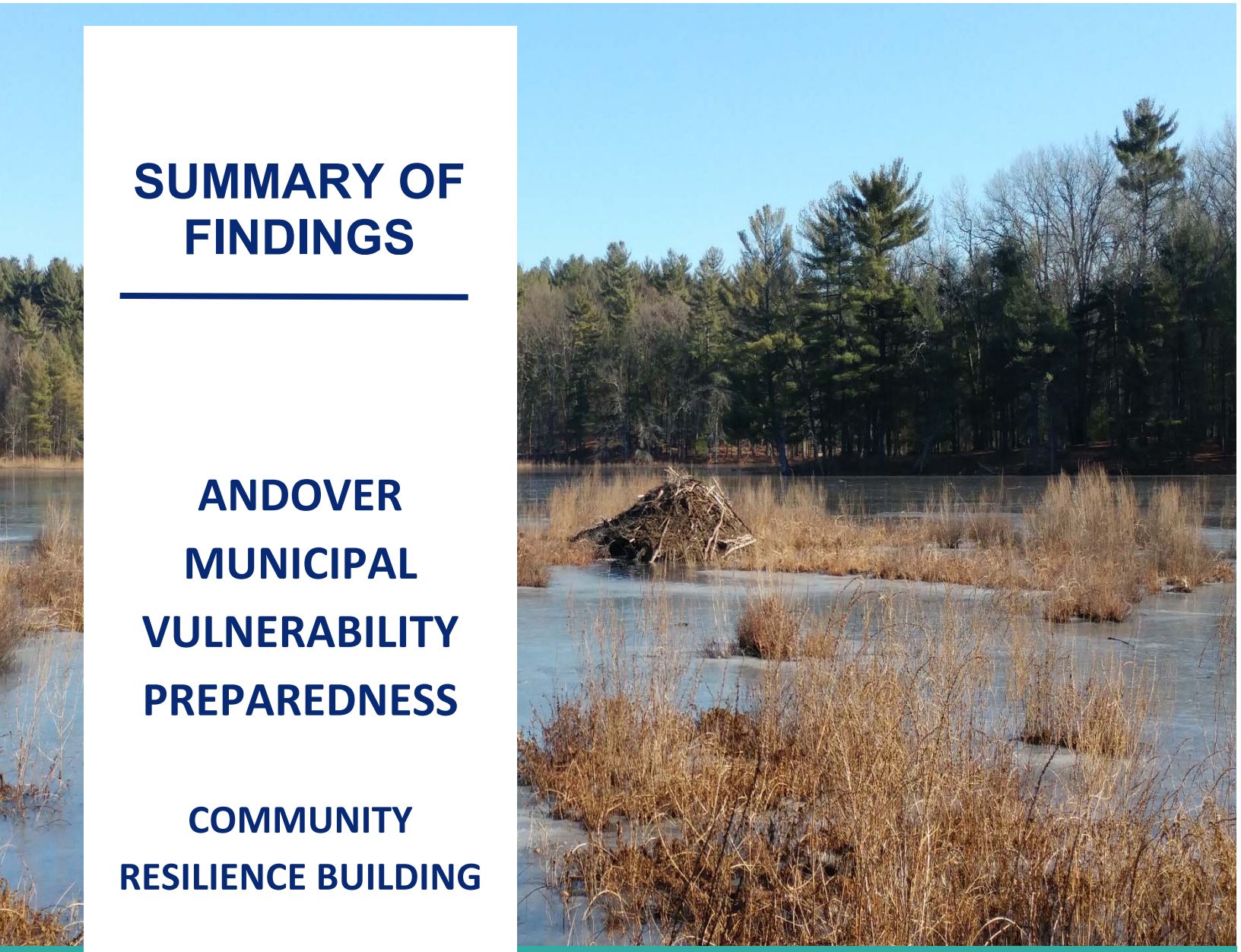
SUMMARY OF FINDINGS



ANDOVER MUNICIPAL VULNERABILITY PREPAREDNESS

COMMUNITY RESILIENCE BUILDING

JUNE 2019

TOWN OF ANDOVER

With assistance from

Merrimack Valley Planning Commission

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Overview

Executive Order 569 and the Massachusetts Municipal Vulnerability Preparedness Program

Governor Baker in September 2016 issued Executive Order 569, directing the Secretary of the Energy and Environmental Affairs and the Secretary of Public Safety to coordinate efforts across the Commonwealth to strengthen the resilience of communities, prepare for the impacts of climate change and mitigate damage from extreme weather events. The state agencies were charged with establishing a framework that each City and Town could use to assess local vulnerabilities to climate change and to develop appropriate action-oriented response strategies.

The Commonwealth's agency response is the Municipal Vulnerability Preparedness Grant Program (MVP) which provides Massachusetts communities with support to plan for resilience and implement key adaptation actions. The MVP framework, developed by The Nature Conservancy, employs a workshop-based model designed to help local stakeholders in:

- Characterizing climate-related and extreme weather hazards of highest concern to the community;
- Understanding the science of climate change and adaptation. EOEEA has established a website www.resilientma.org as a data clearinghouse for science and state-specific geographic data on climate change;
- Identifying existing and future vulnerabilities and asset strengths in areas of infrastructure and critical facilities, socio-economic characteristics and environmental resources;
- Developing and prioritizing actions for community resilience based on identified opportunities for risk reduction and resilience building;
- Implementing key actions through community partnerships.

With completion of the resilience building planning process, a city or town can become a formally designated MVP community, eligible for MVP action grants to undertake technical plans as well as design and construct priority resilience projects.

The Town of Andover in 2018, seeking to become an MVP-designated community, applied for and received an MVP Planning Grant to organize a series of community resilience building planning workshops. The workshops were originally slated to take

place during Fall 2018. But crisis events intervened, and the workshop schedule was postponed. Town officials and residents were forced to develop immediate response and recovery actions to a public safety emergency that vividly highlighted, on the ground, some of the community's vulnerabilities and resiliency strengths. In late afternoon September 13, 2018, the Town of Andover, along with neighboring communities of Lawrence and North Andover, experienced a series of simultaneous natural gas explosions and fires caused by release of high-pressure gas into a low-pressure distribution system. The event occurred as Columbia Gas-contracted construction crews were working on a major infrastructure upgrade to replace 7,506 feet of low-pressure gas mains including cast iron segments originally installed in the early 1900s.

Columbia Gas crews at work on Elm Street, Fall 2018. Photo credit: Eagle Tribune

The explosions and fires ignited by natural gas-fueled appliances damaged 131 structures in Andover, North Andover and Lawrence. Leonel Rondon, an 18-year-old Lawrencian, was killed when a house chimney collapsed onto his parked car in a building explosion on Chickering Road in Lawrence. At least 21 people received treatment at area hospitals for injuries.[1] The three municipal Fire Departments responded to initial calls and required mutual aid from departments throughout eastern Massachusetts, New Hampshire and Maine.

Residents with homes served by natural gas were told to shut off gas service and to evacuate. As a safety precaution, National Grid shut down electrical power to the affected communities. Local roads and the regional highways became gridlocked as State Police closed Interstate 495 ramps into Andover, North Andover and Lawrence and as resident evacuations took place through the afternoon commute peak and into the evening.

On September 14, 2018, in response to the severity of the situation, Governor Baker made a State of Emergency declaration. In Andover, officials on short notice set up overnight shelter at the Senior Center. Andover schools were closed, and Merrimack College temporarily evacuated its buildings. Before power could be restored and people allowed to return to their homes and businesses in the days and weeks following, teams of inspectors would enter each building to conduct safety checks and ensure no concentrations of trapped gas were present.

By the weekend of Sept. 15-16, officials were transitioning from Emergency Response to the Recovery phase of operations, a massive effort which extended into December. Gas service restoration to the 8,600 impacted area Columbia Gas customers involved replacement of 48 miles of gas lines in the three communities. With utility construction crews dispatched to the Merrimack Valley from throughout the country, the gas line replacement work was completed weeks ahead of the Nov. 19 scheduled completion date, but full service restoration to individual properties was a time-consuming process complicated by requirements of code compliance in replacing appliances in older structures and the demand for more plumbers and contractors. Temporary housing for displaced residents in area hotels/motels and RV trailers was established. To house construction workers, Columbia Gas leased a cruise ship docked in Boston Harbor.

[1] NTSB Preliminary Report PLD13MR003 10/11/2018 and Safety Recommendation Report PSR-18/02, 12/6/2018

Many central Andover businesses, including restaurants dependent on gas service, were forced to shut down for weeks and months as they awaited service restoration. Some reopened after converting their energy source to propane or electric. Restoration of heat and working appliances was finally completed for most properties by the end of December, but in some cases, work continued into 2019.

The Columbia Gas explosions emergency reinforced the importance for community engagement and planning on how to effectively respond and mobilize resources to protect and inform the public. The Sept. 13th disaster and the months of recovery thereafter provided the backdrop for the Town of Andover's MVP resilience building workshops, which took place on consecutive Thursday mornings—January 24, 2019 and January 31, 2019.

