Town of Lexington

Community Resilience Building Workshop

Summary of Findings

April, 2019

FUSS & O'NEILL

Project No. 20170390.F10

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Overview

Extreme weather and natural and climate-related hazards are an increasing concern for the communities of Massachusetts, and there is a clear need to involve municipalities, corporations, organizations, and the State in increasing resilience at all levels. Recent storm events affecting the region have highlighted many of the vulnerabilities that towns and cities face. Hurricane Irene and Superstorm Sandy brought intense flooding to many municipalities and threatened (or destroyed) infrastructure across the state. Extreme temperatures at both ends of the spectrum have pushed the limits of communities' preparedness to protect both infrastructure and people. In coastal communities, the impacts of sea level rise are felt daily and further exacerbate the impacts of other extreme events. Current climate modeling indicates that all of these hazards are expected to increase in frequency and scale over the coming decades. The Municipal Vulnerability Preparedness (MVP) program provides support and a prescribed process for cities and towns in Massachusetts to plan proactively for resiliency and implement key climate change adaptation actions.

In 2018, the Town of Lexington was awarded a $37,500 MVP grant to fund the planning stage of this process and simultaneously complete an update to the Town's Hazard Mitigation Plan. The Town partnered with Fuss & O'Neill, a state certified MVP Provider, to complete a comprehensive, baseline climate change and natural hazard vulnerability assessment and develop a list of priority actions for the Town. This process involved a project kickoff meeting on February 1, 2019 at which the membership of the MVP Core Team was developed. The MVP Core Team met on February 14, 2019 to determine initial concerns and worked to identify stakeholders within the municipality and set goals for the process. Those stakeholders were then invited to participate in a Community Resilience Building (CRB) workshop on March 21, 2019, engaging in a day-long, tried and tested process developed by The Nature Conservancy. The CRB methodology is an "anywhere at any scale" format that draws on stakeholders' wealth of information and experience to foster dialogue about the strengths and vulnerabilities within the Town. Workshop participants interacted at both large and small group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions.

The 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 Lexington;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Top Hazards and Vulnerable Areas

During the Community Resilience Building workshop, participants were asked to identify the top four natural hazards of concern for the Town of Lexington. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as ongoing Town conversations that are forming the basis for the Town's concurrent Hazard Mitigation Plan update. Flooding was identified as one of the Town's top hazards. The impacts of changing precipitation patterns were identified as a second hazard. Extreme temperatures, including days over 90 degrees F as well as extremely cold days, were identified as a third hazard. Finally, the impacts of wind associated with severe weather events including hurricanes, Nor'easters and tornadoes, were seen as a fourth major hazard. These four hazards have already had demonstrated impacts on the Town, and as climate change progresses, these hazards are expected to have ever greater consequences for infrastructure and environment, as well as for various societal elements. Specific areas of concern are identified below.

Top Hazards

- Flooding
- Precipitation
- Extreme Temperatures
- Wind

Areas of Concern

While many impacts are expected to be felt Town-wide, certain elements, locations, or community groups present particular concerns.

Ecosystems
Wetland complexes on the northwest and southeast sides of Town, Cambridge Reservoir, Arlington Reservoir, Lexington Reservoir.

Infrastructure
Turning Mill Pond Dam; wastewater pump stations; intersection of Watertown and Pleasant Streets; intersection of 2A and Spring Street; intersection of Lincoln Street and Marrett Road; intersection of Bedford Street, Hancock Street, and Massachusetts Avenue; flooding in Constitution Road and Oxbow Road vicinity, Valleyfield Street and vicinity; Simonds Road outages.

Vulnerable Populations
Senior Residents, school-aged children, homebound residents, dependent adults, non-English speakers, low-income residents, Greeley Village, Countryside Manor, Countryside Village, Vine Brook Village, Brookhaven.

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Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to Lexington throughout its history, from hurricanes bringing wind, intense precipitation, and localized flooding to the inland community, to winter storms delivering ice and snow. Notable historic events include impacts from the Great Hurricane of 1938 and Hurricane Carol in 1954. More recently, the Halloween snowstorm of 2011 caused extensive damage, bringing down trees and powerlines in Lexington and throughout the Commonwealth. Already in early 2019 the Town has seen trees down across roads, blocking both in-Town travel and routes into and out of the Town. In the most recent case, downed trees were entangled with electrical wires, such that emergency responders could not begin clearing blocked roads until the wires had been rendered safe.

In general, Lexington has been experiencing an increasing regularity of storms. More intense storms delivering higher volumes of precipitation in a single event are expected to put significant pressure on dams, culverts, and other drainage infrastructure that were designed to handle smaller storms with more consistent distributions of precipitation.

The Town is also noticing a shift in the type and timing of storms. Many storm events now encompass a mixture of rain, ice, and snow, making it more difficult to maintain safe, accessible roadways. Unexpected heavy snow when leaves are still on the trees is more likely to cause damage and power outages, as was the case in October 2011. Frequent freeze-thaw cycles in recent winters, due to an increase in temperature fluctuations above and below the freezing point, have also made road maintenance more challenging and caused an increase in damage to paving surfaces.

Extreme temperatures, both hot and cold, have had an impact on Lexington's residents, particularly on more vulnerable populations, such as senior residents, those with underlying health conditions, and school age children. These concerns are expected to increase as the Town sees more days above 90 degrees each summer.

Climate change is also bringing previously unseen natural disasters to Massachusetts. CRB workshop participants noted during the workshop that ten years ago tornados were not a concern in Lexington, however in recent years it has become more typical for the Town to receive tornado warnings. In August 2016, the Town was fortunate that a tornado which touched down in neighboring Concord skipped over Lexington, but the Town is very aware that a tornado could have serious impacts on infrastructure, neighborhoods, and the Town's water tower.

While it did not emerge as one of the top four hazards, Lexington also has some concerns related to drought. The Town is part of the Massachusetts Water Resources Authority (MWRA) and receives its water from the Quabbin Reservoir. However, the Cambridge Reservoir, which services the Cambridge Water Department, is partially located in Lexington, and has been suffering from excessive chloride concentrations in recent years due to drought and decreased dilution of salt in the base flow. There are also some residents not served by the public water supply who rely on private wells which may be susceptible in drought conditions.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts and bridges are recognized as a high-priority concern town-wide. Regardless of condition, culvert and bridge structures were designed to accommodate historic patterns of precipitation and runoff, which are rapidly transforming as a result of climate change. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding. Emergency service providers in the workshop noted that flooded roads can restrict and delay emergency access to certain areas of Lexington, and downed trees from wind or storm events can contribute to blockages at undersized culverts.

Dams

Three dams in Lexington were discussed at the CRB Workshop. The Town's two major dams have undergone recent repairs and were generally not considered a concern at this time. Specifically, the Old Reservoir Dam, an earthen dam which impounds Lexington Reservoir, underwent extensive rehabilitation work in the last couple of years and the dam crest height was also increased by 6 inches. Turning Mill Pond Dam is a smaller dam located on Town-owned conservation land alongside Route 128. This dam has not been recently assessed and condition was not known by the workshop participants. In addition to

man-made dams, beaver dams were also raised as an infrastructure concern. Whereas the town generally has some record of and control over man-made stream crossings or impoundments, beaver dam activity is often known only anecdotally, if at all, and can cause unpredictable problems during heavy precipitation, when flooding occurs in unexpected locations. Beaver activity is known to be an issue in the southwest corner of Town, in the vicinity of Cambridge Reservoir, as well as in the large wetland complex on the northwest side of Town.

Roads

Lexington's roadways are vulnerable to flooding, as well as the impacts of snow and ice. In addition, there are three known choke-points in Town that can be problematic in good weather, and increase the risk of emergency delays during hazard events. Specific areas of concern that were noted during the CRB workshop included: the intersection of Watertown and Pleasant Streets; the intersection of 2A and Spring Street; the intersection of Lincoln Street and Marrett Road; Massachusetts Avenue at Harrington; flooding in the vicinity of Constitution Road and Oxbow Road, and flooding in the vicinity of Valleyfield Street. In addition to specific locations that are subject to climate change impacts, shifting weather patterns due to climate change are increasing the difficulty of maintaining the Town's roadways more generally. Pot holes and sinkholes are becoming more problematic due to new patterns of freezing and thawing that occur repeatedly throughout the winter season. Roadways in Town are also susceptible to blockages from trees and power lines brought down by wind storms, or closure due to isolated flooding. These impacts in turn compromise the Town's ability to provide emergency services. Lexington is good at mitigating emergency situations when roadway closures or other hazards develop, however, especially as climate change increases the frequency of risks, more focus on prevention of hazard conditions is necessary to increase the resiliency of Lexington's roads. Emergency Management personnel also noted that it is increasingly difficult to keep residents off of the roads during hazard events, which increases the safety risks for both residents and first responders.

Stormwater Infrastructure

Detention basins and other stormwater infrastructure are recognized as a potential concern Town-wide. Similarly to culverts conveying natural streams, there is a general recognition that much of the stormwater drainage system was designed to accommodate historic patterns of precipitation and runoff, and may be undersized as climate and weather patterns continue to shift. The Town's aging stormwater infrastructure exacerbates flooding potential during heavy rains. Ongoing development in Lexington and a pattern of tearing down older homes to build larger ones has added to the amount of impervious area in the Town, which in turn has increased runoff and can increase flooding potential. Furthermore, while newer Stormwater Best Management Practices (BMPs) meet appropriate standards and are being designed to withstand climate change impacts, existing BMPs are frequently not maintained by private owners. This not only renders them ineffective, but also contributes to increased potential for flood events. Untreated stormwater can have significant environmental effects for tributaries receiving flows if that stormwater carries sediment loads, pathogens, or other pollutants of concern.

Drinking Water Supply

Lexington is part of the Massachusetts Water Resources Association, and as such receives its public water supply from the Quabbin Reservoir. This enables the Town to be very resistant to drought, although participants noted that this also means that residents tend to be less aware of drought conditions and less in tune with the need for water conservation practices. Drought does impact the Town when high water use creates localized issues for users. Some residents in Lexington have private wells, although private wells are more likely to be associated with geothermal systems or irrigation than with drinking water. In addition, there is currently no back-up water supply for the Town. Cambridge Reservoir is located within the Town, but does not service Lexington residents. That supply, which is part of the Cambridge Water

Department system, has been suffering from drought impacts that have resulted in drastically increased chloride readings in recent years.

Water and Wastewater Infrastructure

Much of the Town's water and wastewater infrastructure is aging and in need of ongoing maintenance and upgrades. Lexington has 10 wastewater pump stations, several of which are vulnerable to hazards, from power outages to flooding. Two pump stations in particular are in need of storm hardening or relocation to protect them from flooding. Back-up power is being addressed at all but one of the pump stations. Five stations were upgraded with generators over the last 5 years; two are currently in construction to add back-up power; one is in the design phase; and one is expected to go into the design phase in the next year. The Town has also been proactive in addressing infiltration and inflow problems in its sewer system in order to prevent sewage overflows during periods of heavy precipitation.

Utilities Infrastructure

Lexington's electrical, gas, and communication networks are vital to providing services on an everyday basis as well as during hazard events, but utilities networks are vulnerable to a variety of climate change-related hazards. As demonstrated by the October 2011 snowstorm and many more recent storm events, aboveground lines can be knocked out by snow and ice, in addition to wind events, causing extensive impacts to the Town. Extreme heat can also be a stress on the electrical system, as increasing use of air conditioning leads to a risk of brown outs and outages, particularly if heat impacts are region-wide. Simonds Road was called out by workshop participants as an area with frequent power outages. In addition to threats to the lines themselves, communications networks can be stressed by the sheer volume of use that may occur during a hazard event. The Town is currently talking with FirstNet about implementing a system that would give first responders priority access to cellular services during a hazard. Most of the Town's electrical infrastructure is aboveground (including 126 miles of electrical distribution wires), and the costs to convert to underground wires would be exorbitant. The safety and reliability of Lexington's underground gas infrastructure is also important to the Town's resiliency and the Town has a good relationship with the gas provider, National Grid. A representative from National Grid noted that the Town received start-up funding from National Grid in 2017 as part of the Energy Efficiency Community Initiatives Program to implement energy efficiency programs.

Buildings and Facilities

Lexington is currently in the process of building a new Fire Headquarters at 45 Bedford Street and investigating options for renovating or rebuilding the Police Station currently located at 1575 Massachusetts Avenue. The new facilities are being designed to ensure that they can withstand major storms so that key emergency services will be available and ready for response when needed. The Police Chief noted that he is also pushing for new facilities to feature a large lobby that can serve as a heating or cooling station during periods of extreme temperatures, and offer numerous charging stations for cell phones to make sure that residents who are otherwise able to shelter-in-place will have the power necessary to maintain communications access. These new facilities were viewed as a major strength by workshop participants, and the Police Chief expressed his thanks for the support of community residents in making the project possible. Other critical facilities in Town are currently less resilient. Power outages in particular are a problem, and the Town is interested in evaluating a variety of strategies to make critical facilities and schools more resilient. Lexington has already made a number of improvements to its facilities' energy efficiency through the Massachusetts Green Communities program; the Town was one of the first five communities designated under the program.

Residential Property

Flooding of private homes is a concern, particularly flooding related to drainage problems and increased stormwater runoff. Many of the Town's smaller, older homes are being torn down and replaced with larger structures which increase impervious area and decrease runoff. Stormwater runoff from extended rainfall like that associated with recent precipitation events can cause significant impacts, increasing the threats to private property.

Environmental

Tree and Forest Management

Forests provide critical ecosystem services that help buffer the effects of climate change, from sequestering carbon, to increasing groundwater recharge, to modulating local temperature. Street trees are likewise critical for infiltration of rainwater and provision of shade. However, trees and forests are also threatened by climate change. Wind and storms cause blowdowns, drought can contribute to die-off, invasive pests (e.g. Emerald Ash Borer, Hemlock Wooly Adelgid, Asian Longhorned Beetle) are threatening to eliminate certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. The Town's emergency services also recognize that hazard events can convert trees from assets to threats, and there is a tension between Town departments around how best to manage tree planting and tree removal to mitigate both environmental and infrastructural risks. There is also some concern over wildfire risk, which is increased by the build-up of fuel (deadwood and underbrush) that results from die-offs and a lack of informed forest management.

Open Space

Open space provides ecosystem services that help buffer the effects of climate change, from sequestering carbon, to increasing groundwater recharge, to modulating local temperature. Open space is also critical in floodplains for providing a buffer and increased flood storage, near public water supplies to maintain high water quality and promote recharge, and to maintain overall habitat connectivity that will be vital to allowing ecosystems and individual species to adapt to a changing climate. The Lexington Conservation

Agent noted that Lexington has approximately 1400 acres of preserved Open Space, and two additional properties will be considered for acquisition during Town Meeting this spring. Two additional areas on the southeast side of Town were called out by workshop participants as potential priorities for protection: the wetlands and meadow area that is currently owned by the Town of Arlington, and the wetland area owned by Belmont Country Club. These areas were noted as high priority for permanent protection and potential use for nature-based flood control. There is concern about potential climate hazards and how they may affect the Town's open space properties, including trail networks and residents' ability to access and utilize open space.

Watersheds, Wetlands, and Wildlife Habitat

Lexington has played an active role in watershed-scale efforts to maintain resiliency and improve the quality of waterbodies and ecosystems. The Town was a founding member of the Resilient Mystic Collaborative, now 13 communities strong, and Lexington is also active in the Charles River Watershed Association. The Town has participated in the development of watershed plans for each of the three watersheds that exist within its boundaries, and has also implemented priority projects that were developed as part of these plans. Significantly, the Town has completed two stream daylighting and restoration projects: one at Willard's Woods and one at Whipple hill. The Town has strong land management and land stewardship programs and is "famous for its strict conservation commission", which takes the protection of wetland areas very seriously and has developed local regulations to supplement the Massachusetts Wetlands Protection Act.

Streambed Stability

In addition to concerns about the protection of sensitive areas, streambed stability and erosion were brought up as specific concerns that relate to the function of infrastructure such as culverts and bridges. Failures in streambed and bank stability can lead to erosion that undermines roadways or threatens public and private property. An area downstream of Constitution Road near the Pine Meadows Golf Course is a known concern.

Environmental Contaminants

I-95 runs through Lexington, passing in close proximity to several sensitive environmental areas, including Cambridge Reservoir, and extensive wetland and floodplain areas. A variety of hazardous materials are known to be carried along this route that could pose a significant threat to people or the environment in the event of a spill. It was also noted at the workshop that hazard events, and flooding in particular, have the potential to mobilize contaminants from locations that may otherwise be secure or have no impact, into areas that may pose greater risk to public safety and the environment.

Invasive Species

Invasive plants and animals are already a source of concern in Lexington, as they are throughout the Commonwealth. Forest and upland ecosystems are threatened by a variety of invasive plants, including plants such as oriental bittersweet, multiflora rose, and several non-native honeysuckles. Riparian and aquatic habitats are severely threatened by common reed, Japanese knotweed, invasive water chestnut, hydrilla, purple loosestrife, and Eurasian milfoil. Critical invasive insect pests already in the region include the Asian Longhorned Beetle and Emerald Ash Borer, both of which have the potential to do serious damage (both environmental and economic) to Massachusetts' forests and trees. The Asian Longhorned Beetle has not yet been reported within Lexington, but the Town has had two cases of Emerald Ash Borer which led to the removal of 30 trees in response. These and other species already pose a significant challenge and have serious consequences for ecosystem health and resilience, and these impacts are likely to increase in response to climate change. Warming temperatures will also bring new invasives to the area, and these will have an easier time gaining a foothold if the Town's natural ecosystems are simultaneously weakened due to changes in climatic conditions. Lexington currently implements a three-

year invasive species management plan for many Town projects. More detailed risk assessments and corrective recommendations would benefit the Town.

