Town of Leicester

Community Resilience Building Workshop
Summary of Findings

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FUSS & O'NEILL

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Town of Leicester

Community Resilience Building Workshop

Summary of Findings

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 2017, the Town of Leicester was awarded a $20,000 MVP grant to fund the planning stage of this process. 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 the development of an MVP Core Team, which met on August 22, 2018 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 September 19, 2018, 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 Leicester;
- 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 Leicester. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as ongoing Town conversations about emergency management and Hazard Mitigation Planning. Storm events, such as Nor'easters, and associated wind, ice, and snow were identified as one of the Town's top hazards. Extreme precipitation and flooding, especially drainage-driven issues such as flooded roads, was identified as a second hazard. Wind and associated tree and infrastructure damage was identified as a third hazard. Impacts of extended drought, such as those seen during summer 2016 were identified as a fourth 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 the environment, as well as for various societal elements. Specific areas of concern are identified below.

Top Hazards

- Snow, ice, and Nor'easters
- Extreme precipitation and flooding/hurricanes
- Extreme wind/tornados
- Drought

Areas of Concern

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

Neighborhoods/Communities

Becker College campus, Pine Street neighborhood, Leicester Housing Authority Elderly Housing, ARCHway residential school, McAuley Nazareth Home for Boys

Dams

Waite Pond Dam, Rochdale Pond Dam, Chapel Street Dam

Ecosystems

Henshaw Pond, Greenville Pond, Rochdale Pond, waterbodies affected by beaver activity, algal blooms, and mosquitos

Infrastructure

Cell and communication towers, cross-country water main, aging stormwater/sewer system, pump stations, DPW yard, electrical sub-stations, Route 56 and Marshall Street culvert

Current Concerns and Challenges Presented by Hazards

Increasingly intense storms and extreme weather events throughout the year, including heat waves, drought, tornadoes, microbursts, torrential rain, and ice storms, have seriously impacted the Leicester community in recent years. Frequent heavy rain, high winds, extreme low and high temperatures, and extended periods without rain have caused hazardous conditions such as flooding, washouts, downed trees, ice slicks, and fire-prone lands. These hazards are putting unprecedented strain on existing utilities, buildings, infrastructure, public services, and natural resources.

Leicester has experienced extreme weather events throughout its history. Many residents recall the impacts of the 1955 Hurricane, during which Rochdale Pond flooded. In 1992 and 1995, the Town faced major power outages. There is a general sense, however, that the frequency and intensity of extreme weather and hazard events are increasing. Referring to the impacts of increasing days above 90°F, a Police Sargent at Becker College noted that the "humidity is like it's never been." Tornadoes were virtually unheard of in the area a decade ago, but in the last five years, the number of tornado events in the area have been in the double digits. Town Administrator, David Genereux, also noted that even when storms are smaller in magnitude and do not trigger full-scale emergency operations, the increasing number of smaller, but still significant, events generates real needs that require a response from the Town. Leicester's varying topography sometimes exacerbates hazard impacts as well; the Town's elevation varies from 660 feet to 1100 feet, with many gullies.

In 2006, an ice storm left 70% of Town without power for up to seven days; at one point, 60% of the Town could not be accessed due to downed trees. Residents reported more Nor'easters in 2018 than years past and bad ice storms in 2007-2008 that delivered several inches of rain on top of snow cover, making clean-up and removal extremely difficult. In October 2011, snow loads caused a number of commercial roofs in Town to collapse. This past year, in January 2018, extreme weather brought temperatures of -40° F.

Leicester is a Town with 28 waterbodies and 35 miles of streams. Rain events, such as the October 2006 storm which dumped 10" of rain in 6 hours, put significant pressure on dams, culverts, and other drainage infrastructure that were designed to handle smaller storms with more uniform distributions of precipitation. Some dams in need of assessment are owned by the Town while others are privately owned. The Town is particularly concerned with replacement or resizing of culverts, upgrading early 20th century sewer infrastructure, and managing beaver activity in order to adapt to precipitation changes, reduce flooding risk, mitigate infiltration and inflow, and make the Town more resilient. Similarly, intense rain events stress the Town's older sewer plant; slow and steady rain poses no problems for the plant, but a storm that brings two inches of rain in three hours taxes the plant's capacity.

While excessive rain poses problems for Leicester, the Town has also experienced limitations to its drinking water supply. Only about 50% of the Town is serviced by public water supply. In 2016, drought caused a number of private wells to dry up. The portion of Leicester served by public water is serviced by multiple water and sewer districts. One of these districts, the Leicester Water Supply District (LWSD), reported significant drought effects on one of their public supply wells located in Paxton. As LWSD's superintendent stated at the workshop, "when you see your water level dropping 500 feet over 5 years, you know you've got a problem." Another of the Town's water districts, Cherry Valley & Rochdale Water District, has also experienced concerns with water supply. In response, they established a connection line to Worcester for use on an emergency basis in 2016. The Cherry Valley & Rochdale Water District now purchases its public drinking water exclusively from the City of Worcester and the supply they manage

within Leicester is used only as backup. Cherry Valley also has to send its waste water to Worcester for treatment. Despite the costs of buying drinking water and paying for wastewater treatment on an on-going basis, the actions taken by Cherry Valley were necessary to establish reliable systems for their customers while the water district works to address the vulnerabilities of its own infrastructure.

Other environmental issues occurring in Leicester include algal blooms in swimming holes and ponds due to agricultural runoff, increasing illness caused by tick-and-mosquito-borne diseases, and invasive plants, including the water chestnut, pressuring the sustainability of the local, native ecosystems.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Stormwater management and drainage-driven flooding on roadways are recognized as concerns Town-wide. In particular, the Route 56 & Marshall Street culvert is a known point of flooding due to an undersized culvert. A detailed inventory is needed to catalog the size and condition of culverts. 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. Other concerns related to excessive pressure on bridges and culverts include beaver-influenced flooding, the intentional filling of wetlands, and new developments falling short of achieving best practices for stormwater management.

Buildings

The building department has responded to storm hazards by not issuing permits in flood zones. Also, building codes have changed drastically in recent years after “a bunch” of commercial roofs collapsed under snow load brought by the storm of 2011. Wind-bracing is now considered necessary on all buildings due to recent changes in the weather experienced in Town.

Dams

Dams in Leicester have been identified as a high-priority for assessments and safety improvements. Waite Pond Dam, Rochdale Pond Dam, and Chapel St. Dam are known areas of concern. Most Town-owned dams are regulated under State dam safety regulations, and most are known quantities. Less information exists about many of the small dams in Town, particularly private dams, and whether they pose a risk. Residents are also concerned about beaver dam activity in local waterbodies. Beaver-influenced areas need to be more fully identified and assessed so as to avoid flooding and unforeseen consequences from unknown debris dams that may have developed in recent years. The Cherry Valley/Rochdale Water and Sewer District is being affected by beaver activity, as a portion of its cross-country water main is currently inaccessible below water because of a beaver dam.