Working groups focused on discussing priority actions at the January 31st workshop held at the Memorial Hall Library (MVPC Photo)

Invitations were distributed to approximately 75 stakeholders with excellent participation of more than 50 people. The first workshop at Old Town Hall focused on characterizing the Town's top hazards. Small table group discussions were organized to identify community features most vulnerable to natural hazards exacerbated by climate change. Groups also identified community assets that contribute to mitigating risk and aiding recovery. The second workshop, a week later at Memorial Hall Library, centered on discussion of actions the town could take related to infrastructure, societal factors and the environment to build a more resilient Andover and better prepare for future emergencies.

Planning Project Vision Statement

Andover core team members developed the following vision for the Town's Municipal Vulnerability Preparedness planning project:

Through a series of Community Resilience-Building workshops, Andover seeks to develop an action plan to substantially and sustainably improve its resilience to and preparedness for local climate-related hazards. Andover seeks to achieve this by:
(1) defining local climate-related hazards;
(2) identifying Andover's strengths and vulnerabilities regarding each of these hazards, now and in the future; and
(3) developing a prioritized action plan to improve Andover's resilience to and preparedness for these hazards.

In developing this action plan, the following factors should be considered:

- Maintaining and improving quality of life in Andover
- Maintaining fiscal balance and stability despite large and unforeseeable municipal expenses during and after events
- Maintaining communication pathways, and information technology systems, during events (including power outages)
- Maintaining water quality and protecting our natural resources through changing conditions
- Maintaining and replacing aging infrastructure to withstanding current and future hazards
- Protecting transportation systems against hazards, including: 1) pothole maintenance from multiple freeze-thaw periods and 2) public transportation reliability
- Avoiding and mitigating damage to private and public property during events
- Providing emergency shelter options to vulnerable populations during events
- Culling at-risk trees and removing fallen trees during storms in a timely manner
- Avoiding poor air quality as temperatures rise, especially during heat waves
- Accommodating increasing energy use and the resulting strain on the electrical grid during heat waves
- Managing insects, pests, and wildlife with changes in precipitation patterns and increasing temperatures

The Workshop Planning and Project Prioritization Process

Agendas for the Jan. 24 and Jan. 31, 2019 workshops and presentations are attached as appendices.

As noted above, Workshop #1 included an opening presentation with summaries of the MVP Program and planning framework, climate change data and projections and Andover's history of hazard events. In table discussions, participants identified and categorized the strengths and/or vulnerabilities of critical community infrastructure, societal features and environmental features.

At the start of Workshop #2 participants, on entering the library meeting room, voted on the three to four most important elements in each category--infrastructural, societal and environmental—and focused table discussions on actions that either enhance community strengths or mitigate hazard risks exacerbated by climate change.

In both workshops, lead facilitators from MVPC guided table discussions of 10-12 people aided by volunteer scribes. Each table delegated a volunteer to report out for the table in the large group discussion.

At the end of the second workshop, participants voted across the three categories to select the three top recommended priority resilience projects. After the workshops, MVPC staff met with the Core planning team to consolidate the risk matrices prepared at the tables and fill in gaps in prioritizing projects (High Priority, Medium Priority, Low Priority) and outline anticipated implementation schedules (Ongoing, Short-Term of 1 to 5 years, Medium Term of 3-5 years, and Long-Term of more than 5 years).

Following Workshop #2, MVPC staff prepared a list of the top three priority actions as determined by the voting. These and other high priorities in the categories of Infrastructure, Societal, and Environmental were presented at a listening session that followed the workshops on June 4, 2019. Prior workshop attendees, as well as community members who were unable to attend, came to see the slideshow, prepared by MVPC staff, reviewing the MVP process and the outcomes of the workshops and voting. Comments were taken and incorporated into the draft Summary of Findings.

Planning Context

Climate Data for Andover and the Shawsheen Basin

Nine of the ten warmest years on record have all occurred since 2005, according to the U.S. National Oceanographic and Atmospheric Administration. Average global temperatures have risen steadily in the last 50 years. Scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. [2]

What does this mean for Andover? Here are some of the statistics:

Changing Temperatures

- From 1971 to 2000, the Shawsheen River Watershed basin and the Merrimack Valley annually had an average of 7 days with temperatures above 90 degrees Fahrenheit.
- By the end of the century, Andover and the region are projected to have fourteen (14) to as many as seventy-two (72) more days per year with temperatures rising above 90 degrees.
- The area can expect shorter, milder winters with seven (7) to twenty-nine (29) fewer winter season days yearly with temperatures below freezing on average.
- Mean annual temperatures in Massachusetts are expected to be 3.8-10.8°F warmer than over recent decades.
- Total heating degree days will be 15-37% lower, but cooling degree days are projected to triple by century's end.
- The agricultural season will be longer with growing degree days expected to increase by 30 to 100%.[3]

Changing Precipitation

- Total annual precipitation at century's end is projected to increase by as much as 18% above the 1971-2000 baseline of 45", with most high precipitation events concentrated in the winter and spring months.
- Winter precipitation is expected to increase by as much as 36%. Winters are projected to get wetter with more precipitation occurring as rain or freezing rain, rather than snow because of the increase in temperatures.

- For summer and fall seasons, data projections are showing variable precipitation levels with potential for a moderate change in the number of consecutive dry days (less than 1 mm precipitation).
- The 1971 to 2000 baseline is 17 on average annual consecutive dry days and that is projected to increase by 3 days at the end of this century.[4]

More Frequent, Intense Storms

According to the Fourth National Climate Assessment issued in 2018, heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901. There are important regional differences in trends, with the largest increases occurring in our northeastern United States.

The frequency and intensity of heavy precipitation events in Andover and the Merrimack Valley are projected to continue to increase throughout the 21st century. The northern United States, including New England, is projected to receive more intense precipitation events in the winter and spring, while parts of the southwestern United States are projected to receive less precipitation in those seasons.

Consequences of more extreme storm events include infrastructure failures, disruptions to local economies, and increased public safety risks with more demands on local government and first responder capacity.

March 2018 Nor'easter in Andover
Photo credit: Eagle-Tribune

[2] https://www.noaa.gov/news/2018-was-4th-hottest-year-on-record-for-globe

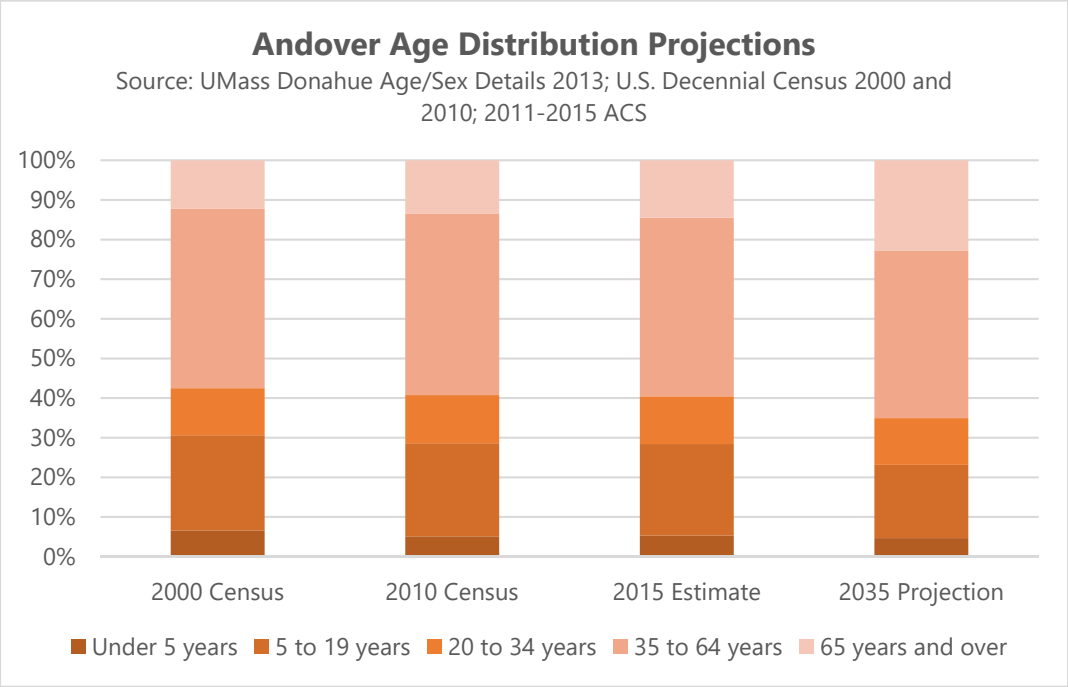
[3] http://www.resilientma.org/resources/resource::2152 National Climate Science Center at the University of Massachusetts Amherst, Massachusetts Climate Change Projections, March 2018.

[4] Ibid.

