Community Resilience Building Workshop- Summary of Findings

Devens, MA

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Overview

Located in north central Massachusetts, the Devens Regional Enterprise Zone ("Devens"), formerly known as Fort Devens, offers unique opportunities for its businesses and residents. Devens is host to an array of businesses and world-class high-technology companies, as well as historic and new innovative 'green' residential housing developments. Devens also has a large amount of permanently protected open space.

Sustainability was one of the fundamental principles of the Devens redevelopment, and as such, strives to balance economic development with protection of its built, natural, and social environments. Devens was recently selected by the Commonwealth of Massachusetts to participate in the Municipal Vulnerability Preparedness (MVP) Program to assess potential climate change impacts, vulnerabilities, and to prioritize actions for enhanced short- and long-term community sustainability and resiliency.

1.1 Community Resilience Building Workshop

The Municipal Vulnerability Preparedness (MVP) Program provides technical assistance to communities across Massachusetts to assess potential impacts from climate change, the communities' vulnerabilities to those impacts, and to prioritize resiliency actions using the Community Resilience Building (CRB) framework. Under this framework, a "community-driven process" is designed to foster engagement and collaboration among community stakeholders. For the community of Devens, the Devens Enterprise Commission (DEC) and MassDevelopment Devens (MD Devens) led the MVP planning efforts and hosted two CRB workshops, with support from consulting firm, VHB (a state-certified MVP provider).

Two (2) half-day workshops were held on March 29 and April 4, 2018. See Appendix A for the workshop presentation and attendance sign-in sheets. The workshops' central objectives were to:

- Share with stakeholders about historic trends and projected future climate change scenarios;
- Define the top local natural and climate-related hazards of concern;
- Identify existing and future strength and vulnerabilities;
- Develop prioritized actions for the community; and
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

1.1.1 Pre-Workshop Coordination

In February 2018, the Devens' MVP Core Team ("the Core Team") convened to kick off the preparation for the CRB workshops. The Core Team consists of the following representatives:

- Peter Lowitt, Director, Devens Enterprise Commission (DEC)
- Neil Angus, Environmental Planner, DEC
- Thatcher Kezer, Senior Vice President (former), MassDevelopment Devens Operations
- Chief Joe LeBlanc, MassDevelopment Devens Fire/Public Safety
- John Marc-Aurele, Engineering Manager, MassDevelopment Devens Engineering
- David T. Blazon, Manager, MassDevelopment Devens Public Works

During this pre-workshop meeting, the Core Team discussed workshop logistics and timeline, anticipated workshop goals and outcomes, and key community stakeholders to be engaged and invited to the workshops. A preliminary list of identified key stakeholders included a diverse group of businesses, neighborhood and community groups, institutions, natural resources/environmental organizations, neighboring municipalities, as well as various state and federal agencies. See Appendix B for a summary of the Core Team's pre-workshop meeting, which also includes a preliminary list of identified stakeholders to be engaged in this MVP process.

1.1.2 Preparation for the Workshops

1.1.2.1 Pre-Workshop Engagement Survey

Given a large number of businesses in the community, the Core Team also distributed a survey in advance of the CRB workshops to solicit input from business owners regarding their perspectives on key risks and concerns related to climate impacts on Devens. The survey was sent to more than 130 businesses, industries,

and organizations within Devens. The survey received a total of 14 responses. Highlighted responses included:

- Approximately 43 percent of participants indicated that their businesses and organizations have an emergency operations or response plan and protocol in place;
- Top concerns and issues for businesses and organizations should there be damages or disruption due to major weather events (flooding, prolonged heatwaves, extreme storms, etc.) include loss of revenue, property damage and associated recovery costs, as well as injuries, illness or other safety impacts to employees; and
- Additional resources needed for effective preparedness for these businesses include early warning system, shelter and medical response, reliability and stability of utility systems, transportation assistance (for residents without cars, especially during extreme hot or cold days), and ability for telecommuting.

See Appendix C for the full survey questionnaire and results.

1.1.2.2 Data Collection: Climate Literature Review & Identification of Critical Assets

To prepare workshop materials, the Core Team reviewed various resources and publications, including:

- MA Executive Office of Energy and Environmental Affairs (EEA)'s *Massachusetts Climate Change Projections Report* (2017) –this report provides a standard, peer-reviewed set of temperature, precipitation, and sea level rise projections for the state of Massachusetts.
- National Oceanic and Atmospheric Administration (NOAA)'s *State Climate Summary for Massachusetts* (2014) –this report includes highlights of the climate trends and observed conditions which Massachusetts has already experienced to date.
- Boston Research Advisory Group (BRAG)'s *Climate Change and Sea Level Rise Projections for Boston Report* (2016) –this publication provides the basis for considering future regional flood projections.
- *Montachusett Hazard Mitigation Plan* (2016) –this plan identifies hazards along with specific locations and level of vulnerability for communities within the Montachusett Region.
- Devens' *Comprehensive Emergency Management Plan* (2014)—this document lays out the protocol and resources for effective communication and coordination during an emergency in Devens.

The Core Team developed a summary of future climate scenarios and implications for Devens, as well as a preliminary list of critical assets and infrastructure to be reviewed with participating stakeholders at the workshops. Based on the available data, the Core Team also produced a base map, inclusive of layers of identified assets and infrastructure, and future flood projection. See Appendix D for a summary

on climate data and preliminary identification of critical assets and infrastructure in Devens.

1.1.2.3 Community Resilience Building Risk Matrix

Based on projected climate conditions and potential impacts to critical assets and infrastructure in Devens, the MVP Provider collaborated with the Core Team to set up a Risk Matrix to further analyze community vulnerabilities and strengths and to prioritize actions. The Risk Matrix was utilized to facilitate break-out sessions during the workshops. See Appendix E for the complete Risk Matrix for Devens.

As per the CRB Workshop Guide, and to assist with the group discussions, the Risk Matrix was divided among three community components- infrastructural, societal, and environmental. With each of these groupings the stakeholders identified vulnerabilities and strengths, and identified and prioritized actions. Examples for each of the community components include:

Infrastructure	Societal	Environmental
Roads and bridges	Public health and safety	Forests and wetlands
Utilities	Public facilities and institutions	Water
Buildings	Recreational facilities and areas	Rare and endangered species
Railroads	Vulnerable and special needs populations	

2

Top-Priority Hazards and Vulnerable Areas

To date, communities across Massachusetts, including Devens, have already been experiencing changing climate conditions. Between 1900 and 2014, the state's average annual temperatures have increased by approximately 3°F. The number of hot days with maximum temperatures above 90°F has been consistently above average since the 1990s, and the highest number of days above 90°F took place in most recent period between 2010 and 2014. The state has experienced above-average precipitation in the last ten years, averaging approximately 51 inches per year (compared to the overall long-term average of 45 inches per year between 1895-2009). Furthermore, since 2005, there have reportedly been about 30 percent more extreme precipitation events (days with rainfall above two inches). More specifically, Devens is located between Worcester and Middlesex Counties, which have been experiencing storms that warrant FEMA Disaster Declarations more regularly since 2010.

