Town of Holden

Community Resilience Building Workshop

Summary of Findings

May, 2018

FUSS & O'NEILL

Project No. 20170390.A11

FUSS & O'NEILL

Town of Holden

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 Holden was awarded a $16,000 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 March 20, 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 May 7, 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 Holden;
- 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 Holden. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as Town conversations that have formed the basis for the Town's Hazard Mitigation Planning. Summer precipitation events were identified as one of the Town's top hazards. Winter storms and Nor'easters with associated wind and ice were identified as a second hazard. Impacts of extended drought, such as those seen during summer 2016 were identified as a third hazard. Finally, heat effects, particularly the increase in extremely hot days (over 90 degrees F) predicted over the next several decades, 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

- Summer Precipitation Events
- Winter Storms/Nor'easters/Wind and Ice
- Drought
- Extreme Heat

Areas of Concern

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

Neighborhoods/Communities
Checkerberry Village, Senior Center, elderly residents, group homes

Ecosystems
Wachusett Watershed

Infrastructure
Town wells, stormwater basins, Quinapoxet culvert/Tannery Brook culvert, Eagle Lake Dam, National Grid transmission lines

Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to Holden 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. Much more recently, Town officials in Holden note that the Town has been experiencing 100 year storms at a frequency of up to three per year. January and March of 2018 brought major storms that are fresh in the Town's memory, and wind and ice impacts from severe storms are a major concern. A significant ice storm in 2008 took out major portions of the Town's power by bringing down overhead powerlines.

Drought is a concern in Holden as well. The Town's most recent major drought was in 2016. At that time the Town was able to implement water conservation measures and did not experience any major impacts to Town water supply, however there is a concern that supply could become an issue as climate change progresses and extreme heat and drought become more common. Moreover, impacts to private wells were largely undocumented and these sources may be less robust. The issue is further complicated by new development which is increasing the demand for water. The extended drought during summer 2016 brought all of these issues into the public eye and emphasized the need to increase the resilience of the public water supply to ensure adequate access during longer droughts.

Intense storms have become increasingly problematic for the Town, in large part because storms now tend to bring a combination of precipitation types (ice, rain, and snow) all in one storm event. This complicates the effort to maintain access and provide services. Extreme temperatures at both ends of the spectrum have also posed occasional challenges for Holden, especially for the Town's more vulnerable populations.

Specific Categories of Concerns and Challenges

Infrastructural

Town Wells

Holden's groundwater wells are the primary water supply in Town, and approximately 75% of the Town population is serviced by public water. However, the wells are not currently considered to be robust to drought and storm impacts. There have not been major supply concerns related to drought thus far, however demand on the water supply is increasing due to new development in Town and as drought and extreme temperatures become more regular with climate change, there is expected to be additional pressure on the Town wells. A more immediate concern is that the wells do not all have back-up power systems, leaving them vulnerable to power outages that result from storms or other hazard events.

Public Drinking Water Surface Supply

The Town does have access to surface drinking water supply as well. The Town can purchase supply from Worcester that is delivered through a main supplied from the Wachusett Reservoir. That and other nearby reservoirs were affected during the 2016 drought, so there is concern that this back-up water source may be affected by a regional drought and could therefore be unavailable during the times that Holden most needs it.

Electrical Infrastructure

National Grid provides power to Holden Municipal Light. Holden Municipal Light is aggressive in maintaining electrical infrastructure within the Town. However, there are two main National Grid transmission lines that feed power to the Town, and these lines have been problematic. Outages outside Holden have been the cause of long term power outages from climate change storm events, and this is expected to continue to worsen as storms become increasingly unpredictable.

Dams

In general, while most town-owned dams are regulated under State dam safety regulations, and are therefore known quantities, less information typically exists about many small dams, particularly private dams. In some cases, it is not even known which dams still exist, let alone their condition or risk potential. In Holden, Eagle Lake Dam is the primary dam of concern. The Dam is privately owned, however there are political questions as to who is actually responsible for the maintenance of the dam. There are also conflicting values at stake surrounding the dam, e.g., those who would like to see the dam removed or water levels lowered to reduce risks during a failure event are at odds with those who are concerned with losing the recreational value of the lake. Most of the other dams are owned and maintained by Massachusetts Division of Conservation and Recreation (DCR).

Culverts and Stormwater Conveyances

Culverts and stormwater infrastructure are recognized as a potential concern Town-wide. The Quinapoxet Culvert/Tannery Brook Culvert is of particular concern, and there is a general recognition that many culverts 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.

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 eliminating certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. In Holden, forest management is also linked to concerns over wildfire risk, which is increased by the build-up of fuel that results from die-offs and is further exacerbated by drought and extreme heat.

Tick and Mosquito Borne Disease

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.

Algal Blooms

Holden's waterbodies are subject to algal blooms, particularly during times of excessive heat and/or drought. Algal blooms result 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. If residential lawns lead right down to the water, there is no buffer to trap and filter nutrients.

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. Holden has a network of forest and agricultural land in Chapter 61a which could be further expanded to serve as an open space buffer.

Invasive Species

Invasive plants and animals are already a source of concern in Holden, 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 area 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. 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.