Wildlife Habitat

The Town's concern for the vitality and resilience of its watersheds, wetlands, and open space is for both human safety and enjoyment, as well as for the well-being of wildlife. Ongoing improvements to storm water infrastructure and road/stream crossings are expected to increase habitat quality and resiliency, reducing decades of negative impacts to riparian and wetland habitats. Managing beaver issues, which are a significant wildlife concern in certain areas of Lexington due to their role in flood risk, is part of the larger project of stewarding wildlife habitat.

Harmful Algal Blooms

Lexington does not currently suffer from any major issues related to algal blooms, but harmful algal blooms are of particular concern during times of excessive heat and/or drought. Excessive algal growth is exacerbated by climate change impacts, including increasing temperatures, drier summers, and overall lower water levels, and results in fish kills, recreation impacts, and negative health effects. The problem is exacerbated by increasing nutrient pollution, which is frequently driven in part by land use change around ponds, lakes, and reservoirs. If residential lawns lead right down to the water, there is no buffer to trap and filter nutrients.

Winter Road Treatment

Deicing chemicals are easily washed off the road by rain and melting ice, and they end up concentrating in nearby waterbodies, soils and groundwater. Salt and magnesium chloride have negative effects on water quality, aquatic species, soils and vegetation. Freshwater aquatic plants and animals are adapted to a narrow range of low chloride levels and even a slight increase can have negative effects. Increased chloride concentrations in water can also alter the distribution of oxygen and nutrients in waterbodies which can stress aquatic organisms. Similar to freshwater aquatic plants, most land plants are adapted to low levels of chloride in the soil. Salt that accumulates in soils can stress vegetation and provide opportunities for nuisance invasive plants to establish. Finally, excess salt that enters the groundwater supply can lead to more expensive and intensive drinking water treatment requirements. The Cambridge Reservoir is already seeing the impacts of excessive chloride levels, with 95%-100% of samples from 2016 and 2017 exceeding acceptable chloride levels.

Societal

Communication Services

Many channels of communication are coordinated during hazard events. The Town convenes its senior management team in advance of known approaching events to discuss preparations and what-if scenarios. The Town recently created a new position and hired a Public Information Officer, whose focus is communication with the public and understanding how messages about emergency response, preparation, and resource availability will be disseminated. Lexington deploys a CODE RED alert system to send mass messages to all registered users during emergency situations. All citizens and businesses are encouraged to register to receive alerts. Question remains whether critical communications services like this can reach everyone with consistent and reliable information, especially seniors and dependent adults, homebound residents, residents without a cell phone or landline, and residents who speak English as a second language. Existing social organizations in the Town complement and bolster the formal communications system by coordinating on-the-ground information gathering and sharing strategies to reach more citizens. Overall the Town believes that its organization among departments is strong when it comes to communications, but there are known areas where improvements could contribute to greater resiliency.

Vulnerable Populations

Workshop participants acknowledged the challenges of identifying and reaching vulnerable individuals, especially those who may no longer have a land-line telephone, or who may not self-identify as vulnerable. Certain populations, especially seniors, homebound residents, dependent adults, low-income residents, and those with underlying medical conditions, are known to be at higher risk during hazard events and

may require support beyond emergency notifications. Workshop participants expressed concerns about these populations' ability to obtain food and medical supplies during hazard events, as well as the challenges involved in getting certain residents to leave their homes (and sometimes their pets) in order to seek shelter elsewhere. Better understanding what these needs are and how the Town can best prepare to proactively support its entire population are areas that require more exploration.

Commercial Districts

Lexington has several business districts. The Hartwell Avenue Commercial District is bordered by Hanscom Air Force Base and houses the MIT Lincoln Laboratory. The Hartwell Avenue Commercial District is considered one of the most prominent defense industry and life sciences hubs in the Boston area, and is the largest of the Town's business districts. Ongoing zoning initiatives are exploring the possibility of further expansion of the district. Additional business centers in Town include the Forbes Road/Route 2A District, the Hayden Avenue District, and Lexington's Historic Center. Workshop participants expressed concern about potential climate-related risks to these commercial areas, specifically the Hartwell Avenue Commercial District.

Stress on Emergency Services

Lexington's Fire, Police, and Public Works departments bear much of the burden of responding to the increased human threats that result from climate-induced hazards. These departments are also tasked with the provision of shelter services in times of need. An ever larger percentage of the departments' time and resources must be devoted to handling things like traffic accidents resulting from ice or other dangerous conditions and activities to maintain traffic flows or protect property during storm events, and Public Works is relied upon to clear roads and maintain access throughout the Town. First Responders noted the increasing challenge of communicating with residents about the need to avoid going out during dangerous conditions, and the extra risks associated with unnecessary travel during bad road conditions. There is a sense that many residents have lost their ability to be self-sufficient and are increasingly dependent on emergency services personnel. The Police Chief also noted his concerns about the safety of his officers when responding to hazard events that are increasingly unpredictable.

Transportation

Lexington's major transportation routes include local roadways, Route I-95 and Route 2A and the MBTA and bus lines through Town. Workshop participants noted Lexington's many transportation options as an asset to the community, however many roads in Lexington are vulnerable to flooding, as well as the impacts of snow and ice, and wind. These impacts in turn compromise the Town's ability to provide emergency services. The Town has been working proactively to shift transportation modes towards more environmentally-friendly and less carbon-dependent transportation. The Town is pursuing the creation of bike paths and sidewalks through the Complete Streets program. Additional effort is needed to encourage use of alternative transportation, as well as to ensure that residents who utilize public transportation are well supported, both for everyday transport needs and during hazard events.

Resident Engagement and Education

The Town recognizes the importance of engaging the community in climate resiliency planning. It is essential to communicate to the public about emergency situations, including information on road closures, driving bans and how to access emergency shelters. Workshop participants also noted the importance of educating owners of detention basins and septic systems about the importance of maintaining and cleaning them out on a regular basis to prevent failures or flooding. Lexington benefits from a well-educated and engaged citizenry. The Town's residents have historically been very supportive of resiliency efforts, and the Town offers a number of avenues for residents to engage with climate change films, sustainability fairs, and other awareness-oriented activities.

Pests and Disease Control
Climate change is affecting pests and disease vectors both through changing precipitation conditions and changing temperature conditions. Warmer, wetter conditions lead to increased mosquito populations, while the absence of sufficient periods of cold means that pest populations that would historically have been killed off or reduced are able to survive the winter and emerge in greater numbers the following season. Further, as the Massachusetts climate begins to look more like the climate of the mid-Atlantic and southern states, we are seeing new types of diseases show up in existing pests (e.g. mosquitoes carrying West Nile Virus or Zika and ticks carrying Rocky Mountain Spotted Fever). A recent CDC report showed that vector-borne diseases tripled between 2004 and 2016, with approximately 75% of cases being related to tick-borne disease. Lexington is a member of the East Middlesex Mosquito Project, and receives support for mosquito control efforts on public lands.

Development
Over time, population increases and urban development have increased the impervious cover in Lexington, thereby increasing stormwater runoff and contributing to flooding problems throughout Town. Tear down of smaller homes to replace them with larger ones has exacerbated the issue, as large basements displace groundwater and leads to excessive pumping which creates further pressure on the stormwater system. As noted above, maintenance of stormwater infrastructure can also be hard to enforce. Lexington does not have strong stormwater regulations for projects that are outside of Conservation Commission jurisdiction. There is a sense that additional regulation or incentives may be necessary to decrease impervious cover.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. Lexington has been proactive in protecting Open Space and the Town's natural resources through land procurement, wetlands protection and strong stormwater regulations. The Town has also been proactive in addressing dam repairs, conducting stream restoration work, and working with other local communities to take a watershed-scale approach to resiliency. The Town has a number of organizations and partnerships that promote climate resiliency, and residents are broadly supportive of such efforts.

- Lexington is currently developing a new **Comprehensive Plan**.
- The Town was one of the first five communities to be designated as a Massachusetts **Green Community**.
- Lexington has a **Sustainable Action Plan** to address resilience and sustainability issues.
- Lexington has approximately 1400 acres of existing forested and wetland **open space**.
- The Town benefits from a strong **land management and stewardship program**.
- Lexington has or is part of many **active organizations** that contribute to resilience building, including the Global Warming Action Coalition, the Resilient Mystic Collaborative and Citizens for Lexington Conservation.

- Lexington's citizenry is well-educated on climate change and the Town offers many **outreach opportunities** such as films, sustainability fairs, etc.
- Lexington has adopted **stretch code** and builders understand the importance of building structures that are efficient and resilient.
- The Town recently hired a **Public Information Officer** to increase communication and accessibility of information.
- Lexington has had a **Tree Commission** for approximately 20 years.
- Lexington was the first community in the Commonwealth to develop a **Tree Bylaw** to diminish removal of trees during construction projects.
- Lexington utilizes the **Code Red system** as an opt-in option for communication alerts.
- The Town practices training drills, and is working with neighboring communities on **emergency preparedness.**
- Lexington has established robust **mutual aid agreements** with neighboring towns.
- Lexington is currently in the process of investigating options for renovating or rebuilding the **Police Station** currently located at 1575 Massachusetts Avenue.
- The Town is in the process of building a new **Fire Headquarters** at 45 Bedford Street as a resilient, category 4 building.
- Lexington has historically benefited from a very **supportive community** which enables them to be proactive on resiliency measures.
- The Town has installed **green infrastructure practices** such as bioretention areas and raingardens at Town facilities, including the DPW Public Services facility and some of the schools.
- The Town has completed two significant **stream daylighting and restoration** projects at Willard's Woods and Whipple Hill.
- Lexington has an aggressive **tree planting program**.
- Lexington is incorporating **bike lanes and sidewalks** where possible.
- Lexington has already completed several **culvert upgrade projects** with designs that meet Army Corps standards for storm readiness and habitat quality.
- The Town is in the process of adding **back-up generators at pump stations** to ensure that all pump stations continue to operate during power outages.
- The Town is involved in **watershed-scale resiliency efforts** through the Mystic River Watershed Association's Stormwater Collaborative.
- The Town completed **modeling of water distribution systems** less than two years ago.

- Lexington has installed **Variable Frequency Drives at pump stations** to save on energy use and increase equipment longevity.
- The Town is offering a new **rain barrel program** to all residents this year in partnership with a local Girl Scout's Gold Project.
- Lexington was a partner on three **watershed plans** for regional planning and identification of priority projects.
- Recent **dam repairs** have been made to both of the Town's major dams.
- Lexington has been proactive with preventative measures to maintain **underground utilities**.
- The Town has an established **Emergency Operations Center** with access to cots and other equipment for sheltering needs.

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Top Recommendations to Improve Resilience in Lexington

Participants at the CRB workshop identified a number of recommendations to address vulnerabilities and increase resiliency in three main topic areas: infrastructure, environment, and society. Management of water, primarily dealing with excesses of water due to flooding and improving undersized or deteriorating infrastructure systems, was a primary concern that emerged in both the small and large group discussions. Establishing an Urban Forest Master Plan to address both environmental benefits from tree and forest cover and protect vulnerable infrastructure emerged as a second major theme. Finally, much attention centered around providing services and information to the Town's residents during hazard events, with particular attention to vulnerable populations.

Highest Priority

- **Inventory and upgrade culverts and bridges** to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority re-sizing or replacement projects. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios. Focus on known problem areas as well as structures Town-wide.

- **Conduct a condition assessment and study feasibility of removal at Turning Mill Pond Dam,** to evaluate the current status of the dam, evaluate threats, and consider options for improving stream habitat and aquatic organism passage or increasing flood storage and flood control possibilities.

- **Identify vulnerable populations and foster an improved communications network** for reaching all residents, and especially vulnerable populations, in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance. Utilize networks of existing groups to encourage communication efforts led by churches, schools, social groups, or Town agencies. Focus should be on populations that may be more vulnerable to climate-induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events. Establish clear messaging and consider a back-up information distribution plan for use during power/internet outages. Ensure that Code Red messaging is released in multiple languages to increase accessibility for non-English speakers.

- **Develop an Urban Forest Master Plan** to serve as a comprehensive tree, forests and land management program to help address micro-flooding and drainage issues; to identify, remove, and replace problem trees; preserve intact forests and street tree cover; utilize shade trees to limit heat island effects; and provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures). Simultaneously plan for the removal of excess standing dead wood and selective thinning to create space for more evenly aged forest stands and greater long-term resiliency. Focus on increasing stormwater infiltration and aquifer recharge, developing forests as effective carbon sinks, and improving habitat for native species. Simultaneously evaluate existing land use regulations and develop requirements for new development to encourage appropriate plantings and further limit tree removal. Obtain professional, third-party recommendations regarding the appropriate types and locations for trees that will address competing needs for street tree enhancement and infrastructure protection.

- **Increase maintenance of catch basins, conveyances and detention ponds**. Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Review and improve maintenance schedule and budgets, keep up with regular maintenance of publicly-owned structures, and increase frequency of street sweeping and catch basin cleaning.

- **Develop programs to incentivize disconnection or removal of impervious surfaces**, either through implementation of a Town-wide Stormwater Utility or through separate incentives which offer property tax credits for the implementation of green infrastructure or removal of pavement. Promote infiltration practices and pre-treatment of stormwater runoff.

- **Develop green infrastructure solutions for stormwater management** to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding. Develop a list of specific priorities, assess feasibility and cost (including life cycle cost analyses), rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Also review the Town's already strong regulations and update as necessary to support green infrastructure and low-impact development.

- **Re-evaluate the Town's procurement process for stormwater work** to focus on qualifications-based procurement rather than low-cost procurement, with the goal of ensuring that systems are designed to optimize long-term functional success and consider life-cycle costs and ease of maintenance.

- **Develop and implement designs for storm-hardening at vulnerable pump stations,** including evaluating the option of relocating pump stations for greater flood resilience. Establish priority actions for reducing potential flooding impacts, including consideration of nature-based solutions or green infrastructure approaches. Continue to implement emergency back-up power solutions for all pump stations.

- **Assess flood resiliency and stream stabilization opportunities Town-wide.** Model flooding and increased precipitation predicted by climate change studies to identify at risk locations throughout Town. Assess the viability of using nature-based solutions such as restoration of wetlands and stream channels or implementation of green infrastructure to develop a list of specific priority projects where reduction of stormwater runoff, streambank stabilization, and increased flood storage capacity could mitigate flooding risk and limit damages due to erosion and scouring. Consider a variety of alternatives, including bank or streambed armoring, restoration approaches, or allowing a stream to naturalize. Incorporate the results of the assessment with an inventory of culverts and bridges to evaluate priority actions. Assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. The Hartwell Avenue corridor is an area of particular interest.

- **Develop a Climate-driven City-wide Business Improvement Plan** to support Lexington's existing commercial districts and make the business community more resilient. Evaluate potential climate change risks to the Hartwell Avenue Commercial District and include mitigation recommendations when considering expansion of the district. Identify business development areas where impacts from climate hazards can be easily avoided or mitigated (e.g., by avoiding floodplains or areas of known drainage-related flooding). Explore targeted improvements, such as a microgrid, which could be employed to provide extra resilience to existing business districts. The plan's goals should also include a focused plan for attracting climate-friendly businesses to

the City that will invigorate the City's economy and keep Lexington's business community at the forefront of resilience and technological advancement.

- **Develop and incentivize neighbor-to-neighbor support systems** to build alternate support and response networks at the neighborhood level and reverse the trend of increasing reliance on Town services. Consider programs like funding for neighborhood potluck events or block parties that will encourage residents to get to know their neighbors and become aware of their potential needs.

- **Conduct a traffic study** with particular focus on the three known choke points in Town that are considered to be likely problem areas during hazard events, especially if a hazard results in diversion of traffic off of the highway.

- **Upgrade the Town's radio systems** and consider whether copper connections between Town buildings could offer strategic resilience to decrease reliance on cellular service during emergencies.

- **Install a Road Weather Information System (RWIS) in collaboration with neighboring communities** and develop a network of mini weather stations that will support definition of local risks in live time (e.g., lightning strikes, tornadoes, heavy precipitation, and wind events). Develop a regional system, including Brookline, Newton, Bedford, Wellesley, and other local communities and contract with a weather service to increase the capacity of the RWIS to provide detailed weather information as events unfold.

- **Implement the FirstNet system** to prioritize cellular access for first responders during hazard events.

- **Investigate opportunities to establish a micro grid** to maintain power in key areas independent of the main grid and support emergency operations and other key emergency response systems when electric power is lost. Consider how and if the rail trail behind these facilities can be used to connect Town Hall and emergency operations in emergency events. Focus on establishing redundant systems as well as increasing maintenance of existing infrastructure.

