Town of Ware

Municipal Vulnerability Preparedness

Final Report

May 2018

Prepared for the Town of Ware
By the Center for Resilient Metro-Regions at the University of Massachusetts, Amherst
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Prepared by the Center for Resilient Metro-Regions at the University of Massachusetts, Amherst
for the Town of Ware by
Elisabeth Hamin, PhD and Center Director
August Williams-Eynon

And the Ware Core Team
Nancy Talbot, Chair of the Board of Selectmen
Stuart Beckley, Town Manager
Ruben Flores-Marzan, AICP, Director of Planning & Community Development
Judith Mosso, MPA, Assistant to the Director
Dick Kilhart, Director of Public Works
Christopher Rice, Building Commissioner
Anna Marques, Building Inspector
Ed Wloch, Deputy Fire Chief

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Overview

This report contains the findings of the Municipal Vulnerability Preparedness (MVP) process conducted with the Town of Ware, MA from January to May 2018. This process was facilitated by the Center for Resilient Metro-Regions at the University of Massachusetts, Amherst, and was completed to support Ware's goal of becoming an MVP community. Funding and technical assistance provided by the Massachusetts Executive Office of Energy and Environmental Affairs and The Nature Conservancy were critical to the success of the MVP process.

The Town of Ware is located on approximately 40 square miles of land in Hampshire County, with the Swift River on its western boundary and the Ware River in the southeastern part of town. The Quabbin Reservoir lies in the northwest quadrant of town, with the Windsor Dam, its spillway and the Goodnough Dike within town boundaries. The Town's population was 9,872 as of the 2010 census and population has been slowly shrinking since 2000. With a long history as a textile mill center, Ware is struggling to maintain a pleasant downtown as most of its labor force now works elsewhere in the region. Route 9 is the major east-west corridor, and the only public mass transit in the area is the Pioneer Valley Transit Authority's (PVTA) limited Ware Shuttle, soon to be further reduced by fiscal constraints to an express route between Ware, the town of Palmer, and Union Station in Springfield.

Ware has experienced historical and recent events that have placed the need for resilience in the spotlight. Environmental hazards, such as flooding from hurricanes in 1938 and 1955, the state-wide drought of 2016, and a recent ice flood in January 2018 are prominent in local memory and build awareness of the importance of the MVP process. As a town with a small tax base and socio-economic challenges in its downtown area, these environmental threats add to the existing issues Ware faces. However, Ware has strengths as well as vulnerabilities, with strong social networks, good planning, and institutions in place that can facilitate resilience-building going forward.

These issues, along with others that arose during the planning, implementation, and analysis of the Community Resilience Building Workshops, are explored in this report, through specific identification of community vulnerabilities and strengths and the actions selected to address them.

We are pleased to submit this Final Report to document the results of the Municipal Vulnerability Preparedness program for the Town of Ware.

I. Description of Process

MVP program implementation in Ware began with formation of the Core Team, drawn from key roles among municipal staff. Ruben Flores-Marzan, AICP (Director of Planning & Community Development) and Judith Mosso, MPA (Assistant to the Director) assembled town leaders, including Town Manager Stuart Beckley, Chair of the Board of Selectmen Nancy Talbot, Director of Public Works Dick Kilhart, Deputy Fire Chief Ed Wloch and Building Commissioner Christopher Rice. This group convened alongside Center for Resilient Metro-Regions (CRM) staff for a kickoff meeting on January 26, 2018.

At this meeting, CRM staff and the Core Team arrived at a consensus on Ware's goals for the MVP process, while also identifying a broad array of stakeholders and finalizing the project timeline and roles for the Core Team and CRM staff. After the kickoff meeting, the Core Team moved to stakeholder engagement and CRM staff began preparation for the Community Resilience Building Workshops. Identified stakeholders ranged from local non-governmental organizations (NGOs) such as a local land trust to public health organizations and local business interests, town staff such as the Fire Chief, Tree Warden, public works personnel, and important employers in town such as Baystate Health.

Stakeholder engagement for the Workshops consisted of emailed invitations to the list of stakeholders with follow-up calls and reminder emails, plus open meeting listing and publicity about the MVP meeting on the Ware website. Given Ware's small population size and connected community, this approach was effective and nearly all invited stakeholders were able to attend the Workshops.

Meanwhile, CRM staff conducted a preliminary analysis to support identification of vulnerabilities, strengths, and actions during the Workshops as well as future resilience planning efforts by Ware officials. This analysis produced several maps displaying: the geographic distribution of social vulnerability[1]; environmental features such as flood zones, tree canopy, and impervious surfaces; critical infrastructure; and a range of other resilience-providing facilities, including food outlets, emergency shelters, cooling centers and public transportation. These maps are included for reference in the Supplemental Materials section at the end of this Report. During preparation of this analysis, CRM received continual input from the Core Team on content accuracy and presentation, as well as on general Workshop preparation and coordination, to ensure success of the CRB Workshops.

Workshop 1 was held on March 9, 2018 at the Ware Fire Station. After introductions were made by the Town, CRM staff gave a brief presentation covering the goals and objectives for the day, state-provided climate projections for the Chicopee River Basin, the results of our preliminary analysis, and a framework for considering nature-based solutions for resilience actions. We came to

[1] Social vulnerability: A combination of socioeconomic variables that affect different social groups' sensitivity and adaptive capacity to natural hazards. Our analysis includes factors such as wealth/poverty, age, race, and gender, among others, as adapted from the Hazards & Vulnerability Research Institute at the University of South Carolina.

consensus on the community's top hazards, partially based on the Town's 2016 update to their Hazard Mitigation Plan, and then moved into small groups to begin identifying features and actions. With broad representation from many key public and private institutions, the first workshop achieved significant development of the Risk Matrices (Appendix A) as well as identification of the preliminary top preferred actions to address those.

Workshop 2 was held on March 23, 2018, also at the Ware Fire Station. This Workshop focused on completing the teams' Risk Matrices, in particular the entries for actions and priorities that were largely not reached in the first Workshop. CRM staff began the Workshop with a reminder of the general MVP process plus a broader explanation of possible resilience actions that was tailored to the risks and opportunities identified in the first Workshop. Participants then worked in small groups to fill in the portions of the Risk Matrix that had not been completed during Workshop 1. Workshop 2 thus provided a useful set of actions and prioritization, as well as the key large-group identification of top-priority actions. Report-outs and plenary discussion confirmed the priority list from Workshop 1 and added items from the content developed in Workshop 2, with a particular focus on identifying some actions that could be accomplished quickly and others that were important but would take more time and effort.

Workshop sign-in sheets (see Appendix E) provide a comprehensive list of participants and their affiliations.

After completing both Workshops and compiling the results in a master Risk Matrix (Appendix A), the Final Report was drafted with continual feedback from the Core Team. Workshop findings were also presented in a public listening session, held at the Ware Fire Station on April 11, 2018. A complete Final Report was then produced, reflecting input from all stages of the process.

II. Summary of Findings

Primary vulnerabilities were identified in Ware's water infrastructure, as well as in the elderly, low-income, and vehicle-lacking populations (exacerbated by the shortage of public transportation). Ware's main strengths were identified in their breadth of community-based social organizations, which provide key support and can be mobilized further to build resilience.