Stormwater BMPs

Newer Stormwater Best Management Practices (BMPs) meet appropriate standards and are being designed to withstand climate change impacts, however existing BMPs are frequently not maintained by private owners. This not only renders them ineffective, but also contributes to increased potential for flood events and water quality impairments. Untreated stormwater can have significant environmental effects for tributaries receiving flows if that stormwater carries sediment loads, pathogens, or other pollutants of concern.

Societal

Local and State Regulations

There was recognition among workshop participants that regulations are outdated and therefore insufficient to address climate change risks. The Town sees a need for revised regulations that restrict development to maintain buffers and open space and updated regulations that utilize current design standards and data (e.g., Atlas 14/Cornel data for rainfall).

Industrial Park

The industrial park in town suffers from limited access for emergency vehicles, particularly in flood events. FEMA mapping for the park is inaccurate, failing to indicate flood risks where they in fact occur.

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 and residents of Holden's group homes, 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 (particularly as insurance will often not cover emergency refills if pills are left at home), as well as the challenges involved in getting seniors 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.

Pets and Service Animals

Pets and service animals are seen as members of the family and residents frequently refuse to use shelters or other emergency services if those services do not also accommodate their pets. This can therefore be a barrier to providing services to the Town's citizens, including vulnerable populations. Simultaneously, providing adequate shelter and services for animals can be a challenge in and of itself.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. Holden benefits from a number of relationships that increase the Town's resilience, particularly in terms of protecting its water supply. The Town also has existing emergency shelters, and is working on developing an evacuation plan.

- The Town benefits from Holden Municipal Light's aggressive maintenance of local power distribution infrastructure, although the two main transmission lines from National Grid that feed the Town are a source of concern.
- The Town has existing shelters which are constantly being evaluated and assessed; shelters are supplied with 8 days worth of food.
- The Town is currently working with CMRPC on an evacuation plan.
- Holden is a Right to Farm Community.
- The Town water supply has not had drought-related issues thus far.
- The Department of Conservation and Recreation (DCR), Division of Water Supply Protection, Wachusett Section, is an important resource and partner to the Town.
- Holden benefits from efforts by The Office of Water Resources to promote water quality and conservation through water resources policy and planning efforts.
- The Town's drinking water supply watersheds are managed and protected by The Office of Watershed Management.
- Much of the Town's MS4 regulated area is managed by the Office of Watershed Management because it is within the Wachusett Reservoir watershed.
- Oriol Health Care conducts quarterly disaster drills and maintains a seven-day food supply.
- Oriol Health Care is well-versed in and experienced with emergency management and can serve as a resource for the Town.
- The Town's sewer system is mostly less than twenty years old and therefore infiltration and inflow are not problems the Town faces.

Top Recommendations to Improve Resilience in Holden

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. Maintaining services, either via back-up power or proper operations and maintenance plans, was a theme that developed over the course of the workshop.

Highest Priority

- Conduct a study to investigate opportunities to provide green emergency power backup, include feasibility of battery storage. Several pump stations and wells have emergency power supply from traditional generators. Eight additional wells and pump stations have no emergency power backup.

- Develop battery storage infrastructure to support key locations during outages and enable the Town to purchase power at night when it is cheaper and then feed energy to the grid during the day.

- Develop public education and outreach on appropriate operation and maintenance (O/M) of stormwater BMPs on private properties. Identify legal authority to enforce established O/M requirements.

- Assess green infrastructure opportunities for stormwater management to 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. Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects.

- Determine status of forest management planning, particularly on lands owned by the Town and Commonwealth, in order to reduce wildfire threats and encourage management of invasive species.

- Identify a local champion to develop a vulnerable population data base with cooperation from the Council on Aging, schools, and town clerk's census data.

- Assess mosquito, tick, and other pest control options; provide public education and outreach about associated risks, including determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program.

- Communicate awareness and availability of Preparedness Package and other information about emergency preparedness.

- Work with FEMA to correct flood maps at Industrial Park to reflect accurate, current flood risks.

Moderate Priority

- 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. Focus in particular on Emerald Ash Borer and Asian Longhorned Beetle.

- Provide education and outreach on fertilizer impacts, via the Agricultural Commission, to inform landowners about the negative water quality impacts of nutrient pollution and how these are linked to algal blooms.

- Coordinate with Town departments to incorporate green infrastructure into planned road improvements.

Lower Priority

- Distribute an emergency kit list to all citizens to encourage self-preparedness for hazard events.

- Establish emergency plans for group homes; ensure that all group homes are identified as high risk facilities and that emergency plans coordinate with Town emergency procedures.

- Develop an evacuation plan for elderly housing facilities.

CRB Workshop Participants

Name	Position/Organization
Ryan Mourazian*	Water and Sewer Superintendent/ Holden DPW
Kelley Freda*	Environmental Analyst/ MassDCR
Jim Robinson*	General Manager/ Light Department
Philip Leger*	Chief of Environmental Health and Response/ WDPH/ CMRPHA
Pat Bruchmann*	Chief of Public Health Nurse/ CMRPHA
David Lindberg*	Building Commissioner/ Planning and Development
Chris Montiverdi*	Emergency Management/ Holden Fire
Russ Hall*	Fire Chief/ Holden Fire
Mary Lohman*	Industrial Park
Chris DeMoranville*	Supervisor of DPW operations/ Holden DPW
Isabel McCauley*	Senior Civil Engineer/ DPW
John Woodsmall*	Director of Public Works/ DPW
Steve D'Aquila*	Holden Agricultural Commission
Tara D'Andrea*	Administrator of Holden Rehab/ Oriol Health care
Bob Oriol	Oriol Health Care