The following section discusses the top-priority hazards and areas of concern, based on the review of climate change trends and projections and identified critical assets and systems for Devens.

During the first stakeholder engagement workshop, the following four hazards were determined as top-priority, which may pose the greatest threat to Devens presently and in the future:

- Extreme Precipitation and Flooding;
- Severe Storm Events;
- Extreme Heat; and
- Wildland Fire.

2.1 Extreme Precipitation and Flooding

In the Nashua Basin, where Devens is located, there is some uncertainty in terms of projected changes in precipitation patterns. Seasonal precipitations may vary, such that summer and fall seasons may experience more or less total precipitation. In general, Devens may potentially experience an increase of up to six inches of total

annual average precipitation volume by mid-century, and an increase of up to eight inches by end of the century. It is also projected that the frequency of high-intensity rainfall events will increase over time throughout the 21st century. Table 1 provides a summary of the projected changes in precipitation patterns.

Table 1 – Projected Changes in Precipitation Patterns for the Nashua Basin.

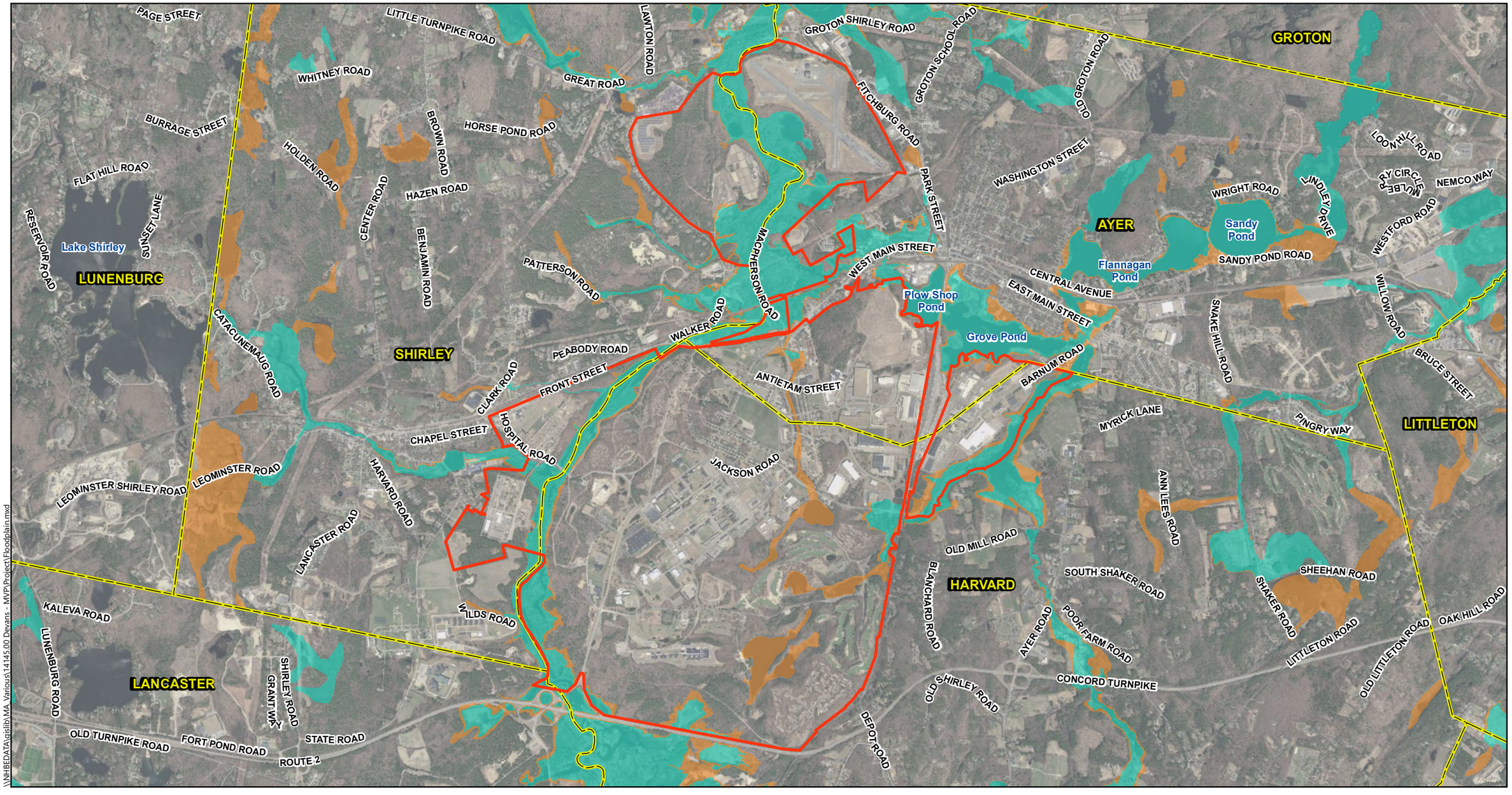
	Baseline (1971-2000)	Mid-Century (2040-2069)	End of Century (2080-2099)
Total Annual Precipitation	46 in.	↑ 1 to 6 in.	↑ 1.2 to 8.3 in.
Days per year with over 1" rainfall	7 days	↑ 0.5 to 3.3 days	↑ 1 to 4 days
Days per year with over 2" rainfall	< 1 day	↑ 0 to 0.4 day	↑ 0 to 0.6 day
Days per year with over 4" rainfall	< 1 day	↑ by <1 day	↑ by <1 day
Annual consecutive dry days	16 days	↑ 0 to 2 days	↑ 0 to 3 days

Additionally, using the Federal Emergency Management Agency (FEMA)'s Flood Insurance Study (FIS) for Middlesex County and the Boston Research Advisory Group (BRAG)'s *2016 Climate Change and Sea Level Rise Projections for Boston Report*, it is projected that what is considered the current 0.2-percent flood event (i.e. 500-year flood) will likely become the one-percent flood event (i.e. 100-year flood) by 2085. Figure 1 illustrates the future flood projections.

2.1.1 Potential Impacts from Extreme Precipitation and Flooding

Highlighted potential impacts from extreme precipitation and flooding include:

- Travel delays along roads that are especially prone to flooding;
- Increasing stress on stormwater infrastructure;
- Increasing risk of contaminants entering waterbodies;
- Increasing risk of deteriorating soil conditions due to heavy downpours and flooding events;
- Increasing risk and/or damage to building envelopes of existing building and facilities due to driving rain, extreme weather events (particularly during thunderstorm and high wind conditions);
- Increasing risk of flooding for low-lying properties; and
- Erosion due to flooding can expose unexploded ordinance sites and contamination from former brownfield areas within this Superfund site.



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Legend

- Devens
- Current 100-yr Floodplain (FEMA)
- 2085 - Mean Projection - Approximate 100-year Floodplain (Current 500-year Floodplain)
- Municipal Boundary

Devens Regional Enterprise Zone (DREZ) | Ayer, Harvard, Lancaster & Shirley, MA

Note: This map is an approximate representation of the forecasted limits of flooding. The map does not provide information regarding changes in base flood elevations that may occur over time.

