEANED UP NOW - FEDERAL FUNDING					L	O/S
MIDDLETON POND (ALGAE BLOOMS)	CRANE RIVER (CHANNEL OF WATER) MIDDLETO[redacted]	TOWN	V	IS CURRENT DRONE TREATMENT SCALABLE FOR FUTURE BLOOM FREQUENCY EDUCATION OF LOCAL RESIDENTS, LAWN CARE COMMUNICATION.		X			L	O
RIVERS (PROTECTION) WATER QUALITY	MULTI[redacted]	TOWN	V	X EDUCATION RUN OFF CONSERVATION BUFFER		X ENFORCEMENT PROTECTION (REGULATORY OPTION/UPDATE)			M	O
SESD (HEALTH, SOCIETAL, ... ENVIRONMENTAL)	[redacted]	TOWN / STATE	V							
TREES	MULTIPLE	TOWN / PRIVATE	V/S	X LID OPTIONS		X				

Table 7

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	DROUGHT	Severe STORMS & EXTREME TEMPS	COASTAL HAZARDS		Priority H-M-L	Time S Long O ongoing
Infrastructural										
Pump Stations - water & Sewer / watersupply	multiple	town	V/S	TVing Sewers, lining, Inspections (ongoing) study for preventing leading @ pump stations	Replace bridge leading to well 1 - Danvers, Middleton, State	redundant power at pump stations		replace bridge leading to well 1	Bridge-H Pumps-M	S L/O
Communications	multiple	town	V/S	build in redundancies	battery backUPS+ across communication infrastructure	pubric safety & electric are priorities (radio commun.) (monitoring & control)			H	O
Tibbot's Ave flooding	waterfront (Danvers River)	town, private	V	Underground storages retention Basins			Flooding Feasibility Study		L	L/O
~~Frost Fish Brook~~ TRANSFORMERS & SUBSTATIONS		town	V/S		generators to mitigate solar power & battery backup	air conditioners			L	O
Culverts	townwide	town	V	culvert assessment looking at future/bylaw update projected rainfall					H	O
Dams & Dikes	multiple	town	V	dam assessment & repair (meadow dam Water Commission)		Railings/safety precautions at dam or caution sign			H	L/O
Societal										
Seniors (senior Housing, Nursing, Assisted Living) Home For Deaf	multiple	town/private	V	council on aging-elderly list of locations?	solar panels & battery	backups at senior housing (~~Townowned~~) additional shelters & transportation		or state?	H	O
Children (Schools)	multiple		V/S		solar panels & battery	back-up at high school (emergency shelter) shelter at Smith school			M	L/O
Hogan Regional Center (Hospitals) Peabody Center		private/state		use as evacuation site		additional shelter to house Hogan & rehab (agreement w/Hogan)			M	L/O
Low income housing (Conifer Hill Drive) Rand Circle, Cherry Hill		town							L	
Businesses w/hazar				Flooding Feasibility study in Danversport? where it floods - how to prevent					L	
Hotels/Motels			V/S			addition shelter emergency management NOT COMPLETE PLAN			L	
Environmetal										
Frost Fish Brook		town	V	bank stabilization with green infrastructure/ erosion control/ maintenance					H	L/O
Industrial Facilities (Fuel Storage & Tranzene & ITW Polymers Eastern Propane Adhesives)		private	V				Sea			
Danversport (Flooding, Habitat)	danversport		S/V				Sea wall? living shoreline surge protection feasibility study		M	L/O
Parks, Recreation Fields, Open Space (trails)	multiple		S/V	plans park detention/ retention basin to handle existing flooding					M	L
Beavers (Rail Trails)	rail trail		V	college pond culvert cleaning & rail trail					L	O
Vector Bourne Diseases	townwide		V	outreach for mosquitos & ticks					M	O