Prioritized community actions centered on these vulnerabilities and strengths. They included protecting water infrastructure, improving communications and mobilizing social networks to create regional wellbeing teams, and expanding an existing transportation alternative, among other items. Actions can be integrated with current town initiatives, including the anticipated Complete Streets effort for downtown and efforts to redevelop vacant structures downtown.

These actions will be implemented or further explored through continued formation of coordinating stakeholder groups, integration with ongoing Town planning efforts, and development of related existing Town goals such as a Complete Streets bylaw. State funding will be requested for specific infrastructure upgrades that will improve public safety, as well as a communication strategy to enable quicker response in times of public health emergency.

III. Completed Risk Matrix

Please refer to attached Excel document for completed Risk Matrix, which was not included here for formatting reasons. Please note: dark orange rows are those identified as top priority actions during the CRB Workshops and confirmed as important for the Town by the Core Team, while lighter orange rows were those identified as second-highest priority actions.

IV. Description of Community Vulnerabilities and Strengths

Many vulnerabilities and strengths were identified during the Community Resilience Building Workshops, which have been captured on the Risk Matrix (Appendix A). This section identifies the items of primary importance to the Town.

Primary Vulnerabilities

Infrastructural

In terms of infrastructure, primary vulnerabilities center on water provision and protection. Ware is surrounded by water in many directions, including the Ware and Swift Rivers and many smaller brooks, all of which are potentially subject to flooding that may increase in frequency as precipitation patterns change.

Specifically, the town water supply infrastructure (including public wells and a pumping station on Barnes Street) lies within the 100-year floodplain, and a severe flood could contaminate the system. Additionally, there are two dams in the downtown area, as well as river channels and levees, on the Ware River. If these were to fail during a flood event, the downtown area would face significant risk of damage. Other flood levees and dams throughout town, such as those at the Quabbin Reservoir and within the Beaver Lake community, would also cause significant hazards if they were to fail. Some areas are already vulnerable to flooding; specifically, the region of Upper Church Street which crosses the floodplain at the Ware River was recently closed due to an ice flow event in January 2018. South Street has also been subject to stormwater flooding due to drainage issues.

The preliminary analysis by CRM also indicated that while most of the town's critical facilities are located out of the floodplain, several are close to floodplain boundaries, namely the Department of Public Works headquarters and the Ware Fire Station. Floodplain maps may be redrawn in the future to reflect climate-driven shifts in precipitation patterns. This warrants future monitoring to determine whether these facilities require flood protection.

As a more general vulnerability, Ware has a high amount of public infrastructure as compared to private or non-profit infrastructure. The town's relatively small tax base means it faces the challenge of generating enough revenue to address deferred maintenance issues while keeping taxes stable. If this remains an ongoing issue, inability to conduct regular maintenance may create new vulnerabilities and impede service provisions.

For more detail on infrastructure and facilities that may be impacted in Ware which were not discussed during these Workshops, the 2016 Hazard Mitigation Plan update presents a thorough examination of potential natural hazards and related vulnerabilities.

Societal

Social vulnerabilities were largely connected to the elderly population, both downtown and scattered in the rural areas of Ware. This group can be isolated chronically from services and resources and specifically during emergencies. This disconnection is exacerbated by the lack of public transportation options, which particularly impacts all Ware residents without the means for vehicle ownership. Although most of the population lacking a vehicle is located downtown, the need for more public transportation pervades the town. Other noted social vulnerabilities focused on low income populations in general, which are largely located downtown and in designated low-income housing. Having fewer resources to recover from hazard impacts or adapt to ongoing climate shifts, people with lower incomes experience greater vulnerability in general.

To expand upon transportation systems, the scarcity of options contributes to local vulnerability. An NGO is providing limited dial-a-ride services for those lacking cars in the area, but there is no proper public transportation system, and those without cars would be at increased risk in an evacuation event. According to the 2012-2016 American Community Survey, roughly 8% of Ware households lack access to a vehicle. However, in several census block groups this figure ranges from 30-45% among renting populations. Additionally, Ware's street infrastructure is principally designed for passenger cars, and does not focus on safely including other non-motorized modes of transport such as bicycling or walking. Although this also pertains to infrastructure, it creates a societal vulnerability by decreasing access to services and facilities for Ware residents who do not own a car. Transportation-related societal vulnerabilities are a significant impediment to upward economic mobility. Thus, it is critical for Ware to continually engage with regional and statewide decision-makers to find transportation alternatives as not doing so will most likely change the nature of these vulnerabilities from temporary to permanent in nature.

Related to this lack of transportation access is the reality of the local food system. Ware has only two major groceries: Big Y, which is located on the commercial strip of Route 32 outside the downtown area, and Walmart, located further south on Route 32. Neither store is within a reasonable, pleasant walking distance from the center of town, and the shortage of public transit options makes them even less accessible to residents lacking cars. This increases vulnerability for these residents. Furthermore, if Routes 32 and 9 were somehow compromised and food supply trucks were unable to reach these stores, this could pose a major issue to the town food supply.

Additionally, a central theme of the Workshops that arose many times was the perceived lack of community cohesion and coordination present in Ware, which currently prevents neighbors from supporting one another in times of need as a way to stretch and supplement emergency and social services. This was identified as a key vulnerability that needed to be addressed.

CRM's preliminary analysis included 16 variables that affect vulnerability, based on academic research[2] and key issues of local importance (Table 1). Data was retrieved from the American

[2] These variables were adapted from the Hazards and Vulnerability Research Institute (HVRI) at the University of South Carolina. For a specific reference, see: *Cutter, S. L., Boruff, B. J., & Shirley, W. L. (2003). Social Vulnerability to Environmental Hazards. Social Science Quarterly, 84(2), 242-261.*

Community Survey (ACS) 2012-2016 5 Year Estimates for the census block group level.[3] Each block group received a score from 1-3 based on the distribution of each variable (1 = low vulnerability, 3 = high vulnerability). The scores were then totaled to create an index of social vulnerability, which was then mapped to show a geographic distribution of social vulnerability.

Table 1. Variables used in CRM's social vulnerability analysis. Second column indicates the effect on vulnerability as the variable increases. Issues of local concern highlighted by Ware's staff are in italics.

Variable	**Effect on Vulnerability**
Age (% pop. under 5 yrs./over 65 yrs.)	Increases
Median home value	Decreases
No vehicle access (% of households)	Increases
Female headed households (% of households)	Increases
Non-white population (% of total pop.)	Increases
Hispanic population (% of total pop.)	Increases
Low English proficiency (% of total pop.)	Increases
Renters (% of total pop.)	Increases
Length of residency (year majority of pop. moved in)	Decreases
Below poverty line (% of total pop.)	Increases
Per capita income	*Decreases*
Unemployment (%)	*Increases*
Education (% pop. over 25 w/less than HS degree)	*Increases*
Disability (% of households)	*Increases*
Length of commute (% w/ longer commutes than state average)	*Increases*

In addition to the vulnerabilities in the elderly population noted by Workshop participants, CRM's preliminary analysis indicated highest overall social vulnerability in the downtown area due to lower incomes, higher unemployment, lower educational attainment, and less access to vehicles. Medium vulnerability was found in the rural areas of Ware, due to the higher concentration of young children, lower educational attainment, and the locally identified issues of longer commutes and individuals with disabilities (see Appendix B for complete preliminary analysis).