Year 2085 – Mean Projection – Approximate 100-year Floodplain

Source: FEMA, VHB, ESRI

2.1.2 Areas of Concern

In Devens, the areas of concern due to extreme precipitation and flooding include:

Infrastructure	Societal	Environmental
› Flooding of retention pond by the Fire Department. › Flooding of main lift station at the Wastewater Treatment Plant. › Stress on pump house with elevated water levels. › Travel delays and disruption of already flood-prone areas such as Jackson Road, Patton Road, MacPherson Road, and Barnum Road. › Access to community resources such as Loaves and Fishes and Women's Shelter during and after flooding events. › Undersized culverts along Willow Brook (under Cavite and Buena Vista Streets).	› Shriver Job Corps Center and Francis W. Parker School are located near the current 500-year floodplain. › Potential mold exposure and other damages if critical facilities that are not properly remediated. › Increase in ticks, pests, poison ivy, and airborne allergens. › Weak communication network with some of the personnel at Army facilities on flood-prone Barnum Road.	› Potential stormwater system overflow into Little Mirror Lake. › Threats to rare and endangered species, such as the Blue-spotted Salamander, Grasshopper Sparrow, and Blanding's Turtle. › Potential environmental hazards due to cargo release in the event of flooded rail roads. › Fallen trees along the Nashua River can cause upstream flooding. › Groundwater and soil contamination issues at brownfield areas within the Superfund site.

2.2 Severe Storm Events

In addition to the increasing frequency of high-intensity rainfall events through mid- and end of century, high winds (due to tropical storms, tornadoes, severe thunderstorms, Nor'easters, etc.) are highly likely to occur. High winds (sustained surface winds greater than 40 mph lasting more than an hour) can impart damaging forces on utility poles, trees, and roofs. Lightning producing thunderstorms may become more frequent, which is a concern during the summer months, especially for outdoor activities.

Although the projected number of hurricanes reaching Massachusetts is uncertain, the North Atlantic hurricane activities are projected to increase in frequency, intensity and duration.

2.2.1 Potential Impacts of Severe Storms

In addition to heavy precipitation and flash flooding impacts associated with severe storms as discussed in the previous section, recent history has shown that high winds can take down trees which may obstruct roads and rail lines, down power lines, and propel damaging debris. Severe ice storms may also occur more frequently, due to warmer temperatures that likely lead to winter precipitation events in the forms of rain or ice. Impacts from these extreme storm events can lead to travel and commute delays, injuries, and property damage.

2.2.2 Areas of Concern

In Devens, an area of concern with severe storms is power outages. At the same time, it should be noted that Devens has strong infrastructure and redundancies in place to support its power grids, and it was anecdotally shared that the longest period that Devens has ever been without power was no more than 13 hours. Other areas of concern due to severe storms include:

Infrastructure	Societal	Environmental
› Fallen trees on roads, buildings, utility lines and rail lines.	› Limited back-up power at the Shriver Job Corps Center, Women's Shelter, Mount Wachusett Community College, and Oxbow Schoolhouse. › National Guard activities, sporting events, and cultural gatherings can bring up to 10,000 people to the area. If all these people are gathered outside, local emergency responders are especially concerned about lighting strikes if there is a storm in the area. Devens' ability to provide shelter or evacuate such large groups or special needs populations is also limited. › Significant number of non-English speaking employees.	› Fallen trees and debris make trails impassible. › Ice damage to tree limbs.

2.3 Extreme Heat

Temperatures across the state are projected to increase significantly throughout the century. Similarly, temperatures within the Nashua Basin are projected to continue rising. As a result, Devens may expect to experience warmer winter months and more frequent droughts due to less rain in the summer. More extreme heat days (days with maximum temperature over 90°F) are also anticipated – up to 30 more days by mid-century and up to 70 more days by the end of the century. Table 2 provides a summary of projected temperature changes.

Table 2 – Projected Temperature Changes for the Nashua Basin.

	Baseline (1971-2000)	Mid-Century (2040-2069)	End of Century (2080-2099)
Average Annual Temperature	47.6°F	↑ 3.0 to 6.4°F	↑ 3.9 to 10.9°F
Days per year >90°F	4.37	↑ 9 to 30 days	↑ 12.5 to 69.9 days
Days per year >95°F	0.23	↑ 2 to 13 days	↑ 4 to 42 days
Days per year >100°F	<1 day	↑ 0 to 3 days	↑ 0 to 17 days
Days per year <32°F	156 days	↓ 19 to 38 days	↓ 23 to 64 days
Days per year <0°F	9 days	↓ 3.7 to 6.6 days	↓ 4 to 7.7 days

2.3.1 Potential Impacts of Extreme Heat

The potential impacts from rising temperatures and more extreme heat days include:

- Poor air quality due to increase in warmer temperatures and extended heatwaves;
- Exposure and heat-related illnesses for vulnerable populations, including the elderly and young children, as well as for those working outside for extended periods of time without shelter;
- Increasing demand for cooling due to warmer temperatures and extended heatwaves, which may stress the power grid and increase energy costs for residents and businesses;
- Increasing stress on transmission lines, substations, train tracks, roads, bridges, and other critical infrastructure due to more intense heat;
- Weakening tree root systems due to drought which may make trees less stable during extreme precipitation and high wind events;
- Increase risk of wildland fires; and
- Changes in tree species (migration of species) may result in invasive species and challenges for existing wildlife habitats. Invasive species may also impact diversity of plant/tree species over time.

2.3.2 Areas of Concern

During extreme heat events, areas of concerns for Devens include:

Infrastructure	Societal	Environmental
› Stress to the power grid. › Impacts on freight rail commerce.	› Facilities such as the Francis W. Parker School may not have adequate air conditioning for extreme or long-duration heat events. › Limited back-up power at Shriver Job Corps Center. › Groundwater levels may not be sustainable in the long-term if the community continues to grow and also experience more frequent drought conditions.	› Increase in invasive species. › Change in rare and endangered species habitats. › Along the Nashua River Corridor, extended periods of hot days can weaken tree roots which increases the chances of erosion during the next heavy rain event. › Increase risk of wildfires.

2.4 Wildland Fire

Wildfires are commonly perceived as hazards in the western part of the country; however, wildfires are a growing problem in the wildland/urban interface of the eastern United States. As periods of extreme heat or drought conditions increase, this is a long-term concern for the forest environments in Devens. An estimated one-third of the land area in Devens is protected open space.

2.4.1 Potential Impacts of Wildland Fires

Potential impacts due to wildland fires include:

› Threats to human safety and property;
› Economic impacts of property damage;
› Destruction of crops, timber resources, recreation areas, and wildlife habitat;
› Poor air quality and visibility; and
› Wind-born ash can blanket nearby areas.