Drinking Water Supply

50% of Leicester is supplied by public water, and Leicester is served by three water districts: Leicester Water Supply District (LWSD), Hillcrest Water District (which is managed by LWSD), and Cherry Valley/Rochdale Water and Sewer District (Cherry Valley). LWSD supplies its customers via wells, while all of Cherry Valley's water is currently purchased from the City of Worcester. Water supply is a topic of concern for all three districts. For the Cherry Valley customers connected to the Worcester water supply, that connection currently alleviates most direct concerns regarding drought, as the Quabbin Reservoir contains five to seven years' worth of water (assuming no recharge). However, there is concern about what would happen if the water district was disconnected from the Worcester supply line due to a hazard. Cherry Valley has a few days' worth of water stored at any given time, but the district is largely at the mercy of Worcester with regard to its water supply. Cherry Valley is interested in preparing Henshaw Pond, a licensed water supply, to serve as a future back-up to ensure adequate access during longer periods of droughts or a disconnection from Worcester. Permitting for use of the pond as a water supply has been maintained despite the fact that Henshaw Pond has not been in use for some time, however bringing the pond back into service would require dredging and construction of a new water treatment facility. The impacts of drought are also one of the top concerns for the LWSD Superintendent. In the 2016 drought, LWSD was nearing a critical point with their supply, and their wells have still not fully recovered.

Water and Wastewater Infrastructure

The Cherry Valley & Rochdale Water District has major concerns with infrastructure, especially a cross-country water main. The main, which supplies the Rochdale area, includes a 1.5 mile stretch of pipe that passes through a wetland, with large sections now inundated under two feet of water because of impoundments created by beavers. The pipe needs to be replaced and upgraded, but is largely inaccessible. Other sections of the pipe are only two to three feet underground and therefore not protected beneath the frost line. Although water is flowing in the main, it is vulnerable to freezing and flood-related hazards, and impacts to this line could affect service to more than 2,000 people. Larger pump stations and wells are supplied with back-up generators, but not all water and sewer infrastructure is covered by back-up power. Additionally, many of the pipes date back to the early 20th century and are disintegrating underground causing inflow and infiltration during heavy rain or snowmelt.

Transportation Vulnerabilities

Managing stormwater is a major challenge impacting transportation year-round. Saturated roads are vulnerable to failure and an increase in the number of freeze/thaw cycles is causing road beds to move and heave. With drainage-driven flooding occurring town-wide, there is significant risk of roads becoming impassable during heavy precipitation. Flooded or ice-covered roads could effectively cut off multiple sections of Town. Potential bottlenecks at major routes could pose public safety concerns in the case of an event that required evacuation or critical materials delivery. There is also an expectation that these traffic problems would be greatly exacerbated in the case of a regional hazard event that closed down the

Massachusetts Turnpike and forced additional traffic onto local routes. Snow drifting also poses potential problems for transportation. Participants noted that drifting is problematic on major roads, including near the airport and golf course on Route 56. Pleasant Street, Henshaw Street, Whittemore Street, and Mulberry Street are also areas of concern.

Environmental

Trees and Forests

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, new invasive pests (e.g., Emerald Ash Borer, Asian Longhorned Beetle) are increasingly threatening certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. In Leicester, there is also 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. The Town and National Grid addressed major tree hazards on old growth trees after a storm in 2008, and National Grid has been conducting ongoing tree-trimming. However, in general, the Town is approximately 30 years behind on tree maintenance, and further tree management is urgently needed to open up canopies, which would increase solar exposure and increase the effectiveness of roadway deicing.

Harmful Algal Blooms

Invasive plants and algal blooms have been a problem at both Greenville Pond and Rochdale Pond. Excessive algal growth is exacerbated by climate change impacts, including increasing temperatures, drier summers, and overall lower water levels in the ponds.

Invasive Species

Invasive plants and animals are already a source of concern in Leicester, 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, two types of swallowwort, 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 area include the Asian Longhorned Beetle (which has been found in abutting communities) and Emerald Ash Borer, both of which have the potential to do serious damage (both environmental and economic) to Massachusetts' forests and trees. 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.

Environmental Pollutants

There is concern in Town about multiple sources of potential pollutants which could be mobilized by heavy precipitation events or flooding. There are potential latent contaminants in the vicinity of the National Grid powerlines and sub-station which need to be investigated, and potentially remediated. The DPW yard was also brought up as a potential source of pollutants, although a Stormwater Pollution Prevention Plan (SWPPP) should be in place for the facility. Used car lots and salvage lots in Town which are not properly managed are also a source of concern. These sites have a high potential for leaks and spills that contribute to contaminated stormwater runoff. These sites have also been known to have standing water that becomes a breeding ground for mosquitoes.

Societal

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). These changes present a major public and animal health challenge in terms of education, prevention, and treatment. Leicester residents report an increase in cases of Lyme disease, and local mosquitoes have been increasingly testing positive for West Nile, although this does not correlate to an uptick in reported disease incidence; there have been no reported cases of West Nile in Town to date. Leicester explored the possibility of joining a mosquito control district approximately fifteen years ago but did not do so because of the expense involved. There is currently renewed interest in exploring this option, which may be linked to the fact that the City of Worcester has recently begun spraying for mosquitos again.

Emergency Communications and 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. Moreover, certain populations, including seniors and the homeless, are known to be at higher risk during hazard events and may require support beyond emergency notifications. Understanding what these needs are and how the Town can best prepare to proactively support its entire population are areas that require more exploration.

Stress on Emergency Services

Leicester's Fire and Police departments bear much of the burden of responding to the increased human threats that result from climate-induced hazards. 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. During the 2006 power outage, the fire department spent nearly one and a half days straight pumping out cellars for residents whose homes had been inundated by flooding. The Fire Chief also noted the increased number of fires that tend to coincide with power outages because of appliances unknowingly left on when the power comes back on, or fireplaces that are used during outages despite having not been properly maintained. Providing services is complicated by road closures and other impacts linked to hazard events; emergency responders noted that an ambulance could not get through to Worcester earlier this fall because of road flooding. These departments are also tasked with the provision of shelter services in times of need.

Becker College

The Becker College campus in Leicester houses approximately 240 students. There are no generators for backup power in the dormitories, nor are the buildings air conditioned. Becker College occasionally sends students home during severe weather events because of these limitations. As the climate continues to warm, additional challenges are expected, and heat stroke is of particular concern for students involved in sports and summer programs that use the campus. Candle use in violation of college policy during power outages can also be a fire risk. From a facilities standpoint, the college has experienced problems with flooding: the gymnasium, which is at a low elevation, had three inches of standing water due to flooding two years ago.