Environmental

Primary environmental vulnerabilities identified were impervious surfaces (concentrated in Ware's downtown) and Ware's trees and forests (concentrated in rural areas). Due to the heat-trapping quality of impervious surfaces and the relative lack of tree canopy, Ware's downtown will experience greater impact from increasing temperatures due to climate change than the town's surrounding rural areas. The concentration of impervious surfaces also means that stormwater runoff is not readily absorbed, exacerbating flooding issues. Trees, while providing a cooling service that mitigates heat, can also present a hazard during storms if they fall on roads, houses or power lines (as evidenced during the October 2011 nor'easter). Buildup of undergrowth in forests can also add to fire risk. Although it was not noted in the Risk Matrix, some discussion highlighted that

[3] It should be noted that due to the small population of Ware, there is inherent uncertainty in ACS data at the census block group level due to the large Margins of Error in relation to population size.

changes in climate also precipitate increased presence of invasive insects that threaten street trees and forests.

Some groups also noted that the Town in general, despite the availability of undeveloped areas, suffers from a relative lack of accessible recreation space. In particular, lack of safe physical access to the Ware River for swimming presents a significant issue, as normally that would provide a cooling opportunity during hot weather. *See Appendix B for complete preliminary analysis of environmental vulnerabilities.*

Lastly, the Massachusetts Office of Technical Assistance (OTA) has recently begun a Chemical Safety and Climate Change Preparedness project to help municipalities assess and address risks posed by hazardous chemical use and industrial accidents in light of changing climate threats. Ware has several parcels identified as at-risk on this map, and may have other parcels in flood plains that are likely to have some chemical storage. As this program develops, it may provide a helpful set of resources for including toxic waste usage among environmental vulnerabilities.

Primary Strengths

Infrastructural

Primary strengths identified included emergency features such as the cooling center used at the Ware Senior Center; the presence of the Fire Station and the National Guard Armory; existing emergency generators in various locations; and the systems in place to regulate flooding, although these were also potential vulnerabilities. Additionally, the local rail trail and hydropower facilities in town could provide alternative transportation and energy provision options, potentially increasing system redundancies and adding to resilience.

Lastly, although it was not mentioned during the Workshops, the Ware-Gilbertville covered bridge (located in the northeast corner of town) provides a strength, having shown resilience during flood events. It withstood the major 1938 Hurricane (which washed out the railroad immediately adjacent) and has since been well-maintained, receiving structural repairs and fire protection upgrades in 2010. It no longer has a weight limit.

Societal

In addition to the emergency response services such as ambulance, fire, and the Baystate Mary Lane health care facility, a key strength that emerged was Ware's many social service-oriented nonprofits and public-private partnerships. These organizations, such as the Community Benefit Advisory Committee of Baystate Mary Lane (includes churches, food pantries, and other frontline community organizations) and the Quaboag Hills Community Coalition and Substance Use Alliance, work in concert to address the needs of Ware residents. They have a prominent presence in town and are well embedded within the community. The social networks they form can supplement emergency response in various ways or address issues like poverty or mental illness before emergencies occur, reducing general vulnerability and building resilience. Similarly, the faith community, the Senior Center, and other social institutions and employers represent strengths and assets for coordination and communication.

Additionally, the Quaboag Connector, a call-based van transportation service that aims to address the gaps in public transportation in the Quaboag Valley Region (includes Ware and 7 other towns), is an essential strength that can be built upon for access to services, employment, and education that bolster overall resilience. Given its increasing utilization by the non-driving population, the Connector may be helpful during emergencies as well. Maintaining or increasing funding for the Connector is essential in light of PVTA's fiscal constraints, which will likely continue to reduce Ware Shuttle service.

CRM's preliminary analysis also included a resilience map, which measured the extent of the quarter-mile and half-mile walking radius around many of these services. This indicates how much of Ware, and which vulnerable populations, are within walking distance of facilities should other forms of transportation be unavailable (due to an emergency or lack of a personal vehicle). Generally, most of these services are concentrated in the downtown, which is a good match to the neighborhoods of greatest vulnerability. However, some services are distributed farther out along Route 32, somewhat distant from population centers (see Appendix B).

Environmental

The great extent of open space in the town is a clear strength. Grenville Park, a 100+ acre recreational and environmental resource immediately adjacent to Ware's downtown and the Ware River, is a primary strength for the town. Its tree canopy and undeveloped area provide cooling, floodwater retention, and wildlife habitat, while its recreational resources (sports fields, walking trails, playgrounds, etc.) provide space for social gatherings and exercise. The Park's presence adds value to the town and attracts visitors.

Conservation land in Ware's floodplains, including the land surrounding the Quabbin Reservoir, along the Ware River, and in wetland areas, also provides a strength in terms of flood reduction. Similarly, town forests provide many environmental functions, such as cooling, air filtration, rainwater infiltration, and provision of wildlife habitat. In this vein, the East Quabbin Land Trust is an important player in facilitating land acquisition and management to support these goals.

Two strengths that were noted are emergent and should be encouraged for resiliency. Local farms and food producers have a key role to play in supporting the food supply. Buy-local programs through retailers could help connect Ware residents to these resources. Finally, solar energy projects represent both a strength and vulnerability for the town. While they provide alternate sources of energy and potentially revenue, they can also incentivize clear-cutting of private forests for installation, and must therefore be carefully located.

V. Prioritized Community Actions

Identifying highest priorities for the community was done in several ways, to assure that there was ample opportunity for a thoughtful collaborative process. First is the Matrix process as noted in the MVP, which provided the base for all conversation. Second, at the end of Workshop 1 we asked workshop participants to 'sticky dot' vote on the top priorities they had identified in the matrices. In Workshop 2, participants revisited their responses in Workshop 1 and added any items they thought were missing while they continued to fill in the Matrices. At the end of Workshop 2 we had groups report out their highest priority items that were relatively easy and quick, and their highest

priority items that would be longer and more challenging. We held a public listening session based on the matrix results. Finally, the Core Team reviewed the findings from all these steps to build buy-in to the results. The Findings below represent a synthesis of these approaches. There was a great deal of commonality across all of these, with specifics changing a bit (i.e., reverse 911 or community-based wellness checks) but core needs stayed the same, as reported here. Results from each of these are briefly discussed below, with overall priorities summarized below.

1. Matrix process: priorities are included in the appendix and summarized below.

2. Core team: In conversations with the Core Team, two goals have stood out in importance and connection to existing town goals: Complete Streets implementation and improvements to the downtown streetscape. Both of these features arose during discussion, in whole or in parts, in the Workshops and can be found in the Risk Matrix. However, specific solution ideas were suggested by the Core Team to accompany those on the Risk Matrix and should be mentioned here.

   Firstly, the Core Team is working towards creating a Complete Streets bylaw and a soon-to-follow phased implementation plan. This would aim to provide the conditions for increased bicycling as a means of transportation to jobs and services, which supports residents who lack vehicles while also reducing greenhouse gas emissions and contributing to public health. Additionally, town officials hope that Complete Streets upgrades would attract more homebuyers and diversify the tax base. Complete Streets are thus a key method of building Ware's resilience and CRM supports their inclusion as an additional recommendation.

   A second long-standing Town objective for increasing social and economic vitality is rehabilitating downtown private property which has fallen into disrepair or become vacant. Increasing local employment and retail would improve local resilience. Working with property owners to conduct a charrette-based visioning process and develop a master plan for these types of properties, with phased improvements, is thus an important recommendation to build overall resilience.