2.4.2 Areas of Concern

The main area of concern for human caused wildfires is the wooded military gun range South Post. During drier months when wildfires are more likely, the Fire Department is concerned about site accessibility as well as the ability to respond to a wildfire in an area that may be littered with live ammunition rounds. Additional concerns are:

Infrastructure	Societal	Environmental
› Potential damage to structures along the built environment interface. › Destruction to an extensive recreational trail infrastructure.	› Risks to public health and safety during an active fire (direct fire and smoke). › Threat to firefighter safety.	› Threat to Devens' current tree inventory. › Release of carbon (sequestered by trees) into the atmosphere. › Risks to wildlife and their habitat.

3

Current and Future Concerns Presented by Hazards

As climate change exacerbates existing or creates new hazards, it is important to understand how such hazards have already impacted Devens' resources and infrastructure, as well as how stakeholders perceive the impacts of future scenarios. This section summarizes inputs from workshops stakeholders and their perspectives on what Devens has experienced, currently faces, and anticipates in the future as impacts from the identified hazards and changing climate conditions.

3.1 Extreme Precipitation and Flooding

There have been several flooding events in recent Devens history, which can be attributed to multiple days of rain, ground saturation, and high groundwater levels. Heavy rainfall events, which occur throughout the year, have led to flooding and standing water on low-lying sections of some of the major roads such as Barnum Road and Jackson Road. Impacts due to flooding of these roads may have been exacerbated due to undersized culverts designed for 25-year storm events. Conveyance systems along Jackson Road struggle to keep up with intense rain events. Culverts under the railroad tracks at the intersection of Barnum and Patton Roads also have limited capacity. They regularly fill with silt and are impacted by beaver activity, and are not able to drain stormwater as quickly as necessary. As these are the primary routes that provide access to numerous key resources and businesses in Devens, workshop stakeholders stressed the accessibility of these roadways as key concern given more frequent rainfall and

Figure 2: Flooding of MacPherson Road on April 18, 2007

flooding are expected in the future. Other minor roads such as MacPherson Road are also impacted regularly by flooding from the adjacent Nashua River.

Implications to infrastructure that would be in the future floodplain were also considered. The future flood projections raise potential challenges related to infrastructure state of repair and needed improvements. Workshop stakeholders discussed the potential for raising the elevation of roadways prone to flooding as a potential solution. However, it would not be feasible for certain areas with already limited clearance, such as where the Barnum Rail Bridge and MacPherson Rail Bridge are currently located.

Other infrastructure-related concerns included potential impacts to existing rail lines in the area. While it remains challenging to predict future flood levels, rail accessibility is critical and poses a near-term concern that needs to be coordinated with the Boston and Maine Railroad and CSX. Currently, the Boston and Maine Railroad marshalling yards and the CSX freight line, shared with the MBTA/Keolis commuter rail, runs through Devens. These rail lines have also been identified as critical assets of Massachusetts Department of Transportation's (MassDOT) freight system under its 2018 Draft Freight Plan. Disruptions to these rail lines would interfere with the transport and delivery of goods and services throughout the region, and could potentially create cascading effects to the Commonwealth's economic development. Workshop stakeholders noted that water levels have historically reached the MacPherson Rail Bridge during major rain events, and under future conditions the rail tracks could get inundated. In addition, these rail lines run through the Grove Pond area, which is also a source of drinking water for Devens and neighboring town Ayer. Freight and commuter rail lines also dissect Zone 1 and Zone 2 Water Resource Protection areas through Devens and the adjacent communities, raising the concerns for potential rail-related emergencies as a result of more extreme weather events.

In addition to transportation infrastructure, several of the Devens resources, including public wells, Devens Wastewater Treatment Plant, Shriver Job Corps Centers, are also located in potential areas that may be flooded in the future (as illustrated in Figure 3). Workshop stakeholders also expressed concerns about increasing flood events that may impact the operations of and access to Devens community service providers such as Loaves and Fishes and Transition Women's Shelter, in addition to the safety and long-term maintenance of these facilities.

Workshop stakeholders also raised a concern regarding stormwater contamination issues for Devens' environmental resources. For instance, Little Mirror Lake is a conservation easement and home to various state-listed rare and endangered species such as the Blue-spotted Salamander, Grasshopper Sparrow, and Blanding's Turtle. Extreme precipitation and flash flood could result in overflow and discharge of stormwater pollutants into the Lake, which could pose an issue for the nearby pump house that supplies fresh water to the Devens community. Heavy rainfalls can also threaten habitat washout of the rare and endangered species found in and around the lake area.