- **Evaluate opportunities for "strategic undergrounding" to improve electrical resiliency**, including working with Eversource to identify locations where overhead distribution lines would be relocated underground in key areas or high-hazard areas. Particular attention should be paid to essential facilities to ensure they maintain a safe and reliable power supply during hazard events.

- **Prepare an Energy Assurance Plan** to help the Town prepare, respond, recover, and mitigate the effects of future energy supply disruption from climate change. Include consideration for renewable power supplies.

- **Review and revise Town regulations** pertaining to stormwater management and compliance in order to increase resiliency, ensure that regulations accommodate and encourage nature-based solutions, and provide legal authority to enforce protective measures. Develop new standards for projects/lots under an acre in size to expand the Town's jurisdiction over stormwater management.

Moderate Priority

- **Study the possibility of expanding the public water supply** to establish a back-up in the case of contamination or catastrophic disconnection from the MWRA system. Also consider the possibility that increasing frequency of drought may lead additional communities to join the MWRA system, putting additional drawdown pressure on the Quabbin Reservoir.

- **Continue implementing upgrades to reduce sewer infiltration and inflow** and locating and eliminating illicit connections to decrease inputs of groundwater into the sewer system.

- **Install underground stormwater retention tanks** at key locations to decrease peak flows during storm events. Evaluate the potential to utilize tanks as cisterns to supply irrigation water at Town properties.

- **Review native planting lists** to incorporate recommendations for plants that are expected to be more resilient to changing climate conditions. Consider adding recommendations for the use of more southern species that might not have historically been considered native to eastern Massachusetts.

- **Develop comprehensive plan for beaver management** to mitigate unpredictable flooding or impoundment impacts. Consider management strategies both for mitigation of negative impacts of beavers as well as strategies for working with beavers to increase flood capacity and improve wildlife habitat.

- **Pursue public facilities upgrades that would increase resiliency.** Focus on designing new buildings and retrofitting existing buildings for resilience to power outages, water supply problems and floods. Consider installation of solar panels with battery storage to increase resiliency to power outages. Adopt utility system upgrades such as pin and sleeve cable connectors on all buildings to increase the safety and weatherproofing of electrical line connections. Acquire additional portable generators to utilize during outages.

- **Develop a way to publicize emergency evacuation routes during an emergency.** Consider purchasing mobile signs or other equipment to facilitate flexible posting options during hazards and enable emergency services to remain flexible and responsive. Further, ensure that evacuation plans include consideration for moving residents who lack private transportation.

- **Create messaging and preparedness guidelines for the public** and develop and implement shelter-in-place preparedness education to ensure that residents know how to prepare and respond to a variety of different potential hazards. Include information on where to turn for more detailed information during a hazard event.

- **Pursue opportunities to fund open space acquisition** consistent with Town planning priorities. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands. Priority should also be given to larger parcels that can provide connectivity between existing conserved parcels to maintain habitat corridors. Incorporate understanding of climate change impacts and priorities gained through the MVP Planning Process into future open space planning.

- **Evaluate recreation areas and open space properties to assess risks** related to climate change impacts. Develop and implement mitigation strategies as necessary to increase the resiliency of open space properties and ensure continued availability of these resources to Town residents.

- **Continue to develop relationships with local watershed associations** and regional efforts to protect waterbodies and other sensitive areas within the Town. Continue to pursue implementation of priority projects included in the existing watershed plans that Lexington helped to develop.

- **Analyze hazardous materials risk** to develop an understanding of how climate-change induced hazards could potentially increase the risk of accidents or spills involving I-95 or other roadways running through Town and quantify the potential risks to the Town that could result from accidents involving various classes and types of materials. Further evaluate the potential for hazardous materials to be transported in flood waters or otherwise mobilized by a hazard event. Develop a list of hazardous materials storage sites to ensure that emergency responders have a list of where potentially hazardous materials are being stored.

- **Assess additional mosquito/tick/pest control options,** including the use of nature-based solutions such as the establishment of buffers between developed and undeveloped areas. Determine future risks due to increase in type and quantity of pests/disease vectors due to climate change. Build on existing efforts by the Board of Health and East Middlesex Mosquito Project to continue proactive planning and education and outreach programs.

- **Assess the risks and needs facing the Town's vulnerable populations**, particularly homebound or dependent adults and senior residents. Include assessment of transportation needs, both for everyday access and during emergency events. Assess the potential for climate change impacts to exacerbate existing health risks and develop strategies, including education and outreach programs, to encourage advance preparedness.

- **Develop a comprehensive plan for emergency sheltering operations** to build on the Town's existing sheltering procedures.

Lower Priority

- **Continue to facilitate a shift to alternative transportation** by further expanding the Town's bike paths. Conduct a traffic study of the bike path network to understand what types of vehicles (scooters, bikes, etc.) are being used and assess locations where increased access points or other improvements are necessary to increase the commuter capacity of the bike path network. Encourage use of transportation modes that do not rely on fossil fuels.

- **Establish a Community Emergency Response Team (CERT) program** to train volunteers in disaster preparedness and develop a group of citizens who can support emergency services personnel during hazard events.

- **Establish programs to understand and support climate-related challenges facing low-income residents,** for example, the costs of damages incurred during flood events and the high costs of water bills (for residents receiving water from Waltham or Belmont) or energy bills. As appropriate, institute intermunicipal agreements to establish discounted water and sewer service for low-income residents.

- **Plan for long-term maintenance of all emergency equipment** from the acquisition stage to ensure that equipment is functional when needed. Develop operations and maintenance plans for portable generators, light towers, etc. and perform maintenance on an annual basis to keep vital resources at-the-ready.

- **Evaluate climate change risks at sites that concentrate vulnerable populations**, such as nursing homes. Consider ways of increasing the resiliency of such sites and increasing the feasibility of shelter-in-place response.

- **Conduct a study to identify areas where redundant sidewalks could be retired** to reduce impervious surface, while still maintaining robust pedestrian access networks.

- **Conduct an analysis of wireless reliability in Lexington** and the potential impacts of various climate change hazards on cellular and internet systems.

- **Incentivize or regulate good pesticide/fertilizer management and lawn-maintenance BMPs.**

- **Investigate the potential benefit of controlled burns** to increase resiliency and restore upland wildlife habitat at appropriate open space locations.

- **Assess environmentally-friendly road treatment alternatives,** including salt brine, byproducts from the brewing industry, and other new products to address excessive chloride concentrations in Cambridge Reservoir. Assess options for both efficacy and cost-effectiveness as well as potential environmental impacts, such as nutrient content.

- **Utilize the Town's communications resources to conduct outreach regarding winter road emergencies**, with the intent of limiting roadway use to essential personnel during hazard events and enabling emergency services and Public Works to more effectively and efficiently do their jobs of returning the roadways to a safe condition.

- **Develop comprehensive invasive species management** from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift.

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CRB Workshop Participants

All workshop invitees are listed below; attendees are indicated with an asterisk.

Name	Position/Organization
John Livsey*	Town Engineer
Dave Pinsonneault	Public Works Director
Ross Morrow*	Assistant Town Engineer
Mike Sprague*	Senior Civil Engineer
Karen Mullins*	Director of Conservation
Derek Sencabaugh	Interim Fire Chief
Mike McLean*	Police Captain
Melissa Interess*	Director of Human Services
Sean Dugan*	Public Information Officer
James Malloy	Town Manager's Office
Sheila Page	Assistant Town Planner
Marc Valenti*	DPW Operations
Mike Cronin	Facilities Director
Jim Kelly*	Building Commissioner
Melisa Tintocalis	Economic Development
Tom Case*	IT
Mark Corr*	Lexington Police Chief
Brian Savage*	Lexington Police Department
Kari Sasportas*	Board of Health Director
Tony Serio*	Youth and Family Services
Michelle Ciccollo	State Representative
Senator Barrett	Senator, 3rd Middlesex
Jordan McCarron*	Conservation Stewardship Coordinator
Nick Nichols*	Appropriation Committee
Jay Flynn*	Board of Health
Charles Hornig*	Planning Board
Chris Ford*	Assistant Fire Chief
Mark Sandeen*	Sustainable Lexington Committee
Dan Voss*	Sustainable Lexington Committee
Suzie Barry	Board of Selectman
Ginna Johnson	Chair, Planning Board
Ricki Pappo*	Lexington Global Warming Action Coalition
Charles Lamb	Capital Expenditures Committee
Glenn Parker	Appropriations Committee
Gerald Paul*	Tree Committee
Wendy Heiger-Bernays	Board of Health
Philip Hamilton*	Chair, Conservation Commission
Holly Samuels	Conservation Land Steward
Keith Ohmart*	Citizens for Lexington Conservation Commission
Eileen Entin	Citizens for Lexington Conservation Commission
Michael Watkin	Hanscom Air Force Base
David Wong*	Hanscom Air Force Base
Patrick Herron*	Executive Director, Mystic River Watershed Association

Julie Wormser	Deputy Director, Mystic River Watershed Association
Julie Dyer Wood	Director of Projects, Charles River Watershed Association
Emily Norton*	Executive Director, Charles River Watershed Association
Justin Damon	President, Shawsheen River Watershed Association
Ronit Goldstein	Eversource
Tammy Saporito*	National Grid
David Kaplan	Cambridge Water Department
Jamie O'Connell*	Cambridge Water Department

* indicates attendees

Citation

Fuss & O'Neill (2019). Community Resilience Building Workshop Summary of Findings. Town of Lexington, Fuss & O'Neill, Inc. Springfield, Massachusetts.

CRB Workshop Project Team: Name, Organization, Role

Name	Organization	Role
John Livsey	Town Engineer	Project Coordinator/Core Team Member
Derek Sencabaugh	Fire Chief	Core Team Member
Melissa Interess	Director of Human Services	Core Team Member
Karen Mullins	Director of Conservation	Core Team Member
Sean Dugan	Public Information Officer	Core Team Member
Mike McLean	Police Captain	Core Team Member
David Pinsonneault	DPW Director	Core Team Member
Sheila Page	Assistant Town Planner	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Julianne Busa	Fuss & O'Neill	MVP Lead Facilitator
William Guenther	Fuss & O'Neill	Scribe
Stefan Bengtson	Fuss & O'Neill	Scribe
Matt Skelly	Fuss & O'Neill	Scribe
Jamie Caplan	Jamie Caplan Consulting	Scribe/HMP Process

Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants, and to John Livsey who acted as the local Project Coordinator. Thanks to the Town of Lexington for providing a meeting space for the Core Team Meeting and the CRB Workshop.

Funding for the CRB Workshop was provided through a Massachusetts MVP grant.

Appendix A

Final Risk Matrix

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.or

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

H-**M**-**L** priority for action over the
V = Vulnerability **S** = Strength

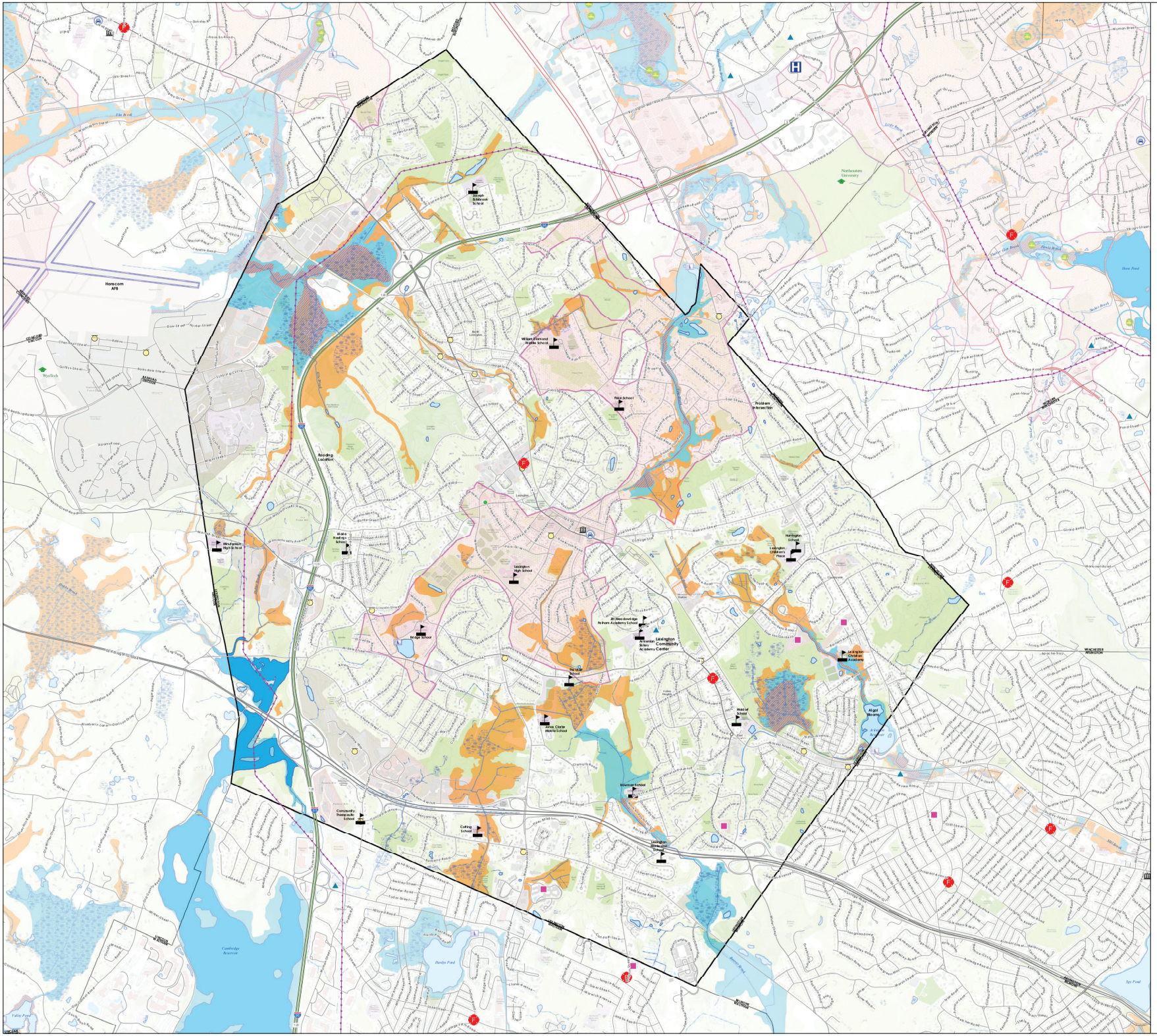
Features	Location	Ownership	V or S	Flooding	Precipitation	Extreme Temperatures	Wind	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Culverts and Bridges	Town-wide	Town	S	Lexington has already completed several culvert upgrade projects with designs that meet Army Corps standards for storm readiness and habitat quality.					
	Town-wide	Town	V	Inventory and upgrade culverts and bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority re-sizing or replacement projects. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios. Focus on known problem areas as well as structures Town-wide.				H	
Dams	Town-wide	Town	S	Recent dam repairs have been made to both of the Town's major dams.					
	Town-wide	Town	V	Conduct a condition assessment and study feasibility of removal at Turning Mill Pond Dam, to evaluate the current status of the dam, evaluate threats, and consider options for improving stream habitat and aquatic organism passage or increasing flood storage and flood control possibilities.				H	
Roads	Town-wide	Town	V	Install a Road Weather Information System (RWIS) in collaboration with neighboring communities and develop a network of mini weather stations that will support definition of local risks in live time (e.g., lightning strikes, tornadoes, heavy precipitation, wind events). Develop a regional system, including Brookline, Newton, Bedford, Wellesley, and other local communities and contract with a weather service to increase the capacity of the RWIS to provide detailed weather information as events unfold.				H	
	Town-wide	Town	V	Utilize the Town's communications resources to conduct outreach regarding winter road emergencies, with the intent of limiting roadway use to essential personnel during hazard events and enabling emergency services and Public Works to more effectively and efficiently do their jobs of returning the roadways to a safe condition.				L	
Stormwater Infrastructure	Town-wide	Town	S	The Town has installed green infrastructure practices such as bioretention areas and raingardens at Town facilities, including the DPW Public Services facility and some of the schools.					
	Town-wide	Town	V	Increase maintenance of catch basins, conveyances and detention ponds. Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Review and improve maintenance schedule and budgets, keep up with regular maintenance of publicly-owned structures, and increase frequency of street sweeping and catch basin cleaning.				H	
	Town-wide	Town	V	Develop green infrastructure solutions for stormwater management to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding. Develop a list of specific priorities, assess feasibility and cost (including life cycle cost analyses), rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Also review the Town's already strong regulations and update as necessary to support green infrastructure and low-impact development.				H	
	Town-wide	Town	V	Re-evaluate the Town's procurement process for stormwater work to focus on qualifications-based procurement rather than low-cost procurement, with the goal of ensuring that systems are designed to optimize long-term functional success and consider life-cycle costs and ease of maintenance.				H	
	Town-wide	Town	V	Install underground stormwater retention tanks at key locations to decrease peak flows during storm events. Evaluate the potential to utilize tanks as cisterns to supply irrigation water at Town properties.				M	
	Town-wide	Town	V	Conduct a study to identify areas where redundant sidewalks could be retired to reduce impervious surface, while still maintaining robust pedestrian access networks.				L	
Drinking Water Supply	Town-wide	Town	V	Study the possibility of expanding the public water supply to establish a back-up in the case of contamination or catastrophic disconnection from the MWRA system. Also consider the possibility that increasing frequency of drought may lead additional communities to join the MWRA system, putting additional drawdown pressure on the Quabbin Reservoir.				M	
Water and Wastewater Infrastructure	Town-wide	Town	S	The Town is in the process of adding back-up generators at pump stations to ensure that all pump stations continue to operate during power outages.					
	Town-wide	Town	S	The Town completed modeling of water distribution systems less than two years ago.					
	Town-wide	Town	S	Lexington has installed Variable Frequency Drives at pump stations to save on energy use and increase equipment longevity.					
	Town-wide	Town	V	Develop and implement designs for storm-hardening at vulnerable pump stations, including evaluating the option of relocating pump stations for greater flood resilience. Establish priority actions for reducing potential flooding impacts, including consideration of nature-based solutions or green infrastructure approaches. Continue to implement emergency back-up power solutions for all pump stations.				H	
	Town-wide	Town	V	Continue implementing upgrades to reduce sewer infiltration and inflow and locating and eliminating illicit connections to decrease inputs of groundwater into the sewer system.				M	
Utilities Infrastructure	Town-wide	Town	S	Lexington has been proactive with preventative measures to maintain underground utilities.					
	Town-wide	Town	V	Investigate opportunities to establish a micro grid to maintain power in key areas independent of the main grid and support emergency operations and other key emergency response systems when electric power is lost. Consider how and if the rail trail behind these facilities can be used to connect Town Hall and emergency operations in emergency events. Focus on establishing redundant systems as well as increasing maintenance of existing infrastructure.				H	
	Town-wide	Town	V	Evaluate opportunities for "strategic undergrounding" to improve electrical resiliency, including working with Eversource to identify locations where overhead distribution lines would be relocated underground in key areas or high-hazard areas. Particular attention should be paid to essential facilities to ensure they maintain a safe and reliable power supply during hazard events.				H	
Buildings and Facilities	Town-wide	Town	S	The Town was one of the first five communities to be designated as a Massachusetts Green Community.					
	Town-wide	Town	S	Lexington has adopted stretch code and builders understand the importance of building structures that are efficient and resilient.					
	Town-wide	Town	S	Lexington is currently in the process of investigating options for renovating or rebuilding the Police Station currently located at 1575 Massachusetts Avenue.					
	Town-wide	Town	S	The Town is in the process of building a new Fire Headquarters at 45 Bedford Street as a resilient, category 4 building.					
	Town-wide	Town	V	Prepare an Energy Assurance Plan to help the Town prepare, respond, recover, and mitigate the effects of future energy supply disruption from climate change. Include consideration for renewable power supplies.				H	
	Town-wide	Town	V	Pursue public facilities upgrades that would increase resiliency. Focus on designing new buildings and retrofitting existing buildings for resilience to power outages, water supply problems and floods. Consider installation of solar panels with battery storage to increase resiliency to power outages. Adopt utility system upgrades such as pin and sleeve cable connectors on all buildings to increase the safety and weatherproofing of electrical line connections. Acquire additional portable generators to utilize during outages.				M	
Residential Property	Town-wide	Town							