Citation

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

CRB Workshop Project Team: Organization, Name, Role

Name	Organization	Role
Pamela Harding	Director, Planning and Development	Project Coordinator/Core Team Member
Ryan Mourazian	Water and Sewer Superintendent	Core Team Member
Russ Hall	Fire Chief	Core Team Member
Chris DeMoranville	Supervisor of DPW Operations	Core Team Member
Chris Montiverdi	Emergency Management/Fire	Core Team Member
Kelley Freda	Environmental Analyst/ MassDCR	Core Team Member
Isabel McCauley	Senior Civil Engineer/ DPW	Core Team Member
Jim Robinson	General Manager/Light Department	Core Team Member
John Woodsmall	Director of Public Works/ DPW	Core Team Member
Philip Leger	Chief of Environmental Health and Response/ WDPH/ CMRPHA	Core Team Member
Peter Lukes	Town Manager	Core Team Member
Pat Bruchmann	Chief of Public Health Nurse/ CMRPHA	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Kurt Mailman	Fuss & O'Neill	Facilitator/Scribe

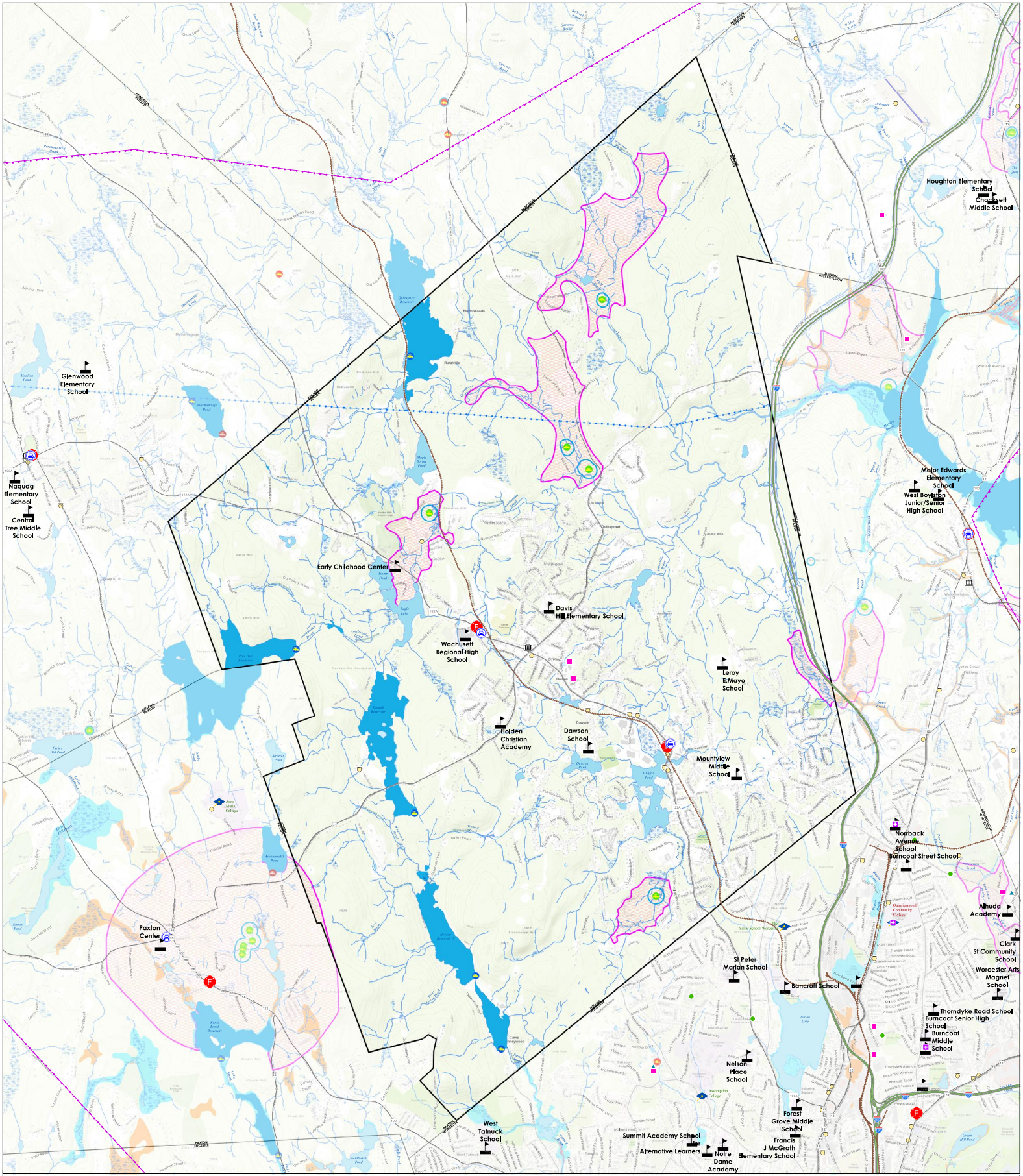
Acknowledgements

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

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

Appendix A

CRB Workshop Base Map



HOLDEN, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

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

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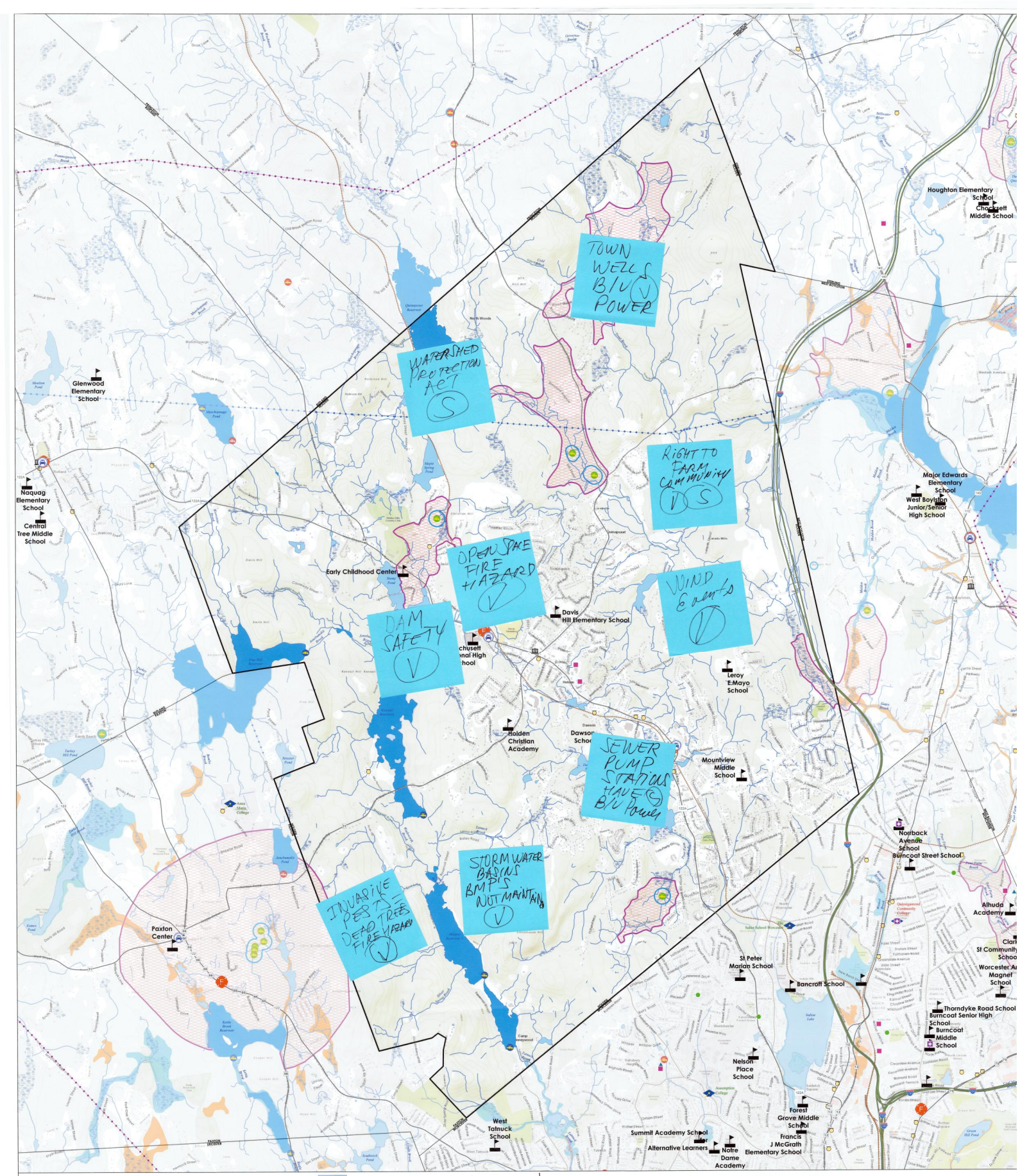
Appendix B