Planning Context

Andover Demographics

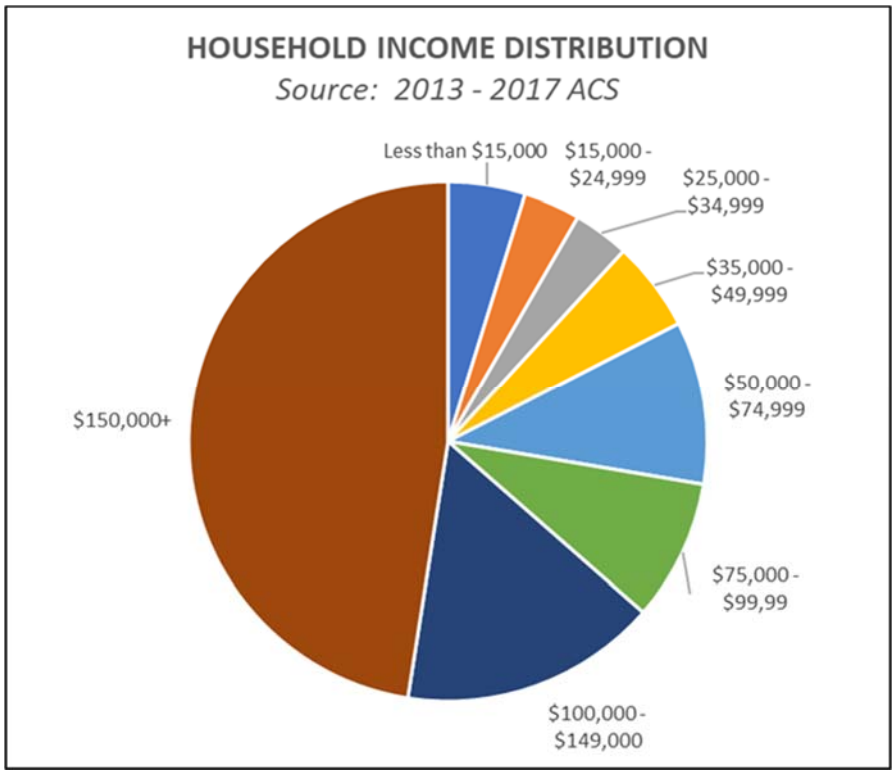
- Andover's population is growing faster than the Merrimack Valley region overall. Projections indicate continued growth in the coming years. With associated household growth, the population projections indicate a growing demand for more housing.
- The composition of Andover's households is also changing with more households with children and more single-person households, many of which are older adults over age 65 years.
- Demographic forecasts project more older adults and fewer children in the coming years. Andover's senior population by 2035 is projected to double from levels of this century's first decade.



- Andover's racial and ethnic diversity is increasing, especially the population identifying as Asian. The population of other racial and ethnic minorities including Black/African American and Hispanic/Latino is growing slightly.
- Andover's population has lower disability rates than the region, and while it is more common for older adults to have disabilities in general, Andover has a

lower proportion of its older population reporting disabilities than in the Merrimack Valley region. However, there is still an estimated one quarter (about 1,227) of older adults age 65 years and over with disabilities.

- Andover's households have an estimated average median income of $143,292 significantly higher than the median income for households region-wide and 16th highest average in the Commonwealth. Yet, more than 2,100 households in Town (17.45% of all Andover households) have incomes below $50,000, according to the American Community Survey 2013-2017.

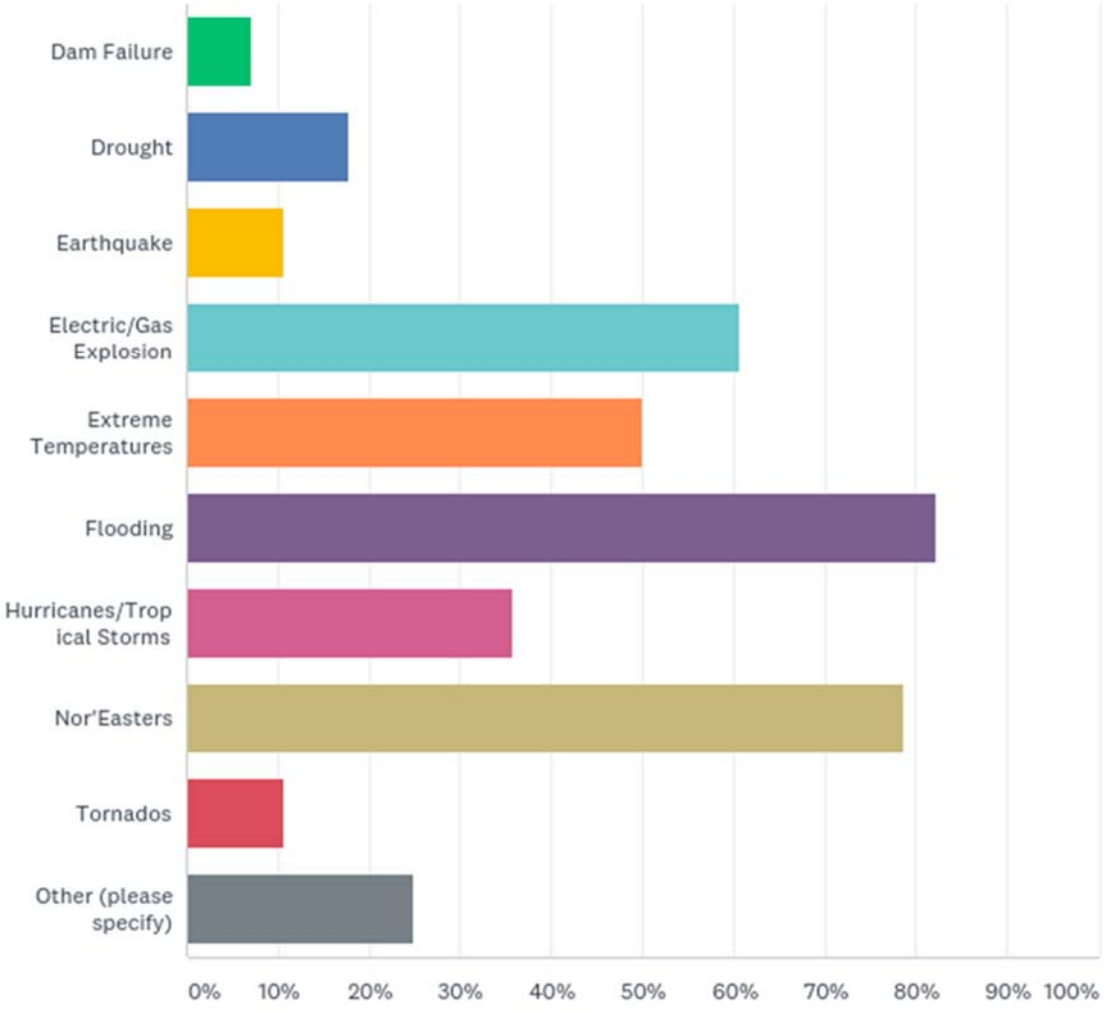


- About 80 percent of Andover households own and 20 percent rent their homes. The homeownership rate in Town is significantly higher than in the Merrimack Valley region overall (63 percent).[5]

[5] Town of Andover Housing Production Plan 2018-2022 prepared by Merrimack Valley Planning Commission with JM Goldson community preservation & planning

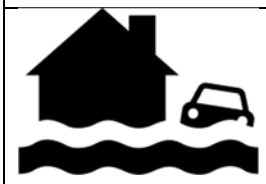
Top Hazards for Andover

In preparation for the community resilience workshops, the project team sent out a community survey asking stakeholders to identify the top four potential hazard events of most concern. Twenty-eight people responded to the survey question which generated the following response levels.



Informed by the survey, the Core Team characterized the top Andover hazard concerns.

Town of Andover Primary Hazard Concerns Identified



Flooding

Approximately 12% of Andover's land area lies within either the designated flood zone areas with either a 1% (100-Year) or .2% (500-year) chance of occurrence. Risk of flooding events are heightened by the effects of climate change which portends higher precipitation levels in Winter/Spring seasons and more frequent, intense storms. In fact, parameters of the so-called 100-year storm are changing. In the 1960's, a 24-hour event that produced 6.5 inches of rain was categorized as a 100-year storm. By 2015, threshold for the 100-year storm (i.e. storm with 1% occurrence odds in any year) was 8.4 inches of rain over 24 hours. [6] Significant flood events occurred in Andover most recently in Spring 2010 and the Mother's Day Flood of 2006.

Nor'Easters

Storms of heavy winds and rain along with severe winter storms are the most frequent naturally occurring hazard in Massachusetts. And with climate change, the intensity and frequency of these storms will rise. Nor'easters have caused major tree damage and infrastructure disruption to Andover, memorably in March 2018 and Oct. 2017 when storms precipitated road closures and extended power outages.

Failure of Aging Infrastructure

The Sept. 13, 2018 Gas Explosions underline heightened concern with infrastructure condition. Cast-iron gas mains over a century old and not conducive to high pressure gas distribution were contributing factors in the disaster event. Bridges, culverts, dams, sewer, water and storm drain lines, power and communication networks, many installed in the first half of the 20th century or earlier are all vulnerable to extreme storm events.

[6] https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html National Oceanic and Atmospheric Administration, Atlas 14 Precipitation Frequency Atlas of the United States & Technical Paper # 40, U.S. Dept. of Commerce.

Extreme Temperatures

Average Summer & Fall temperatures in the Shawsheen River Basin could increase 12.4° F by century's end. The annual number of extreme heat days of greater than 90° F is expected to increase by as much as 32 more days in 2050. [7] Extended heat waves could significantly impact public health as well as infrastructure, economic systems including agriculture and ecosystems of forests and wetlands.