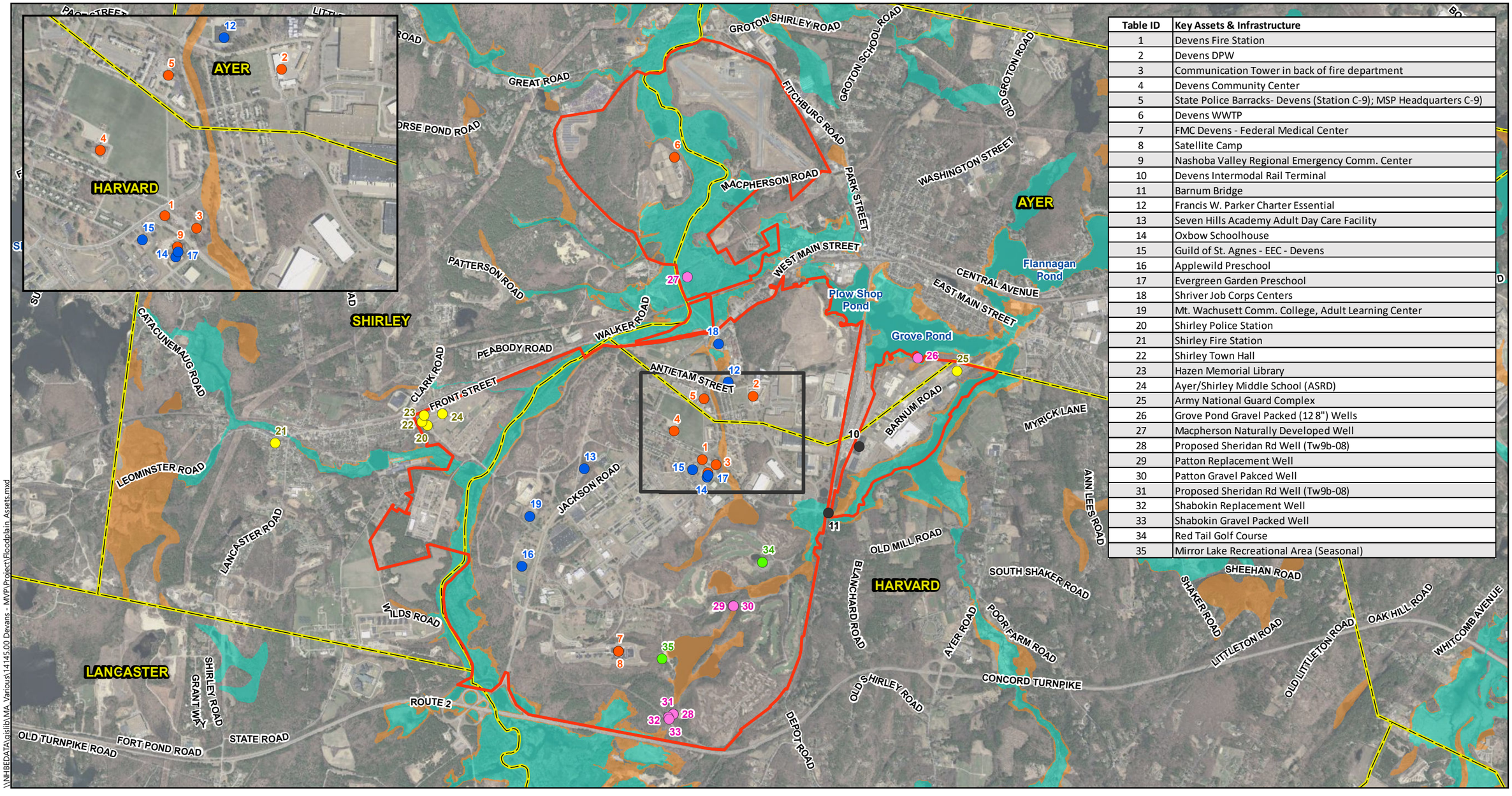

Table ID	Key Assets & Infrastructure
1	Devens Fire Station
2	Devens DPW
3	Communication Tower in back of fire department
4	Devens Community Center
5	State Police Barracks- Devens (Station C-9); MSP Headquarters C-9)
6	Devens WWTP
7	FMC Devens - Federal Medical Center
8	Satellite Camp
9	Nashoba Valley Regional Emergency Comm. Center
10	Devens Intermodal Rail Terminal
11	Barnum Bridge
12	Francis W. Parker Charter Essential
13	Seven Hills Academy Adult Day Care Facility
14	Oxbow Schoolhouse
15	Guild of St. Agnes - EEC - Devens
16	Applewild Preschool
17	Evergreen Garden Preschool
18	Shriver Job Corps Centers
19	Mt. Wachusett Comm. College, Adult Learning Center
20	Shirley Police Station
21	Shirley Fire Station
22	Shirley Town Hall
23	Hazen Memorial Library
24	Ayer/Shirley Middle School (ASRD)
25	Army National Guard Complex
26	Grove Pond Gravel Packed (12 8") Wells
27	Macpherson Naturally Developed Well
28	Proposed Sheridan Rd Well (Tw9b-08)
29	Patton Replacement Well
30	Patton Gravel Pakced Well
31	Proposed Sheridan Rd Well (Tw9b-08)
32	Shabokin Replacement Well
33	Shabokin Gravel Packed Well
34	Red Tail Golf Course
35	Mirror Lake Recreational Area (Seasonal)

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0 1500 3000 6000 Feet

Legend

- Devens
- Municipal Boundary
- Current 100-yr Floodplain (FEMA)
- 2085 - Mean Projection - Approximate 100-year Floodplain (Current 500-year Floodplain)

Key Assets and Infrastructure

- City/Town Facilities
- Institutions/Education Facilities
- Infrastructure
- Other Critical Facilities
- Recreational/Open Space
- Public Health Office

Devens Regional Enterprise Zone (DREZ) | Ayer, Harvard, Lancaster & Shirley, MA

Note: This map is an approximate representation of the forecasted limits of flooding. The map does not provide information regarding changes in base flood elevations that may occur over time.

Year 2085 – Mean Projection – Approximate 100-year Floodplain and Key Assets and Infrastructure

Source: FEMA, VHB, ESRI

3.2 Severe Storms

To date, Devens regularly experiences severe storms. In fact, just within the first three months of 2018, a string of four Nor'easters swept through the New England region. In Devens, damages included:

- Closure of MacPherson Road due to flooding;
- Numerous downed trees (however, only one localized power outage);
- Erosion and sedimentation of a newly constructed stormwater management system; and
- Minor impacts to properties and businesses.

After experiencing an active month of March, the stakeholders are concerned about the near-term and long-term impacts of severe storm frequency. One of the key concerns which stakeholders raised was the conditions of roadways, which may be worsened due to more frequent freeze-thaw cycles and compounded by impacts from extreme storm events. When the road shoulders are eroded or softened, there is also the potential for damage to heavy equipment such as snow plows to be damaged when they drive off the asphalt. Devens' Department of Public Works (DPW) has indicated the need for different standards and more durable materials, as existing roads are performing less than the recommended ten-year life span.

Another concern was the potential erosion of river banks and fallen trees along the Nashua River Corridor that can cause back up of water and upstream flooding during extreme storm events. Another erosion issue unique to Devens is the exposure of unexploded ordnance (UXO) sites, as well as the potential for uncovering former contamination or brownfield sites (i.e. Superfund).

Additionally, residents of Devens and surrounding communities (Ayer, Shirley, and Harvard) currently enjoy a network of recreational trails. However, fallen trees and debris from more frequent high wind and ice storm events could affect the safety and access to these trails.

3.3 Extreme Heat

Devens relies on groundwater for its drinking water supply and has an abundant water supply to service existing and near-future community needs. Shortage of water supply could become an issue should there be a significant increase in water demand, compounded with increasing temperatures and prolonged drought periods that could deplete groundwater reserves.

A major concern related to extreme heat days and/or prolonged heatwave is for people working or playing outside for extended periods of time. However, extreme heat has not been frequent enough or severe enough to cause lasting damages. At the same time, being able provide publicly accessible cooling stations or shelters, especially for the vulnerable populations (elderly, young children, special needs, etc.) is a consideration for Devens during hot days. Currently, for instance, some Devens

community resources and institutions such as the Parker School and Veteran Housing only have partial or limited AC systems in place.

3.4 Wildland Fire

Wildfires occur annually in Devens at varying magnitudes. Most incidents have been small, human-induced brush fires that were quickly contained and controlled by the Devens Fire Department. These small fires were accessible via road and trail networks on Devens land. Larger wildfires have generally been the result of lightning strikes (during periods of extended drought), but they were also quickly contained and controlled by the Devens Fire Department and the U.S. Army (which still maintains a presence at Devens).

As drought extent is likely to increase in the future, Devens is concerned with the increase in wildfire frequency and being able to access the dense vegetation to suppress them. Currently, Devens Fire Department has trouble accessing all areas of the forests where fires may occur. There are limited fire breaks that allow responders to get into the middle of the wooded areas. This lack of access can slow response efforts and give the fire more time to spread.

4

Current Strengths and Assets

Devens has numerous strengths that help it prepare for, respond to, and recover from the identified hazards. As a carefully planned community with sustainability as one of the guiding principles, Devens is already on the right track to enhance greater community resilience. This section discusses what Devens is already doing to strengthen its assets and infrastructure and to prepare for the changing climate.