Societal						
Communication Services	Town-wide	Town	S	The Town recently hired a Public Information Officer to increase communication and accessibility of information.		
	Town-wide	Town	S	Lexington utilizes the Code Red system as an opt-in option for communication alerts.		
	Town-wide	Town	V	Upgrade the Town's radio systems and consider whether copper connections between Town buildings could offer strategic resilience to decrease reliance on cellular service during emergencies.	H	
	Town-wide	Town	V	Conduct an analysis of wireless reliability in Lexington and the potential impacts of various climate change hazards on cellular and internet systems.	L	
Vulnerable Populations	Town-wide	Town	S	The Town has an established Emergency Operations Center with access to cots and other equipment for sheltering needs.		
		Town	V	Identify vulnerable populations and foster an improved communications network for reaching all residents, and especially vulnerable populations, in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance. Utilize networks of existing groups to encourage communication efforts led by churches, schools, social groups, or Town agencies. Focus should be on populations that may be more vulnerable to climate-induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events. Establish clear messaging and consider a back-up information distribution plan for use during power/internet outages. Ensure that Code Red messaging is released in multiple languages to increase accessibility for non-English speakers.	H	
	Town-wide	Town	V	Develop and incentivize neighbor-to-neighbor support systems to build alternate support and response networks at the neighborhood level and reverse the trend of increasing reliance on Town services. Consider programs like funding for neighborhood potluck events or block parties that will encourage residents to get to know their neighbors and become aware of their potential needs.	H	
	Town-wide	Town	V	Assess the risks and needs facing the Town's vulnerable populations, particularly homebound or dependent adults and senior residents. Include assessment of transportation needs, both for everyday access and during emergency events. Assess the potential for climate change impacts to exacerbate existing health risks and develop strategies, including education and outreach programs, to encourage advance preparedness.	M	
	Town-wide	Town	V	Establish programs to understand and support climate-related challenges facing low-income residents, for example, the costs of damages incurred during flood events and the high costs of water bills (for residents receiving water from Waltham or Belmont) or energy bills. As appropriate, institute intermunicipal agreements to establish discounted water and sewer service for low-income residents.	L	
	Town-wide	Town	V	Evaluate climate change risks at sites that concentrate vulnerable populations, such as nursing homes. Consider ways of increasing the resiliency of such sites and increasing the feasibility of shelter-in-place response.	L	
Commercial Districts	Town-wide	Town/Private	V	Develop a Climate-driven City-wide Business Improvement Plan to support Lexington's existing commercial districts and make the business community more resilient. Evaluate potential climate change risks to the Hartwell Avenue Commercial District and include mitigation recommendations when considering expansion of the district. Identify business development areas where impacts from climate hazards can be easily avoided or mitigated (e.g., by avoiding floodplains or areas of known drainage-related flooding). Explore targeted improvements, such as a microgrid, which could be employed to provide extra resilience to existing business districts. The plan's goals should also include a focused plan for attracting climate-friendly businesses to the City that will invigorate the City's economy and keep Lexington's business community at the forefront of resilience and technological advancement.	H	
Stress on Emergency Services	Town-wide	Town	S	The Town practices training drills, and is working with neighboring communities on emergency preparedness.		
	Town-wide	Town	S	Lexington has established robust mutual aid agreements with neighboring towns.		
	Town-wide	Town	V	Implement the FirstNet system to prioritize cellular access for first responders during hazard events.	H	
	Town-wide	Town	V	Develop a way to publicize emergency evacuation routes during an emergency. Consider purchasing mobile signs or other equipment to facilitate flexible posting options during hazards and enable emergency services to remain flexible and responsive. Further, ensure that evacuation plans include consideration for moving residents who lack private transportation.	M	
	Town-wide	Town	V	Create messaging and preparedness guidelines for the public and develop and implement shelter-in-place preparedness education to ensure that residents know how to prepare and respond to a variety of different potential hazards. Include information on where to turn for more detailed information during a hazard event.	M	
	Town-wide	Town	V	Develop a comprehensive plan for emergency sheltering operations to build on the Town's existing sheltering procedures.	M	
	Town-wide	Town	V	Establish a Community Emergency Response Team (CERT) program to train volunteers in disaster preparedness and develop a group of citizens who can support emergency services personnel during hazard events.	L	
	Town-wide	Town	V	Plan for long-term maintenance of all emergency equipment from the acquisition stage to ensure that equipment is functional when needed. Develop operations and maintenance plans for portable generators, light towers, etc. and perform maintenance on an annual basis to keep vital resources at-the-ready.	L	
Transportation	Town-wide	Town	S	Lexington is incorporating bike lanes and sidewalks through Complete Streets projects.		
	Town-wide	Town	V	Conduct a traffic study with particular focus on the three known choke points in Town that are considered to be likely problem areas during hazard events, especially if a hazard results in diversion of traffic off of the highway.	H	
	Town-wide	Town	V	Continue to facilitate a shift to alternative transportation by further expanding the Town's bike paths. Conduct a traffic study of the bike path network to understand what types of vehicles (scooters, bikes, etc.) are being used and assess locations where increased access points or other improvements are necessary to increase the commuter capacity of the bike path network. Encourage use of transportation modes that do not rely on fossil fuels.	L	
Resident Engagement and Education	Town-wide	Town	S	Lexington has a Sustainable Action Plan to address resilience and sustainability issues.		
	Town-wide	Town	S	Lexington has many active organizations that contribute to resilience building, including the Global Warming Action Coalition, the Resilient Mystic Collaborative and Citizens for Lexington Conservation.		
	Town-wide	Town	S	There is currently a citizen article prepared for Town meeting that would create a new Sustainability Director position.		
	Town-wide	Town	S	Lexington's citizenry is well-educated on climate change and the Town offers many outreach opportunities such as films, sustainability fairs, etc.		
	Town-wide	Town	S	Lexington has historically benefited from a very supportive community which enables them to be proactive on resiliency measures.		
	Town-wide	Town	S	The Town is offering a new rainbarrel program to all residents this year in partnership with a local Girl Scout's Gold Project.		
	Town-wide	Town	V	Incentivize or regulate good pesticide/fertilizer management and lawn-maintenance BMPs.	L	
Pests and Disease Control	Town-wide	Town	V	Assess additional mosquito/tick/pest control options, including the use of nature-based solutions such as the establishment of buffers between developed and undeveloped areas. Determine future risks due to increase in type and quantity of pests/disease vectors due to climate change. Build on existing efforts by the Board of Health and East Middlesex Mosquito Project to continue proactive planning and education and outreach programs.	M	
Development	Town-wide	Town	S	Lexington is currently developing a new Comprehensive Plan.		
	Town-wide	Town	S	The Town has strong stormwater regulations that require single-family construction projects to consider stormwater.		
	Town-wide	Town	V	Develop programs to incentivize disconnection or removal of impervious surfaces, either through implementation of a Town-wide Stormwater Utility or through separate incentives which offer property tax credits for the implementation of green infrastructure or removal of pavement. Promote infiltration practices and pre-treatment of stormwater runoff.	H	
	Town-wide	Town	V	Review and revise Town regulations pertaining to stormwater management and compliance in order to increase resiliency, ensure that regulations accommodate and encourage nature-based solutions, and provide legal authority to enforce protective measures. Develop new standards for projects/lots under an acre in size to expand the Town's jurisdiction over stormwater management.	H	

Environmental						
Tree and Forest Management	Town-wide	Town	S	Lexington has had a Tree Commission for approximately 20 years.		
	Town-wide	Town	S	Lexington was the first community in the Commonwealth to develop a Tree Bylaw to diminish removal of trees during construction projects.		
	Town-wide	Town	S	Lexington has an aggressive tree planting program.		
	Town-wide	Town	V	Develop an Urban Forest Master Plan to serve as a comprehensive tree, forests and land management program to help address micro-flooding and drainage issues; to identify, remove, and replace problem trees; preserve intact forests and street tree cover; utilize shade trees to limit heat island effects; and provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures). Simultaneously plan for the removal of excess standing dead wood and selective thinning to create space for more evenly aged forest stands and greater long-term resiliency. Focus on increasing stormwater infiltration and aquifer recharge, developing forests as effective carbon sinks, and improving habitat for native species. Simultaneously evaluate existing land use regulations and develop requirements for new development to encourage appropriate plantings and further limit tree removal. Obtain professional, third-party recommendations regarding the appropriate types and locations for trees that will address competing needs for street tree enhancement and infrastructure protection.	H	
Open Space	Town-wide	Town	S	Lexington has approximately 1400 acres of existing forested and wetland open space.		
	Town-wide	Town	S	The Town benefits from a strong land management and stewardship program.		
	Town-wide	Town	V	Pursue opportunities to fund open space acquisition consistent with Town planning priorities. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands. Priority should also be given to larger parcels that can provide connectivity between existing conserved parcels to maintain habitat corridors. Incorporate understanding of climate change impacts and priorities gained through the MVP Planning Process into future open space planning.	M	
	Town-wide	Town	V	Evaluate recreation areas and open space properties to assess risks related to climate change impacts. Develop and implement mitigation strategies as necessary to increase the resiliency of open space properties and ensure continued availability of these resources to Town residents.	M	
Watersheds, Wetlands, and Wildlife Habitat	Town-wide	Town	S	The Town has completed two significant stream daylighting and restoration projects at Willard's Woods and Whipple Hill.		
	Town-wide	Town	S	The Town is involved in watershed-scale resiliency efforts through the Mystic River Watershed Association's Stormwater Collaborative.		
	Town-wide	Town	S	Lexington was a partner on three watershed plans for regional planning and identification of priority projects.		
	Town-wide	Town	V	Develop green infrastructure solutions for stormwater management to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding. Develop a list of specific priorities, assess feasibility and cost (including life cycle cost analyses), rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Also review the Town's already strong regulations and update as necessary to support green infrastructure and low-impact development.	H	
	Town-wide	Town	V	Continue to develop relationships with local watershed associations and regional efforts to protect waterbodies and other sensitive areas within the Town. Continue to pursue implementation of priority projects included in the existing watershed plans that Lexington helped to develop.	M	
Streambed Stability	Town-wide	Town	V	Assess flood resiliency and stream stabilization opportunities Town-wide. Model flooding and increased precipitation predicted by climate change studies to identify at risk locations throughout Town. Assess the viability of using nature-based solutions such as restoration of wetlands and stream channels or implementation of green infrastructure to develop a list of specific priority projects where reduction of stormwater runoff, streambank stabilization, and increased flood storage capacity could mitigate flooding risk and limit damages due to erosion and scouring. Consider a variety of alternatives, including bank or streambed armoring, restoration approaches, or allowing a stream to naturalize. Incorporate the results of the assessment with an inventory of culverts and bridges to evaluate priority actions. Assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. The Hartwell Avenue corridor is an area of particular interest.	H	
Environmental Contaminants	Town-wide	Town	V	Analyze hazardous materials risk to develop an understanding of how climate-change induced hazards could potentially increase the risk of accidents or spills involving I-95 or other roadways running through Town and quantify the potential risks to the Town that could result from accidents involving various classes and types of materials. Further evaluate the potential for hazardous materials to be transported in flood waters or otherwise mobilized by a hazard event. Develop a list of hazardous materials storage sites to ensure that emergency responders have a list of where potentially hazardous materials are being stored.	M	
Invasive Species	Town-wide	Town	V	Review native planting lists to incorporate recommendations for plants that are expected to be more resilient to changing climate conditions. Consider adding recommendations for the use of more southern species that might not have historically been considered native to eastern Massachusetts.	M	
	Town-wide	Town	V	Develop comprehensive invasive species management from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift.	L	
Wildlife Habitat	Town-wide	Town	V	Develop comprehensive plan for beaver management to mitigate unpredictable flooding or impoundment impacts. Consider management strategies both for mitigation of negative impacts of beavers as well as strategies for working with beavers to increase flood capacity and improve wildlife habitat.	M	
	Town-wide	Town	V	Investigate the potential benefit of controlled burns to increase resiliency and restore upland wildlife habitat at appropriate open space locations.	L	
Harmful Algal Blooms	Town-wide	Town				
Winter Road Treatment	Town-wide	Town	V	Assess environmentally-friendly road treatment alternatives, including salt brine, byproducts from the brewing industry, and other new products to address excessive chloride concentrations in Cambridge Reservoir. Assess options for both efficacy and cost-effectiveness as well as potential environmental impacts, such as nutrient content.	L	

Appendix B

CRB Workshop Base Map



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Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- 0.2% Annual Chance of Flooding

N
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Miles

Data sources:
MassGIS - Infrastructure, Hydrology, and Administrative Data
ESRI - World Topographic Map - Base Map