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices


TOWN WELLS B/U POWER
WATERSHED PROTECTION ACT
RIGHT TO FARM COMMUNITY
OPEN SPACE FIRE HAZARD
DAM SAFETY
WIND EVENTS
SEWER PUMP STATIONS HAVE B/U POWER
STORM WATER BASINS BMP'S NOT MAINTAIN
INVASIVE PESTS — DEAD TREES FIRE HAZARD
Glenwood Elementary School
Naquag Elementary School
Central Tree Middle School
Houghton Elementary School
Chaffee Middle School
Major Edwards Elementary School
West Boylston Junior/Senior High School
Early Childhood Center
Davis Hill Elementary School
Leroy E Mayo School
Holden Christian Academy
Mountview Middle School
Norback Avenue School
Burncoat Street School
Paxton Center
St Peter Marian School
Bancroft School
Thorndyke Road School
Burncoat Senior High School
Burncoat Middle School
Nelson Place School
Forest Grove Middle School
Francis J McGrath Elementary School
Notre Dame Academy
Summit Academy School for Alternative Learners
West Tatnuck School
Town Hall
Police Station
Fire Station
School
Health Center, School
Colleges and Universities
Community Groundwater Source
Surface Water Intake
Non-Community Groundwater Source
Emergency Surface Water
Assisted Living Facility
Nursing Home
Rest Home
Underground Storage Tanks
Railroads - Active Service
Powerline
Landing Strip/Airport
Stream
Ditch/Canal
Aqueduct
Pond, Lake, Ocean
Reservoir
Wetland
Submerged 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
Environment
N
W
E
S
0
0.5
1
Miles
Data sources:
MassGIS - Intrastructure, Hydrology, and Administrative Data
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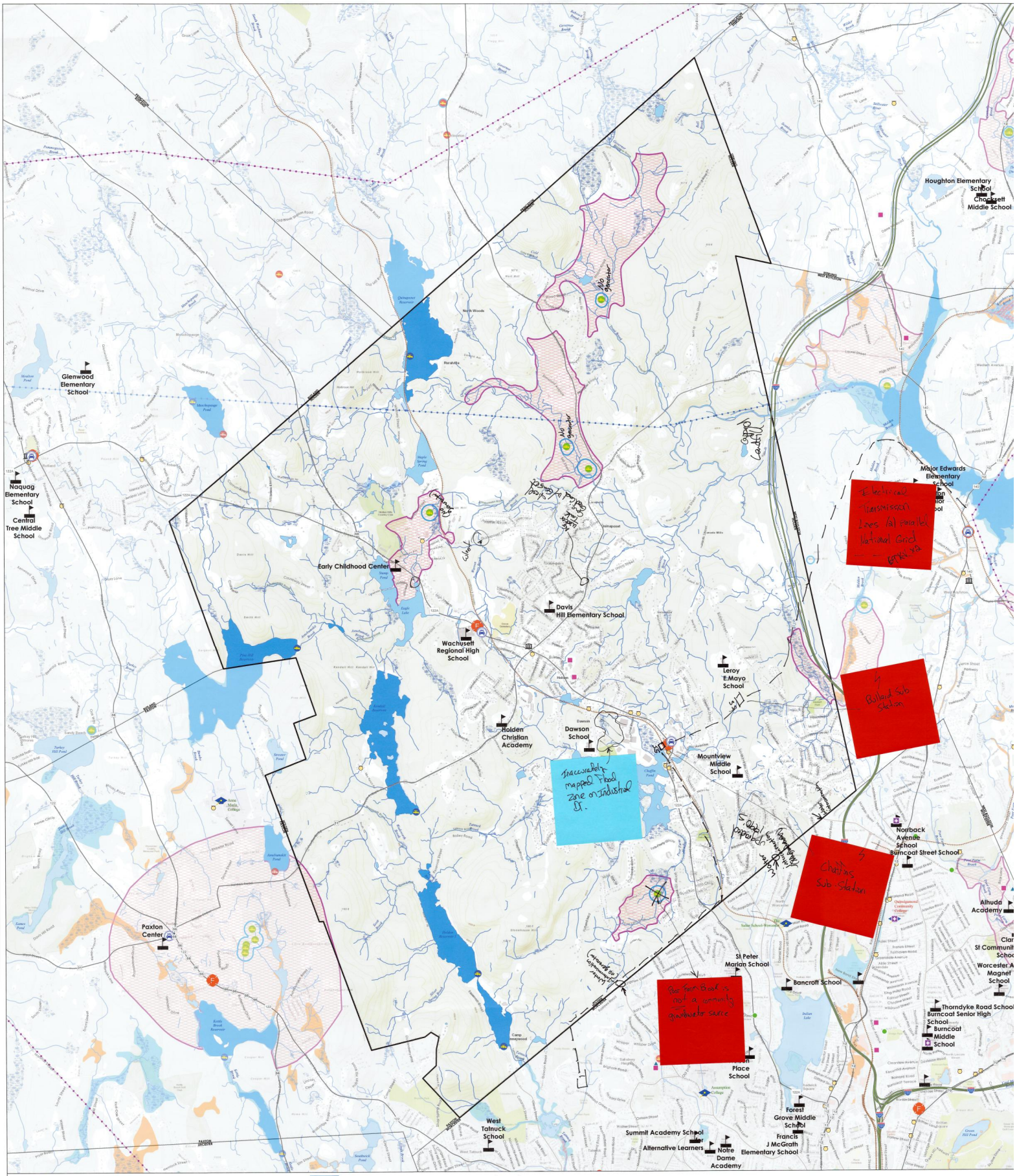
HOLDEN, MA
MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM
FUSS & O'NEILL



Infrastructure

- Town Hall
- Police Station
- Fire Station
- School
- Health Center, School
- Colleges and Universities
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Emergency Surface Water
- Assisted Living Facility
- Nursing Home
- Rest Home
- Underground Storage Tanks
- Railroads - Active Service
- Powerline
- Landing Strip/Airport
- Stream
- Ditch/Canal
- Aqueduct
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Submerged 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 0.5 1