3. Workshop 2 Fast/Easy, Hard/Important Summary: At the end of Workshop 2, each of the small groups (4) were asked to choose one "easy and fast" action to be implemented over the short term, and one "important but difficult" action to focus on long-term (see Table 2). These actions could stem from any of the three community sectors. This exercise aimed to test the priorities listed on the matrices, and stimulate quick momentum for resilience-building as well as long-term investment and buy-in for the process. The results, as shown in Table 2 below, match the general priorities listed above but add items of long-term community concern (town pool, Title V loans).

Table 2. Results of the final group exercise that concluded Workshop 2.

Easy and Fast	Important but Difficult
• Create local plan for community resilience response from neighbor to town scale	• Create clustered microgrids for community energy resilience
• Improve communications with state DCR regarding Quabbin dams	• Permanently resurface rail trail (potentially with permeable paving)

• Promote use of Code Red (local reverse-911) and extend to cell phones + businesses • Petition for extension of state Title V loans for private well upgrades • Explore options for the acquisition of portable microgrids technologies for the quick energization of critical facilities while waiting for regular electricity service to be restored	• Raise/protect pump station at Church St • Repair or replace town pool

Priority Actions Synthesized

Infrastructural

- Upgrading the monitoring, maintenance, and protection of downtown flood infrastructure (dams, channels, and levees) and water supply infrastructure (wells and pump systems), including assuring on-going access to portable or other generators in case of power outages.
- Assure alternative transportation routes are available, including the Quaboag Connector described below in lieu of more PVTA investment in the area, as well as the rail-trail which is under development. These assist with emergency response, but also with connecting current residents to employment, which builds individual household resiliency.

Societal

- Develop (with a consultant) an overall plan for communication to the public and among town and state officials in case of a public health event, including coordination with DNR regarding Quabbin conditions, information on location and timing of cooling stations, routes for evacuation in case of flooding, and similar information.
- Plan to use school buses + Quaboag Connector to evacuate/transport vulnerable populations to shelters/cooling centers
- Mobilize Baystate's Community Benefit Advisory Committee to provide shelter during emergencies
- Create a regional volunteer emergency response team that conducts wellbeing checks (among other duties), based on Ware's network of social service and community organizations
- Improve coordination between that network and emergency facilities/service providers to increase access to shelters and recovery facilities during/after emergencies
- Build relationships and communication among neighbors and neighborhoods, in general and especially between the elderly and other age groups, to encourage cohesion and community preparedness

Environmental

Given Ware's excellent open space and environmental services, none of the top priorities originated in the Environmental sector. Two Environmental actions were designated second-highest priority actions were:

- Pursue further land acquisition and conservation in floodplains and wetlands for flood reduction

- Implement existing forest management plans to maintain growth and manage fire risk. This could become a high priority item if drought conditions occur more frequently or if insect infestations bring widespread tree death, given Ware's extensive tree canopy and forests.

VI. Next Steps for Integrating Findings

Key next steps for implementation are summarized below:

- Seek funding from the State to implement high priority items listed above
- Establish a Community Resilience Support Group composed of leadership of the organizations convened at CRB Workshops to assist in coordinating multifaceted resilience actions
- Conduct further review of existing Town plans (Master Plan, Hazard Mitigation Plan, Open Space Plan, Heritage Landscapes Plan) to identify areas of overlap with resilience actions
    - Determine opportunities for zoning amendments and developer incentives to support resilience actions, especially low-impact development/green infrastructure
    - Identify ways to connect resilience to community development, including addressing abandoned buildings and increasing local employment opportunities
- Continue pursuing Complete Streets bylaw implementation, as well as downtown streetscape visioning plan
- Explore increasing funding to Quaboag Connector to improve household level resilience for lower income and non-car owning families.
- Explore creation of 'Ware Coalition' of neighborhood-based alliances of social organizations, which are capable of collaborating with emergency management and volunteer wellbeing-check team (similar to regional Quaboag Valley social organization networks, but Ware-specific).
- Begin development of a resiliency-based infrastructure redundancy strategy that focuses on the use of existing portable microgrids and telecommunication technologies to quickly restore public services after an extreme event occurs. The goal of this objective is to reduce residents' exposure to vulnerability while giving statewide authorities and private sector providers the time and ability to safely restore these critical services.

VII. Appendices

Appendix A: Prioritized Risk Matrix & Full Completed Risk Matrix

Prioritized Risk Matrix:

Dark orange = Top priority items identified during Workshop 2 and confirmed as important for the Town by the Core Team

Light orange = Next priority actions identified during Workshop 2 and confirmed as important for the Town by the Core Team

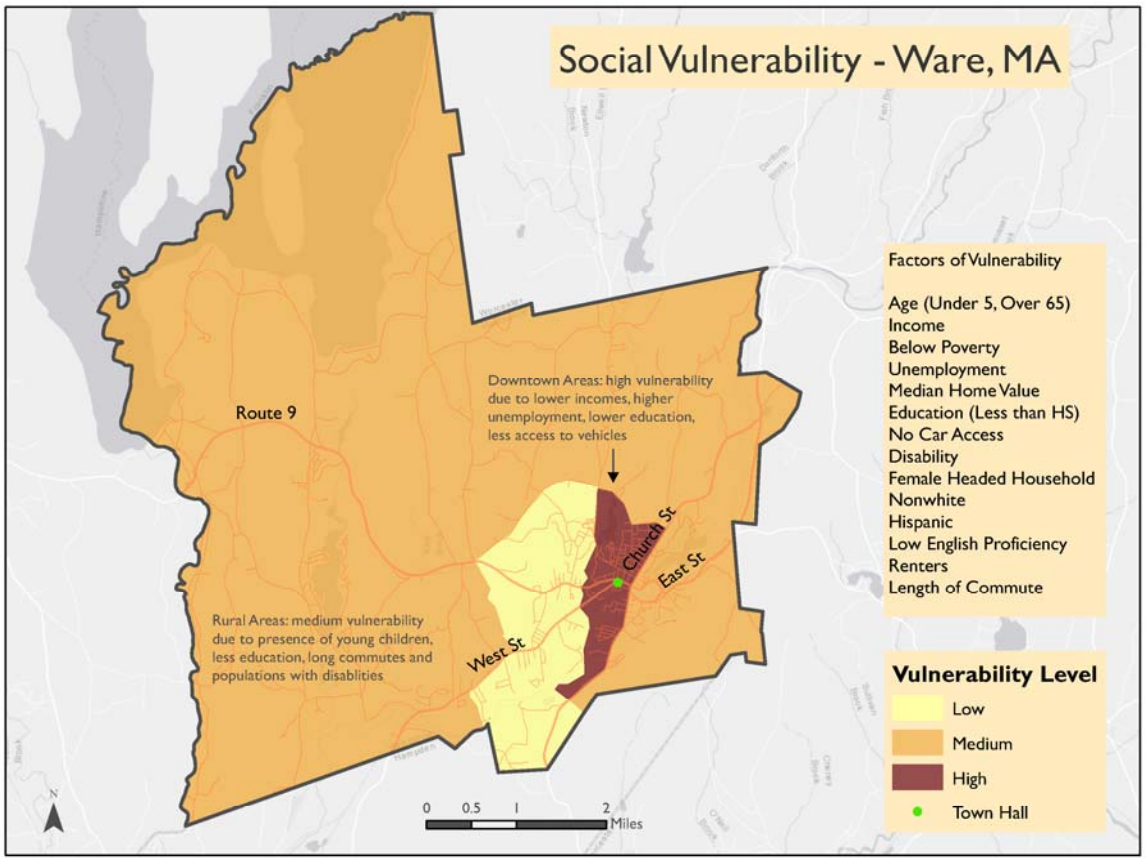
[Prioritized Risk Matrix: 2-page insert]