FUSS & O'NEILL

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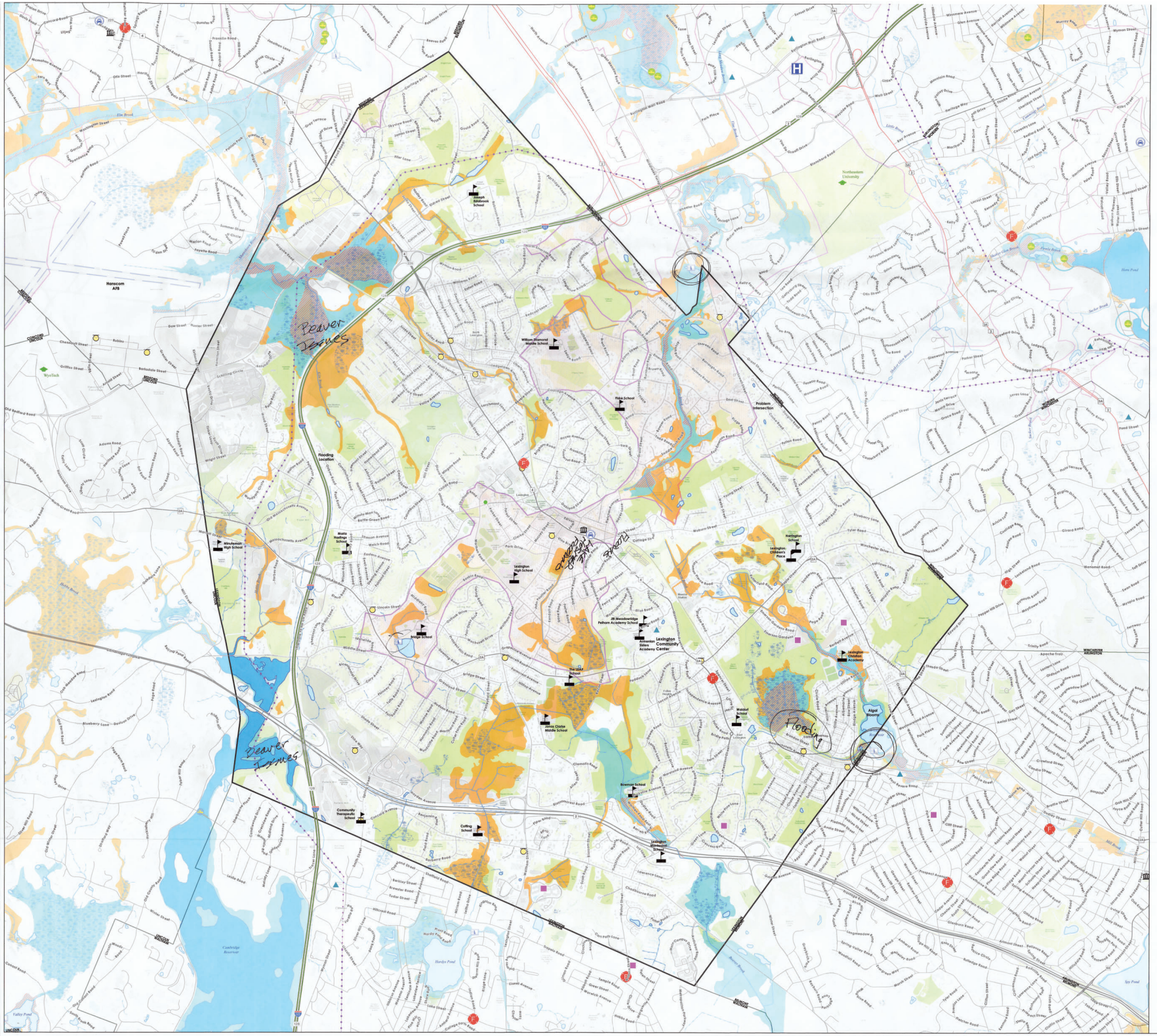
Appendix C

CRB Workshop Outputs: Participatory Mapping Exercise & Risk Matrices



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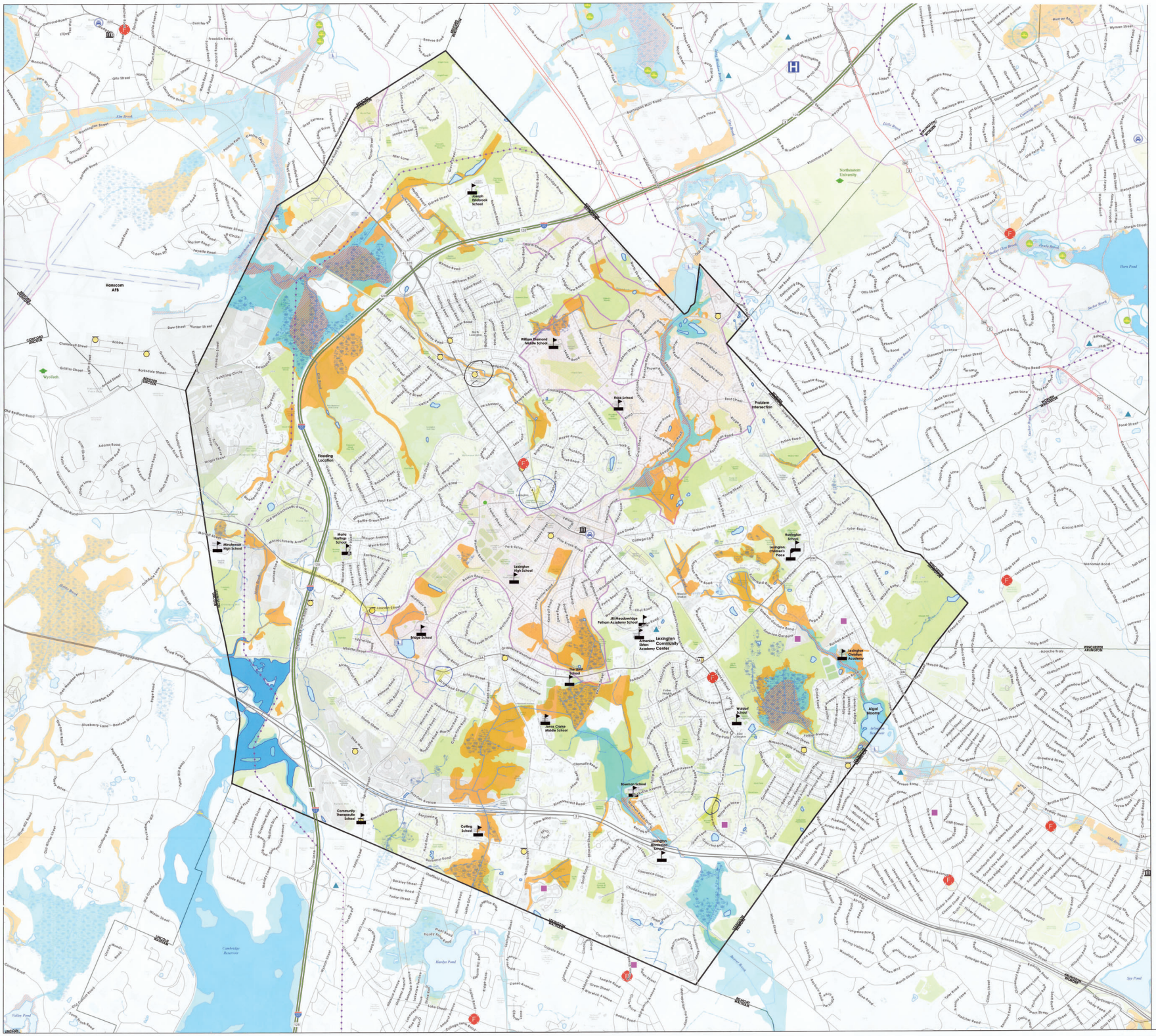

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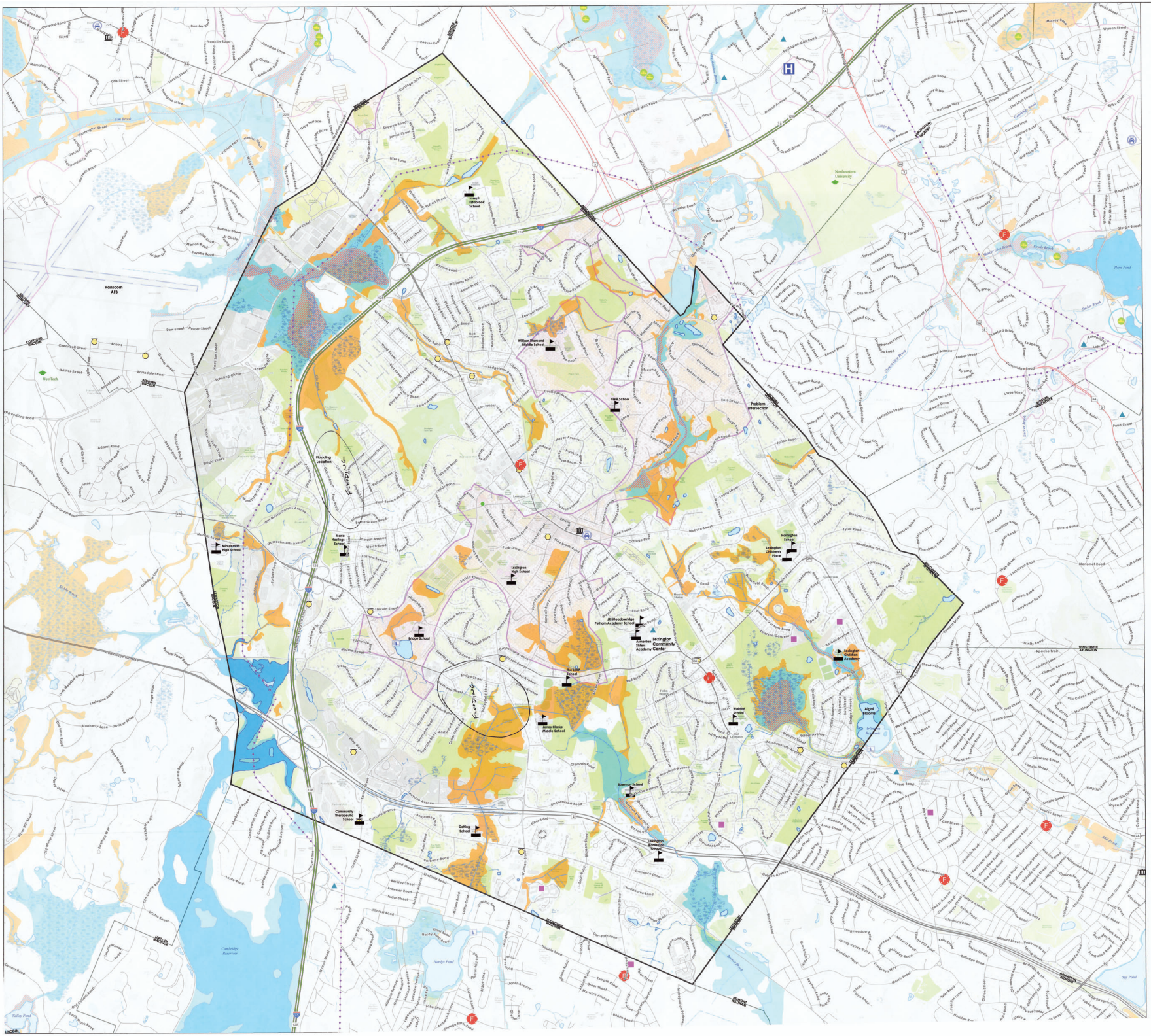
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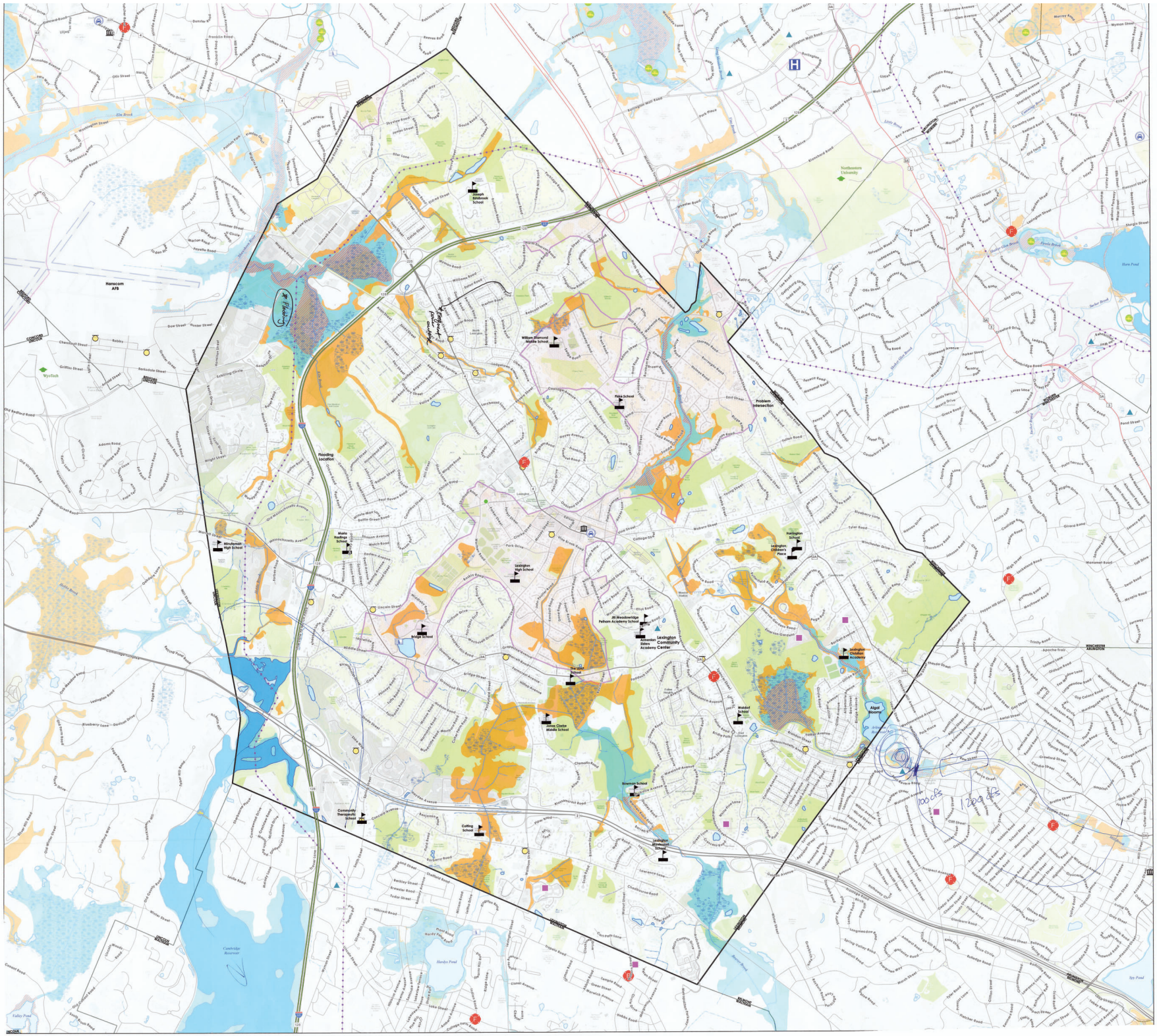

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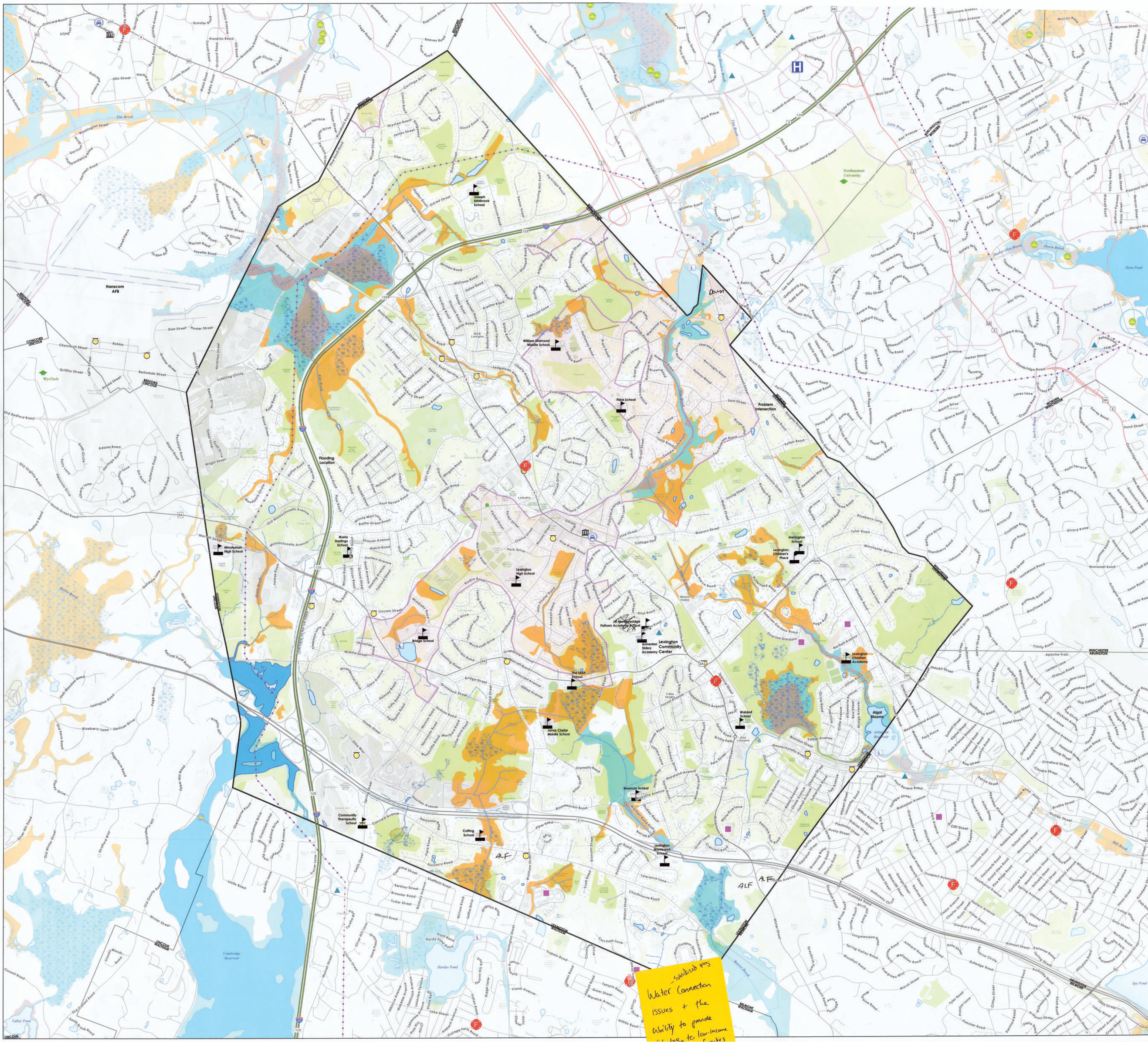