[7] http://www.resilientma.org/resources/resource::2152 National Climate Science Center at the University of Massachusetts Amherst, Massachusetts Climate Change Projections, March 2018.

Concerns & Challenges Presented by Hazards and Climate Change

Andover Infrastructure & Critical Facilities – Vulnerabilities Identified

Roadways, Bridges and Culverts: Andover has 220 miles of roadways, 188 miles of which are owned and maintained by the Town. MassDOT owns and maintains 23 miles and 16 miles are private, unaccepted ways. Bridges and undersized culverts can act as choke points restricting stream flow. Low-lying, flood-prone areas considered particularly vulnerable to flooding are North Main Street including sections along the Shawsheen River at Shawsheen Plaza and Washington Park, Shawsheen Square area of the Balmoral Building and Riverina Road, Central Street and River Street; areas along Fish Brook including High Plain Road; and along Skug River at Salem Street.[8]

Dams: Andover has several public and privately-owned dams. Two privately owned dams are classified as significant hazard and require emergency management plan updates in 2019: the 160-year-old Foster's Pond Dam at Rattlesnake Hill Road and Ballardvale Dam on the Shawsheen River. Dams at High Street by the Marland Place assisted living complex and the ornamental dam by the Balmoral condo in Shawsheen Square were removed in 2017.

Utilities: National Grid is electricity distributor for Andover and maintains a regional grid network that within town includes six substations, limited underground conduit and extensive overhead wires considered highly vulnerable to intense storms and associated winds as well as extreme heat. The Town suffered prolonged power outages from a series of Nor'easters in October 2017 and again in March 2018 impacting residents, businesses, schools and local government as 80% of the Town was without power for at least four successive days. Columbia Gas provides natural gas supply to Andover. Vulnerability of its infrastructure was tragically demonstrated in

[8] Merrimack Valley Planning Commission, Transportation Program

the September 2018 explosions which occurred through accidental overpressurization of 100-year-old gas lines.

Water, Sewer & Stormwater Infrastructure: Andover's water, sewer and drainage infrastructure is vulnerable because of age and condition in some areas but is also a strength in mitigating hazards and protecting public health. MVP Workshop participants raised concerns of the adequacy of existing infrastructure to serve the Town's growth demands and accommodate changing conditions projected with climate change.

Except for a few properties served by private wells, 99% of the Town has access to the public drinking water system supplied by surface water sources at Haggetts Pond, the Merrimack River and Fish Brook. Haggetts Pond, with a 1,422-acre watershed area, serves as the primary storage reservoir and is the site of the water treatment plant which has operational capacity to treat 18 million gallons per day (mgd). Andover's water distribution system includes 250 miles of pipes, pump stations at Fish Brook and East High, and four storage tanks at Bancroft Road, Wood Hill and Ward Hill Reservation. Total storage capacity is 14 million gallons. Vulnerabilities include the lack of a natural gas back-up generator at the Water Treatment Plant.[9]

Andover maintains sewer lines and pump stations which direct raw sewage to the regional wastewater treatment plant operated by the Greater Lawrence Sanitary District (GLSD) at Charles Street in North Andover. Andover is a member community of the GLSD with Lawrence, Methuen, North Andover and Salem, NH. About two-thirds of Andover properties are on public sewer with exceptions being the southeast section of Town in area of Harold Parker State Forest and the westerly section of Town including the River Road and Dascomb Road areas, currently under study for possible sewer system expansions. Average daily flow treated at the GLSD North Andover regional facility is 30 million gallons per day, well below the plant's design capacity of 165 million gallons per day.[10] While the GLSD system currently processes fewer gallons per day than design, there are specific elements of the Andover system that are vulnerable to flooding events including the Shawsheen River interceptor and pump station.

[9] Andover Water Department, Drought Management Plan, revised May 2015

[10] Greater Lawrence Sanitary District, Cheri Cousens, Executive Director

The Greater Lawrence area is one of 772 urban areas across the country with a combined sewer/drainage system at its urban core. Other cities with combined sewer overflow (CSO) systems on the Merrimack are Manchester, NH, Nashua, NH and Lowell and Haverhill. Under normal conditions, the combined sewer system collects rainwater runoff, industrial wastewater and domestic sewage all in one pipe and transports flows to the regional treatment plant. Heavy rainfall events, however, can overtax system capacity and cause combined sewer overflows (CSOs) with discharges of untreated sewage and street runoff into the Merrimack River. With more intense precipitation events generated by climate change, the concern is that the number of CSOs will increase despite long-term control plans and investments by wastewater treatment operators including GLSD.

Andover maintains 8,100 stormwater structures including 4,722 catch basins, 1,028 outfalls, 1,876 manholes and 30 oil/grit separators.[11] In 2016, the U.S. EPA and MassDEP updated the permit regulating municipal management of separate storm sewer systems (MS4s). It went into effect in 2018 and requires that urbanized Massachusetts communities, including Andover, take proactive steps to implement tracking systems to guard against illicit discharges that could pollute waterways. The permit also prescribes maintenance of stormwater infrastructure and mandates promotion of low impact development techniques including nature-based stormwater treatment systems. This increased maintenance and oversight could be a strength as the community works to improve the quality of its waterways.

Municipal Facilities & Resources: Andover's facilities include nine school buildings, only three of which (Bancroft Elementary, Woodhill Middle School and High Plain Elementary) have full air conditioning. Need for power back-up is an issue at school buildings and other facilities. A backup-generator was recently installed at Memorial Hall Library, a regional library used as a warming center in hazard emergencies. The Senior Center and the nearby Youth Center are available as emergency shelters and were used as such in the aftermath of the Sept. 13 gas explosions. Needs at the Senior Center include upgrades to kitchen facilities, the addition of backup power, and the installation of showers. Senior Center renovations are estimated to cost $2 million and are programmed in the Town's Capital Improvement Program. Fire prevention needs at municipal facilities include sprinkler systems and lightning protection. Plans are in design for upgrades to the Ballardvale Fire Station including the addition of a backup

[11] Andover DPW, Marc Fournier, Deputy Director

generator which is also needed at the West Station on Greenwood Road. Also, a major vulnerability identified is the need for a reliable fiberoptic communications link connecting Town Hall, the Public Safety complex at North Main Street and other municipal facilities.

Andover Societal Features – Vulnerabilities Identified

Elderly, Disabled, Youth and Non-English Language Households: Andover is among the wealthier communities in the Commonwealth. Despite its high average median household income, the Town has a number of residents considered vulnerable to hazard events and climate change including an increasing senior population, significant numbers of youth and a diversity of households with non-English speakers.

Senior & Low-Income Housing, Nursing Homes and Assisted Living: Communications and emergency protocols are a challenge particularly in messaging to Andover's seniors. The requirement to register for alert notifications through Code Red of the Senior Center Info network can be an obstacle. Andover has a growing senior population, many of whom are aging in place throughout Town. There is also senior housing available at Andover Commons at Railroad St., Avalon St. Clare and Riverside Woods, both at River St., and Andover Housing Authority off Morton St. at Chestnut Court and Memorial Circle area. Nursing home facilities are the Wingate at Andover St. and Academy Manor on Morton Street. The need to consider emergency plans for vulnerable populations was highlighted in the Mother's Day Flood of 2006 when Marland Place, an assisted living facility on High Street located within the 100-year floodplain, had a voluntary evacuation with residents moved to other locations, primarily with family members. Other assisted living facilities in town are Bridges by Epoch on Lowell Street, which opened in 2018 and Stone Hill on Elm Street, which is under construction and scheduled for opening in Spring 2019.

North Main Street near the Shawsheen Plaza during the 2006 Mother's Day Flood (MVPC Photo)

Vulnerable Neighborhoods:
Andover is, after Lawrence, the Essex County community with the highest flood claim payouts through the federal flood insurance program. Approximately 1,800 acres are within the existing 100-year flood zone (area with a 1% chance of flooding in any year) and another 605 acres are within the 500-year floodplain (area with a .2% chance of flooding). Since 1978, there have been 192 property loss claims totaling $7.9 million in Town. Currently, Andover has 443 flood insured properties, according to FEMA. More than half of the flood insurance payouts, $4.8 million, have been at 28 buildings that have sustained multiple losses from flooding. The neighborhoods most vulnerable to flooding in Town are those located along the Shawsheen River and Fish Brook. Areas of highest vulnerability concern include Shawsheen Village, Balmoral, Washington Park condos, Powder Mill Square, Woburn St., Dale Street condos and High Plain Road.[12]

Spring Grove Road after Oct. 2017 Nor'easter (photo credit Eagle Tribune)

Access to Regional Services:
Andover is served by regional hospitals and medical centers including Holy Family Hospital and Lawrence General Hospital. Workshop participants raised concerns about limited access to regional medical facilities outside of Town in the event of flooding or downed trees along arterial streets.

[12] MA Dept. of Conservation & Recreation Flood Hazard Management Program

Andover Environmental Features – Vulnerabilities Identified

Resource Areas: Andover boasts a wealth of water resources and protected conservation lands. The Town's land area is split among three watershed areas—the Ipswich, the Merrimack and the Shawsheen.