Development Challenges

Workshop participants noted that a number of the challenges facing Leicester are exacerbated by development. Development in Town has resulted in the intentional filling of wetlands, which has reduced flood storage capacity and the ability for stormwater to infiltrate. Subdivision designs do not always fully account for stormwater handling and plowing needs. Single family housing projects are generally not covered under the existing Stormwater Bylaw. Even when the developments are properly designed and built, the additional input to existing infrastructure overwhelms structures that are in many cases already at or over capacity.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. The Town has a Hazard Mitigation Plan currently under review, which parallels the MVP process in many important ways. Key institutions in Town provide support to potentially vulnerable populations and are well positioned for resilience.

- Leicester adopted a stormwater bylaw approximately ten years ago which may need updating, but which helps to control runoff and pollutants.

- The Town has three fire stations in different areas of Town; this distribution helps to ensure that access to emergency services is maintained during hazards, even if some routes through Town are inaccessible

- Leicester's newest fire station and Emergency Operations Center was completed in December of 2017.

- The Town has a strong positive relationship with National Grid and benefits from the company's investment of time and money into clearing hazard trees and improving the robustness of the electrical system through grid modernization. National Grid also maintains a list of high priority locations and residents and seeks to restore power to those properties first.

- Vibra Healthcare operates a medical center and long term care facility in Leicester which is available to provide services to residents, has a backup generator and fuel for three days, and could potentially serve as a shelter during hazard events.

- Multiple institutions in Town could provide support for emergency planning efforts as well as provide shelter and resources to residents in times of need.

- A number of the Town's pump stations and wells have backup generators already in place to maintain vital functions during power outages.

- Connection to the City of Worcester water supply alleviates many immediate concerns for the Chery Valley & Rochdale Water District related to drought.

- Cherry Valley has a few days of water storage capacity within Leicester for use in the event of a disconnection from the Worcester supply line. They have a 500,000 gallon concrete tank as well as two smaller tanks.

- Updated building codes have resulted in increased resilience for most newer structures.

- Leicester Housing Authority has an elderly housing facility that has backup generation capacity for one of its buildings, although not the entire facility.

- Becker College has a good-neighbor policy that would allow them to open their dormitories to Town residents during a hazard if school was not in session. The College also conducts annual reviews of its Emergency Operations Plan and looks for ways to improve their preparedness.

- Leicester has owned the 310 acre Hillcrest Country Club Property between Pleasant Street and Henshaw Pond since 2003 and maintains this area as open space and to protect Henshaw Pond's water quality as a drinking water source. The Town makes the property available for recreation via the golf course and trails.

- Leicester is currently working with Central Massachusetts Regional Planning Commission (CMRPC) to update its Hazard Mitigation Plan.

- Although aging pipes and infiltration and inflow are a concern, Leicester has no problems with sanitary sewer overflows during heavy rains, and the sewer system is not yet at the top end of its capacity.

- Leicester's planning regulations require pest-resistant plantings that will not be susceptible to Asian long-horned beetle.

- The Senior Center is available to provide services to vulnerable citizens, as well as to serve as a shelter during hazard events, although it does not offer shower facilities.

- Leicester Housing Authority's elderly housing facility, the ARCHway residential school for students aged 10 to 22 with autism, and the McAuley Nazareth Home for Boys, which serves an under 18 population, are all existing facilities providing services to vulnerable populations in Leicester.

- Leicester benefits from privately-owned and operated cell-towers/communications towers that drive the emergency communication system in Town.

- The Town has an existing CODE RED/Reverse 911 system that is active for emergency alerts.

Top Recommendations to Improve Resilience in Leicester

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, was a primary concern that emerged in both the small and large group discussions. Maintaining sufficient, safe water supply during drought or

other hazards was a second water-related theme. Many of the top recommendations to improve resilience in Leicester therefore revolve around an "All Waters" approach—prioritizing water and wastewater infrastructure improvements, considering nature-based solutions to reduce stormwater runoff, assessing dams and culverts, and developing a redundant water supply for the Town.

Highest Priority

- Assess public and private dams and develop designs for improvements/replacement where necessary. Assessment should include a town-wide survey to update information on which small dams still exist, establish ownership and an understanding of condition, and determine risks and priority projects. More detailed design work is expected to be necessary for Waite Pond Dam, Rochdale Pond Dam, and Chapel Street Dam, each of which is a known problem area where the Town would like to pursue actions to improve resilience of the structures.

- Conduct field inventory of culverts 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. Known problem areas, should receive particular focus and design planning; for instance, it is already known that the culvert at Route 56 and Marshall Street is undersized and needs to be enlarged.

- Repair and update water and sewer infrastructure, especially critical infrastructure like Cherry Valley's cross-country main where the pipe is susceptible to freezing and breakage and where unplanned emergency repairs could potentially have substantial impacts to up to 2,000 residents, as well as to the surrounding wetlands.

- Continue implementing improvements to reduce sewer infiltration and inflow in problem areas, including replacement of old, failing pipes, and establish a priority list of next steps for reducing impacts related to infiltration and inflow.

- Assess drainage-driven road flooding and 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 and problems with ice slicks that make roads dangerous or impassable during hazard events. Develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Also review Town regulations and update as necessary to support green infrastructure and low-impact development.

- Complete necessary planning, designs, and permitting to bring Henshaw Pond back online as a back-up water supply, including permitting and plans for dredging the Pond and design of a new water treatment plant. Identify funding options for implementation of what is expected to be, at minimum, a $9 million dollar treatment project. The Henshaw Pond project should be implemented in coordination with a larger Town-wide plan for water supply that involves all three water districts.

- Finalize the Town's Hazard Mitigation Plan which is currently under review and obtain approval from FEMA in order to ensure the Town's eligibility for emergency funding. Ensure that

the plan includes consideration for evacuation of patients from the Vibra Healthcare long-term care facility and that plans are integrated with emergency plans of other major institutions in Town, such as Becker College.

- Develop a comprehensive tree and forests management program to identify, remove, and replace problem trees, preserve intact forests and street tree cover, provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures and resist invasive species), limit wildfire risk, and develop guidelines to manage conversion of forest land.

- Assess disease risk and economic impacts from pests such as mosquito-borne diseases, tick-borne diseases, disease vectors (e.g., mice and deer), and invasive species such as Asian longhorn beetle and emerald ash borer. Include determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and develop an education and outreach program.

Moderate Priority

- Educate residents on building resilience, especially related to snow load on roofs and ways to reduce potential for damages. Develop a public awareness campaign to help private property owners make their structures less susceptible to damages, prevent poorly planned single family development, and reduce the need for emergency assistance that places extra stress on police and fire departments.

- Identify vulnerable populations and foster an improved communications network in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance. Ensure that seniors and other at risk citizens are on the existing list of vulnerable individuals. 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.

- Investigate back-up power options for the Vibra Healthcare long term care facility in order to prepare the medical facility for uninterrupted operations in the event of a hazard.

- Work with Becker College to develop a cooperative agreement and determine how Becker students and/or the campus facilities could serve as a resource to the Town in becoming more climate resilient. Open up active communication channels between the Town and the campus to establish more robust interaction and facilitate this process.