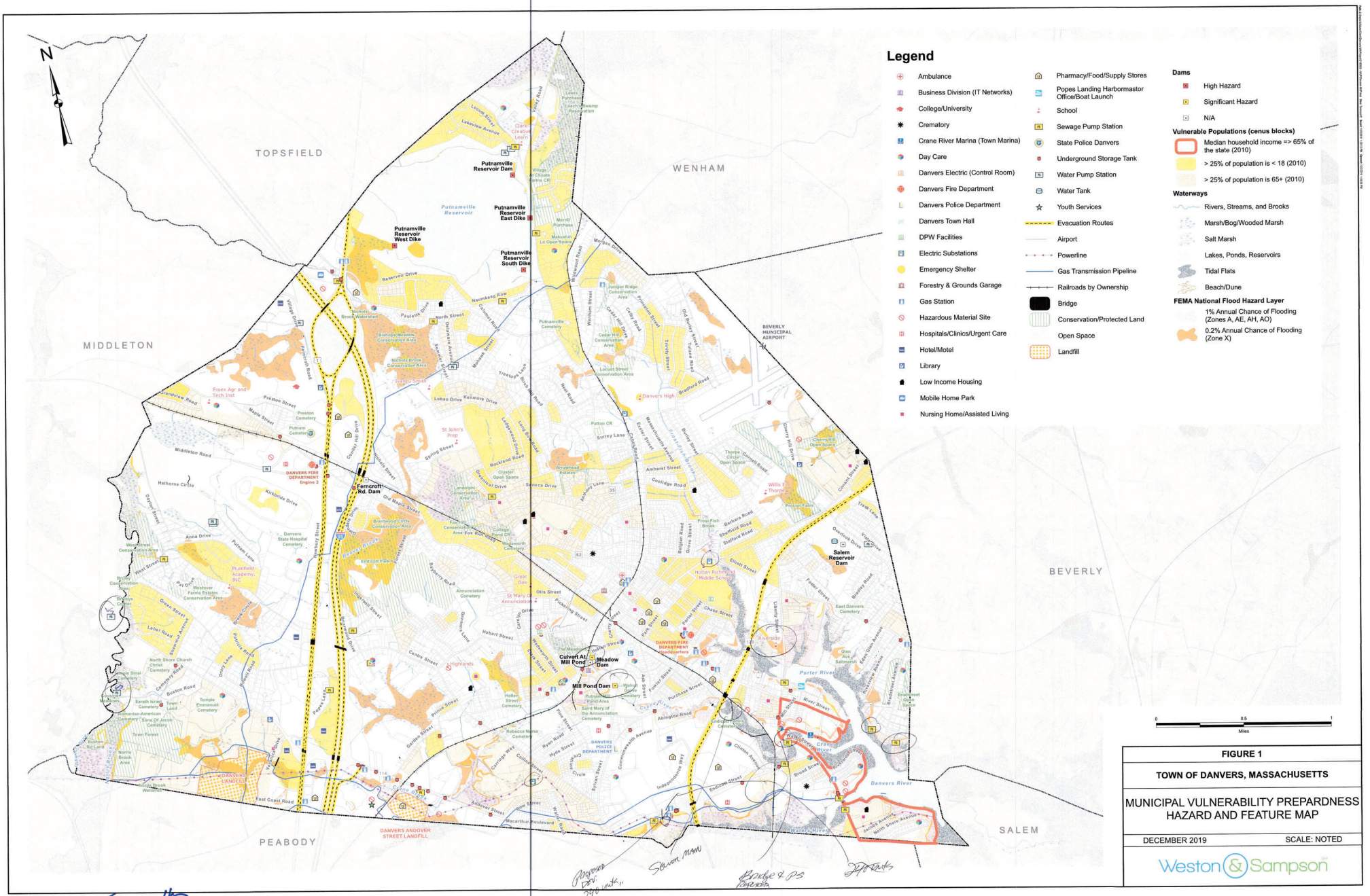


FIGURE 1

TOWN OF DANVERS, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

DECEMBER 2019 SCALE: NOTED

Weston & Sampson

TABLE #2

Table 5

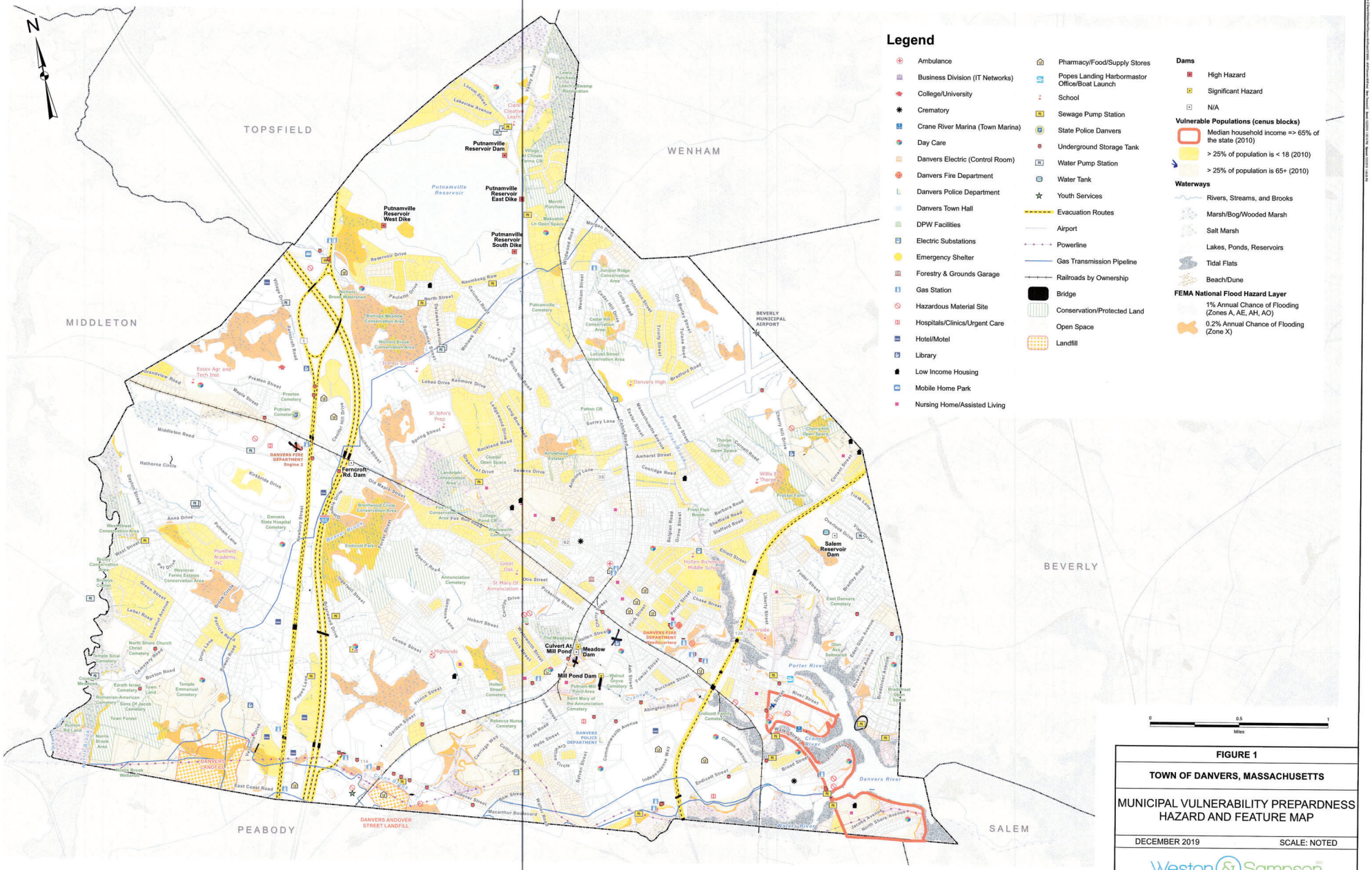


FIGURE 1

TOWN OF DANVERS, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

DECEMBER 2019 SCALE: NOTED

Weston & Sampson

table 6

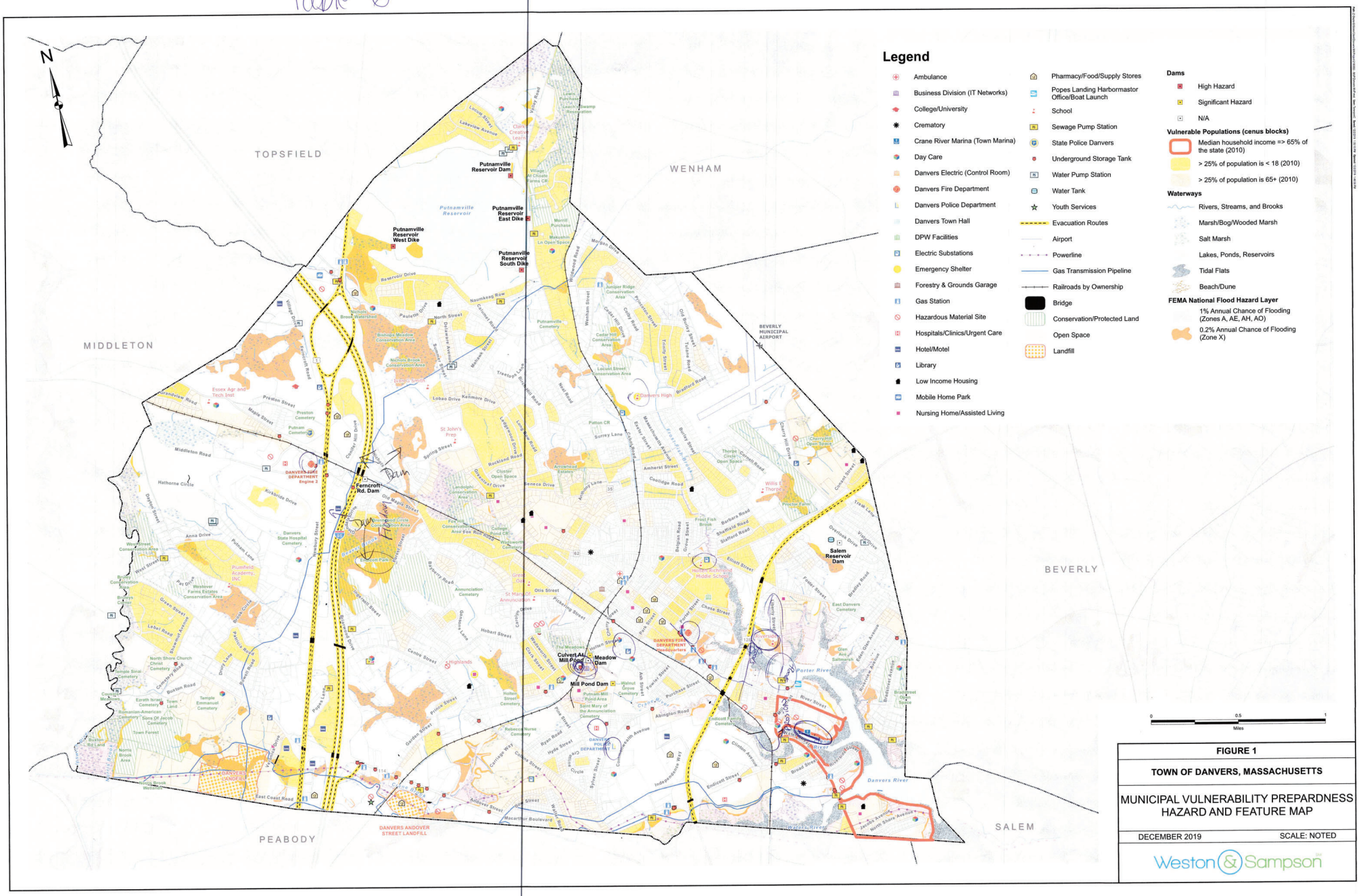


FIGURE 1

TOWN OF DANVERS, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

DECEMBER 2019 SCALE: NOTED

Weston & Sampson

TABLE 7

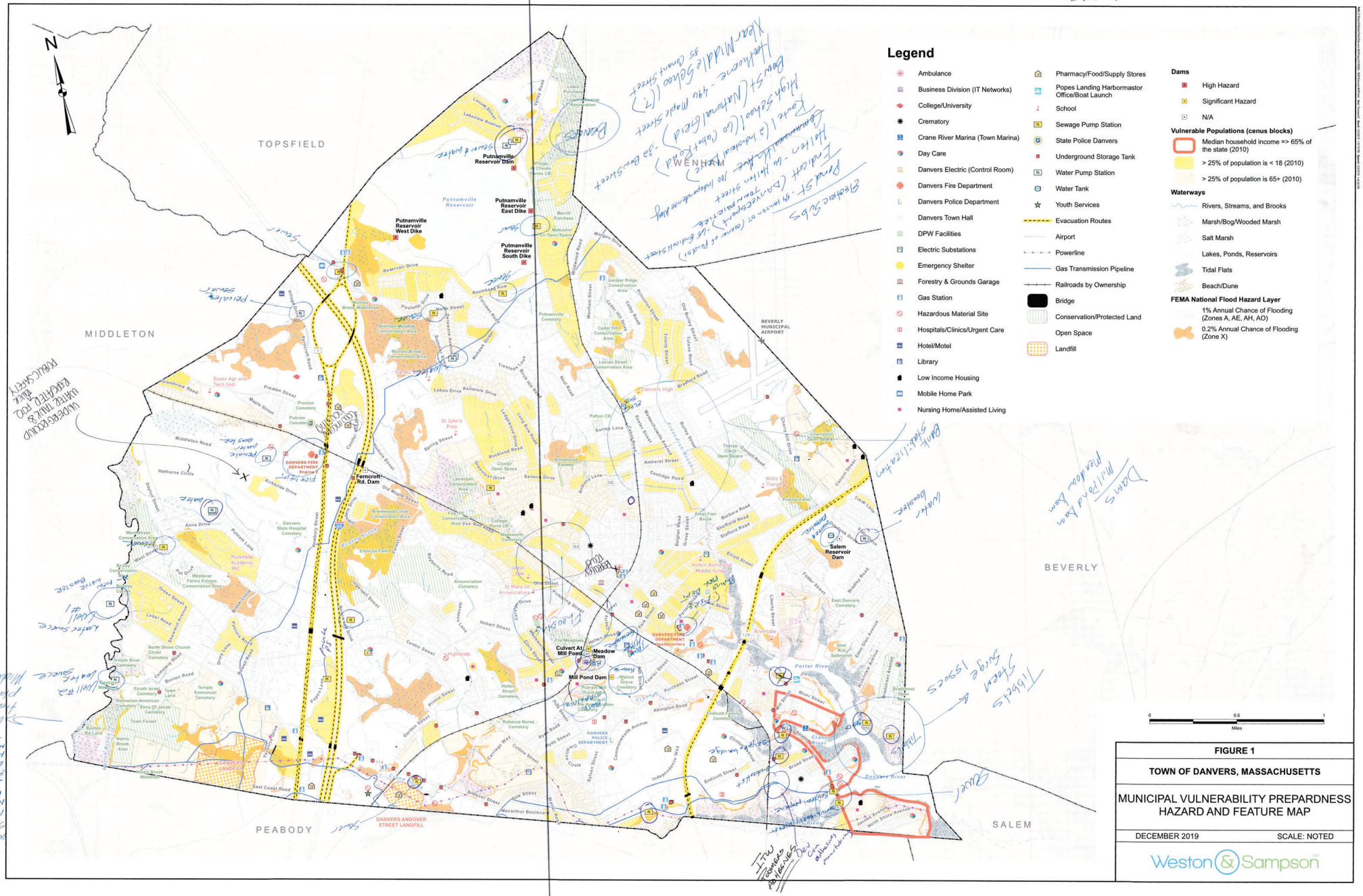


FIGURE 1

TOWN OF DANVERS, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

DECEMBER 2019 SCALE: NOTED

Weston & Sampson

APPENDIX D

Public Listening Session Materials

Municipal Vulnerability Preparedness Planning Grant

Listening Session
Danvers Town Hall
Tuesday, March 10, 2020