[Full Completed Risk Matrix: 5-page insert]

Appendix B: Maps and Preliminary Analysis Produced for Workshops

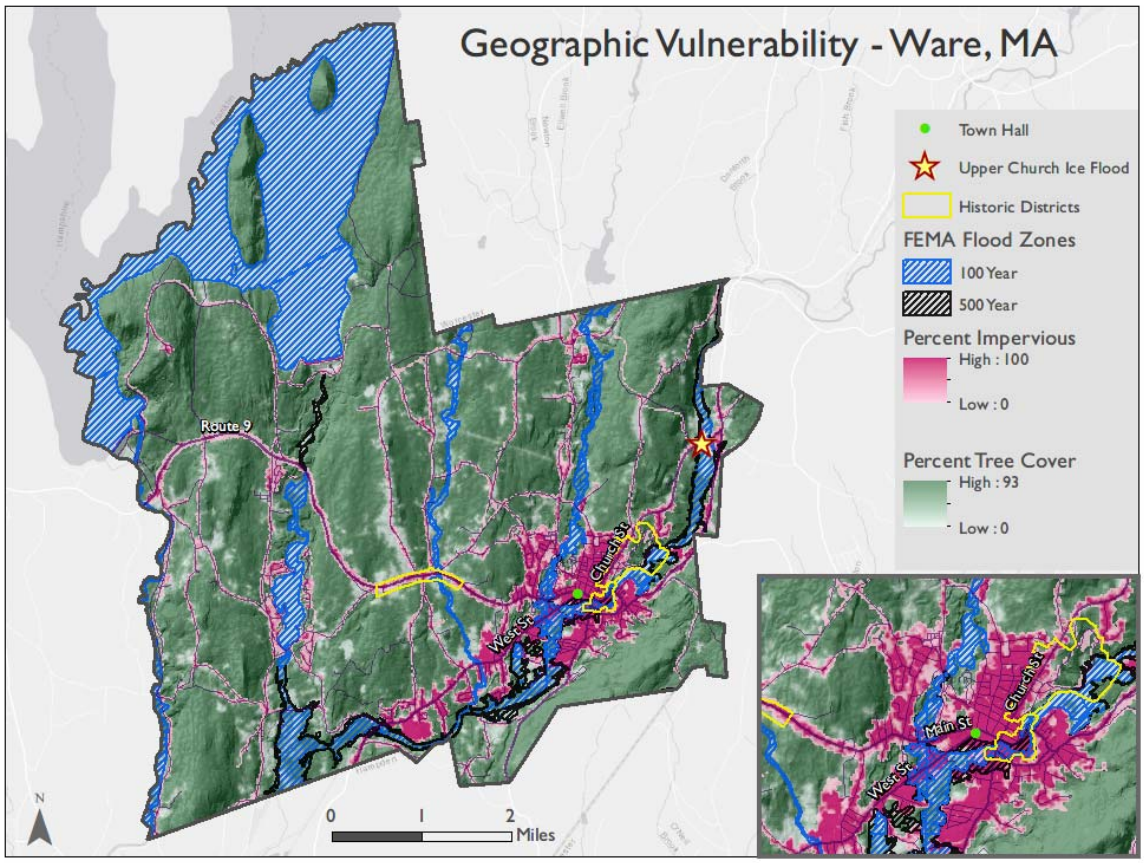
All maps produced for Workshops, revised based upon comments

1. *Social vulnerability*



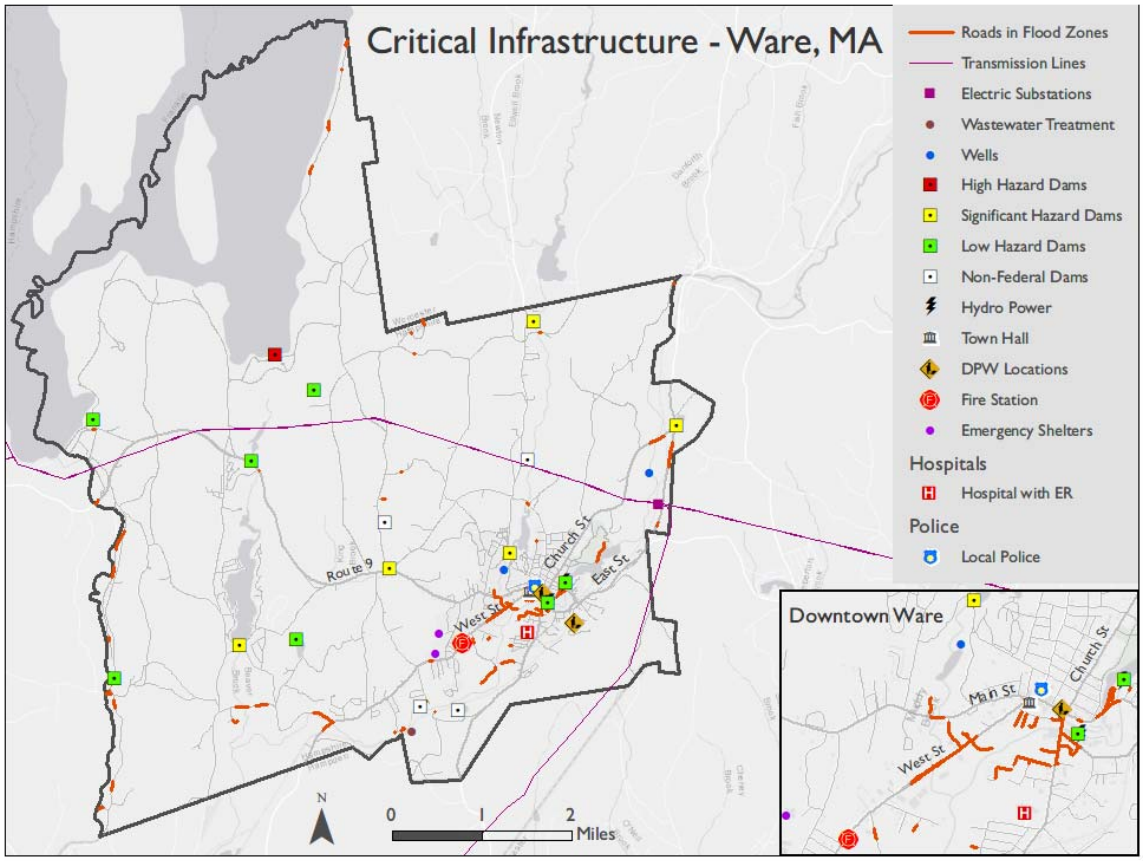
The Social Vulnerability map displays where the most at-risk populations of Ware reside. The results of this analysis indicate that people who live in the dark brown areas of downtown Ware will have the most difficulty rebounding from natural hazards. Therefore, this could be a priority area for targeting resilience actions.