- Confirm that all necessary SWPPPs are in place, particularly at the DPW yard. Stormwater Pollution Prevention Plans (SWPPPs) help to prevent the introduction of pollutants into the environment and are especially important during times of intense precipitation. Ensure that these plans are designed to account for the increased intensity and frequency of heavy rain that the Town has been experiencing.

- Expand back-up power capabilities at facilities serving the Town's vulnerable populations, including Leicester Housing Authority's elderly housing facility, the ARCHway residential school for

students aged 10 to 22 with autism, and the McAuley Nazareth Home for Boys, which serves an under 18 population.

- Develop comprehensive plan for beaver dam management to mitigate against unpredictable flooding/impoundment impacts. Establish creative engineering solutions, identify suitable areas for beaver relocation, and consider the development of special legislation to give the Town authority to address problematic beaver dams on private property.

- Develop a plan to address repetitive loss/flooding areas on Pine Street. Explore options including infrastructure improvements, green infrastructure improvements, and buyouts/relocation in order to determine the best strategy for protecting people and property in this area of Town.

- Improve resiliency and preparedness at Becker College for both the residential student population and summer camps that utilize the campus outside of the academic year. Ensure that emergency plans are in place and coordinated with the Town. Increase air conditioning availability to help students cope with extreme heat as climate change brings hotter days.

- Pursue a three-part strategy to reduce the risk of vector-borne diseases, including 1) public education and outreach for prevention, 2) reduction of stagnant water sources through requirements for abatement and/or mitigation at retention ponds and enforcement of existing regulations at places like salvage yards and used car lots, and 3) evaluation of the costs and benefits of participation in a mosquito control district, which is expected to cost $50K-$60K per year.

Lower Priority

- Seek ways to improve communications coverage beyond the scope of the existing communications towers in Town.

- Strengthen the existing communications network through integration of the Town website and Facebook pages. Determine who will be responsible for posting emergency updates to these sites in a timely fashion. Encourage greater enrollment in the CODE RED/Reverse 911 system.

- Address car sales and salvage lots through stronger enforcement of current regulations in order to reduce the risk of spills and leaks that contribute to polluted stormwater runoff and also limit the potential for standing water and mosquito breeding grounds at these sites.

- Investigate potential contaminants in the vicinity of the National Grid powerlines and sub-station and develop plans for remediation if necessary.

- Establish a location for trash accumulated during flood events in order to facilitate storage and recycling to streamline management of damaged property and reduce the impacts of accumulated trash on first responders.

- Develop plans for pet evacuation to ensure that individuals' pets are safe and secure during a hazard, and that concern about pets does not prevent people from evacuating during an emergency.

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CRB Workshop Participants

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

Name	Position/Organization
Michelle Buck*	Town Planner
David Genereux	Town Administrator
Dennis Griffin	Highway Superintendent
Julie VanArsdalen	Health Agent
Chris Montiverdi*	Emergency Management
Stephen Paretti	Conservation Commission Chairman
Adam Menard*	CMRPC; Economic Development Committee
Joe Wood*	Leicester Water Supply District Superintendent
Ben Morris*	Cherry Valley-Rochdale Water District
Corey McNulty*	Regional Director Plant Operations, Vibra Healthcare
Nancy Hagglund*	Executive Director, Leicester Housing Authority
John Bolduc Jr. *	Sergeant, Becker College Police Department
Bob Wilson*	Fire Chief
Jeff Taylor*	Inspector of Buildings
Ruth Kaminski[a]	Stormwater Committee, Recycling Center
Mike Wilson	Fire Inspector
Marjorie Cooper	Agricultural Commission
Kurt Parliament	Moose Hill Water Commission
Heidi Cooper	Coopers Farm
Dianna Provencher	Little Bit Farm/Select Board Chair
Rachelle Cloutier	Senior Center
Joanne Rose	Council on Aging
Andy Davis	Worcester Airport Director
Richard Antanavica	Finance Advisory/Select Board
Robert Dirsa	Burncoat Pond Watershed District, Chair
Liz Renzi	Burncoat Pond Watershed District, Clerk
Michele Cosper	Cedar Meadow Lake Watershed District, Clerk
Patrick McKay	Parks and Recreation Committee
Brian Green	Select Board
Deb Friedman	Planning Board
Alaa Abusalah	Planning Board
Jason Grimshaw	Planning Board
Robyn Zwicker	Planning Board
James Hurley	Police Chief
Kevin Shaughnessy	National Grid
Jay Lussier	Stiles Lake Water District
Harry Brooks	Select Board
Sandra Wilson	Select Board
Andrew Kularski	Planning Board
Dan True	Leicester Housing Authority
Gregory Toot	Vibra Healthcare
Sharon Nist	Planning Board
Kenneth Cameron	Becker College, Assistant V.P. for Administration
Nancy Crimmin	Becker College President

* indicates attendees, [a] could not attend CRB workshop, submitted written notes

Citation

Fuss & O'Neill (2018). Community Resilience Building Workshop Summary of Findings. Town of Leicester. Fuss & O'Neill, Inc. Springfield, Massachusetts.

CRB Workshop Project Team

Name	Organization	Role
Michelle Buck	Town Planner	Project Coordinator/Core Team Member
David Genereux	Town Administrator	Core Team Member
Dennis Griffin	Highway Superintendent	Core Team Member
Julie VanArsdalen	Health Agent	CRB Workshop Coordination
Chris Montiverdi	Emergency Management	Core Team Member
Stephen Paretti	Conservation Commission Chairman	Core Team Member
Adam Menard	CMRPC; Economic Development Committee	Core Team Member
Joe Wood	Leicester Water Supply District Superintendent	Core Team Member
Ben Morris	Cherry Valley-Rochdale Water District	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Julianne Busa	Fuss & O'Neill	Facilitator/Scribe
Kate Tornyai	Fuss & O'Neill	Scribe

Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants, and to Michelle Buck who acted as the local Project Coordinator. Thanks to the Town of Leicester for providing a meeting space for the Core Team Meeting and 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.org