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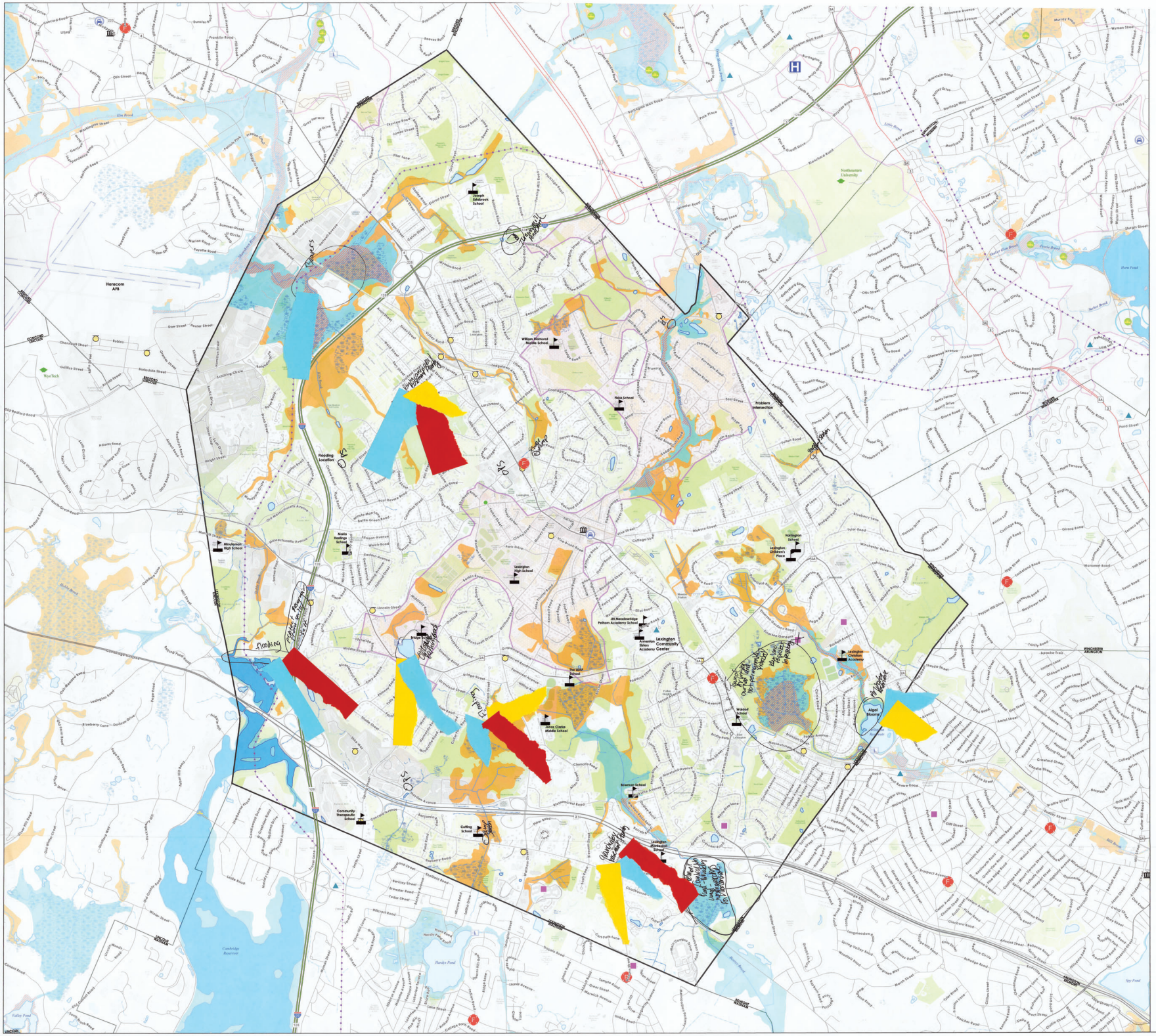

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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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	PRECIPITATION	TEMPERATURE	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural				S: Rain Barrel Program					
CULVERTS/DRAINAGE	TOWNWIDE + SPECIFIC	TOWN + STATE	V	(✓) ✓ - ASSET MGMT PLAN - SW MODELING - TREES - BLOCKAGES	✓ (S) PLANT - TREES to SOAK UP WATER		✓	H	
Power Distribution	TOWN WIDE + SPECIFIC	EVERSOURCE	V		✓	✓ work w/ Eversource to assess locations for	✓ STRATEGIC UNDERGROUNDING	H	
SEWAGE PUMP STATIONS + FORCE MAINS	SPECIFIC	TOWN	V/S	✓ HARDEN/MOVE PUMP STATION	✓				
TREES	TOWN WIDE	TOWN + EVERSOURCE + PRIVATE	V/S	Urban Forest Master Plan; Professional recommendations for type, location, optimal recommendations to convince DPW (3rd Bury)		✓	✓	H	
WATER DIST. SYSTEM	SPECIFIC	TOWN	V			✓			
GAS DIST	TOWNWIDE	Nat. Grid	V			✓			
Societal									
EMERGENCY COMM	SPECIFIC	TOWN	V/S		✓		✓	H	
" SHELTERS	MULTI-SPECIFIC	TOWN	V+S	✓	✓	✓	✓ MORE ROBUST PLANNING NEEDED		
PUBLIC HEALTH EDUCATION	TOWN WIDE	TOWN + STATE	V/S	✓ DEVELOP Guidelines for the public on how to prepare + respond	✓	✓ implement via public info. officer	~~MORE ROBUST PLANNING~~		
Environmental	e.g. - Downst. of Constitution Rd before golf course								
STREAM BED STABILITY (erosion)	TOWN WIDE	TOWN	V	✓ Assessment w/ flood/precip modeling for @ risk locations	✓	PLAN: - armoring - natural-based solutions - restoration/allowing to naturalize			
HEAT ISLAND EFFECT - COOLING	TOWN WIDE	+ PRIVATE	V	Study areas to retire sidewalks		✓ TREES HELP, TREES 9/22P	- Reduce/Disconnect Impervious + shade impervious	Identify locations to	
INVASIVE SPECIES	TOWN WIDE	+ PRIVATE	V	S: DPW does 3 yr. mngmt plan w/ DOE projects; S/V: Conservation has I.S. plan → make more robust		✓ Risk Assessment & Corrective Recommendations followed by action program			
PESTS (TICKS, RODENTS, ...)	TOWN WIDE	+ PRIVATE	V	✓ - Education/Response for homeowners					
TREES	TOWNWIDE	TOWN + PRIVATE	V/S	- PREVENT FLOODING		✓	- no ALB yet; - 2 cases of Emerald Ash Borer, 30 trees removed	currently winter moths [?]	

Existing = 1 @ High School

Daylighting: - Willard's Woods [?] Wapper [?] Hill

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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	EXTREME TEMPS	PRECIPITATION	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Aboveground ~~Electricity~~ Electric Utilities	TW	Public + Private	V	✓ micro grids - particularly to essential Services	✓	✓ town wide	✓		
Road Closures	TW	Public	V	✓	✓ - maintenance of Roads	✓	✓		
Power Outages	TW	Public	V	✓			✓		
WATER Availability	TW	Public	V		✓ Drought preparation ⓥ future burdens on MWRA water	✓			
Area Access to Open Space	TW	Public	V/S	✓ trail / infrastructure - mitigation, cooler atmosphere (S)		✓	✓ Trail maintenance ⓥ		
Increase town-wide impermeable surfaces	TW	Public/Private	V	✓		✓			
Societal									
Acess to Emergency Services	TW	Public	V	✓	✓	✓	✓		
Acess to Open Space	TW	Public	V						
Increase in Vectra Borne disease	TW	Public/Private	V	✓ Tick born diseases, mosquitoes, mold,	✓	✓			
At-Risk Population	TW	Public	V/S	- Identifying those people, out-reach, - identifying groups that work with them. - Language barriers to community Code Red and other communication of power outages, etc.					
Information sharing Across departments.	TW	Public	V	- Regarding identified At-risk population during emergencies					
Development - Business + Private + Public	TW	Public/Private	V	- Change in by-laws & Building Codes to build more sustainability building - Incentive Progms					
Environmental Community Buy-in	TW	Public/Private	V/S	Stormwater ~~Grants~~ program - very supportive utility → of climate change artics		Stormwater Utility Program ↑ buy in for higher initial costs			
Access to Open Space			V		Control Burns		Control burns		
Algael Blooms & Cyanobacteria in Water Supplies - ~~Public~~	TW	Public	V	✓ municipal use of toxics	✓ in lawns	✓ Arlington Res old pools - swimming community pools			
Water quality			V						
Air Quality			V		✓				
Fire Risk			V		✓ ~~control burns~~		✓		
other Local Community Environmental Problems				✓		✓			

INASIVE plants + Forest pests

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

Features	Location	Ownership	V or S	FLOODING	PRECIPITATION	TEMPERATURE	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Above ground utilities	Town wide	private	✓				trees falling *analysis of key locations where potential problems could occur *more aggressive tree mgmt	M	Ongoing
Roads	Town wide	Public (most)	V during events S quality/condition	Mild temp. hazard *more stormwater storage *increased assessment	*analyze existing sys. *upgrade existing sys for storm drainage	*cont. preventative maintenance	Trees falling *More aggressive tree mgmt	M	ongoing
Mode "shift" transportation	Townwide	Public	V & S	*Increase commuter capacity (expand bike path) *Study of types of transportation (ebikes, scooters, etc) *increase access points to other major roads				L → M	long term ~~ongoing~~
Below ground utilities	Townwide	Private	S	*Cont. proactive/preventative updates to current service *Cont. I/I to address ~~Storm~~ sewer water drainage				H	Short-term
Wireless	Townwide	Private	✓	*Info. & analysis on infrastructure + reliability of wireless service throughout town.				L	ongoing
Societal									
Home bound / Dependent adults	Townwide	Public	V			*needs assessment for emerg. assistance		H	ongoing
Seniors	Townwide	Public	V		Transportation *increase access to Pub. trans *back up for emerg. transp.	*health issues *assess what help is needed during emergency. * *		H	ongoing
Communication	Townwide	Public	S	*Metrics for modes of com. *analyzing effectiveness of com. especially during emergencies				H	~~long-term~~ ongoing ~~ongoing~~
Water utility assistance	Avalon Bay / Town border (Main Campus Dr.)	Both	✓	intermunic. agreement for w/s discount				L	ongoing
Environmental									
Stormwater	Townwide	Both	V	*analyze existing infastructure / ID fixes + improvements for stormwater removal *Installing controls + treatment				H	ongoing
Increased risk of disease(s)	Townwide	Public	V	*Increase awareness + education (routine updates) *promoting areas of green inf. ↳ surveying town on ind. basis.				M	ongoing

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Features	Location	Ownership	V or S	FLOODING	TEMPERATURE	PRECIPITATION	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Drainage infrastructure (Culverts, green infrastructure	Town-wide	Town State Private	V/S	– Evaluate local regs to find amendments to reflect climate resiliency opportunities; S – Daylighting Streams – Whipple Hill – Summer St, Willard's Woods – North St.		175 Hayden Ave.	– Evaluate weather data and potential rainfall amounts / Evaluate storm intensities used in modelling	H	O
Road way	Town-wide	Town State Private	V/S	operation and maintenance	– # temp. # temp. * Maintenance of roadway surface			H	O
Reservoirs – Cambridge Water Supply, Old Reservoir → Bathing Beach, Arlington Reservoir	Cambridge water, Hobbs Brook, Lexington, Marrett Rd, Arlington, Lowell St	Cambridge, Lexington, Arlington		– Hazard/spill containment	* Manage Algae Blooms.	tool kit – salt contamination; Operation: maintenance planning		H	O
DAMS – Butterfield, Old Reservoir, Turning Mill Pond Dam	Lowell St, Marrett Rd, Turning Mill Rd/Rts	Lex/Burlington, Marrett Rd/Town, Town		Dam Assessment Risk/Removal				L L M	L L L
Hartwell Ave Commercial Zone	West Lex.	Private, Town, HAFB, Massport, Lincoln Co.		* Evaluate Climate Change hazards for Hartwell Avenue prior to expanding development; * Conduct 100 yr storm flood elevations in Hartwell corridor – results – Adopt stricter flood plain management regs to protect area					
Compost / Solar Facility; Sewer – Pumping Stations	Hartwell Ave; Townwide locations	Town; Town							
Societal Basement Flooding – Town-wide; Power line utility		Street, Marrett Rd, Worthen Rd, Bedford/Highway		Study to explore how to handle basement flooding; Adopt regulation to restrict basements built within groundwater / education and outreach					
Special Populations – medical conditions / age				* Communication to specific populations – create clear messages					
Recreation Facilities									
Hazard Pollution Planning				* Coordinate planning efforts re: potential chemical hazards on highway corridor that can impact water supply					
~~Behavioral~~									
Emergency Planning / Site Dispensing									
Communications Technology				* Alternative means of distributing public information if power goes down					
Environmental									
Stormwater Runoff / Management				* Evaluate standards to apply Town wide to lots under an acre (not just wetland jurisdictional sfh lots.); * Evaluate opportunities for improved green infrastructure / management in existing conditions where development projects					
Rivers, Streams, wetlands ~~protection~~			S	* Evaluate regulation amendments to provide further protection.					
trees	Town, State, Private	Town, State / Federal, Private			* Evaluate Native Plant List to reflect temp zone.				
wild life habitat				Potential * Beaver populations; * maintaining bio diversity for health → keep clean		vector borne diseases potential			
Open Space / Recreation areas.			S	Access for management to deal w/ emergency control / burning open space	* Evaluate Native Plant w/ habitat & temp zone; * Prioritize key areas for land acquisition	for Recreation:	Evaluate facilities for Climate Change hazard planning	hazards and develop plan	
Drinking water Groundwater				* provide infiltration + treatment of stormwater runoff; * Reduce Chloride + salt use.					

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Features	Location	Ownership	V or S	FLOODING	PRECIPITATION	TEMPERATURE	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
TREES — ENERGY LOSS/DAMAGE CONTRIBUTE TO GAP MITIGATION	TOWNWIDE	TOWN/PRIVATE	V/S	DEVELOP ACTION PLAN TO ADDRESS PROBLEM TREES, INC FUNDING, REMOVE & REPLACE, EDUCATION	✓		INVENTORY UNDERWAY	H	O
ROADS — CONSIDER & EDUCATE ON TRAFFIC DESIGN SOLUTIONS; EVAC ROUTES		MASS DOT — MERRITT RD; TOWN — LINCOLN, SPRING & MERRITT		✓	✓	→ (A) Alert & Sleep on all buildings	✓		
Power.		HARRINGTON & HANCOCK (S)		UTILIZE MESSAGE BOARDS, CONSIDER IF MORE ARE NEEDED	Portable generators; → MICRO GRID & BIKE PATH		(V) Upgrade of Radio System.		
ESSENTIAL TOWN FACILITIES — LINKED BY BIKE PATH — POTENTIAL FOR UNDERGROUND SOURCE - MICROGRID					→ AT&T: FirstNet	→ Prioritized cell coms. (S); → Redundancy in 2-way coms (microwave) (S); → Fiber redundancy. (S)	[illegible]		
Cellular. — GENSET MOUS IN PLACE			(V) (S)	PREPARE AN ENERGY ASSURITY ASSESSMENT					
WEATHER STATIONS — INSTALL MORE, DEVELOP NETWORK — CONSIDER NEWTON, OTHER (25-30 mile radius) TIES TO REVERSE 911 — INCLUDE MORE REAL TIME LOCAL INFO — HEAT WAVES, BLACK ICE, LIGHTNING, MICROBURST						— FUNDING FOR STATIONS		H	O
Societal — NEIGHBORHOOD FLOODING — [illegible]									
Nursing Homes & Care facilities	For instance gas leak - had 30-40 ambulances needed or H_2O main break	Private - should have action plan	✓	✓ * Review of evacuation plans → transparency					
Reverse 911 — more & more utilized	TOWNWIDE	T	S	✓	✓	✓	—		
SHELTER STATION AT FIELD HOUSE (HIGH SCHOOL) → FOOD & WATER ← Already Plan in place.									
COMMUNITY CTR — COOLING CTR — INCLUDE IN ENERGY ASSURITY ASSESSMENT									
→ In home, at risk population.	Townwide	TOWN	V	list @ town level of at risk folks./ Proactive Response.....			CERT TEAM // opportunity to work with Hanson.		
Environmental									
Trees									
CHEM STORAGE FACILITIES, BROWNFIELDS, USTS	Townwide	Town Private	✓	✓	✓	✓ get more info about location and cc risks —		M	O consider [illegible]
(*) Storm water Management: Bio Basins									
(*) Challenges with "new" Solutions → Life cycle cost. → Procurement can undermine getting the most qualified vendor. (key with "new" solutions).									