2. *Geographic Vulnerability*



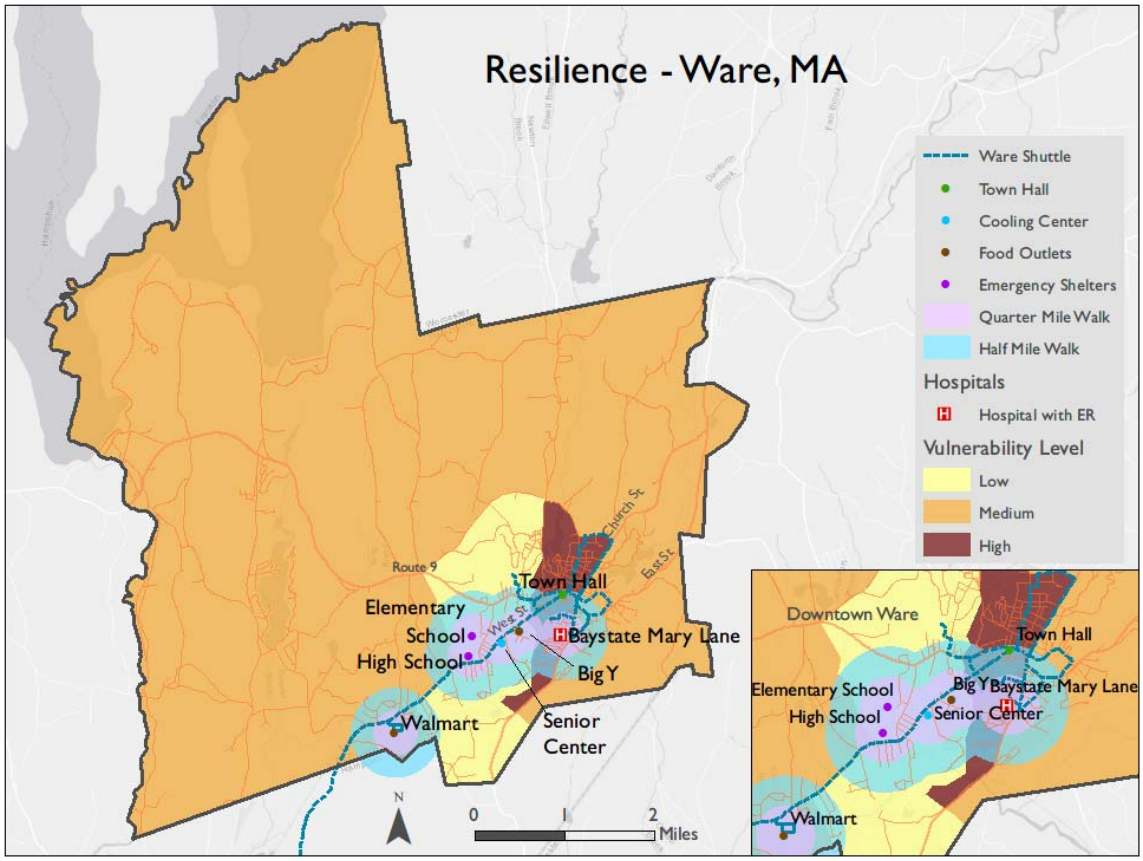
The Geographic Vulnerability map displays environmental layers that relate to natural hazards, such as flood zones, tree canopy, and impervious surfaces. Trees provide important cooling services, and their abundance or scarcity indicates where they will be able to mitigate high temperatures. Impervious surfaces retain heat and prevent stormwater from infiltrating, so areas where they are concentrated will be warmer and more susceptible to flooding. This analysis indicates that the downtown area of Ware has large flood zones, the least tree canopy, and the most impervious surfaces, meaning it is both the most socially and geographically vulnerable to natural hazards like heat and flooding.

3. *Critical Infrastructure*



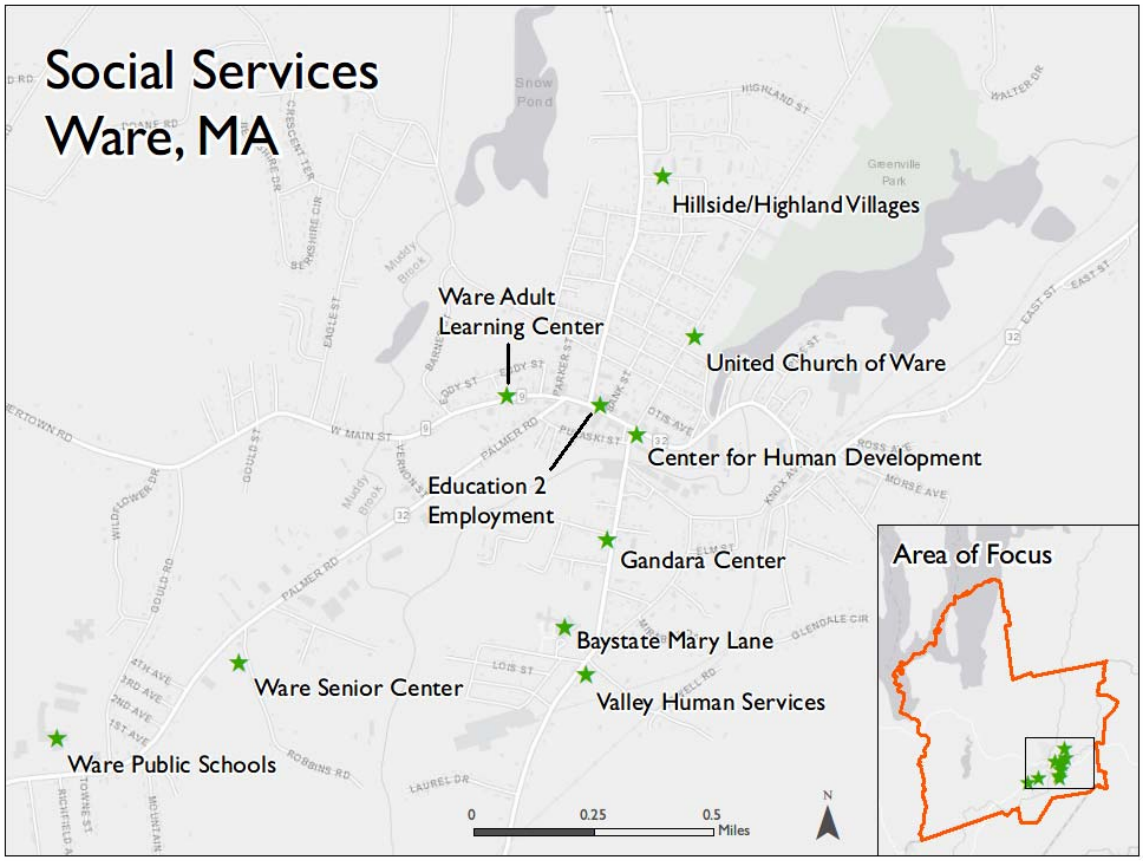
The Critical Infrastructure map contains primarily public infrastructure that the Town relies on daily (dams, wells, transmission lines, etc.) or provides essential services during a hazard event (police, fire, hospitals, etc.). It also shows roads that currently fall within a flood zone. This analysis indicates that several key roads leading to critical infrastructure and the downtown area are at risk from flooding, and could be prioritized for flood barriers, road raising, or other protective measures.