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

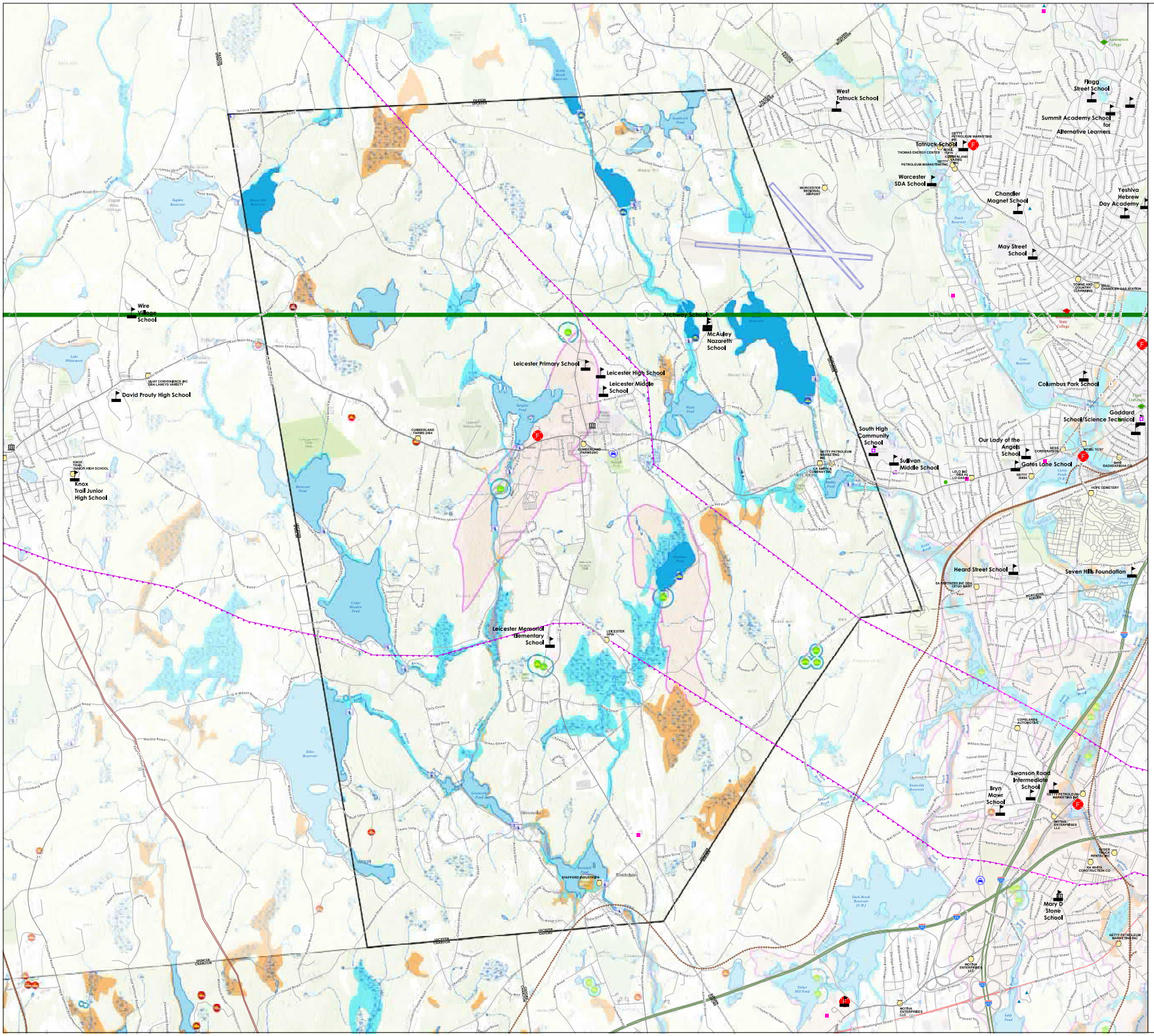
H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Storm Events/ Wind/ Ice/ Snow	Extreme Precipitation/Flooding/Hurricanes	Extreme Wind/ Tornados	Drought	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Culverts and Bridges	Town-Wide	Town	S	Leciester has a stormwater bylaw that helps control runoff and pollutants				N/A	O
	Town-Wide	Town	V	Conduct field inventory of culverts and bridges; assess green infrastructure opoprtunities; focus on undersized culvert at Route 56 and Marshall Street				H	S
	Pine St.	Town/Private	V	Develop a plan to address repetitive loss/flooding areas on Pine Street; explore options including infrastructure improvements, green infrastructure improvements, and buyouts/relocation				M	L
Buildings	Town-Wide	Town/Private	S	Updated building codes have increased resilience for most newer structures				N/A	O
			V	Develop public awareness campaign to educate residents on building resilience, especially related to snow load on roofs and ways to reduce potential for damages				M	L
Dams	Town-Wide	Town/Private	V	Assess public and private dams and develop designs for improvements/replacement				H	S
	Town-Wide	Town	V	Develop comprehensive plan for beaver dam management				M	L
Drinking Water Supply	Town-Wide	Town	S	Some of the Town's pump stations and wells already have backup generators				N/A	O
	Cherry Valley & Rochdale Water District	Town	S				Cherry Valley's Connection to the City of Worcester water supply alleviates drought concerns	N/A	O
	Cherry Valley & Rochdale Water District	Town	S	Cherry Valley has a few days of water storage capacity within Leicester				N/A	O
	Pleasant St.	Town	S	Leicester manages Hillcrest Country Club for open space, drinking water source protection, and recreation.				N/A	O
	Town-Wide	Town	V	Develop necessary planning, designs, and permitting to bring Henshaw Pond back online as a back-up water supply, including dredging plans and design of new water treatment plant; coordinate with a larger Town-wide plan for water supply that involves all three water districts				H	L
Water and Wastewater Infrastructure	Town-Wide	Town	S	Leicester has no problems with sanitary sewer overflows; the sewer system is not yet at capacity				N/A	N/A
	Town-Wide	Town	V	Repair and update water/sewer infrastructure, especially Cherry Valley's cross-country main				H	L
	Town-Wide	Town	V	Continue improvements to reduce infiltration/inflow				H	L
Transportation Vulnerabilities	Town-Wide	Town/Private	V	Assess drainage-driven road flooding and develop green infrastructure solutions for stormwater				H	S
Societal									
Pests and Disease Control	Town-Wide	Town	S	Existing planning regulations require pest-resistant plantings				N/A	N/A
	Town-Wide	Town/Private	V	Assess disease risk and economic impacts from pests such as mosquito-borne diseases, tick-borne diseases, disease vectors (e.g., mice and deer), and invasive species				H	L
	Town-Wide	Town/Private	V	Pursue a three-part strategy to reduce the risk of vector-borne diseases, including 1) public education, 2) reduction of stagnant water sources, and 3) evaluation of participation in a mosquito control district				M	L