6:30 pm – 7:30 pm

Municipal Vulnerability Preparedness (MVP) Program Overview	5 minutes
Climate Change in Danvers	10 minutes
Vulnerabilities in Danvers	10 minutes
Strengths in Danvers	10 minutes
Priorities in Danvers	20 minutes
Wrap-up	5 minutes

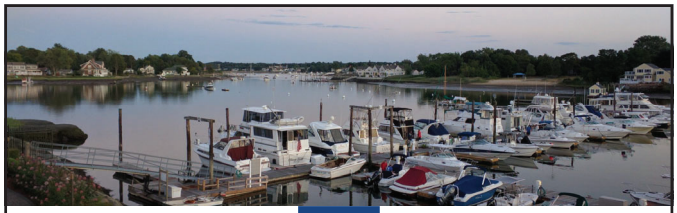
Municipal Vulnerability Preparedness Planning Grant Project
Listening Session
Tuesday, March 10, 2019 7:00 pm – 8:00 pm

Name – Print	Organization (if applicable)	Email
Gail Bernard	Danvers DPW	gbernard@danversma.gov
Steve Bartha	Danvers	sBartha@danversma.gov
William Clark	Board of Selectmen	whclarkjr@verizon.net
GARDNER S. TRASK	Board of Selectmen	GTRASKDANVERS@Gmail.com
DANIEL Bennett	" "	danbennettre@OutLook.com
JOSEPH L. COLLINS	Town Clerk	jcollins@danversma.gov
Diane Langlais	BOS	dilanglais@verizon.net
David A-Mills	BOS	dmills101@gmail.com