Miles

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

HOLDEN, MA

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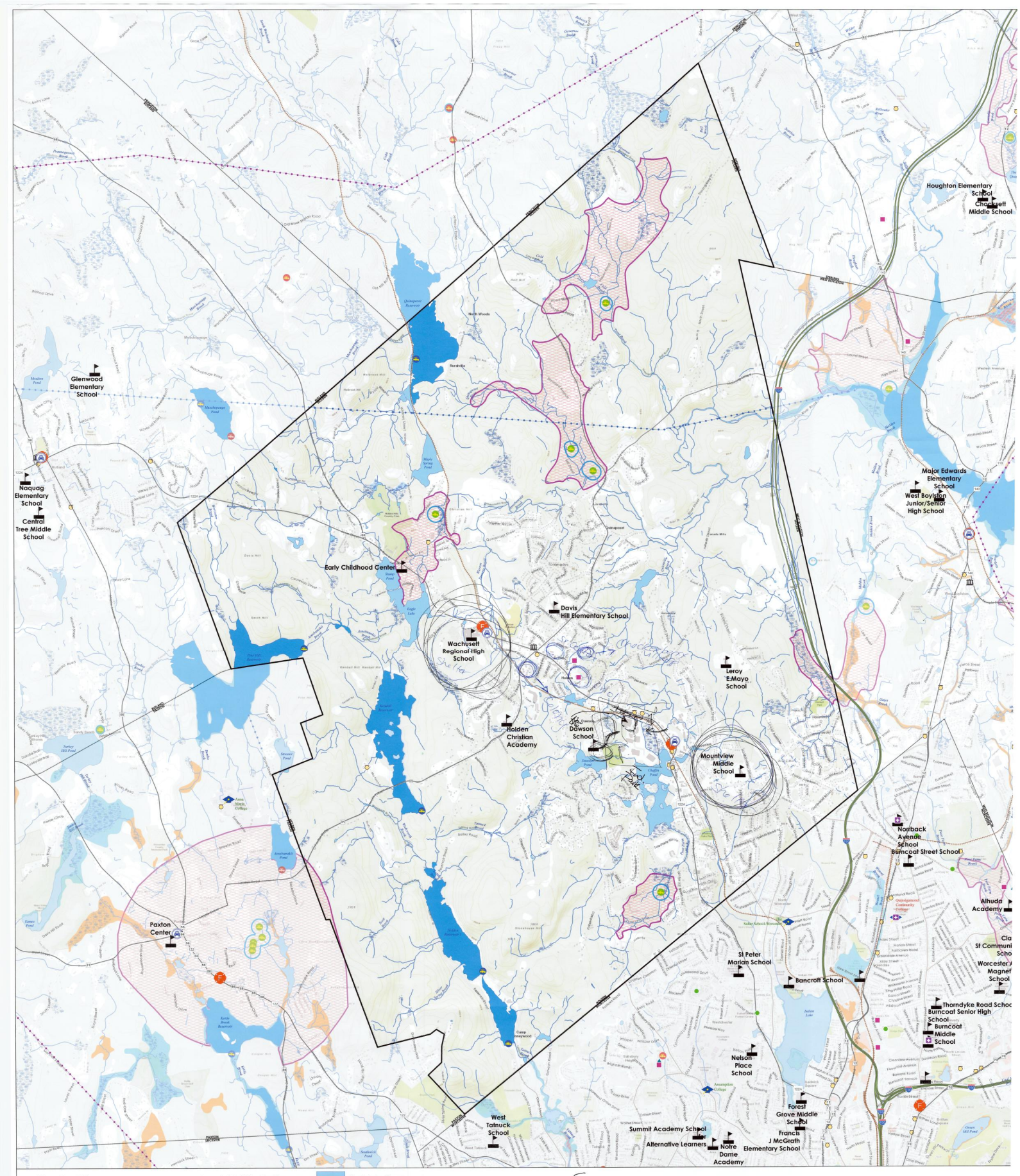

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HOLDEN, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

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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	Summer Precipitation Events	Winter Storms Nor'Easters Wind / Ice	Drought	Extreme Heat	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Industrial Park Access (RR Tracks)		Town	V		X				
Code Red			S						
Town Shelters			S						
1.									
Societal									
Vulnerable Population Database			V	CHECK WITH COA TOWN CLERK SENIORS DATA LOCAL UTILITY DATA SCHOOL SPED NEEDS		COMMITTEE CHAMPION			
Group Homes Shelters									
Elderly Housing Evacuation Plan			V						
Medical sheet supplies during Events	Varies	Town/Private	V						
PUBLIC OUTREACH FOR EMERGENCY PREP									
Environmental									
Tick & Mosquito Born Illnesses			V	✓ ONGOING AWARENESS / EDUCATION ✓					
Outreach (oriol outreach Approach)	BEGIN NOW		S						

Industrial Park has limited access for emergency vehicles

Drought education on emergency supplies for the public

Town is ACCESAD working w/ CMRP on EVACUATION PLANS

SHELTERS CONSTANTLY + CURRENTLY BEING EVALUATED

COMMUNICATE CHRIS'S Preparedness Package to NEEDS only

Oriol outreach & education

LOCAL POWER IS GREAT

Drought Increase risk of tick & mosquito born illnesses

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

H-M-L priority for action over the Short or Long term (and Ongoing)
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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	Summer Precipitation Events	Winter Storm Events - Nor'easters Snow & Ice	Drought	Extreme ~~Heat~~	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Emergency Power Reliability @ 3 water supply pumps	Various	Town	V	✓	✓				
Quinapoxet ~~Rt~~ Culvert	Tannery Brook	Town	V	✓	✓				
Eagle Lake Dam (To Reduce Risk Plan to Lower which will lower Eagle Lake)	Jefferson Mill	Private	V	✓					
National Grid Transmission Lines	WB/Holden	Nat. Grid	V	✓	✓		✓		
Culvert Assessment/Stormwater/BMP	Various	Town/Private	V	✓	✓				
Standby Gaseous fuel Gas/diesel or Genset Backup	Adams Road	Town	S	✓	✓				
Societal AMLD Tree Trimming	Town Wide	Town	S	✓	✓				
Environmental									