Water quality is a concern. Impairments, according to Mass DEP, include:[13]

- Fish Brook: Impaired for chloride and E. coli
- Haggetts Pond: Impaired for mercury in fish tissue
- Ballardvale Impoundment: Impaired for mercury in fish tissue, aquatic plants and non-native aquatic plants
- Foster's Pond: Impaired for non-native aquatic plants, mercury in fish tissue and dissolved oxygen
- Hussey Pond: Impaired for excess algal growth
- Pomps Pond: Impaired for mercury in fish tissue and non-native aquatic plants
- Merrimack River: Impaired for bacteria/pathogens and Phosphorus.

Workshop participants raised concerns about the need to protect Andover's conservation and wildlife corridors threatened by invasive species and changing climate conditions. Interventions have been required to control growth of fanwort, spiny naiad and bluegreen algae at Foster's Pond and other water bodies in Town. The health and viability of street trees and the need for more green space in the downtown and in dense central neighborhoods were also advocated.

According to MassDEP, 230 properties in Town have some record of oil/hazardous material release. Among the sites of concern is the former Landfill off High Plain Road. Plans have been designed and approved for capping the site and constructing athletic recreation facilities on the property.

[13] Massachusetts Year 2016 Integrated List of Waters, Executive Office of Energy and Environmental Affairs

Regulatory Structure/ Planning: Many participants identified an urgent need to update the local land use regulatory structure. Participants would like to see land use regulations that are more responsive to the Town's infrastructure capacity constraints and climate change conditions. Among suggestions are the need to incentivize development outside of flood zone areas, undertake a pro-active program of land acquisition to protect resource areas, and promote best management practices to minimizing impervious pavement and using natural filtration treatment systems for stormwater runoff.

Foster's Pond Dam @ Rattlesnake Hill Road (MVPC photo)

Community Strengths & Assets

Emergency Operations Center at Andover Public Safety Complex (Town of Andover photo)

MVP workshop participants in taking stock of Andover resources not only took account of vulnerable community features, but also identified community assets and strengths that contribute to Andover's resilience in responding to and recovering from hazard events. Infrastructural, Societal and Environmental assets highlighted in the workshop groups include:

Infrastructure investments: Andover municipal government has an established and effective capital planning and budgeting process and has been making regular investments in its street, sewer and water infrastructure. The Town Manager's budget proposed for FY20 includes a $27 million capital improvement program. In addition to having an approved Master Plan, Andover has developed a Facilities Master Plan, which outlines priorities and timetable for upgrades. A model road infrastructure project noted for accommodating heightened flood risk was reconstruction work done earlier this decade at High Plain Road, a project that involved elevating the roadway. Also, coordinated effort by Columbia Gas was completed this past Fall 2018 enhancing system pressurization capacity and replacing century-old cast iron gas pipelines.

Transportation Network: Andover has an established transportation network that includes convenient interstate highway access and regional transit with Merrimack Valley Regional Transit Authority local and commuter bus service. The Town is also served by MBTA commuter rail service with station locations near downtown and at Ballardvale.

Senior and Youth Services: Andover is proactive in organizing a broad range of services and activities promoting wellness, education, creativity and advocacy for youth and seniors. Memorial Hall Library, the Senior Center and the Cormier Youth Center facilities at Whittier Court have all been used as warming centers and/or shelters in community emergencies, including the Sept. 13 gas explosions.

Strong sense of community and civic engagement: A universal theme in workshop discussions was the overwhelming sentiment of community pride and active engagement. Andover has depth in its civic and charitable organizations that include churches, temples and religious groups as well as arts, cultural and historic organizations in addition to neighborhood associations. Andover also has a new organization dedicated to climate change education, Working to Educate for Climate Action Now (WECAN).

Healthy Mix of Small and Large Business Sector: Andover is an economic hub of the Merrimack Valley. Its 1,223 businesses provide jobs for more than 31,000 people. [14] Andover businesses have a track record of providing community support with donations of food and supplies in emergency events as demonstrated most recently in the wake of the Columbia Gas disaster.

Medical Reserve Corps: Andover, through its Health Division, is the lead agency in organizing the regional Greater River Valley Medical Reserve Corps, volunteers of medical professionals available to assist in emergency response and recovery operations.

Hazard Mitigation and Emergency Operations Working Group: Andover has an active interdepartmental municipal team led by Chief Keefe. The group meets monthly and

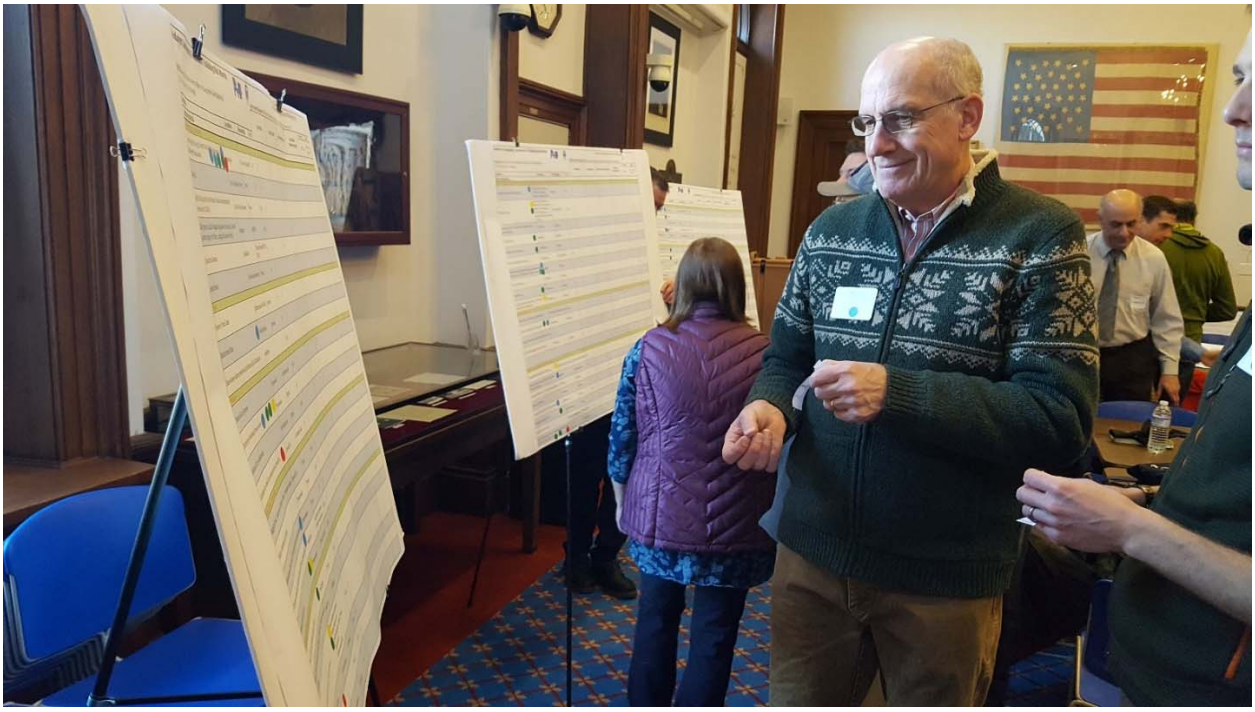
[14] 2018-2023 Merrimack Valley Comprehensive Economic Development Strategy, MVPC

coordinates emergency response and hazard mitigation planning and training activities.

Education Institutions: Phillips Academy, the Pike School and Merrimack College, all have well-established roots in the community and attract students from around the world. All three have sustainability programs along with facilities, students and staff that could support local emergency response, recovery and planning efforts.

Conservation Land and Open Space Resources: Andover boasts both quantity and quality in its supply of open space and conservation lands. Almost one-quarter of the Town's land area is permanently protected open space and recreation land. In addition to the 287 open space properties encompassing 2,073 acres owned by the Town, Andover's conservation resources are boosted by the 695-acre Charles Ward Reservation (341 acres in Andover) owned and managed by Trustees of Reservations and the 3,400 -acre Harold Parker State Forest (888.4 acres in Andover). Andover Village Improvement Society, the second oldest land trust in the Commonwealth, owns and manages 1,149 acres of parcels throughout the Town including segments of the Shawsheen River Greenway and the Deer Jump Trail along the Merrimack River.[15]

[15] Andover Open Space and Recreation Plan, 2017



Andover resident Steve Fink assessing options as he votes on his top priority actions at the January 31st workshop at the Memorial Hall Library (MVPC Photo)

Top Recommendations for a More Resilient Andover

In small table groups, workshop participants identified actions focusing, given time availability on infrastructural, societal and environmental features and issues of most concern. Each table identified their priority actions. Participants came together at the end of the workshop to vote for top three recommendations. Highest priority actions selected by participants were:

Recommendation #1: Undertake a strategic program of land acquisition and adaptation along waterways to provide flood storage and reduce impacts of larger storm events and increased runoff. To accommodate planning and making use of land opportunities as they become available, the Town should consider setting up a dedicated funding source for a land banking and adaptation program, such as local adoption of the Community Preservation Act.

Recommendation #2: Update the Town's zoning bylaws and land use regulations to promote Low Impact Development that incentivizes growth outside of hazard areas, reduces impervious surfaces and promotes nature-based systems of stormwater runoff filtration and pollutant reduction.