Stephen King	DANVERS DPW	SKing@danversma.gov
MARIA KURTIS		mariakiz4a@gmail.com
CHARLES BLUTE	SELF	charlesblute245@comcast.net
Mike Miller	Self	mikemiller0369@gmail.com
Brittany Raesly		Brittany@dailyharvestcafe.com
Sandra Brown		Sandra.d.brown@icloud.com
PAUL PAWLAK JR	SELF	CONPAULPAWLAK@VERIZON.NET
Jen Brenker	Town of Danvers	JBrenker@danversma.gov
Nova Samolai	Self	robandnova@gmail.com

Weston & Sampson

Municipal Vulnerability Preparedness Planning Grant Project
Listening Session
Tuesday, March 10, 2019 7:00 pm – 8:00 pm

Name – Print	Organization (if applicable)	Email
BRADSTREET W	TOWN MEETING MEMBER	–
Timothy Donahue	Town Meeting Member	T.imDonahue04@Gmail.com
Jon Matteracchia		JMatteracchia@gmail.com



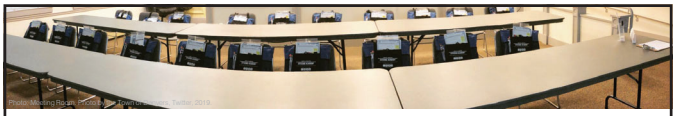
TOWN OF DANVERS

Public Input Session

March 10th, 2020

Photo: Danversport. Photo by the Town of Danvers, Town Website, 2016.