Group Homes: Usually staffed but may not be fully prepared

EMERGENCY KIT ☑ LIST TO ALL

Elderly Checkerberry
- JUST MAKE SURE THEY ARE ON LIST

Create vulnerable population live database

Shelters are SOLID

Code Red Line (211) (911)

PETS + SERVICE ANIMALS

Rx - INSURANCE ISSUE
ELEC EMERGENCY
MED SUPPLIES
ADL NONEXISTENT

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	Summer Precipitation Events	Winter Storms Wind/Ice/Snow Nor'Easters	Drought	Extreme Heat	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Societal									
LOCAL/STATE REGS DON'T ADDRESS CURRENT CC IMPACTS									
WIND Events			V	ENERGY OUTS	ENERGY OUTS		ENERGY OUTS	WILD FIRES	
DAM SAFETY / HUMAN ANIMAL			V	STRESSED	STRESSED				
WATERSHED PROTECTION Act			S	Regulates Activities w/ 400' TRIBS					
Environmental									
WATER WELLS BACKUP POWER	VARIOUS	TOWN	V	V	V	V	V		
SEWER PUMP STATIONS BACKUP POWER	"	"	S						
OPEN SPACE FIRE HAZARD			V	MANAGE PESTS / INVASIVE PATHOGEN — FOREST/WOODS OUTREACH TO GOVT OWNED PROPERTIES: STATUS OF FOREST			PEST MGT PLANNING		
PUBLIC DRINKING WATER SUPPLY			S/V	ACCESS TO DRINKING WATER — EXTREME DROUGHT					
FAILURE TO MAINTAIN BMPs (PRIVATE) DECREASE FLOOD CAPACITY, INC WATER QUALITY THREATS			V	LIMITS DEVELOPMENT PUBLIC ED/OUTREACH / NOTIFY LOCAL AUTHORITY					
ALGAL BLOOMS RIGHT TO FARM			V/S	SW PUBLIC OUTREACH THRU AGI COMMISSION ABOUT THREATS FROM FERTILIZER CONSIDER BMP ROAD TRIP DCR (KELLY TO SPEAK) FOR AGI TOUR					
TRIBUTARIES IMPACTED BY SW FLOWS			V	WORK TO BE WITH BMP TOWN OFFS/GI TO SCHEDULED ROAD IMPROVEMENTS					

1 STORAGE

Appendix C

CRB Workshop Presentation Materials

FUSS & O'NEILL

Boston Firefighters, January 4, 2018 (Reuters)

Cambridge Reservoir, Lincoln, MA (Boston Globe)

Municipal Vulnerability Preparedness Program
Community Resilience Building Workshop
Town of Holden

May 7, 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 Holden
- Discussion by Holden representatives on status of current planning
- Introduction to CRB Workshop process

- Large group
  - Determine top four hazards

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

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Fuss & O'Neill Overview

At Fuss & O'Neill, we place great emphasis on collaboration; both within the company and with our clients. We are guided by what is best for the client and the project – in identifying client champions, naming project leaders, building project teams, and providing responsive service and quality deliverables.

We strive to partner with our clients to understand their businesses and to be stewards of their resources as if they were our own, and aim to develop services and solutions that anticipate evolution of their unique business needs.

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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.

Kurt Mailman

Kurt manages diverse wastewater and stormwater management projects from evaluation of pumping systems to capital improvement plans, funding, assessment, and design of challenging hydraulic conveyance systems and training of operations staff. He is adept at managing all aspects of complex multidisciplinary projects from project initiation through construction and commissioning of facilities.

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MVP Program - Holden $16,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency planning
  - Comprehensive Approach
    - Infrastructure
    - Society
    - Environment
  - Scope and Process Use the 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

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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
- Priority given to projects that propose nature-based solutions, green infrastructure, and enhancement of natural systems
- Phased approach encouraged
- Application deadline May 18
- Project award early June
- Next funding round anticipated early in FY19

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

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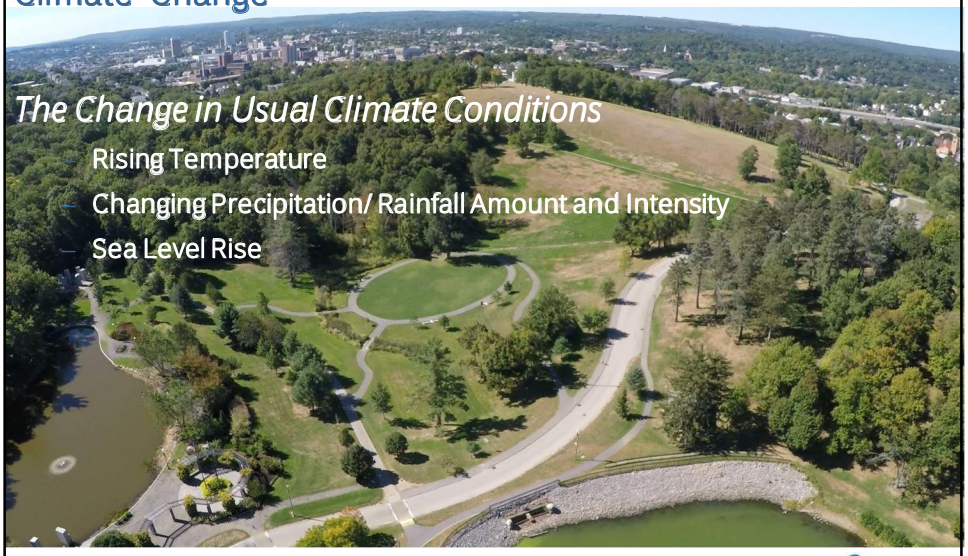
Terminology