4.1 Identified Strengths and Assets

A major strength is Devens' capability to quickly restore power within the jurisdiction by building and maintaining a strong and redundant electrical infrastructure network. Power outages do occur but the time that businesses and residents within Devens were without power has been minimal. Many public and larger private facilities also have emergency back-up generators.

Additional strengths have been identified by stakeholders, including:

- **Robust partnerships with surrounding communities** – Devens has established great relationships with adjacent towns and communities of Ayer, Harvard, and Shirley, which has proven helpful for sharing of information and resources such as public works equipment and emergency response services. Maintaining such strong connection will help streamline the regional planning and recovery efforts, as well as the communications around these efforts, during and after emergency weather events. The E-911 Regional Dispatch and the continued presence of the U.S. Army and Massachusetts National Guard are regional assets that play important roles in recovery and resiliency for Devens and the surrounding region.
- **Minimal flood risk** – None of the existing critical emergency response or public facilities are located in the current 100-year flood zone.
- **Natural flood protection** – Several water bodies in the area, such as Mirror Lake, Little Mirror Lake, Nashua River Corridor, Black Spruce Bog and Robins Pond, can serve, to a certain extent, as flood management assets. Little Mirror Lake has the capacity to hold more water during periods of extreme rain. In addition, the existing eskers can serve as natural levees due to their high elevation and steep slopes.

- **Established policies, plans, and communication protocols for human and environmental protection** –
  - Devens updated its Comprehensive Emergency Management Plan in 2014, which included evacuation plans and response protocols during emergency or disaster situations.

Figure 4: Canoe launch at Nashua River

  - Devens has a Soil Management Policy, with measures included to prevent soil exposure, erosion and contamination.
  - Devens Stormwater Regulations require on-site infiltration and incorporation of Low-Impact Development (LID) Stormwater Management design, which help recharge local aquifers and provide more flexible and adaptable drainage systems that can better respond to more frequent and intense storm events.
  - All schools and day care facilities in Devens have developed their own evacuation plan.
  - Devens Fire Department establishes a regular communication system with the military and Devens Public Works during periods of expected severe weather.
  - Devens Emergency Management utilizes a Code Red system to send out emergency message via a phone call or text message to subscribers.
- **Drinking water protection** – Public water supply wells are plentiful and have not been affected by drought or flooding contaminations.
- **Prevention measures to avoid surface water contamination** – Low-impact development and on-site groundwater recharge requirements in Devens Development Rules and Regulations, coupled with the Water Resource Protection requirements for all developments, helps to protect both surface and groundwater resources from potential contamination.

Figure 5: Mirror Lake

- **Available resources to improve communication to the disabled and non-English speaking community** – Mount Wachusett Community College receives grants to help provide English as Second Language (ESL) training for local business employees. The Devens Enterprise Commission also offers translation

and communication services for the disabled and non-English speaking community at all its public meetings.

- **Adequate designated shelters for extreme weather and/or emergency events –**
  - Shriver Job Corps Center has the largest kitchen in Devens and could be used as back-up to accommodate more people during an emergency event.
  - The Bob Eisengrein Community Center is equipped to temporarily shelter up to 400 people. Other sheltering available at the regional middle school in the neighboring town of Shirley.
  - The Hazen Memorial Library and the Ayer Shirley Regional Middle School in Devens could be utilized as a warming/cooling center.
- **Development regulations that promote more compact and resilient development patterns** – Parking maximums (instead of minimums), shared uses, and transportation demand management regulations help minimize impervious surfaces associated with developments. This aids in better stormwater management, and reduced urban heat island effects.

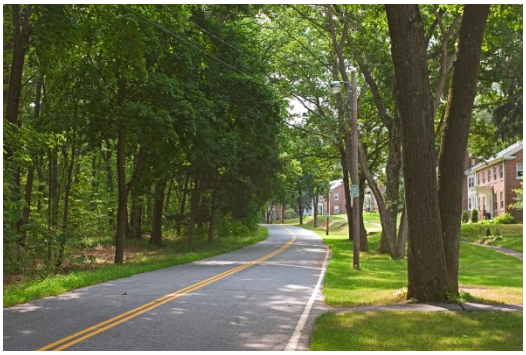

Figure 6: Historic Residential Devens

- **Protected open space and forested areas** – In addition to providing shade and cooling effects, these green spaces can help improve air quality. Trees and other riparian vegetation can also help reduce erosion along stream banks. Numerous bogs, marshes, and other wetland areas that are protected within these open spaces also help absorb and filter runoff and reduce flooding.
- **Established operations to minimize exposure and/or discharge of hazardous waste** – Devens operates a regional household hazardous waste disposal center, which collects hazardous products from small business and households in 14 towns in the region. This operation helps reduce the amount of hazardous materials in the region that may be improperly stored and exposed or discharged to the environment during extreme weather events.
- **Energy efficient requirements for homes and buildings –**
  - All new residential homes are built to a Home Energy Rating System (HERS) index of under 50, which means most are better insulated and have higher energy performance than traditionally built homes. These homes are more resilient and able to withstand stronger storms, as well as providing safer and more livable conditions during longer periods during power outages.
  - The Transitions Women's Shelter is one of several buildings in Devens that achieved the U.S. Green Building Council's (USGBC) Leadership in Energy & Environmental Design (LEED) certification.

- **Green roof requirements** – Devens has green roof requirements for any developments that require an air permit. Green roofs provide additional building insulation, absorb and filter runoff, reduce urban heat island effects, and improve air quality.
- **Clean energy generation** – Devens generates approximately 10 percent of the energy it uses locally through various ground-mounted and building-mounted solar photovoltaic panels. Devens Utilities has explored the possibility of installing battery storage systems to shave electricity peak demand and to provide temporary local emergency back-up power supply. The current state of the Devens electricity network (redundancy) coupled with the current high costs make back-up battery storage financially challenging for municipal services. As technology advances and more efficient and affordable options for battery storage systems become available, this strategy could be revisited for both municipal as well as private business emergency back-up power needs.

5

Top Recommendations to Improve Resilience

As an outcome of the workshops, the Core Team worked with stakeholders to develop a list of recommendations to help Devens prioritize its planning efforts for resiliency. This section highlights some of the actions presented in the Community Resilience Building Risk Matrix (see Appendix E).

When prioritizing the actions, the team considered the following:

- Necessity for advancing longer-term outcomes;
- Impacts from recent hazard events;
- Contribution towards meeting existing local objectives; and
- Funding availability.

Many of the proposed actions involve communication. Key collaborations include neighboring municipalities (and their key departments such as DPW, EMS and Public Safety), the regional E-911 dispatch center, the Massachusetts Army National Guard, and the U.S. Army located on base. Strengthening these relationships and understanding their strengths will help the area remain operational and accessible to the region during disasters.

5.1 Highest Priority Actions

- Provide the ability for more staff coverage for the Fire Department during extreme weather events.
- Engage military in Emergency Operations Center (EOC) exercises.
- Perform more regular maintenance of existing culverts throughout Devens and specifically along Willow Brook, Patton Road, and Barnum Road to reduce flood issues, as well as seek funding for culvert improvements throughout Devens.
- Develop a resource-and-supply relocation plan for organizations that provide community resources and services.