Emergency Communications and Vulnerable Populations	Town-Wide	Town	S	Leicester Housing Authority has an elderly housing facility with backup generation capacity; the senior center provides regular services and shelter services; the ARCHway school and McAuley Nazareth Home for Boys also provide services to vulnerable populations	N/A	O
	Town-Wide	Town/Private	S	The Town has an existing CODE RED/Reverse 911 system that is active for emergency alerts and benefits from privately-owned communications towers that drive emergency communication systems	N/A	O
	Town-Wide	Town/Private	V	Identify vulnerable populations and foster an improved communications network	M	S
	111 Huntoon Memorial Hwy	Private	V	Investigate back up power options for the Vibra Healthcare long term care facility	M	S
	Town-Wide	Town/Private	V	Seek ways to improve communications coverage beyond the existing communications towers in Town	L	O
	Town-Wide	Town	V	Strengthen existing communications network through integration of Town website and Facebook pages; assign responsibility for posting timely updates; encourage enrollment in CODE RED/Reverse 91	L	S
	Town-Wide	Town/Private	V	Expand backup power at facilities serving vulnerbale populations	M	L
Stress on Emergency Services	Various Locations	Town	S	The Town has three fire stations in different areas of town, one of which houses a brand new Emergency Operations Center	N/A	O
	Town-Wide	Town	S	The Town has a strong positive relationship with National Grid, which invests in clearing hazard trees, modernizing the grid, and priority power restoration to key facilities	N/A	O
	Huntoon Memorial Hwy	Private	S	Vibra Healthcare operates a medical center and long term care facility which can provide services to residents, has a backup generator and fuel for three days, and could potentially serve as a shelter	N/A	O
	Town-Wide	Town/Private	S	Multiple institutions in Town are able to provide support for emergency planning efforts and provide shelter and resources in times of need	N/A	O
	Town-Wide	Town	S	Leicester is currently working with CMRPC to update its Hazard Mitigation Plan	N/A	O
	Town-Wide	Town	V	Finalize the Town's Hazard Mitigation Plan	H	S
	Town-Wide	Town/Private	V	Develop plans for pet evacuation to ensure concern about pets does not prevent people from evacuating	L	S
Becker College	Town Center	Town/Private	S	Becker College regularly reviews Emergency Operations plans and has a good-neighbor policy that would allow them to open their dormitories to Town residents if school was not in session	N/A	O
	Town Center	Town/Private	V	Work with Becker College to develop a cooperative agreement and determine how the college could serve as a resource to the Town in becoming more climate resilient	M	S
	Town Center	Town/Private	V	Improve resiliency and prepardeness at Becker College for residential students and summer camps	M	O
Development Challenges	Town-Wide	Town/Private	V	Review and revise Town regulations to support green infrastructure and low-impact development	H	S
Environmental						
Trees and Forests	Town-Wide	Town/Private	V	Develop a comprehensive tree and forests management program	H	L
Harmful Algal Blooms	Town-Wide	Town/Private	V	No specific action identified	N/A	N/A
Invasive Species	Town-Wide	Town/Private	S	Leicester's planning regulations require pest-resistant plantings that will not be susceptible to Asian long-horned beetle.	N/A	O
Environmental Pollutants	Town-Wide	Town	V	Confirm that all necessary SWPPPs are in place	M	S
	Transmission Sub-station	Private	V	Investigate potential contaminants in vicinity of National Grid powerlines and sub-station and develop plans for remediation if necessary	L	L
	Town-Wide	Town	V	Address car sales and salvage lots through stronger enforcement of current regulations to reduce risk of spills and leaks that contribute to polluted stormwater runoff and limit standing water	L	L
	Town-Wide	Town	V	Establish a location for trash accumulated during flood events	L	S

Appendix B

CRB Workshop Base Map



LEICESTER, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Town Hall
- Police Station
- Fire Station
- Health Center, School
- School
- Private University
- Public University
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Emergency Surface Water
- Dams
- Underground Storage Tanks
- Assisted Living Facility
- Nursing Home
- Rest Home
- Interstate
- U.S. Highway
- State Route
- Non-numbered Road
- Pipeline
- Powerline
- Powerline Arbitrary Extension
- Landing Strip/Airport
- Railroads - Active Service
- Perennial Stream
- Intermittent Stream
- Shoreline
- Manmade Shoreline
- Aqueduct
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Wellhead Protection Zone I
- Wellhead Protection Zone II

Flood Zone Designations

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

N, W, E, S

0 0.25 0.5 1 Miles

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

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Appendix C

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices

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	SNOW / ICE NOR'EASTERS	EXTREME PRECIP HURRICANES	EXTREME WIND	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
POWER DISTRIBUTION - GRID HAS A TREE TRIM PROGRAM	TW	GRID	S	✓	✓	✓			O
DAMS - ADD'L ASSESSMENTS NEEDED	TW	TOWN/ PRIVATE	V		✓			H	O
~~DPW~~ VA PUMP STATIONS - BACKUP POWER NEEDED	TW	DISTS	V	✓	✓	✓		H	O
REPAIR/UPDATE WATER/SEWER SYSTEM	TW	DISTS	V		✓			H	O
SNOW LOAD ON ROOFS - PUBLIC BUILDINGS	TW	TOWN/P	V	✓				M	O
Societal									
HAZ MIT PLAN UNDER REVIEW	TW	T	S	✓	✓	✓	✓	H	O
CONFIRM SENIORS/AT RISK ARE ON "LIST"	TW	T	V/S	✓	✓	✓	✓	M	O
LONG TERM CARE FACILITY COULD BE POWER BACKUP	FACILITY	P	S	✓	✓	✓		M	O
HOW CAN BECKER STUDENTS OF/ON CAMPUS BE A RESOURCE?	CAMPUS	P	S	✓	✓	✓		M	O
LONG TERM FACILITY - EVACUATION CONSIDER WITHIN HMP	FACILITY	P	V	✓	✓	✓		M	O
Environmental									
I/I ISSUES - OLD PIPES	TW	DISTRICTS	V		✓			H	O
DPW YARD - CONFIRM SWPPP	DPW	T	V		✓			M	O
POTENTIAL CONTAMINANTS AT SUB STATION - TALK TO GRID REPS	TRANSMISSION LINES	GRID	V		✓			M	O