Recommendation #3: Undertake a public education messaging campaign that highlights the local impacts of climate change risks and actions the community and households can take in preserving natural resources, enhancing flood storage capacity and promoting alternative energy systems for carbon emission reduction.

After the January workshops, the MVP project core team met to finalize the risk matrix package, rank action priorities and outline envisioned implementation timeframes (Ongoing, Short-term of one to five years, and Long-term of more than five years).

Other High Priority community resilience projects identified by Workshop stakeholders and MVP core team, in addition to the Top 3 Workshop Outcome Recommendations above were:

- Establish and fund a Town Tree Planting and Removal Program including a Tree Inventory.
- Complete renovations to Senior Center, used as emergency shelter, and expand equipment to include showers, beds, kitchen facilities and accessibility communications/audio.
- Undertake design engineering study of Shawsheen River Bridge (North Main Street (plaza), Shawsheen Village). (Bridge currently acts as a flow obstruction in extreme precipitation events.)
- Implement Stormwater Management Best Practices and standards including nonpoint source measures outlined in the Watershed-Based Plan for Foster's Pond (6/30/2017).
- Upgrade aging stormwater infrastructure to handle more intense storms. Include funding for equipment to evaluate and maintain infrastructure as well as additional DPW staff to conduct work.
- Design and construct open space green area in downtown at space in rear of Old Town Hall using low impact development methods (LID).
- Design and install replacement structure of the stone culvert at River Street near the Wilmington Line.
- Bury electrical lines underground in appropriate locations including the Andover downtown business district.
- Improve communication and collaboration with National Grid in long-term power grid investment plans for power backup capacity and emergency response.
- Implement Sewer System Inflow & Infiltration Study recommendations (2018) of upgrades.
- Support regional program of the Greater Lawrence Sanitary District of long-term controls and reduction of CSO events in the Merrimack River.
- Invest in Water System upgrades including Hydraulics systems and Water Tanks maintenance.
- Expand availability and update emergency alert notification systems.
- Develop emergency communication protocols and networks including establishment of emergency resource hubs as central locations for community information and care services.
- Redevelop Lewis Street DPW maintenance yard as resilience model planned development within the Historic Mill District.

- Provide public education on health-related impacts of climate change including insect borne illnesses (Lyme, West Nile, etc.). (from listening session)

Appendices

- **Workshop Participants & Resource Staff**
- **Reference Sources**
- **Citations & Acknowledgements**
- **Additional Comments Received (post listening session)**
- **Risk Matrices**
- **Workshop Agendas**
- **GIS Maps**

Workshop Participants & Resource Staff

Name	Organization
Rich Bizzozero	Director, Mass. Office of Technical Assistance & Technology
Rick Campo	Columbia Gas
Thomas Carbone*	Director of Public Health, Andover
Barbara Burke	Andover Building Department
Chris Clemente*	Andover Building Commissioner/Inspector of Buildings
Elaine Clements	Andover Historical Society
Joe Connelly*	Director of Community Services
Annmary Connor*	Director of Elder Services, Andover
Cheri Cousens	Executive Director, Greater Lawrence Sanitary District
Christopher Cronin*	Director, Andover Department of Public Works
Melanie Cutler	Andover High School
Robert Decelle	Andover Trails Committee
Robert Douglas*	Andover Conservation Director
Alix Driscoll*	Andover Conservation Commission
Steve Fink	Sustainable Andover
Marc Fournier	Andover Public Works, Deputy Director/ Highway Superintendent
Alan French	Andover resident
David Gendall	National Grid
Steve Golden	Andover Greenway
Allison Guerette	Sustainability Coordinator, Phillips Academy
Amy Hollman	Andover resident
Amy Janovsky*	AVIS/Foster's Pond Corporation
Chief Patrick Keefe*	Andover Police Department
Ellen Keller	Ozzy Properties and Andover Community Trust
Charlie Kendrick	Historic Mill District Task Force
Ann Knowles	Andover Planning Board & Historic Mill District Task Force
Seth Krueger	Columbia Gas
Mike Lindstrom*	Andover Deputy Town Manager
Chief Michael Mansfield*	Andover Fire Dept.
Art Martineau*	Andover Acting Town Engineer
Paul Materazzo*	Andover Director of Planning & MVP Project Manager
Beth Mazin	Director, Memorial Hall Library
Ben Meade	Andover Conservation Agent
Harry Mishkin	Andover resident
Anil Navkal	Andover Green Advisory Board
Janet Nicosia*	Andover Director of Facilities
Ann Ormond*	Andover Director of Business, Arts & Culture
Louis Ouellette	Executive Director, Andover Housing Authority
Mary Pritchard	Courageous Conversations Andover
Elizabeth Robert	Region 3 Regional Health & Medical Coordinating Coalition
Tammy Saporito	National Grid
Austin Simko*	Andover Chief Strategy Officer and Town Clerk
Susan Stott	Andover Village Improvement Society (AVIS) and resident
Paul Szymanski*	Andover School Dept. Assistant Superintendent of Finance
Ellen Townson*	Andover Conservation Commission
Morgan von Prelle Pecelli	Andover resident
Rev. Alex Will	South Church
Karen Conard, Facilitator	MVPC
Joseph Cosgrove, Facilitator	MVPC
Anthony Komornick, Facilitator	MVPC
Peter Phippen, Facilitator	MVPC
Jerrard Whitten, Facilitator	MVPC
Jennifer Hughes, Facilitator	MVPC

***indicates member of MVP Project core planning team**

Reference Sources

Massachusetts State Hazard Mitigation & Climate Adaptation Plan, September 2018, Executive Office of Energy and Environmental Affairs.

Merrimack Valley Multi Hazard Mitigation Plan Update, April 2016, Merrimack Valley Planning Commission.

Massachusetts Climate Change Projections, March 2018, Northeast Climate Adaptation Science Center (NECASC) for the MA Executive Office of Energy and Environmental Affairs.

Special Report-Global Warming of 1.5 Degree Centigrade, Intergovernmental Panel on Climate Change, October 2018.

Fourth National Climate Assessment, U.S. Global Change Research Program, November 2018.

Town of Andover Housing Production Plan 2018-2022, prepared by Merrimack Valley Planning Commission with JM Goldson community preservation & planning, 2018.

American Community Survey, Five-year Estimates 2013-2017.

Andover Open Space and Recreation Plan, 2017.

A Framework for Decision Making - Andover Master Plan, 2012.

Drought Management Plan, Andover Water Department, Revised May 2015.

Fish Brook Watershed Advisory Committee Final Report, Town of Andover, MA, April 2010.

Sanitary Sewer Master Plan, Town of Andover, MA, prepared by CDM Smith, June 2016.

Andover Facilities Master Plan Final Report, prepared by MGT of America Consulting, June 7, 2016.

Foster's Pond Watershed-Based Plan, prepared by Foster's Pond Corporation for MassDEP, June 30, 2017.

Citations & Acknowledgements

For future referencing of this project and report, the following citation should be used: *Municipal Vulnerability Program Community Resilience Building Workshop Summary of Findings,* Town of Andover, 2019. Prepared by Merrimack Valley Planning Commission.

This Town of Andover planning project was funded through a Municipal Vulnerability Planning Grant awarded by the Massachusetts Executive Office of Energy and Environmental Affairs.

The Town and MVPC are appreciative of the state agency resource assistance for funding as well as technical aid provided. Special thanks to all stakeholders who participated in the planning workshops.

Additional Comments Received

(Post Listening Session)

- Comment on Infrastructure Risk Matrix – Foster's Pond Dam: The project, proposed by the former Town Highway Supt. Is located proximate to the Dam but is not "at" or physically connected to the dam. It would be a Town project to replace a drain on Rattlesnake Hill Road, immediately downstream from the dam, with a catch basin incorporating a hydrodynamic separator to remove particles, oil and grease from stormwater run-off on the road that now flows unfiltered into the wetland. The project is not related to the dam.
- Create a program for active oversight of natural resources in town, including management of invasive plants and damage to trees from deer, disease and insects.
- Raise the priority of invasive species from low to medium on the risk matrix.
- Conservation Land/Open space should be considered Green Infrastructure.
- Add rain gardens to the matrix.
- The Ledge Road landfill project to create playing fields on top in not yet approved and should be noted in the plan.
- Other factors that should be considered in creating the action plan: maintaining and replacing culverts to minimize road closures due to flooding, creating improved walkways and bike routes, timely removal of fallen trees and thoughtful replanting, managing populations of insects, rodents and wildlife to minimize health risks to residents and damage to town and conservation land
- More frequent and intense storms can also result in extensive tree damage and potential water contamination.
- Having a surface water drinking supply should be considered a vulnerability
- Protecting transportation systems against hazards should include flooding and tree damage.
- The Town cannot control the maintenance of private roadways, particularly in industrial areas, leading to potentially sub-standard conditions of these roads.
- Lack of a back-up generator at the water treatment plant results in numerous brown water events throughout town yearly.
- Deal with beaver populations to reduce flooding.
- Any new large-scale development (of more than one single-family residence) could be required to install/construct large enough rain gardens with suitable plant material to deal with rooftop and parking runoff.