- Develop a relocation plan for the Women's Shelter, Veterans Housing and all other social services within Devens to ensure that the facilities can be accessed at all time.
- Promote Code Red, by encouraging more local employees (and not just employers) to subscribe to the system.
- Develop multi-lingual and accessible emergency management messaging.

5.2 Medium Priority Actions

- In addition to the current coordination with surrounding towns' Public Works and Public Safety departments, develop a coordination plan or agreement with private businesses such as Devens Recycling to utilize heavy equipment during and after a storm.
- Seek funding through FEMA and other federal, state and local resources for replacement of undersized culverts along Willow Brook, Patton Road, Barnum Road, and Jackson Road.
- Improve coordination with Devens Military Police to improve firefighting efforts on the South Post.
- Improve communication with military facilities on Barnum Road.
- Coordinate with CSX on safety and remediation plans for the rail lines.
- Designate additional emergency shelters:
  - Follow up with Seven Hills Academy to assess whether the institution can become a designated emergency shelter, especially for those with special needs.
  - Coordinate with Town of Shirley regarding possibility of using the Ayer Shirley Regional Middle School or Hazen Memorial Library as a regional back-up emergency shelter.
- Assess and coordinate with educational institutions and facilities to expand and/or upgrade air conditioning systems. Prioritized institutions to work with include Seven Hills Academy and Francis W. Parker School (charter school). Explore funding sources, if necessary.
- Ensure that special needs facilities and services, such as Loaves and Fishes or the Transition Women's Shelter, have Emergency Action Plans in place.
- Follow up with Mount Wachusett Community College (MWCC) to ensure the institution has back-up generator in place.
- Coordinate with MWCC to share language resources to the local community
- Create an evacuation plan for the future elderly housing on Hospital Road.
- Incorporate resiliency measures more consistently for the future elderly housing on Hospital Road.

- Distribute educational material on pest and disease such as poison ivy and ticks to public facilities, businesses, schools, residents. Include signage at trailheads for ticks, poison ivy, and fire dangers.
- Continue education, awareness, regulation and management of invasive species on public and private lands.
- Increase the urban forest canopy cover to help with stormwater, air quality and heat-island mitigation. Promote the planting of additional tree species that are appropriate for the shifting climate zones.
- Host an open house at the Fire Department to educate property owners on wildfire prevention.
- Develop a needs list and storage requirements for the Bob Eisengrein Community Center, including the following considerations:
  - Arrange bathroom/shower capabilities for long-term sheltering.
  - Purchase privacy curtains and onsite generator.
  - Stock up resources to accommodate infant/toddler resources and special needs.
- Create a mobilization plan for large groups of people at Rogers Field during an emergency.
- Utilize available mapping applications to simulate real-time evacuation scenarios.
- Coordinate with hotels regarding emergency back-up power needs and assess whether these places can serve as emergency shelters.

5.3 Lower Priority Actions

- Continue ongoing culvert maintenance and beaver trapping program to reduce street flooding.
- Continue communication and coordination with Shriver Job Corps Center on their disaster preparedness and recovery capabilities.
- Follow up with Massachusetts Army National Guard Center to discuss and coordinate response capabilities.
- Monitor and plant more vegetation on the eskers
- Continue to manage trails and debris clearing.
- Consider greywater to potable water technology for improved water efficiency.
- Work with businesses to separate grey water for irrigation.

6

Project Team and Workshop Participants

The following list presents members of the Project Team and identified stakeholders that were invited to participate in the two workshops. Individuals with an asterisk (*) attended one or both workshops.

Name	Affiliation	Role in Workshop
Peter Lowitt*	Devens Enterprise Commission	Leadership/Core Team
Neil Angus*	Devens Enterprise Commission	Leadership/Core Team
Joe LeBlanc*	Devens Fire	Core Team
David Blazon*	Devens DPW	Core Team
John Marc-Aurele*	Devens Engineering	Core Team
Kari Hewitt*	VHB - MVP Provider	Facilitator
Carissa Lord*	VHB - MVP Provider	Facilitator
Van Du*	VHB	Facilitator
Scott Adams*	Devens Fire	Stakeholder
Timothy Kelly*	Devens Fire	Stakeholder
Arthur Flynn*	Devens DPW	Stakeholder
Bob Fico*	Devens Recycling	Stakeholder
Dona Neely*	Devens Eco Efficiency Center	Stakeholder
Todd Sumner*	The Parker School	Stakeholder
Phoebe von Conta*	The Parker School (student)	Stakeholder
Dan Gainsboro*	Devens Village Green	Stakeholder
Matt Moen*	TaraVista Behavioral Health Center	Stakeholder
Patricia Stern*	Loaves and Fishes	Stakeholder
Gail Grosbeck*	Johnson Matthey Pharma Services	Stakeholder
Christine Bonica*	Bristol Myers Squibb	Stakeholder

Name	Affiliation	Role in Workshop
Rick Gilles*	USAR Fort Devens	Stakeholder
George Markt*	USAR Fort Devens	Stakeholder
Tim Kilhart*	Town of Harvard DPW	Stakeholder
Mark Archambault*	Town of Ayer Planning	Stakeholder
Robert Pedrazzi*	Town of Ayer Fire Department	Stakeholder
Sandy Ivos	Devens Homeowner Association	Stakeholder
Al Futterman	Nashua River Watershed Association	Stakeholder
Steve Goodman	GFI Partners	Stakeholder
Robert Walker	Ryan Development	Stakeholder
Heidi Ricchi	Town of Shirley/Mass Audubon	Stakeholder
Tom Kinch	Devens Resident	Stakeholder
Tamar Bedard	Nashoba Associated Boards of Health	Stakeholder
Brandy	Transition Women's Shelter	Stakeholder
Melissa Fetterhoff	Nashoba Valley Chamber of Commerce	Stakeholder
Jim Moore	Devens Utilities	Stakeholder

7

Acknowledgements

The Devens Municipal Vulnerability Preparedness (MVP) planning process was compiled by the Core Team, which consists of the following staff from Devens:

- Peter Lowitt, FAICP, Devens Enterprise Commission
- Neil Angus, AICP CEP, Devens Enterprise Commission
- David Blazon, MassDevelopment Devens Public Works
- Chief Joseph LeBlanc, MassDevelopment Devens Fire/Public Safety
- Thatcher Kezer, MassDevelopment Devens Operations (former Senior VP)
- John Marc-Aurele, PE, MassDevelopment Devens Engineering

Devens MVP Core Team was supported by consulting firm VHB, a state-certified MVP Provider. Special appreciation is also extended to the individuals from Devens and surrounding towns who participated in the workshops by contributing valuable time and efforts. Your dedication and feedback made this document more comprehensive and set the high-quality standards for the Devens Regional Enterprise.

CITATION: Devens Enterprise Commission. (2018). *Municipal Vulnerability Preparedness (MVP): Community Resilience Building Workshop Summary Report*. Devens, Massachusetts.