1



WELCOME

Members of the Public **Elected Officials**

Core Team Members

Steve Bartha	Aaron Henry	Rodney Conley	Peter Korpusik
Patrick Ambrose	Chris Sanborn	Clint Allen	Alex Lent
David Lane	David Fields	Richard Souza	Colby Cousens
Robert Pyburn	Peter Mirandi	Phil Tansey	Lisa Dana
Richard Maloney	David Mountain	James Lovell	
Jen Breaker	Pamela Parkinson	Robert Amerault	
Stephen King	Sharon Clement	Cory Grace	

2

AGENDA

PRESENTATION AND DISCUSSION:

- Overview of Climate Change
- Strengths and Vulnerabilities
- Priority Action Items
- Next Steps

Photo: Danversport. Marinas.com, 2017

3

MVP Principles

A community-led, accessible process that

- Employs local knowledge and buy-in
- Utilizes partnerships and leverages existing efforts
- Is based in best available climate projections and data
- Incorporates principles of nature-based solutions
- Demonstrates pilot potential and is proactive
- Reaches and responds to risks faced by EJ communities and vulnerable populations

4

MVP Process/ Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

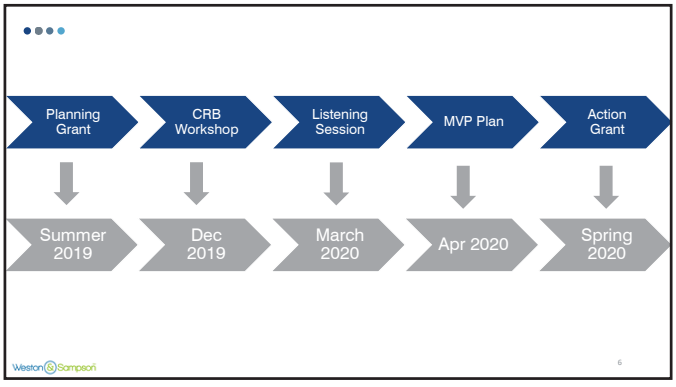
- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaptation actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant

MVP Action Grant

Implement priority adaptation actions identified through planning process

5



6

MVP Action Grants: Project Types

- Vulnerability and Risk Assessment
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency
- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies
- Mosquito Control Districts

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COMMUNITY RESILIENCE BUILDING WORKSHOP

Focus on 4 Hazards

Identify:
- Vulnerabilities
- Strengths
- Priority Action Items

Across 3 Categories
- Infrastructure
- Societal
- Environmental

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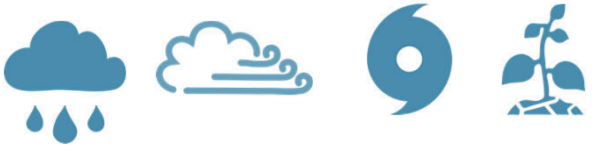
TOP HAZARDS IN DANVERS



Flooding | Severe Storms | Coastal Hazards | Drought

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CHANGES IN PRECIPITATION

MORE **INTENSE & FREQUENT** EXTREME RAIN EVENTS

PRECIPITATION DURING **HEAVY EVENTS** IN THE NORTHEAST **INCREASED BY MORE THAN**

70%

BETWEEN 1958-2010

Massachusetts Executive Office of Energy & Environmental Affairs, 2019. "Changes in Precipitation." Massachusetts Climate Change Clearinghouse. Resilientma.org/changes/changes-in-precipitation

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EXTREME PRECIPITATION

8%

Increase in extreme precipitation events by midcentury

13%

Increase in extreme precipitation events by 2100

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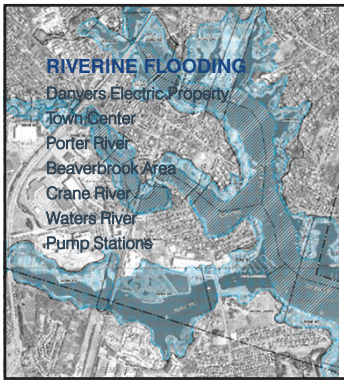

RIVERINE FLOODING
- Danvers Electric Property
- Town Center
- Porter River
- Beaverbrook Area
- Crane River
- Waters River
- Pump Stations

STORMWATER FLOODING
- Ash and Purchase Streets
- High School Field
- Upper Massachusetts Ave
- Upper Valley Road

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SEVERE STORMS

Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities.

Upward trend in North Atlantic hurricane activity since 1970

5 severe windstorms (including microbursts) 2013-2019

$10,000 of damage after 50 MPH winds in June 2018

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COASTAL SURGE + EROSION

Frost Fish Brook
Tibbetts Ave
John George Park

"Rising sea levels have led to increased rates of erosion along beaches and coastlines"

Danvers Hazard Mitigation Plan

(Image Source: Google Maps, Sept 2018)

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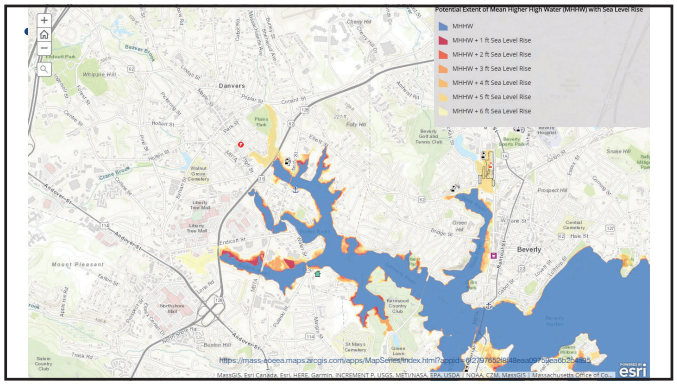