Climate Change



The Change in Usual Climate Conditions

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

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Town of Holden – Nashua and Blackstone River Basin

Rising Temperature

Nashua Basin Blackstone Basin	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Average Annual Temperature (°F)	46.78 48.20	2.20 2.17	to	4.44 4.23	2.99 2.88	to	6.39 6.29	3.54 3.52	to	9.02 9.05	3.90 3.78	to	10.95 11.06
Annual Days with Maximum Temperature over 90°F (Days)	4.37 4.69	5.83 5.41	to	17.04 15.55	8.93 7.80	to	29.98 28.89	10.40 9.95	to	49.93 51.17	12.50 12.23	to	69.88 70.36
Annual Days with Minimum Temperature below 0°F (Days)	9.32 5.96	-2.91 -1.95	to	-5.69 -3.70	-3.75 -2.34	to	-6.66 -4.31	-4.25 -2.59	to	-7.21 -4.87	-4.24 -2.68	to	-7.76 -5.06

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Town of Holden – Nashua and Blackstone River Basin

Changing Precipitation

Nashua Basin Blackstone Basin	Observed Baseline 1971-2000	Projected Change in 2030s			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Total Annual Precipitation (Inches)	45.89 47.13	0.43 0.26	to	4.88 5.53	1.15 1.35	to	6.29 6.79	2.26 2.49	to	7.87 8.67	1.25 1.62	to	8.38 8.71
Annual Consecutive Dry Days (Days)	16.21 16.63	-0.41 -0.36	to	1.65 1.48	-0.79 -0.34	to	1.71 2.05	-0.75 -1.00	to	2.13 2.42	-0.66 -0.59	to	2.82 2.92

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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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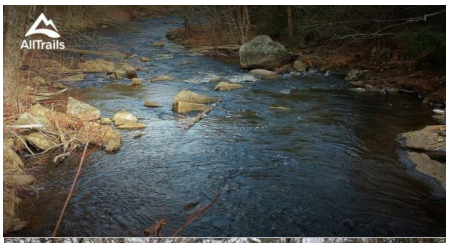
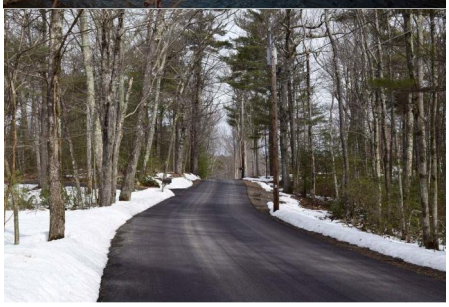
Climate Change Impacts - Precipitation

- Economic
  - Dangerous Floods
- 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

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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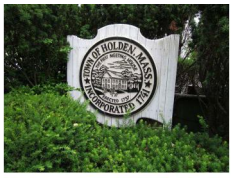
MVP Program

- Community Resilience Building
  - Hold Workshop to Engage Stakeholders in the Community
  - Identify Impacts Using Available Data, Including New Climate Projections Developed by the Commonwealth
  - Identify Community Strengths and Vulnerabilities from Data and Community Input
  - Prioritize Actions - Conclude Workshop
  - Prepare and Review Report and Priorities
  - Move Forward
    - Identify and Monitor Funding Opportunities for Recommendations
    - Incorporate Plan into Other Local Planning Efforts



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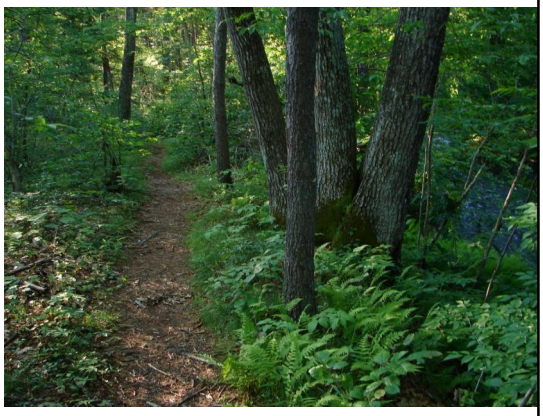
Climate Change Hazards

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



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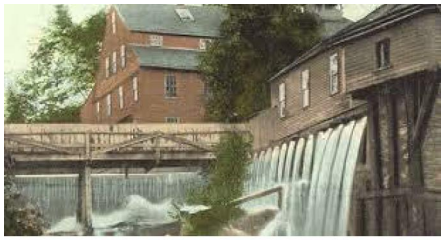
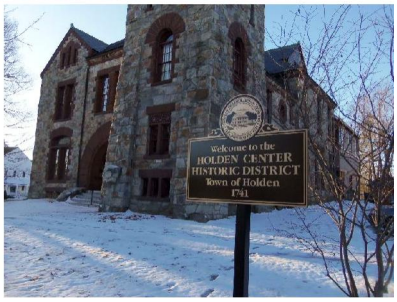
MVP Sectors

- 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?