Leicester CRB

Community Resilience Building Risk Matrix

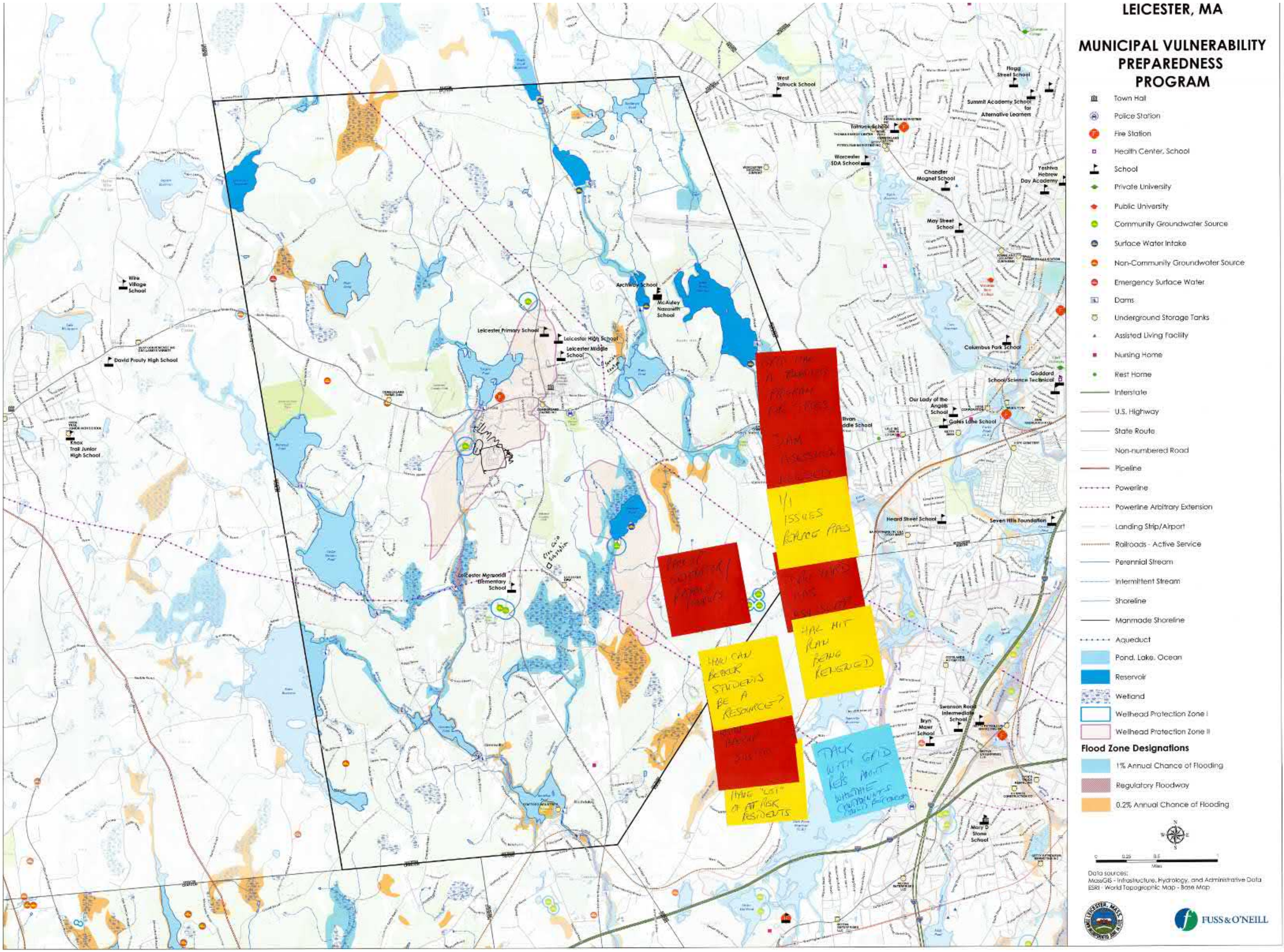
www.CommunityResilienceBuilding.com

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	SNOW/ICE NOR'EASTERS	EXTREME PRECIP HURRICANES	EXTREME WIND	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
culvert @ 56 + Marshall	- - -	?	V	enlarge culvert					
pipeline - cross-country main		Cherry Valley	V	replace + upgrade line →				H	
dams			V	replace/repair	Waite Pond Dam, Rochdale Pond Dam, Chapel St. Dam (→ frequency or flooding impact x2,000 people)			H	
→ drainage driven flooding/ice slicks roads + stormwater system			V	improvements @ priority areas to reduce drainage-driven flooding/washouts					
cell towers/comm. towers		private	S/V	main communic. system for emerg. need better coverage					
Fire Stations (3)			S	located 3 areas of town -					
Hershaw Pond as future back-up supply			V/S	dredging + new treatment system to bring back into use as back-up supply					
Societal									
Senior Center/Shelter			S	Strength					
Fire Station/EOC Finished Dec. '17			S						
LHA - elderly housing Archway - Autistic adult housing		LHA/State	S/V			1 bldg w/ generator for heat, A/C, etc., store expand back-up power capability			
Nazareth School - under 18 / State-owned		State	S			back-up generator			
Pine St. Repetitive Loss - flooding			V						
Becker pop'n. + summer camps			V			ensure emergency plans in place →	increase A/C availability		
car sales/salvage			V		need enforcement - leaks + mosquito breeding prob.				
Environmental									
Golf course, trails, + H2O protection Hillcrest Country Club Property	btwn. Pleasant + Henshaw Pond	Town	S						
wetlands			V	sediment influx	from stormwater				
mosquitoes/ticks + disease			V		public ed/prevention require abatement/mitigation @ retention ponds; enforce @ used car/salvage lots consider mosquito district participation ($50-60K/yr)				
Algal blooms/water chestnut → Greenville Pond/Rochdale Pond			V						
Asian long-horned beetle + tree loss			V/S		Planning regs require non-susceptible plantings				
Beavers			V		pressure state to change regs				

Communications — V/S — - website, FB - determine who will do emergency updates - have CODE RED/Rev. 911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1% Annual Chance of Flooding
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0.2% Annual Chance of Flooding
Data sources:
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ESRI - World Topographic Map - Base Map
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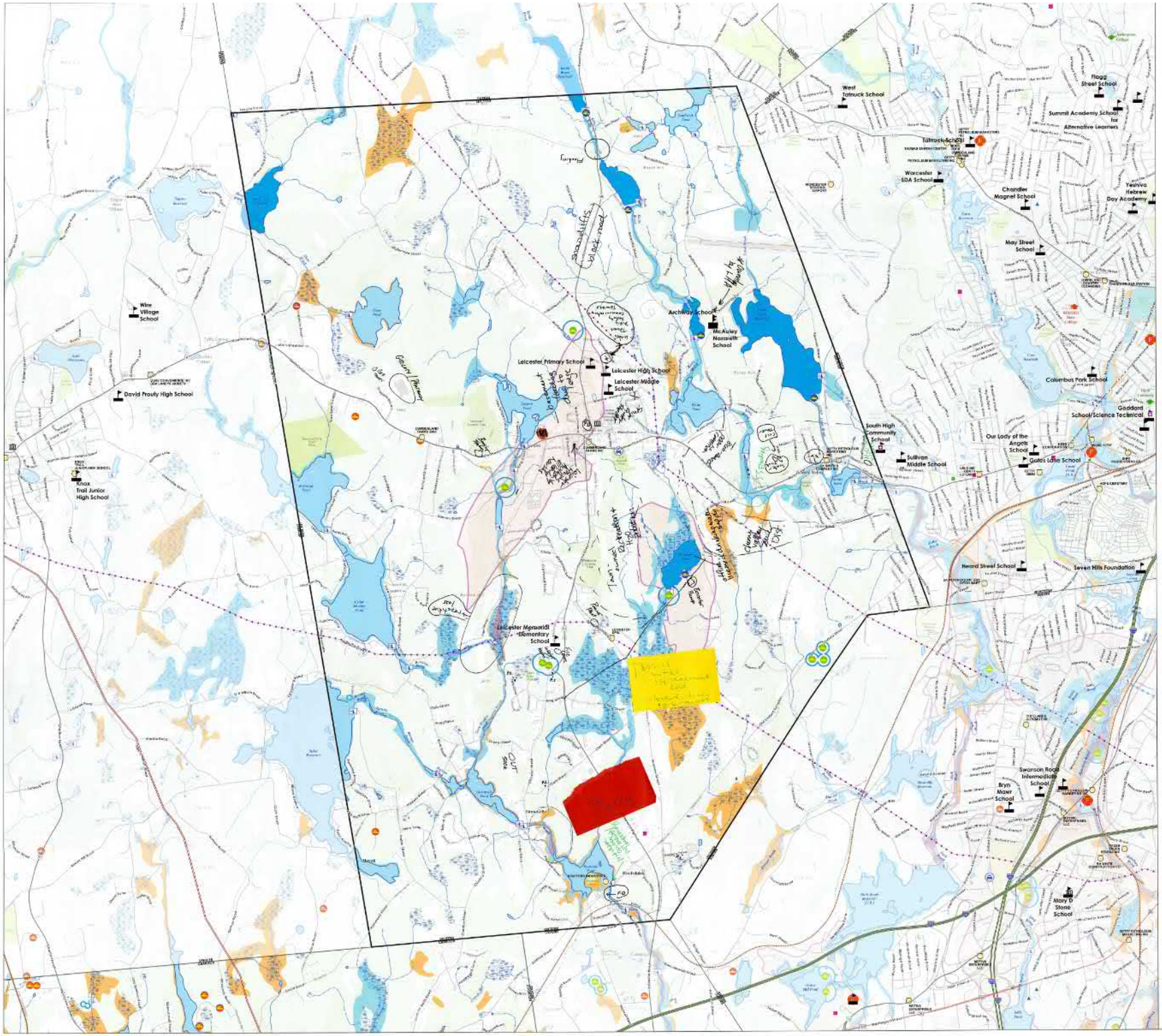
West Tatnuck School
Flagg Street School
Summit Academy School for Alternative Learners
Tatnuck School
Worcester SDA School
Chandler Magnet School
Yeshiva Hebrew Day Academy
May Street School
Columbus Park School
Goddard School/Science Technical
Our Lady of the Angels School
Gates Lane School
Heard Street School
Seven Hills Foundation
Swanson Road Intermediate School
Bryn Mawr School
Mary D Stone School
Archway School
McAuley Nazareth School
Leicester Primary School
Leicester High School
Leicester Middle School
Leicester Memorial Elementary School
Wire Village School
David Prouty High School
Knox Trail Junior High School
I/I ISSUES REPLACE PIPES
HOW CAN BECKER STUDENTS BE A RESOURCE?
HAZ MIT PLAN BEING REVISED)
HAVE "LIST" OF AT RISK RESIDENTS
TALK WITH GRID REPS ABOUT WHETHER COORDINATES COULD BE CLOSER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FUSS & O'NEILL