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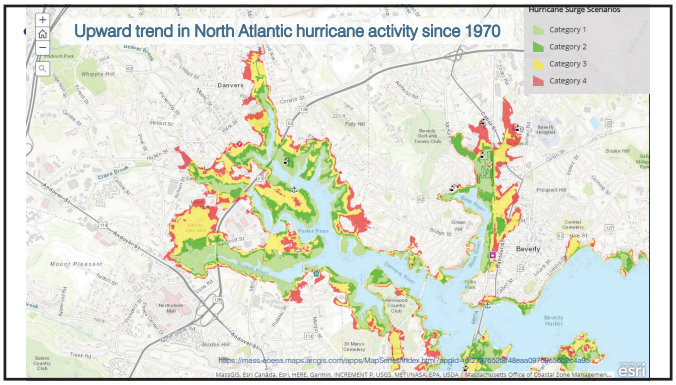

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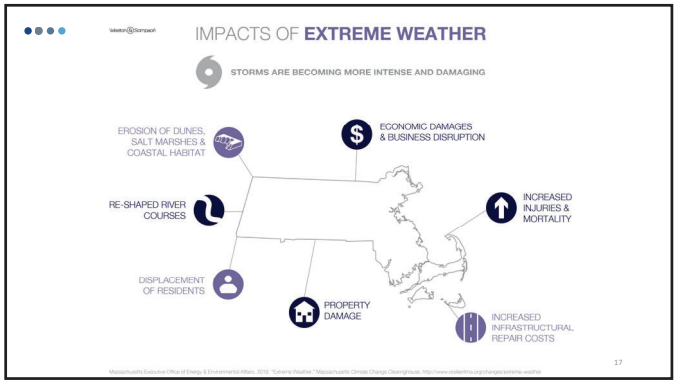

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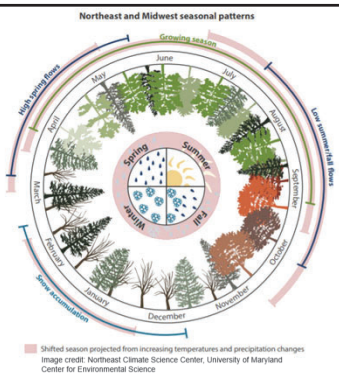

The most notable recent drought event was in

2016

The occurrence of droughts **lasting 1 to 3 months** could go up by as much as **75% over existing conditions** by the end of the century, under the high emissions scenario

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EXTREME TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

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EXTREME TEMPERATURES
IN MASSACHUSETTS

6	24	35
2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE

DAYS WITH TEMPERATURES ABOVE 90°F

145	114	101
2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE

DAYS WITH TEMPERATURES BELOW 32°F

Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "ResilientMA Datagrapher." Massachusetts Climate Change Clearinghouse. Resilientma.org/datagrapher/?c=Temp/state/tx90/ANN/MA/
Notes: Mid-century projected annual averages use a 2040-2069 time range. End-of-century project annual averages use a 2080-2097 time range.

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What hazard most concerns you?

A. Flooding
B. Severe Storms (snowstorms, ice, wind)
C. Coastal Hazards (hurricanes, nor'easters, sea level rise)
D. Drought
E. Other

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INFRASTRUCTURE VULNERABILITIES

- **Flooding of roadways**: MA-128, Tibbets Ave, MA- 1, I 95, Conant St, Poplar St, Locust St area, and Valley Rd
- **IT and communications** lack redundancy and rely on electricity
- **Dams and dikes** in poor condition, like the Sylvan Street Dam at Mill Pond (Mill Pond Dam)
- **Bridges** at risk of flooding, such as the bridge leading to Well 1 in Middleton (owned by Danvers)
- Capacity and condition of **emergency management buildings**
- **Flooding** of the DPW truck storage area, Electric Light Headquarters, Conant St Electric Substation among others, Fire Station-Engine 2, Walnut Grove Cemetery, and residents in the Tibbets Ave neighborhood
- 90% of electrical distribution is **overhead lines** and vulnerable to impact from fallen tree limbs
- **Culverts and stormwater infrastructure** especially Conant Culvert, Beaver Brook, Purchase/Ash Street, Woodvale Culverts (Coolidge, Dartmouth, and Wenham), Adams Street Culvert
- **Impervious surfaces**, including on the parking lots
- **Pump Stations**: Route 114 (water supply), Tibbets Ave (wastewater), Doty St (South Essex Sewer District)
- **South Essex Sewer District Main Line** - potential for erosion near Crane River
- Decrease in **water supply** during summer months and need for redundancy
- **Coastline:** commercial and residential properties, marina, John George Park
- **Popes Landing Seawall** should be elevated

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SOCIETAL VULNERABILITIES

- Need to increase outreach to **seniors and youth**
- **Disabled residents** who may be vulnerable due to isolation
- Need to ensure workforce is safe during **commutes**
- Need to protect **waterfront businesses and residents**
- All businesses may not have an **emergency response plan**
- **Housing Authority properties, assisted living facilities, mobile homes, apartments, motels, hotels, and nursing homes** should be integral in emergency response planning
- Some **schools and shelters** may require **additional resources or equipment**
- **Public health threats** from climate change
- **Non-native English speakers** may be less likely to receive communications in their language
- The Town may need additional **resources for emergency response**

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ENVIRONMENTAL VULNERABILITIES

- **Erosion** at Frost Fish Brook, Crane River, and along coast
- **Cyanobacteria or algae blooms**
- **Danvers Harbor** needs protection from sea level rise and increased storm surge
- **Water supply** during drought
- Reduce **water quality** impacts
- **Tree canopy** damage from wind and invasive species
- **Ipswich River** and the impact of temperature and low flows on fish
- **Storm debris**
- Sewer infiltration and inflow lowers **capacity of sewer system** to function.
- Possible **groundwater contamination** from sewer pipe leaks
- **Beavers** on Beaver Brook, Rail Trail, Endicott Park, and Proctor Farm cause flooding
- **Electric fleet** needs more **infrastructure** to be successful
- **Wetlands and open space** vulnerable to development
- **Contaminated lands**
- **Increase in invasive species**

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What would you consider Danvers' greatest vulnerability?