4. Resilience



The Resilience map documents important places Ware residents can rely on during hazards to secure basic needs, such as food & water, emergency shelter, or cooling, along with the transportation options to get there if personal vehicles are not available (Ware Shuttle). It also provides a quarter mile and half mile walking buffer, to show whether vulnerable populations could reasonably walk to these services. While most people can comfortably walk a half mile, elderly populations and people with disabilities may be only be able to walk a quarter mile or less. While some of these services are within walking distance of vulnerable populations, much of the vulnerable downtown area is further than a half mile away, and transportation may need to be provided in the event of an emergency. In the long term, more of these services may need to be provided in the downtown area to improve resilience.

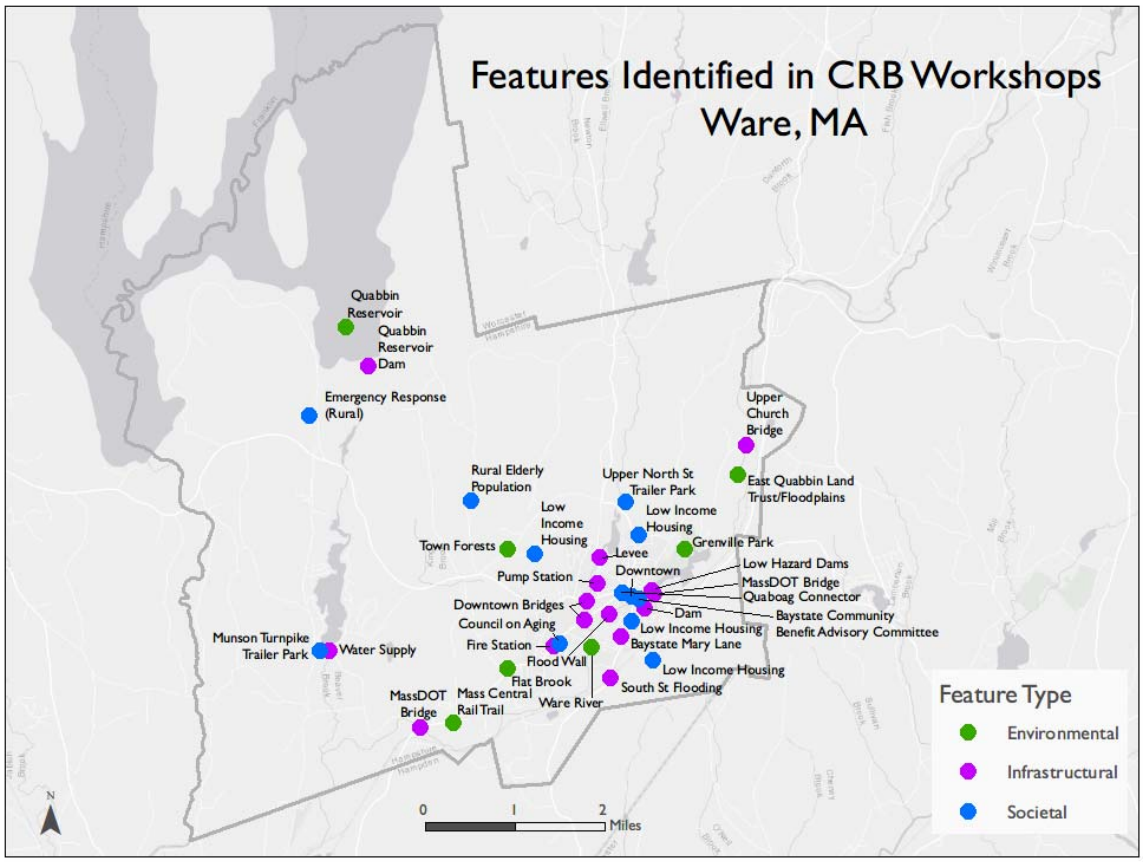
5. *Other Social Services*



This map displays the location of other important social services that Ware residents rely on. Many of these organizations were highlighted as strengths of the Ware community and are here recognized as such.

Appendix C: Map Generated During CRB Workshops

Map generated during CRB Workshops of vulnerability and strength features, correlated with Risk Matrix. Features have been recreated on a digital map for readability.



Appendix D: Additional Analysis of Climate Change Impacts & Vulnerabilities

Aspects of climate change impacts and vulnerabilities that were not addressed during Workshops.

Potential Hazards	
Natural Hazard	*Potential Impacts*
Changes in Precipitation (increase or decrease)	• Public health impacts from mold/worsened indoor air quality • Waterborne illness from contaminated standing water • Vector-borne illness from stagnant water (e.g., increased mosquitos) • Impacts on water quality & quantity from drought • Changes in extent of floodplains • Damage to roads from heavy precipitation or landslides
Rising average temperatures	• Earlier timing of spring peak stream flow • Energy brownouts from higher cooling demand • Public health impact from worsened outdoor air quality • Increased road softening/deterioration from excess heat

Potential Solutions
• Increase tree canopy downtown • Minimize parking lots in zoning regulation • Incentivize nature-based stormwater management and/or enhanced landscaping on new private development using density bonuses or expedited permitting • Require cluster subdivisions in rural areas to preserve open space • Mandate 1-1 (or 2-1) tree replacement of removed trees • Bury power lines to protect from storms

Appendix E: Participant Lists and Public Outreach

Stakeholder list, sign-in sheets for 2 Workshops, and outreach for listening session

List of Stakeholders

Town of Ware MVP - public participation process

Town Boards/Department Heads

- Planning & Community Development
- Board of Selectmen
- Public Works
- Town Manager
- Building Commissioner
- Community Development Authority
- Planning Board
- Board of Health
- Conservation Commission
- Conservation Agent
- Parks Commission
- Housing Authority
- Senior Center
- Public Schools
- Tree Warden

Environmental Justice communities

- Ware Farmers' Market
- Hillside/Highland Village housing
- ADA Chairman
- Sharpest Edge

Public Safety

- Emergency Management
- Police Chief
- Fire Chief

Town Partners

- Beaver Lake Association
- Ware Business & Civic Association
- Beaver Lake Club Corporation

State Partners

- DCR

Business Partners

- Urban Foundation
- Country Bank
- Monson Savings Bank
- North Brookfield Savings
- Westfield Bank
- D&D Fitness Factory
- G&G Medical
- Quabbin Wire
- Ware River Power
- Berkshire Blanket

Regional Partners

- East Quabbin Land Trust
- Quaboag Valley CDC/BAC
- Behavioral Health Network
- Baystate Mary Lane
- Baystate Support Svcs/Dir
- Baystate Engineering Suprvsr

Citizens

- Tufts Graduate Student

Workshop 1 Attendance

TOWN of WARE

COMMUNITY RESILIENCE BUILDING
WORKSHOP 1 SIGN-IN SHEET

Date: FRI, March 9, 2018

Place: TOWN of WARE FIRE STATION

Name	Dept./ Organization	Position	Contact Info
Josh Kusmierz	Planning Board	clerk	413-687 4714
Danya Mattes	Tufts	student	danya.mattes@gmail.com
DAVE FOX	WARE Housing	supervisor	413 967-4477
John Zienowicz	Ware COA	Exe. Director	JZienowicz@TownofWare
BRIAN PAGÉ	QUABBIN WIRE & CABLE	Compliance/Safety	413.967.6231
Barbara Zins			413-967 8304
Carol Zins	WCMH Museum Volunteer		413-967-8304
William Imbier	PARKS & REC	Commisioner	413-388-8896
Chris Talbot	Police	Officer	413 967 3571
Shawn Crevier	Police	Chief	413 967 3571
JAC Patnisen	BTHN & PH	Director / ED President	413 316 0718
Charlene Kareta	Monson Savings	Originator	413 267 1219
Anna Marques	Town of Ware Building Dept.	Assistant	413 967 9648 x114
GAIL FARNSWORTH FRENCH	QVCDC	manager	413.967 3001
JUDI MOSSO	Town of Ware Planning & CD	Asst to Dir	413-967.9648 x120
Dennis R. Ouimette	Parks	Laborer	Ouimette148@Comcast.net
Nancy Talbot	Town Clerk	Selectmen, etc.	967-9648 X113
Edward Ware	Deputy FC / EMD		967-5901
Nelson Rivera	SHARPESTEDGE	OWNER	(413)544-8464