Appendix D

CRB Workshop Presentation Materials

FUSS & O'NEILL

Boston Firefighters, January 4, 2018 (Reuters)

Stiles Reservoir Dam, Leicester, MA (NEREJ)

Municipal Vulnerability Preparedness Program
Community Resilience Building Workshop
Town of Leicester

September 19, 2018

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 Leicester
- Discussion by Leicester participants on status of current planning and risks
- Introduction to CRB Workshop process

- Large group
  - Determine top four hazards

- Small work groups (Using Risk Matrix)
  - Identify Leicester'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 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

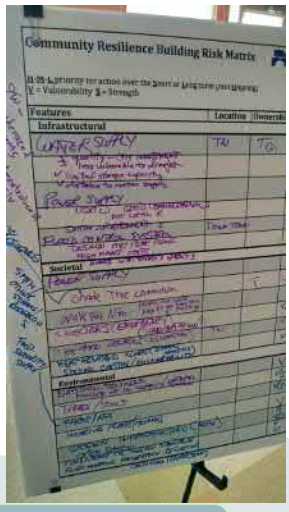
Mary is a municipal public works specialist well-versed in issues related to stormwater management; wastewater collection and treatment; drinking water supply, treatment, and distribution; solid waste management; and sustainable operations. Mary serves as a liaison between the public works project owner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

Leicester MVP Program - $20,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency Planning
  - Comprehensive Approach
    - o Infrastructure
    - o Society
    - o Environment
  - Guidance in the Community Resilience Building Workshop Guide
  - Municipalities That Complete This Process Will Be Designated Municipal Vulnerability Preparedness (MVP) Municipalities



MVP Designation May Lead to Enhanced Standing in Future Funding Opportunities

MVP Action Grant NEW

- Grant supports priority actions identified at Community Resilience Building Workshop
- $10,000 - $400,000 available
- Local match of 25% - can be in-kind
- Next funding round anticipated Fall 2018

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

Terminology

Climate Change

The Change in Usual Climate Conditions

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

Town of Leicester – Blackstone and French Basins

Minimal Chicopee Basin

Rising Temperature

Blackstone French	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Average Annual Temperature (°F)	48.20 47.07	2.17 2.16	to	4.23 4.35	2.88 2.99	to	6.29 6.40	3.52 3.59	to	9.05 9.16	3.78 3.92	to	11.06 11.17
Annual Days with Maximum Temperature over 90°F (Days)	4.69 3.05	5.41 4.19	to	15.55 13.36	7.80 6.51	to	28.89 24.86	9.95 8.36	to	51.17 45.40	12.23 10.33	to	70.36 64.16
Annual Days with Minimum Temperature below 32°F (Days)	142.52 150.63	-10.35 -9.48	to	-26.51 -27.10	-17.60 -18.51	to	-38.76 -39.60	-20.71 -21.45	to	-54.14 -55.40	-22.84 -23.87	to	-65.55 -67.14

Town of Leicester – Blackstone and French Basins

Minimal Chicopee Basin

Changing Precipitation

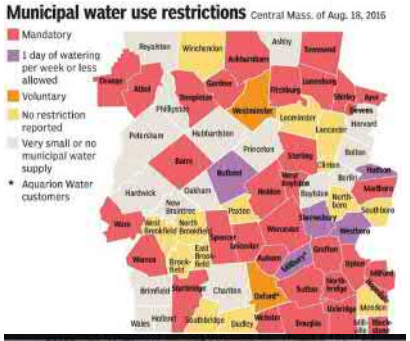
Blackstone French	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Total Annual Precipitation (Inches)	47.13 47.44	0.26 0.33	to	5.53 5.45	1.35 1.31	to	6.79 6.89	2.49 2.68	to	8.67 8.56	1.62 1.98	to	8.71 9.27
Annual Consecutive Dry Days (Days)	16.63 16.82	-0.36 -0.99	to	1.48 1.54	-0.34 -0.80	to	2.05 1.94	-1.00 -1.20	to	2.42 2.38	-0.59 -0.77	to	2.92 2.76

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

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



Stakeholder Updates

Risk Matrix

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									

MVP Program

- Identify Top Four Hazards
  - 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
- Finalize Prioritization Plan

Climate Change Hazards

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

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

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

MVP Sectors

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

Community Resilience Building Workshop

Next Steps:

- Public Review of Priorities
- Monitor and Update
- Annual Review

Community Resilience Building Workshop

Questions?