A. Downed powerlines
B. Flooding of critical facilities and roadways
C. Health impacts (vector- borne disease, heat-related illnesses)
D. Coastal erosion
E. Other

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INFRASTRUCTURE STRENGTHS

- Roadways provide transportation network
- Popes Landing Seawall provides some protection
- Electric Light Department and infrastructure
- Water supply and Water Management Act Conservation measures
- DPW facility and services
- Water and Wastewater infrastructure
- Public safety locations
- Emergency management buildings/DPW
- Police Station
- Fire Station
- IT and Communications

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SOCIETAL STRENGTHS

- **Elderly population** provides experience about previous hazard occurrences
- **Youth** offer energy and capacity to prepare, respond, and communicate
- **Senior Center and schools** provide an avenue for communication and a potential place to shelter
- All of the nursing homes and assisted living facilities have generators
- **Emergency response personnel** (police, fire, ambulance) capacity and access to hospitals
- **Workforce and businesses** keep Danvers thriving
- Housing Authority properties, assisted living facilities, mobile homes, apartments, and nursing homes all provide a **variety of housing types**
- **Endicott Park**
- **National Guard facilities and personnel**
- **Faith-based and community organizations**

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ENVIRONMENTAL STRENGTHS

- Crane River possible flood storage
- Danvers Harbor
- Trees
- Wetlands and open space
- Farms (Essex Tech, Hogan Regional, Richardsons, Connors Farm, Clark)
- Electric Fleet
- The Rail Trail (a western expansion is planned)
- The Danvers Forestry & Grounds Division
- Endicott Park

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What is Danvers' greatest strength considering climate resilience?

A. Emergency response capacity (Fire, Police, Public Works)
B. Local organizations and support
C. Shelters
D. Tree canopy
E. Other

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What services, initiatives, or mitigation measures are you aware the town is taking?

A. Tree pruning and management
B. Extensive stormwater work
C. Blackboard Connect
D. All of the Above
E. None of the Above

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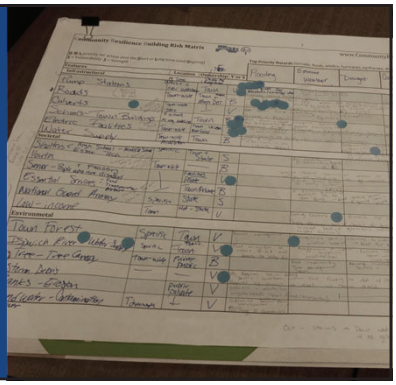
PRIORITY ACTION ITEMS



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HIGHEST HIGH PRIORITIES

- Wetlands and Waterbodies
- Regulations
- Pump Stations
- Culverts and Stormwater Infrastructure
- Roads and Bridges
- Electric Department and Infrastructure
- Emergency Response
- Water Supply

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WETLANDS AND WATERBODIES

- Implement green infrastructure along the John George Bank, Marina, and the Danvers, Waters, Crane, and Porter Rivers
- Assess flood pathway locations and options for floodwalls, stone revetment, erosion control, bank stabilization, and flood storage
- Conduct dredging where possible along rivers and Mill Pond to increase flow capacity and address sediment deposition
- Collect drainage information for areas surrounding Mill Pond, Beaver Brook, and Crane Brook and promote wetland restoration along brooks

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REGULATIONS

- Update zoning, bylaws, and regulations to incorporate climate change considerations and resilience

PUMP STATIONS

- Conduct ongoing inspections and maintenance of pump stations
- Study flood prevention options for vulnerable pump stations and elevate critical infrastructure where needed
- Assess options and needs for redundant power supply at pump stations and install a backup generator at the Doty Ave Pump Station

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CULVERTS & STORMWATER INFRASTRUCTURE

- Assess options for a stormwater enterprise fund
- Study design strategies to improve drainage on Conant Street
- Conduct a capture, storage, and outfall assessment of stormwater infrastructure
- Integrate MS4 work with climate change planning efforts
- Design detention and retention features in parks to handle flooding
- Assess opportunities for green infrastructure and Low Impact Development
- Upsize culverts, elevate roads, and assess roadway
- Consider increasing bank height to address historic Mass Ave

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ROADS AND BRIDGES

- Assess options for addressing flooding along vulnerable roads; strategies could include underground flood storage and low impact development
- Provide public education and municipal staff training regarding evacuation routes
- Assess needs for plow equipment and signalization for heavy snowfall and extreme weather advisories
- Apply for funding for permeable paving
- Replace the bridge leading to Well 1, coordinate with Middleton and the State

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ELECTRIC DEPARTMENT & INFRASTRUCTURE

- Assess options for relocating the Electric Department building and updating deployable barriers as a short-term action
- Improve the access road to the Department of Public Works lower garage/Electric Light Department
- Find elevated (flood-safe) areas for trucks, critical equipment, office space, and other storage needs
- Protect transmission lines and electric infrastructure through a proactive tree management plan or by relocating electrical lines underground
- Elevate or relocate vulnerable substations and avoid siting future substations in flood zones