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Name	Dept./ Organization	Position	Contact Info
Shaun Gremi	P.D.	Chief	413 967-3571
Ruben Flores-Marzan	Town of Ware Planning Dept.	Town Planner	
Cynthia Fendrau	EQLT	Exec. Dir.	413-477-8229
[illegible]	Mass DPW	Director	413-967-9620
Tina [illegible]	North Brookfield Savings	Branch Manage	413-967-6271
GEORGIE NOLAN	BAYSTATE MARY LANE	DIRECTOR SUPPORT SERVICES	413-370-5366
Augie Williams-Eynon	UMASS	Consultant	awilliamseyn@umass.edu
Elizabeth Hamin	UMASS	Consultant	emhamin@larp.umass.edu

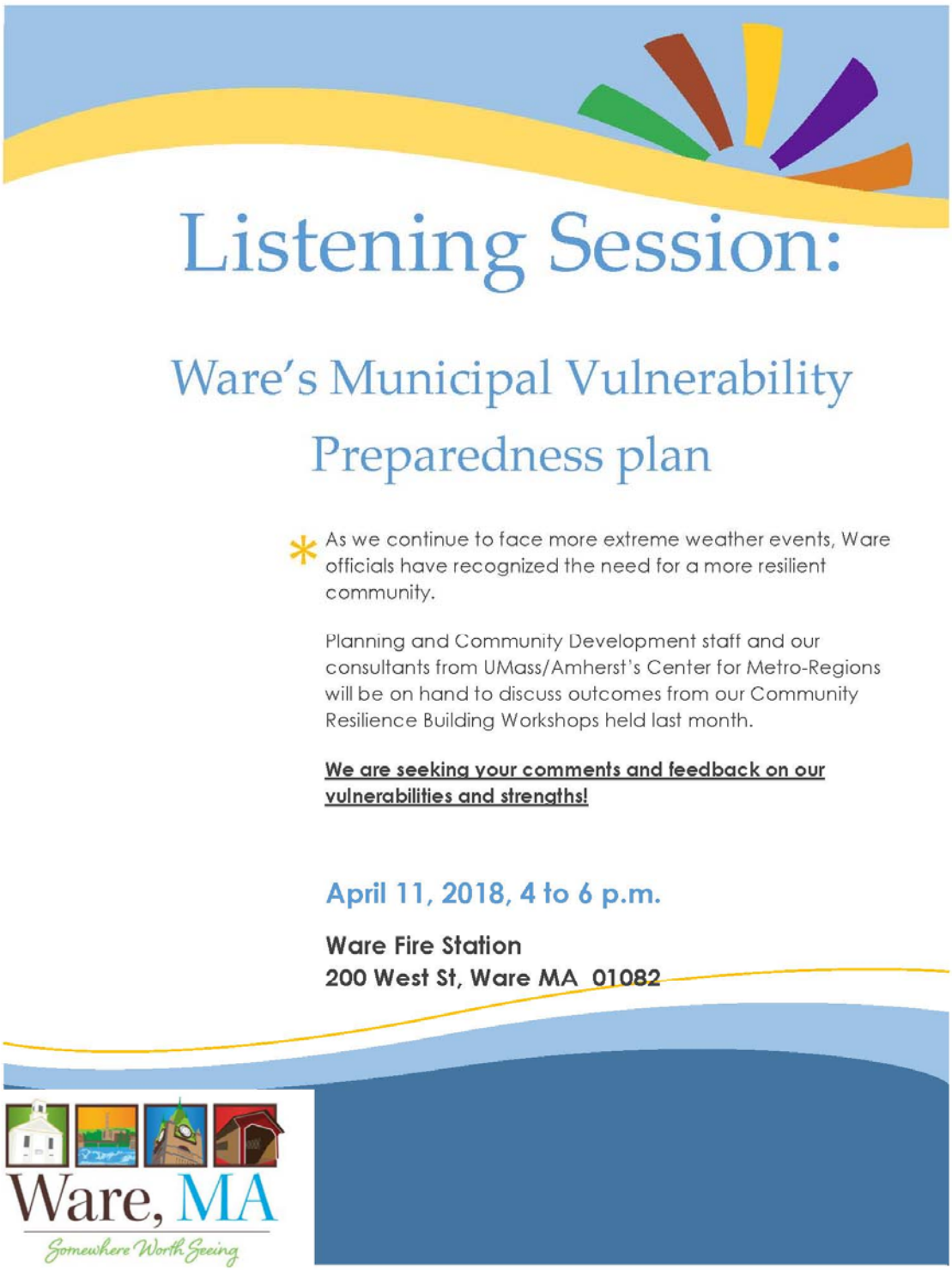
Workshop 2 Attendance

COMMUNITY RESILIENCE BUILDING
WORKSHOP 2 SIGN-IN SHEET

Date: 3/23/2018 **Place:** Ware Fire Station

Name	Dept./ Organization	Position	Contact Info
Judi Mosso	Ware P&CD	Asst/Dir	jmosso@townofware.com
Josh Kusnierz	Tree Warden/DPW →		JKusnierz@hotmail.com
Carol Zins	citizen		czinsie@gmail.com
Barbara Zins			
Shay Metcalf	Health	Director	jmetcalf@townofware.com
George Nolan	Baystate Mary Lane	Director	george.nolan@baystatehealth.org
John Zienowicz	Ware COA	Exec Director	jzienowicz@townofware.com
David Fox	WHA	Maint Super	DFoxwhA@gmail.com
Charlene Kareta	Monson Savings Bank	Loan Originator	CKareta@MonsonSavings.com
Jac Patrissi	DPH2 BHN, Inc.	Dir-Comm Mobilization Dir of DV	jac@GrowingANewHeart... jwhittle.patrissi@bhninc.org
Nancy Opalinski	Ware Selectman	stet	Topalinski@icloud.com
Stuart Beckley	Ware	Town Manager	sbeckley@townofware.com
Ruben Flores-Marzan	WARE	Town Planner	
Nancy Talbot	Ware Selectmen / Town Clerk		ntalbot@townofware.com
Cynthia Henshaw	EQLT	Ex. Dir.	chenshaw@EQLT.org
Richard Kilhart	Ware DPW		dkilhart@townofware.com
Griff Farnsworth-Friend	QVCDC		GriffF@qvcdc.org
Tina Allen	North Brookfield Savings	manager	tallen@banknbsb.com
Anna Marques	Town of Ware Building Dept.	~~Bui~~	amarques@townofware.com

Outreach for Public Listening Session



Notice at Town Hall announcing Listening Session