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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	PRECIPITATION	EXTREME TEMPERATURE	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Electricity	Town Wide			Inventory vulnerabilities. Harden where needed. Tree mitigation. Micro-grids. Redundancy.		Higher demand		H	
Water				Contamination of private wells. Incentives for storm water mgmnt.					
Sewer/septic				Danger from pre-existing private systems					
Roads				Identify key routes.					
Schools/Town Facilities				Design for electricity outage. Multi-day. Resilience levels for different departments/community/population needs					
Communications									
Societal Lanscom			(S)	Micro-grid. Communications hub, Upgrades ongoing (V-transportation of employees in emergency					
Vulnerable Populations				Greeley Village, Countryside Manor, Countryside Village, Vinebrook Village, Nursing homes, Lexhab sites, Brookhaven Need assessment inventory populations					
Emergency Mgmnt Plan				Evacuation Plan Yearly review at town mgmnt level. Staffing plan for key employees.					
Public Shelters				Historically not used. Current need town-wide inventory of vulnerable households Focus on heating/cooling centers. Drop in use					
Hazardous materials inventory									
Enhanced Code Red system to reach entire population. Non-English speakers									
Social resiliency/neighborhoods				Know your neighbor campaign. Know where vulnerable individuals live. Block Parties					
Environmental									
Tree mitigation-utility impact					Snow/ice		Wind events		
Watershed/flooding issues									
Storm water impacts				Upgrade when replacing. Existing system maxed out. Needs more mit. gation actions) Incentives					
Teardowns				Storm water regneeded for every tear down					

Appendix D

CRB Workshop Presentation Materials

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Boston Firefighters, January 4, 2018 (Reuters)

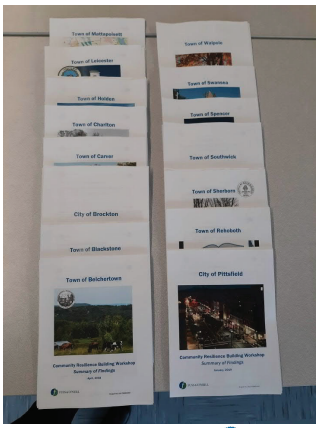
Old Reservoir

Municipal Vulnerability Preparedness Program
MVP Workshop
Town of Lexington
March 21, 2019

Community Resilience Building Workshop

Agenda

- **CRB Team and participant introductions**
- **Introduction to Massachusetts Municipal Vulnerability Preparedness Program (MVP)**
- **Introduction to Climate Change and the Town of Lexington**
- **Discussion by Lexington participants on status of current planning and risks**
- **Introduction to CRB Workshop process**
- **Large group**
  - Review top four hazards
- **Small work groups (Using Risk Matrix)**
  - Identify Lexington's vulnerabilities and strengths
  - Prioritize response actions
- **Lunch**
- **Large group**
  - Report out from small groups
  - Determine overall priority actions for the Town
- **Discussion on next steps**
- **Conclusion**



FUSS & O'NEILL

Fuss & O'Neill Overview

Fuss & O'Neill is a leading MVP consultant in assisting Massachusetts communities secure grant assistance, achieve designation as a Massachusetts Municipal Vulnerability Preparedness (MVP) community, and execute their MVP priority projects.

The MVP team is experienced in local government, environmental services, civil site engineering, stormwater management, and emergency management.

Fuss & O'Neill assisted new MVP communities secure more than $700,000 MVP Action Grants in the program's first funding round.

MVP Project Team

Mary Monahan

Mary is a municipal public works specialist well-versed in issues related to stormwater management; wastewater collection and treatment; drinking water supply, treatment, and distribution; solid waste management; and sustainable operations. Mary serves as a liaison between the public works project owner and the design team.

Julie Busa

Julie is an environmental scientist in the Water Environment and Natural Resources group of Fuss & O'Neill. She has over 10 years of experience in the areas of global biodiversity and forest conservation, sustainability, and ecological modelling. Julie works extensively with municipalities on MS4 compliance and the MVP program.

MVP Project Team

Bill Guenther

Bill is an Environmental Scientist in Fuss & O'Neill's Water and Natural Resource Planning Department. His principal areas of expertise include watershed and stormwater management, water quality monitoring and evaluation, Illicit Connection Detection and Elimination (IDDE) surveys, structural and non-structural stormwater BMP selection, and Harmful Algal Blooms (HABs).

Matthew Skelly

Matthew is a transportation engineer in the Traffic/Highway Group of Fuss & O'Neill's Transportation Business Line. He has a wide range of experience in traffic impact analysis, feasibility and planning studies, transit planning studies, traffic calming, traffic signal design, and roadway design.

Stefan Bengtson

Stefan is an Environmental Scientist in Fuss & O'Neill's Water and Natural Resource Planning Department. His principal areas of expertise include watershed management, water quality monitoring, GIS analysis, and statistical modeling. He has also led field crews in wetland monitoring and ecological research.

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Lexington's MVP and HMP Program - $37,500

Grant Supports Climate Change Vulnerability Assessments and Resiliency Planning and Local Hazard Mitigation Planning

- **MVP Comprehensive Approach**
  - **Infrastructure**
  - **Society**
  - **Environment**
- **HMP Comprehensive Approach**
  - **Assessment**
  - **Participation**
  - **Prioritization**

MVP Designation Leads to Enhanced Standing in Future Funding Opportunities

FUSS&O'NEILL

MVP Action Grant NEW

- **Grant supports priority actions identified at Community Resilience Building Workshop**
- **Up to $2 million available**
- **Local match of 25% - can be in-kind**
- **April 19, 2019 deadline**
- **Requires MVP certification**

Only those communities which have completed the CRB workshop are eligible to apply

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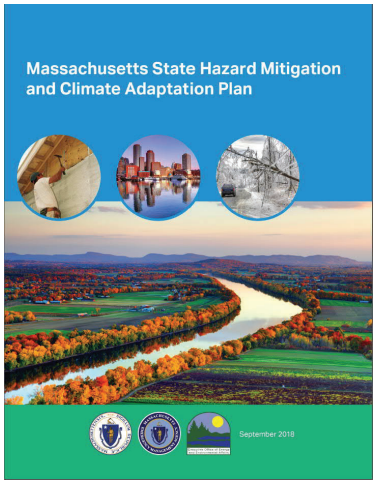
  - MA State Plan
  - Pittsfield
  - Blandford
  - South Hadley
  - Ludlow
  - North Reading
  - UMass Amherst



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Mitigation Defined

- Any action taken to reduce or eliminate long-term risk to life and property from hazards.

Mitigation Saves Lives

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	$4:1	$6:1
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

Natural Hazards

Primary Climate Change Interactions	Natural Hazards
Changes in Precipitation	• Flooding • Drought • Landslide
Rising Temperatures	• Average/Extreme Temperatures • Wildfires • Invasive Species
Extreme Weather	• Hurricanes/Tropical Storms • Severe Winter Storm/Nor'easter • Tornadoes • Severe Weather (strong winds/extreme precipitation)
Non-Climate Influenced Hazards	• Earthquake

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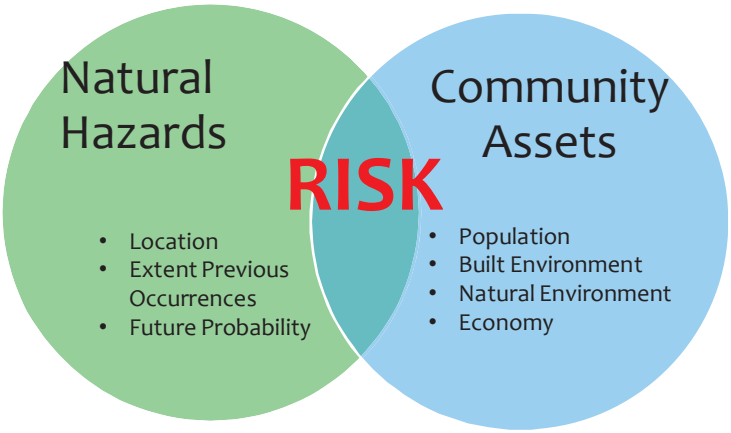
Lexington's Risk?



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Possible Mitigation Actions

- Generators/back-up power for
  - Town Hall
  - Pump Stations
  - Senior Center
- Mitigation actions for historic properties
- Tree mitigation
- Shelter-in-place education

Mitigation Planning

Next Steps	Survey Participation
	Core Team Mitigation Actions Meeting
	Public Meetings

Thank You

Jamie Caplan

Jamie Caplan Consulting

Office) 413-586-0867

jamie@jamiecaplan.com

Terminology

Town of Lexington – Charles Basin and Shawsheen Basin

Rising Temperature

Charles Shawsheen	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Average Annual Temperature (°F)	49.38 48.85	2.05 2.27	to	4.02 4.43	2.67 2.94	to	6.07 6.36	3.23 3.49	to	8.79 9.14	3.49 3.80	to	10.72 11.03
Annual Days with Maximum Temperature over 90°F (Days)	8.95 6.86	7.08 7.12	to	19.58 19.09	10.01 9.97	to	35.04 32.49	12.74 11.78	to	56.79 54.36	15.17 14.06	to	75.87 71.94
Annual Days with Minimum Temperature below 32°F (Days)	136.36 139.15	-10.38 -12.22	to	-25.73 -30.06	-16.89 -18.88	to	-38.60 -42.27	-20.22 -22.01	to	-52.35 -56.63	-22.22 -25.03	to	-63.10 -67.51

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Town of Lexington – Charles Basin and Shawsheen Basin

Changing Precipitation

Charles Shawsheen	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Total Annual Precipitation (Inches)	46.55 45.01	-0.04 0.31	to	4.77 4.84	0.23 0.23	to	6.13 6.51	1.24 1.15	to	7.47 7.90	0.74 1.20	to	8.18 8.27
Annual Consecutive Dry Days (Days)	16.92 17.1	-0.47 -0.66	to	1.46 1.99	-0.65 -0.57	to	2.35 2.30	-1.00 -0.48	to	2.97 2.79	-0.77 -0.26	to	2.71 2.93

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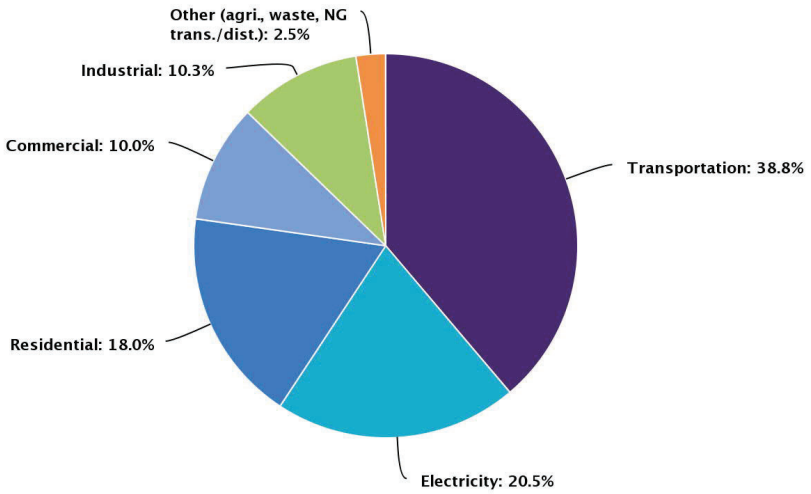
2015 MA GHG Emissions by Sector

76.3 MMTCO2e



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Stakeholder Updates

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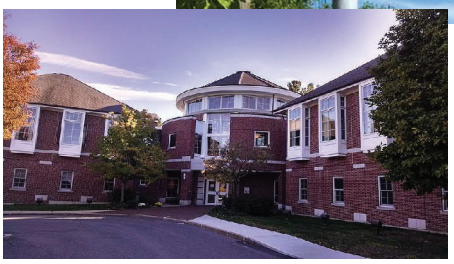
Climate Change Impacts - Temperature

- **Economic**
  - **Winter Recreation**
  - **Snow and Ice**
- **Agricultural**
  - **Longer Growing Season**
- **Health**
  - **Increased Pests**
  - **Heat Stroke**
- **Infrastructure**
  - **Road Buckling**
  - **More Potholes**
  - **Power Outages**
- **Environment**
  - **Change in Habitat**



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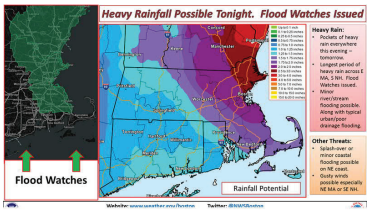
Climate Change Impacts - Precipitation

- **Economic**
  - **Dangerous Floods**
  - **Lost work time**
- **Agricultural**
  - **Excessively Wet Spring**
  - **Drought**
- **Health**
  - **Flood/High Water-related Deaths**
  - **Emergency Response Delays**
- **Infrastructure**
  - **Road Washout**
  - **Environment**
  - **Sewer System Overflows**
  - **Compromised Bridges**
- **Changes in Habitat**



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Risk Matrix – Determine Top Four Hazards

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.com

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

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

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

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Climate Change Hazards

- **Flooding**
- **Extreme Precipitation Events**
- **Heat Waves**
- **Drought**
- **Snow/Ice**
- **Wildfire**
- **Tornadoes**
- **Hurricanes**
- **Nor'easters**
- **Other**

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Lexington's Top Four Hazards

- **Flooding**
- **Precipitation**
- **Extreme Temperature**
- **Wind Events**

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Community Resilience Building Workshop

- **Review MVP Sectors**
- **Maps as tool**
- **List infrastructure, societal, environmental feature**
- **Determine whether a vulnerability or strength**
- **Identify actions to reduce vulnerability or reinforce strength**
- **Prioritize actions**
- **Report Out**

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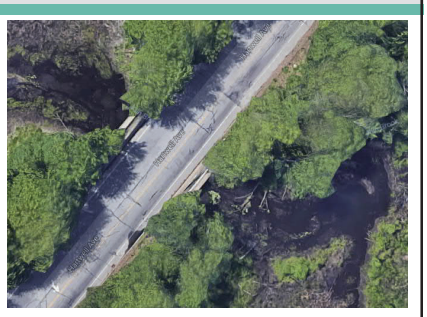
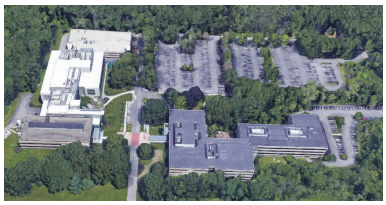
MVP Sectors

- **Infrastructure**
  - Evacuation routes
  - Schools
  - Roads, bridges, dams
  - Water and wastewater
  - Septic systems
  - Hospitals
  - Commercial Buildings, churches
  - Utilities: electric, gas
  - Factories
  - Emergency management facilities





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MVP Sectors

- **Societal**
  - Emergency shelters
  - Senior housing
  - Schools and campuses
  - Economically challenged populations
  - Evacuation plans
  - Animal shelters
  - Hospitals, pharmacies
  - Grocery stores
  - Utilities: electric, gas
  - Homeless
  - Other

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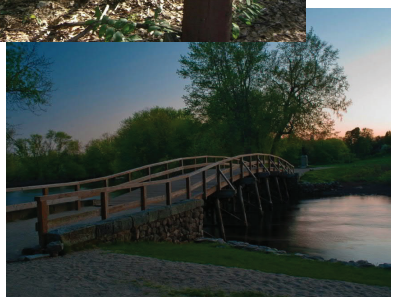
MVP Sectors

- **Environmental**
  - **Drinking water supply**
  - **Rivers and streams**
  - **Parklands**
  - **Agriculture**
  - **Title V systems**
  - **Stormwater management**
  - **Open spaces**
  - **Flood plains**
  - **Forest**
  - **Other**



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Community Resilience Building Workshop

Next Steps:

Public Review of Priorities
Monitor and Update
Annual Review

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Community Resilience Building Workshop

Questions?

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Listening Session

Town of Lexington

Municipal Vulnerability Preparedness
Hazard Mitigation Plan
Public Listening Session

WEDNESDAY, June 13, 2019
Selectman's Room, Lexington Town Hall
1625 Massachusetts Ave, Lexington, MA 02420
8AM – 9AM

- The Town of Lexington received a $37,500 grant from the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) to participate in Municipal Vulnerability Preparedness Planning (MVP) and update its Hazard Mitigation Plan (HMP).

- The Listening Session is an opportunity for members of the public to learn about the MVP and HMP planning process and the planning priorities, ask questions, and provide additional input related to climate change resiliency and natural hazards.