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EMERGENCY RESPONSE

- Build in redundancies and battery backup across communication infrastructure
- Assess redundant power source and communication strategies for the Police Station
- Update the Police's Emergency Response Plan
- Assess resilient relocation options for the Fire Department
- Increase staff, equipment, and training for emergency response personnel, including police, fire, and ambulatory services
- Increase collaboration with Verizon and National Grid to fortify networks and infrastructure
- Update school emergency plans and improve internal and external communication, tools, and planning efforts

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WATER SUPPLY

- Assess options for water capture, conservation, storage, and permitting
- Conduct public outreach and education related to water demand management and water conservation strategies
- Protect existing water supplies and assess yield, while advancing the identification and connection to additional water supplies
- Install backflow prevention to protect potable water supply
- Update aging water infrastructure
- Maintain up-to-date information on existing private wells

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How should Danvers prioritize climate adaptation measures?

A. Based on funding
B. Time frame
C. Asset type (i.e., infrastructure, buildings, or natural systems)
D. Impact on public safety
E. Other

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Which of the following priority action items would you rank as a top priority?

A. Implement erosion control strategies along the Danvers, Crane, and Porter rivers
B. Build in redundancies and battery backup across communication infrastructure
C. Assess options for water conservation, storage, and permitting
D. Assess options for addressing flooding along vulnerable roads; including Route 128, Conant Street, Poplar Street, Tibbetts Ave, I-95, and Route 62.
E. Other

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NEXT STEPS FOR MVP PLAN

1. Post Draft Plan
2. Finalize Plan
3. Comment Period
4. Send to the State for approval
5. Apply for grants

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PUBLIC COMMENT

- **COMMENTS ACCEPTED UNTIL MARCH 31ST**
  https://www.danversma.gov/municipal-vulnerability-preparedness-grant/
- **PLEASE SEND COMMENTS TO:**
  Sharon Clement, sclement@danversma.gov
  Stephen King, sking@danversma.gov

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THANK YOU

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Municipal Vulnerability Preparedness Planning Grant

Listening Session
Danvers Town Hall
Tuesday, March 10, 2020
6:30 pm – 7:30 pm

*****Public input is presented in blue*****

Municipal Vulnerability Preparedness (MVP) Program Overview — 5 minutes

Climate Change in Danvers — 10 minutes

- Brief Overview
- Interactive Polling
    1. What hazard most concerns you?

Answers	Score
a. Flooding	3
b. Severe Storms (snowstorms, ice, wind)	**5**
c. Coastal Hazards (hurricanes, nor'easters, sea level rise)	3
d. Drought	4
e. Other	1

- Discussion: Why do these hazards concern you the most? What memories of climate hazards do you have?
- Public Response:
    1. I would pick all of the above. All of these impact Danvers.
    2. We need to look at historically to see the impact of some of the hurricanes we have experienced to get a better idea of the type of damage we would see today.

Vulnerabilities in Danvers — 10 minutes

- Summary of Outcomes from Workshop
- Interactive Polling
    1. What would you consider Danvers' greatest vulnerability?

Answers	Score
a. Downed powerlines	5
b. Flooding of critical facilities and roadways	**6**
c. Health impacts (vector- borne disease, heat-related illnesses)	1
d. Coastal erosion	2
e. Other	1

- Discussion: what are some of the Town's other climate-related vulnerabilities?
- Public Response:
    1. Impervious surfaces from new development causes flooding problems

Strengths in Danvers — 10 minutes

- Summary of Outcomes from Workshop
- Interactive Polling
    1. What is Danvers' greatest strength considering climate resilience?

Answers	Score
a. Emergency response capacity (Fire, Police, Public Works)	11
b. Local organizations and support	3
c. Shelters	
d. Tree canopy	2
e. Other	

- Discussion: how can the Town's greatest strengths help prepare it for climate change impacts?
- Public Response:
    1. None

Priorities in Danvers — 20 minutes

- Interactive Polling Part 1
    1. What services, initiatives, or mitigation measures are you aware the town is taking?

Answers	Score
a. Tree pruning and management	1
b. Extensive stormwater work	1
c. Blackboard Connect	
d. All of the Above	14
e. None of the Above	3

- Discussion: what other services, initiatives, or measures have you heard of?
- Public Response:
    1. What is Blackboard Connect? Answer: Reverse 911 system
- Summary of Outcomes from Workshop
- Interactive Polling Part 2
    2. How should Danvers prioritize climate adaptation measures?

Answers	Score
a. Based on funding	1
b. Time frame	2
c. Asset type (i.e., infrastructure, buildings, or natural systems)	4
d. Impact on public safety	6
e. Other	0

3. Which of the following priority action items would you rank as a top priority?

Answers	Score
f. Implement erosion control strategies along the Danvers, Crane, and Porter rivers	1
g. Build in redundancies and battery backup across communication infrastructure	1
h. Assess options for water conservation, storage, and permitting	**11**
i. Assess options for addressing flooding along vulnerable roads; including Route 128, Conant Street, Poplar Street, Tibbetts Ave, I-95, and Route 62.	0
j. Other	0

- Discussion on priority action items.
- Public Response:
    1. Why use the term water conservation over water utilization? Danvers has a water storage issue not a water conservation issue. Answer from presenter: conservation is a broad term used to describe action items to address water shortage
    2. Danvers passed a new bylaw at a Special Town meeting in February to improve water recharge in strategic areas through a transfer development program with a density bonus.
    3. The Planning Board needs to consider the larger collective of approvals on small modifications on single parcels to build in wetland areas.
    4. The River Committee is doing work related to dredging.
    5. Green infrastructure improvement would address' the growing amounts of impervious surface.

Wrap-up 5 minutes

- Next steps