- Require pervious pavement and porous pavers for new development. Consider requiring properties to infiltrate on-site rather than allowing stormwater runoff.
- Small berms across driveways should be offered to residents and constructed by DPW to keep rain water on streets and into storm drains rather than running into lower residential properties
- Educational efforts and assistance in developing rain gardens on appropriate residential properties should be pursued
- Ensure stormwater entering the Merrimack River is as clean as possible. Educational efforts and/or regulations about pollutant use on town and private land should be considered. Pesticide, herbicide, fungicide usage for lawn and yard care is extensive in Town. Enforce the Town Pesticide Reduction Policy.
- In caring for trees in town, efforts should be made to plant a variety of species so no monoculture develops. Native species that support wildlife should be emphasized rather than purely decorative non-native species. Work to maintain diversity as climate change pressures increase.
- Put more emphasis on developing by-laws to expand solar installations (on school rooftops, in parking lots as carport placement, etc.) to generate the electricity for the AC that will be needed as temperatures increase, and to create independence from the grid.
- Explore by-laws allowing for large cisterns in large developments to hold water during severe storms to then use during summer drought conditions for sprinkler systems.
- Consider converting some of the school gym showers to single private ones for emergencies.
- Consider providing some overnight cooling facilities in town as well as heated facilities during winter storms.
- Help residents access generators to utilize during winter storm events/cold snaps to keep forced hot water systems going so pipes don't burst. Supply a list of providers who will respond especially to seniors aging in place.
- Compile a list of vulnerable seniors to reach out to during emergencies.

Andover Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

Top Priority Hazards (floods, hurricanes, nor'easters, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING	NOR'EASTERS	AGING INFRASTRUCTURE	EXTREME TEMPERATURE	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Roads, Bridges & Culverts									
Low Lying Areas (e.g. North Main St.; Shawsheen Sq.; Shawsheen Plaza area)	multiple	Town & MassDOT	V	Create Flood Storage Areas at Penguin Park and other Shawsheen River locations				M	O
				Update regulatory structure (inc. Subdivision Regs & zoning to promote Low Impact Development, permeable pavement, stormwater treatment and infiltration and limit development in vulnerable areas.)				H	O
				Integrate flood storage into planning & public works design (e.g. Riverina Road)				M	O
				Invasive plant management at riverfront areas, wetlands				L	L
				ID, assess and map low lying priority areas to define flow bottlenecks and flood mitigation solutions				M	O
				Acquire land for expanded flood storage ; communicate value of acquiring open space				H	S
				Dredge Study of Merrimack				L	L
				Design/engineering review of Shawsheen River culvert near Merrimack River outlet				M	M
				Dedicated funding source for land acquisition for flood storage--CPA, developer contributions				M	L
				Design engineering study of Shawsheen River Bridge at Shawsheen Village (Route 28)				H	L
				Develop & Implement Maintenance & Management plan for culverts				M	O
				Develop neighborhood-based evacuation plans				M	L
River St.	by Wilmington line	Town	V	Stone culvert replacement-design & install				H	S
High Plain Road @ Fish Brook (road reconstructed & elevated early 2010s)	at Fish Brook area	Town	V & S	√					

Rail System inc. Rail bridges & grade crossings (Lowell Junction bridge by Pfizer; xing at Dundee Park)	multiple	MBTA	V & S	√		√			
Evacuation Routes	multiple	Town/MassDOT/MBTA	V	√	√				
Central Street	at Shawsheen River	Town	V	√					
Dams									
Foster's Pond Dam	Rattlesnake Hill Rd.	private--Foster's Pond Corporation	V	Prepare Emergency Action Plan (EAP)				M	S
				Replace outfall pipe at dam with deep sump catch basin to trap silt/debris & protect wetland				M	S
Ballardvale Dam	Ballardvale	private	V	Remove dam to eliminate river flow barrier				M	L
Shawsheen dams removed at Stevens St. & Balmoral	multiple		V & S	√					
Utilities									
Natural Gas System	Townwide	Columbia Gas	V & S			Replace remaining low pressure lines at Lowell St. area		M	O
Electricity-Overhead Power Lines	Townwide	Ngrid/Town	V	Develop and implement tree planting policy & standards; vegetation Management, pruning & clearing coordination between Town and Ngrid				H	O
				Bury electrical infrastructure underground in CBD and appropriate locations				H	L
				Proactive upgrades to substations & transformers				M	L
				Explore microgrid storage, renewable energy sources --possible partnership with Schneider Electric, others				M	L
				Establish power backup capacity to support system, generators				H	O
				Improve communication/collaboration with Ngrid in long-term plans and emergency response				H	O
National Grid--substations	6 substations	Ngrid	V & S	Rebuild Substation #3				M	S
Columbia Gas--small low pressure area Lowell St.	Lowell St.	Columbia Gas	V			√			
Water/Sewer/Stormwater									

Haggetts Pond - Reservoir & Water Tanks--Prospect tanks,	Lowell St.;	Town	V & S	√		Maintain & update water tanks	H	O
Water Distribution System	Townwide	Town	V & S	Hydraulics systems upgrades			H	O
Shawsheen River Sewer Interceptor & pumping station	Shawsheen	Town	V	Design engineering and implement floodproofing			H	O
Greater Lawrence Sanitary District/CSOs on Merrimack	regional	GLSD & upstream WWTP operators	V & S	Upgrade and separate sewer and stormwater system (regional)			H	O
Stormwater System Infrastructure	Townwide	Town	V & S	Clean out blocked inlets, outlets and culverts to improve flow & enable catch basins, infrastructure to function properly			M	O/S
Sewer Infrastructure	Townwide	Town & GLSD	V & S	Inflow & Infiltration Study completed 2018. Implement study recommendations on sewer infrastructure upgrades			H	O/S
Municipal Facilities/Resources								
Schools-Lack of AC and lack of reliable power, frequent outages.	multiple	Town	V & S			Design & Install HVAC Systems and full power backup at Schools	M	L
FEMA Flood Insurance Rate Maps--Outdated, Not Forward Looking	resource	FEMA		Update flood maps			M	L
Fire Stations (lack generators, reliable power)	two satellite stations-Ballardvale Station@ Andover St.; West Station @ Greenwood Rd)	Town	V & S	Install generators			M	O
				Investigate microgrid power feasibility			M	L
				Establish Hubs in neighborhoods for emergency services with community groups, volunteers			H	O
Cell tower/Fiber Optics-Communications	5 locations	private	V & S	Upgrade emergency communication cable connections between municipal facilities (Town Hall & Public Safety Complex)			H	O/S
Senior Center & Youth Center - Shelters	Whittier Ct.	Town/service groups	V & S	Develop & formalize shelter plan to ensure proper staffing & equipment. Involve secular and faith-based community groups in planning and communications.			H	S
				Establish reliable power backup sources for shelters			H	S
				Develop evacuation/bus transportation plans			H	O
				Upgrade Senior Center shelter. Add-ons to include showers, generator, accessibility improvements,, audio systems, beds)			H	O

Brickstone Square (access)	Shawsheen	private	V	√					

Andover Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

Top Priority Hazards (floods, hurricanes, nor'easters, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING	NOR'EASTERS	AGING INFRASTRUCTURE	EXTREME TEMPERATURE	Priority H - M - L	Time Short Long Ongoing
Socio-Economic									
Special/Disadvantaged Populations (Elderly, Disabled, Youth, non-English Language)									
Assisted Living & Nursing Homes	Marland Place, Bridges, Stonehill, Academy Manor, Strawberry Hill	private	V & S	√	√	√	√		
Senior Living	Andover Commons-Railroad St., Chestnut Ct., Stowe Ct., Memorial Circle, Frye Circle, Riverside Woods, Avalon St. Claire	private & AHA	V & S	√	√	√	√		
Youth Services -transportation, families with young children	Townwide	multiple	V	√	√	√	√		
Group Homes	multiple	multiple	V						
Residents in housing w/o generators	Townwide	private	V	√	√	√	√		
Senior transportation service	Townwide	COA, MVRTA	V & S	√	√	√	√		
Vulnerable neighborhoods along Shawsheen inc. Woburn St., High Plain Road, Dale St. condos	multiple	private	V	Land owner outreach & education				M	L
				Establish flood zone overlay district-Shawsheen				M	L
				Develop access and evacuation plans specific to neighborhoods				M	S
				Notification system--Public education campaign for resident Code Red sign-ups with alternate info delivery plan for non-resident employees & elderly; Make available in ADA compliant formats and in multiple languages				H	O/S
				Identifying vulnerable housing stock; enforcement of building codes				M	L
				Assistance to families without legal status; issuance of sanctuary.				M	L
				Transportation plan/evacuation in emergency response				M	L

				Workshops on Emergency Response communications and responses for landlords, employers, medical providers.				M	L
				Develop and use planning models for Shawsheen inc. property rehab & floodproofing,				M	L
Day Care Facilities	Townwide	multiple		√	√		√		
Low Income	Townwide	multiple	V	√	√				
Aging Population Needs; People in Need of Medicine/Med Equipment	Townwide	multiple	V	Develop Master List of Residents with Needs & High Risk Areas for Fire Dept/Emergency Mgmt.,/ Involve Faith-Based Community & Secular Service Organizations				M	S
Services/Features									
Food depots - Whole Foods, Stop & Shop	Shawsheen Plaza & RR St.	private	S	√	√	√	√		
Andover strong sense of community	Townwide	multiple	S	√	√	√	√		
Access to medical clinics/hospitals outside Town	Town/Region	multiple	V	√	√	√	√		
Land Use challenges (Dascomb Road)	multiple	private	S	√		√			
Emergency Response/Mitigation Resources									