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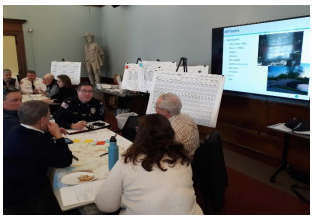
Boston Firefighters, January 4, 2018 (Reuters)



MVP Community Resilience Building Workshop, March 21, 2019

Municipal Vulnerability Preparedness Program Listening Session

Town of Lexington

June 13, 2019

Listening Session

- Introduction to Massachusetts Municipal Vulnerability Preparedness Program (MVP)
- Introduction to Lexington's Hazard Mitigation Plan Update
- Introduction to Climate Change and the Town of Lexington
- Discussion of MVP Priorities
- Introduction to Upcoming Actions
- Discussion
- Next Steps

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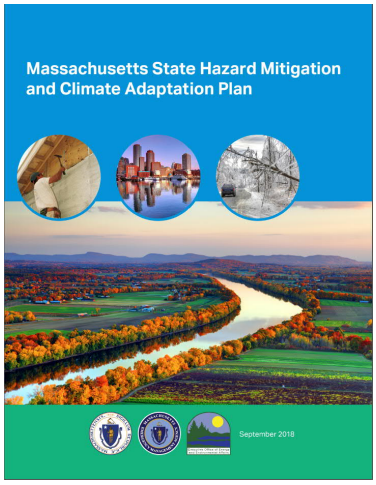

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Lexington's MVP and HMP Program - $37,500

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- HMP Comprehensive Approach
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MVP Designation Leads to Enhanced Standing in Future Funding Opportunities

FUSS&O'NEILL

MVP Action Grant NEW

- Grant supports priority actions identified at Community Resilience Building Workshop
- Up to $10 million available
- Local match of 25% - can be in-kind
- April 19, 2019 deadline
- Requires MVP certification
- Next Action Grant anticipated Summer 2019

Only those communities which have completed the CRB workshop are eligible to apply

FUSS&O'NEILL

Terminology

Climate Change

The Change in Usual Climate Conditions

- Rising Temperature
- Changing Precipitation/ Rainfall Amount and Intensity
- Sea Level Rise

Town of Lexington – Charles Basin and Shawsheen Basin

Rising Temperature

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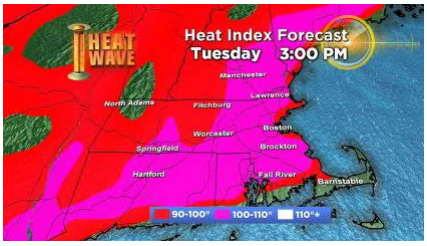
MVP Planning Process: Summary of Findings

Lexington's Top Hazards

- Flooding
- Precipitation
- Extreme Temperatures
- Wind



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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

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

Features	Location	Ownership	V or S	Flooding	Precipitation	Extreme Temperatures	Wind	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Culverts and Bridges	Town-wide	Town	S	Lexington has already completed several culvert upgrade projects with designs that meet Army Corps standards for storm readiness and habitat quality.					
	Town-wide	Town	V	Inventory and upgrade culverts and bridges to rank and prioritize projects for increased flooding resiliency and storm- hardening, followed by design and implementation of priority re-sizing or replacement projects. Green infrastructure, Low- Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios. Focus on known problem areas as well as structures Town-wide.				H	
Dams	Town-wide	Town	S	Recent dam repairs have been made to both of the Town's major dams.					
Stormwater Infrastructure	Town-wide	Town	S	The Town has installed green infrastructure practices such as bioretention areas and raingardens at Town facilities, including the DPW Public Services facility and some of the schools.					
	Town-wide	Town	V	Increase maintenance of catch basins, conveyances and detention ponds. Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Review and improve maintenance schedule and budgets, keep up with regular maintenance of publicly-owned structures, and increase frequency of street sweeping and catch basin cleaning.				H	
	Town-wide	Town	V	Develop green infrastructure solutions for stormwater management to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding. Develop a list of specific priorities, assess feasibility and cost (including lifecycle cost analyses), rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Also review the Town's already strong regulations and update as necessary to support green infrastructure and low-impact development.				H	
Water and Wastewater Infrastructure	Town-wide	Town	S	The Town is in the process of adding back-up generators at pump stations to ensure that all pump stations continue to operate during power outages.					
	Town-wide	Town	S	Lexington has installed Variable Frequency Drives at pump stations to save on energy use and increase equipment longevity.					
	Town-wide	Town	V	Develop and implement designs for storm-hardening at vulnerable pump stations, including evaluating the option of relocating pump stations for greater flood resilience. Establish priority actions for reducing potential flooding impacts, including consideration of nature-based solutions or green infrastructure approaches. Continue to implement emergency back-up power solutions for all pump stations.				H	
	Town-wide	Town	V	Continue implementing upgrades to reduce sewer infiltration and inflow and locating and eliminating illicit connections to decrease inputs of groundwater into the sewer system.				M	
Utilities Infrastructure	Town-wide	Town	S	Lexington has been proactive with preventative measures to maintain underground utilities.					
	Town-wide	Town	V	Investigate opportunities to establish a micro grid to maintain power in key areas independent of the main grid and support emergency operations and other key emergency response systems when electric power is lost. Consider how and if the rail trail behind these facilities can be used to connect Town Hall and emergency operations in emergency events. Focus on establishing redundant systems as well as increasing maintenance of existing infrastructure.				H	

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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

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

Features	Location	Ownership	V or S	Flooding	Precipitation	Extreme Temperatures	Wind	Priority H-M-L	Time Short Long Ongoing
Societal									
Communication Services	Town-wide	Town	S	The Town recently hired a Public Information Officer to increase communication and accessibility of information.					
	Town-wide	Town	S	Lexington utilizes the Code Red system as an opt-in option for communication alerts.					
	Town-wide	Town	V	Upgrade the Town's radio systems and consider whether copper connections between Town buildings could offer strategic resilience to decrease reliance on cellular service during emergencies.				H	
Vulnerable Populations	Town-wide	Town	S	The Town has an established Emergency Operations Center with access to cots and other equipment for sheltering needs.					
		Town	V	Identify vulnerable populations and foster an improved communications network for reaching all residents, and especially vulnerable populations, in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance.				H	
Commercial Districts	Town-wide	Town/Private	V	Develop a Climate-driven City-wide Business Improvement Plan to support Lexington's existing commercial districts and make the business community more resilient. Evaluate potential climate change risks to the Hartwell Avenue Commercial District and include mitigation recommendations when considering expansion of the district.				H	
Transportation	Town-wide	Town	V	Conduct a traffic study with particular focus on the three known choke points in Town that are considered to be likely problem areas during hazard events, especially if a hazard results in diversion of traffic off of the highway.				H	
Resident Engagement and Education	Town-wide	Town	S	Lexington has a Sustainable Action Plan to address resilience and sustainability issues.					
	Town-wide	Town	S	Lexington has many active organizations that contribute to resilience building, including the Global Warming Action Coalition, the Resilient Mystic Collaborative and Citizens for Lexington Conservation.					
	Town-wide	Town	V	Incentivize or regulate good pesticide/fertilizer management and lawn-maintenance BMPs.				L	
Pests and Disease Control	Town-wide	Town	V	Assess additional mosquito/tick/pest control options, including the use of nature-based solutions such as the establishment of buffers between developed and undeveloped areas. Determine future risks due to increase in type and quantity of pests/disease vectors due to climate change. Build on existing efforts by the Board of Health and East Middlesex Mosquito Project to continue proactive planning and education and outreach programs.				M	
Development	Town-wide	Town	V	Review and revise Town regulations pertaining to stormwater management and compliance in order to increase resiliency, ensure that regulations accommodate and encourage nature-based solutions, and provide legal authority to enforce protective measures. Develop new standards for projects/lots under an acre in size to expand the Town's jurisdiction over stormwater management.				M	

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

Features	Location	Ownership	V or S	Flooding	Precipitation	Extreme Temperatures	Wind	Priority H-M-L	Time Short Long Ongoing
Environmental									
Tree and Forest Management	Town-wide	Town	S	Lexington was the first community in the Commonwealth to develop a Tree Bylaw to diminish removal of trees during construction projects.					
	Town-wide	Town	V	Develop an Urban Forest Master Plan to serve as a comprehensive tree, forests and land management program to help address micro-flooding and drainage issues; to identify, remove, and replace problem trees; preserve intact forests and street tree cover; utilize shade trees to limit heat island effects; and provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures).				H	
Open Space	Town-wide	Town	S	The Town benefits from a strong land management and stewardship program.					
	Town-wide	Town	V	Pursue opportunities to fund open space acquisition consistent with Town planning priorities. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands.				M	
Watersheds, Wetlands, and Wildlife Habitat	Town-wide	Town	S	The Town has completed two significant stream daylighting and restoration projects at Willard's Woods and Whipple Hill.					
	Town-wide	Town	V	Develop green infrastructure solutions for stormwater management to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding. Develop a list of specific priorities, assess feasibility and cost (including life cycle cost analyses), rank priority projects in terms of climate resilience potential, and develop concept designs for key projects.				H	
Streambed Stability	Town-wide	Town	V	Assess flood resiliency and stream stabilization opportunities Town-wide. Model flooding and increased precipitation predicted by climate change studies to identify at risk locations throughout Town.				H	
Environmental Contaminants	Town-wide	Town	V	Analyze hazardous materials risk to develop an understanding of how climate-change induced hazards could potentially increase the risk of accidents or spills involving I-95 or other roadways running through Town and quantify the potential risks to the Town that could result from accidents involving various classes and types of materials.				M	
Invasive Species	Town-wide	Town	V	Review native planting lists to incorporate recommendations for plants that are expected to be more resilient to changing climate conditions. Consider adding recommendations for the use of more southern species that might not have historically been considered native to eastern Massachusetts.				M	
	Town-wide	Town	V	Develop comprehensive invasive species management from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift.				L	
Wildlife Habitat	Town-wide	Town	V	Develop comprehensive plan for beaver management to mitigate unpredictable flooding or impoundment impacts. Consider management strategies both for mitigation of negative impacts of beavers as well as strategies for working with beavers to M increase flood capacity and improve wildlife habitat.					
	Town-wide	Town	V	Investigate the potential benefit of controlled burns to increase resiliency and restore upland wildlife habitat at appropriate open space locations.				L	
Winter Road Treatment	Town-wide	Town	V	Assess environmentally-friendly road treatment alternatives, including salt brine, byproducts from the brewing industry, and other new products to address excessive chloride concentrations in Cambridge Reservoir. Assess options for both efficacy and cost-effectiveness as well as potential environmental impacts, such as nutrient content.				L	

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Flooding, Precipitation, Extreme Temps, High Winds

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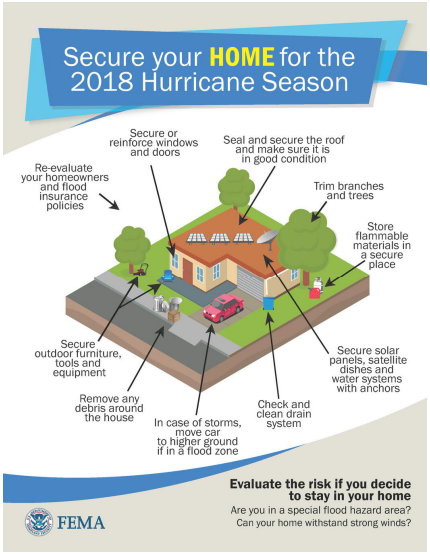
Mitigation Defined

- Any action taken to reduce or eliminate long-term risk to life and property from hazards.



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Mitigation Saves Lives

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	$4:1	$6:1
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

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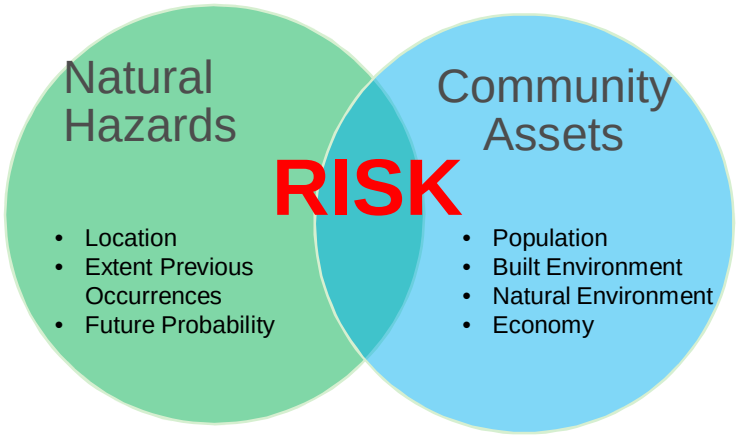
Post-Disaster Choices

Post Disaster Choices

1. Back to normal
2. Build better
3. Improve community

Lexington's Risk?



Natural Hazards

Primary Climate Change Interactions	Natural Hazards
Changes in Precipitation	• Flooding • Drought • Landslide
Rising Temperatures	• Average/Extreme Temperatures • Wildfires • Invasive Species
Extreme Weather	• Hurricanes/Tropical Storms • Severe Winter Storm/Nor'easter • Tornadoes • Severe Weather (strong winds/extreme precipitation)
Non-Climate Influenced Hazards	• Earthquake
Technological	• Dam Failure

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Critical Facilities

Town of Lexington Massachusetts

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Core Team

- Provide supporting data or information.
- Assist in the identification and prioritization of mitigation actions.
- Review and comment on draft plan deliverables.
- Approve final draft plan prior to submission to MEMA and FEMA.

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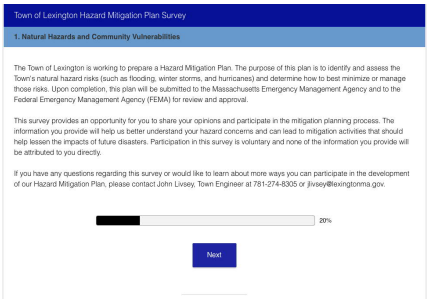
Public Engagement Strategy

- Core Team
- Stakeholder Meetings
- Public Opinion Survey
- Public Meetings
- Public Comment and Review Draft Plan



https://www.surveymonkey.com/r/lexingtonma

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Preliminary Survey Results

- 87 surveys received to date
- Biggest concerns
  - Severe winter storms
  - Severe weather
  - Hurricanes
  - Invasive species
- Most important assets to protect
  - Critical facilities
  - Reduce utility damage
  - Prevent development in high hazard areas
- Preparedness
  - Smoke detectors/carbon monoxide
  - 26% supply kit
  - 14% emergency plan
- Mitigation
  - 80% Removed trees/limbs
- Who took the survey?
  - 53% over 60
  - Estabrook, Bridge, Fiske
  - Email/Text message

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Mitigation Examples

- Recreational fields drainage improvements.
- Access roads in conservation areas.
- Hardy's pond stream clearing.
- Ongoing culvert and drainage upgrades.
- Inventory and upgrade culverts and bridges.
- Identify vulnerable populations and foster an improved communication network.
- Develop a climate-driven town-wide business development plan

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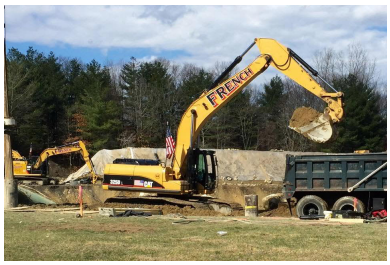
Mitigation Actions

- Local Plans and Regulations
- Structure and Infrastructure
- Natural System Protection
- Education and Awareness Programs



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Plan Adoption And Implementation

Write and Review Plan

Plan Adoption and Implementation

FEMA Approval every 5 years

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Benefits of Mitigation Planning

- Identify cost-effective actions to reduce risk
- Focus resources on greatest vulnerabilities
- Build partnerships
- Increase awareness of hazards and risk
- Communicate priorities
- Align with other Town objectives

FEMA $

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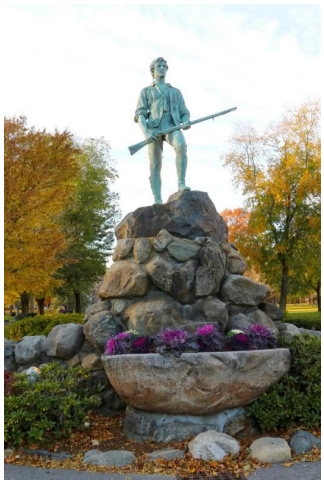
Results!

Reduce losses

Recover faster

RESILIENT!



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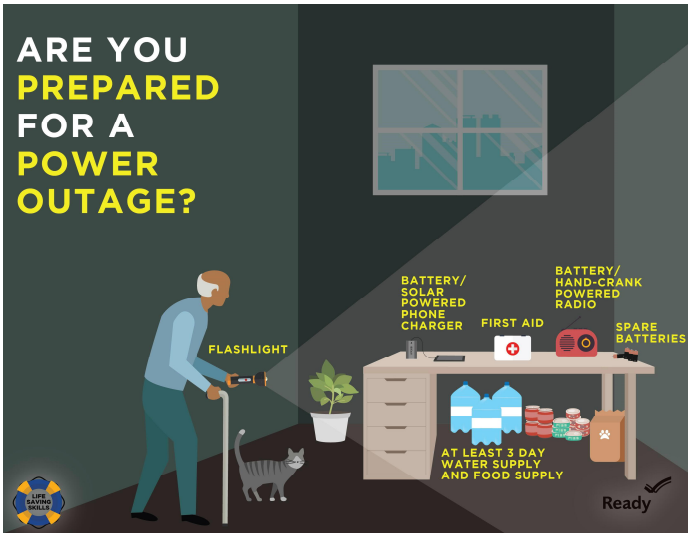
Personal Preparedness and Safety



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Thank You

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Community Resilience Building Workshop

Public Discussion and Q & A

MEETING SIGN-IN SHEET

Project: MVP Listening Session	**Meeting Date: June 13, 2019**
Town of Lexington	**Place/Room: Selectman's Room, Lexington Town Hall**

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Todd Rhodes	482 Marrett Road	339-999 3905	~~tr~~ rhodes.todd@gmail.com

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