Andover Community Resilience Building Risk Matrix

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H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
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Top Priority Hazards (floods, hurricanes, nor'easters, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING	NOR'EASTERS	AGING INFRASTRUCTURE	EXTREME TEMPERATURE	Priority H - M - L	Time Short Long Ongoing
Environmental									
Resource Areas									
Wetlands & Water Bodies	Townwide	multiple public/private	V & S	Public education & outreach on wetlands function (Prepare FAQs for residents)				H	O
				Strengthen regulatory structure (zoning, land use regs) to protect wetlands/water resources, encourage Low Impact Development				H	S
				MS4 Permit implementation as opportunity for planning process and funding to update stormwater management standards				H	O
				Study of Stormwater/Flood Mitigation in Washington Park area				M	L
				Study of invasive species, including aquatics invasives, and strategies to contain				L	L
				More signage on Town conservation properties and demonstration areas with hands-on, technology-integrated learning opportunities				L	O
				Set up programs in schools--sustainability clubs, living laboratories, e.g.				M	O
				Install bioswales or other stormwater treatment BMPs as alternative to point system discharge to wetland areas (Glenwood Road by Foster's Pond)				H	O/S
				Explore Stormwater Utility fee based on Impervious Surface Impact				M	L
Surface Water Supplies-Haggetts Pond, Merrimack, Fish Brook	Multiple	Town	V & S	√		√	√		
Shade Trees/Street trees	CBD and Townwide	Town	V & S		√		Establish Tree Planting and Removal Program	H	O
Conservation Land/Wildlife Habitat Corridors -- Avis, ConCom,Trustees	Multiple	multiple public/private	V & S	Expand community paths, open space linkages				L	O
				ID and develop plan for land acquisition gaps along waterways inc. Shawsheen River Greenway, Merrimack River and Fish Brook				H	O
				Support acquisition of NG land				H	S
				Work with community conservation partners in public education/outreach on value of open space, social media				M	S
Forest lands--Harold Parker, Ward Hill Res.	Multiple	multiple public/private	V & S	√	√	√	√		

Shawsheen Greenway & Merrimack River Trail; Gaps in Open Space Connectivity	Shawsheen River	AVIS/ConCom	V & S	Plan and Implement Gap Acquisitions for completion of trail corridors				H	O
Parks/Open Space									
Lack of Dedicated funding source for Open Space acquisitions	Town Hall	Town	V	Town Meeting appropriation of $1 million annually for land acquisition				H	O
				Renew campaign for passage of Community Preservation Act adoption by Town				M	L
Green space needs in downtown, central neighborhoods;	CBD	Town	V	Design and construct open space green area rear of Old Town Hall				H	O (in design
G.L. Technical School Park Plan	River St.	GLTS/Phillips Academy (	S	Design study & survey and construct improvements including public safety access emergency dock at Merrimack River.				H	O (agreement among parties)
Public swimming areas--Pomps Pond, Foster's Pond, Harold Parker--bacteria, invasives, eutrophication threats		Town/DCR/Foster's Pond Corp.	V & S	Implement Master Plan improvements at Pomps Pond				H	S
Former Landfill (capping for park)	Ledge Rd.	Town	V & S	Complete capping of former landfill				M	S
Regulatory Structure/Planning									
Underreporting of Hazard Material Storage	Townwide	Police/Fire; private	V	√					
Chemicals in freight rail transport, highway	Townwide	Police/Fire, CSX, MassDOT, private	V	√	√		√		
Underground Storage Tanks/ Decommissioned MLP tanks	Townwide	Police/Fire, private	V			√			
Sewer Pump station maintenance (13 in neighborhoods)	Townwide	Town	V	Design and construct capacity upgrades inc. Foster's Pond area pump station				M	L
CSO long term control plan	Merrimack River	GLSD	V & S	√		√		H	L
Lack of Farmland	Townwide		V				ID priority parcel(s)	L	L
Lewis St. Town Yard--redevelopment & cleanup	Lewis St./Historic Mill District	Town	V & S	√					
Alternative energy--solar, wind power	Townwide	public/private	S			Promote geothermal and solar incentives to homeowners		M	O
						Move to municipal solar/alternative energy sources		M	O
						Town-wide education on alternative energy sources and opportunities		M	O

						Site renewable power generation facilities on Town-owned land/schools		M	O
Stormwater treatments/infiltration, excessive impervious surface	Townwide	Town	V & S	Education and Outreach on Best Management Practices; Update land use regulations to promote Low Impact Development				H	S

Municipal Vulnerability Preparedness for Andover

Working Session #1

Andover Old Town Hall, 20 Main Street

Thursday, January 24, 2019 8:30 A.M.

AGENDA

I.	Welcome/Introductions
II.	MVP Overview and Working Session Objectives
III.	Hazards Overview & Resources Presentation (Large Group)
IV.	Instructions for Small Team Breakouts
V.	Small Team Breakouts – Community Identification and Assessment of Strengths & Vulnerabilities A. Infrastructure & Critical Facilities B. Social/Economic Features C. Environment/Natural Resources
VI.	Large Group Wrap-Up: Report Outs from Tables
Workshop #2: Prioritizing Actions for Andover Resiliency **Thursday, January 31, 2019 - 8:30 A.M. at Andover Old Town Hall**	

Municipal Vulnerability Preparedness for Andover

Working Session #2

Andover Memorial Hall Library

January 31, 2019 8:30 A.M.

AGENDA

I.	Welcome & Introductions
II.	MVP Program Overview & Workshop #2 Objectives
III.	Review of Workshop 1: Summary of Andover Hazards, Vulnerabilities & Strengths
IV.	Instructions for Small Team Breakout Exercise— Identifying & Prioritizing Actions to reduce the impact of hazards and increase Andover resilience
V.	Small Team Breakouts – Identifying and Prioritizing Actions A. Infrastructure & Critical Facilities B. Social/Economic Features C. Environment/Natural Resources
VI.	Report Outs from Tables
VII.	Defining Highest Priority Action List
VIII.	Wrap Up and Next Steps
Public Meeting on MVP Workshop Findings: TBD	

Town of Andover

Municipal Vulnerability Preparedness Program

(Critical Infrastructure)

Methuen

Lawrence

Dracut

North Andover

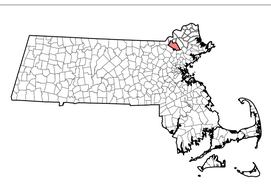
Lowell

Wilmington

North Reading

Legend

- Bridges
- City Offices
- Cemetery
- Clinic
- College
- Compost Site
- Fire Station
- Landfill
- Library
- Nursing Home/ Assisted Living
- Parking
- Police Station
- Post Office
- Public Health Office
- Public Works Garage
- Recreation
- School
- Sewage Pumping Station
- Bus Station
- Train Station
- Water Supply/ Pumping
- Water Tank
- Water Treatment Plant
- Evacuation Routes
- Interstate
- Major Road
- Commuter Rail
- Local Roads
- Pond, Lake, Reservoir
- Perennial Stream
- Intermittent Stream
- Open Space
- 100-Year Floodplain
- 500-Year Floodplain



1 inch = 1,320 feet or 0.25 miles

2,600 1,300 0 2,600 Feet

Merrimack Valley Planning Commission

plan • develop • promote

N

January 4, 2019 MM

Path: J:\Projects\Andover\2018\Andover_MVP2018_CriticalInfrastructure_36x44.mxd

Town of Andover

Municipal Vulnerability Preparedness Program

(Socio-Economic)

Methuen

Lawrence

Dracut

North Andover

Lowell

Wilmington

North Reading

Legend

- Evacuation Routes
- Interstate
- Major Road
- Commuter Rail
- Local Roads
- Pond, Lake, Reservoir
- Perennial Stream
- Intermittent Stream
- Subsidized Housing Locations
- Open Space
- 100-Year Floodplain
- 500-Year Floodplain

1 inch = 1,320 feet or 0.25 miles

2,600 1,300 0 2,600 Feet

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Town of Andover

Municipal Vulnerability Preparedness Program

(Environmental)

Methuen

Lawrence

Dracut

North Andover

Lowell

Wilmington

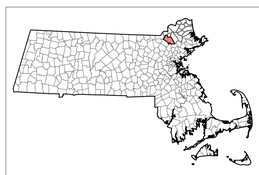
North Reading

Legend

- Evacuation Routes
- Interstate
- Major Road
- Commuter Rail
- Local Roads
- Pond, Lake, Reservoir
- Perennial Stream
- Intermittent Stream
- Open Space
- 100-Year Floodplain
- 500-Year Floodplain
- Chemical Storage Facilities
- Dams

Chemical Release Sites

- Oil
- Hazardous Material
- Oil and Hazardous Material
- Unknown



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