8

Appendices

A: Community Resilience Building Workshop Presentation and Sign-in Sheets

B: Pre-Workshop Meeting Summary and Preliminary List of Stakeholders

C: Pre-Workshop Survey Questionnaire and Results

D: Summary of Climate Change Trends and Projections & Identified Critical Assets for Devens, MA

E: Community Resilience Building Risk Matrix for Devens, MA

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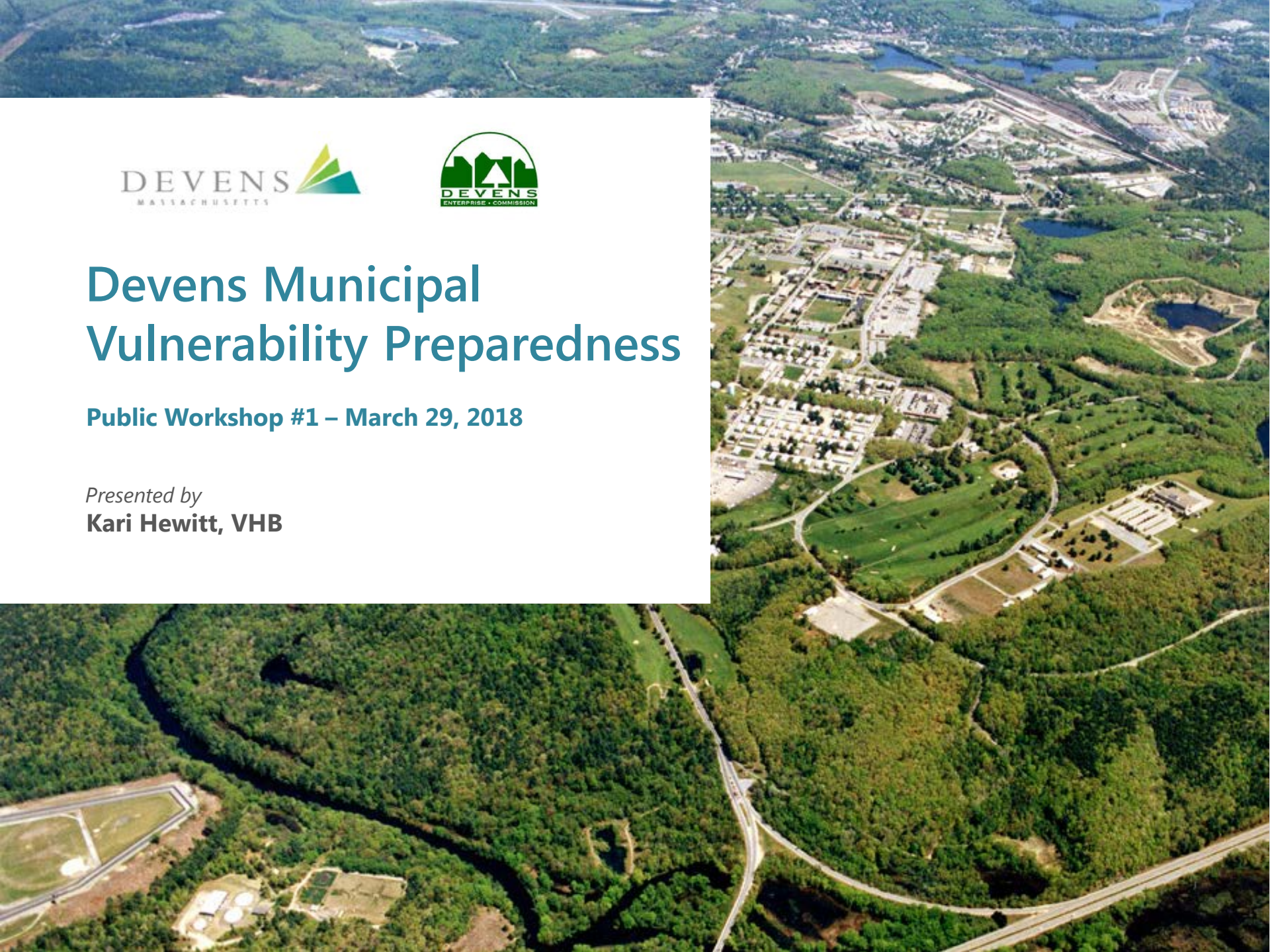
Appendix A: Community Resilience Building Workshop Presentation and Sign-In Sheets



Devens Municipal Vulnerability Preparedness

Public Workshop #1 – March 29, 2018

Presented by

Kari Hewitt, VHB

Agenda

- Introductions
- Overview of the Municipal Vulnerability Preparedness (MVP) Program
- Climate Trends, Projections and Potential Impacts
- Preliminary Identification of Critical Assets and Infrastructure
- Community Resiliency Building Risk Matrix
  - Break-out Discussions

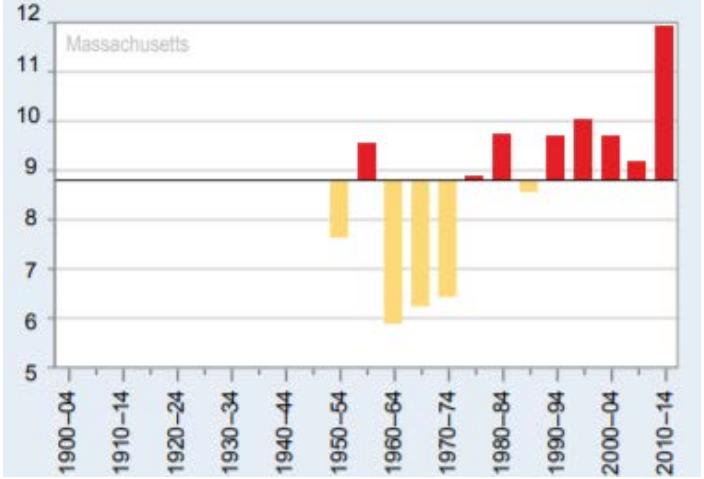
Municipal Vulnerability Preparedness (MVP) Program

- A component of MA Executive Order 569 (September 2016)
- Provides technical support for cities and towns in Massachusetts in resiliency planning efforts:
  - Conducting a vulnerability assessment
  - Developing an action-oriented resiliency plan
- Devens was selected to participate in the first round of the MVP Program
  - Potentially eligible for follow-up grant funding & other opportunities

Climate Trends and Observed Conditions in Massachusetts

- Between 1900 and 2014, average annual temperatures have increased by approximately 3°F.
- Number of hot days (max. temperature above 90°F) has been consistently above average since the 1990s.
- Above-average precipitation has been experienced in the last 10 years
  - More extreme precipitation events have been reported since 2005.
- Middlesex County has had 7 FEMA disaster declarations since 2005.

Observed Hot Days *(Max Temp Above 90°F)*



Observed Extreme Precipitations Events
(2+ or more of rainfall)

Source: NOAA NCEI State Climate Summary, 2014

Climate Projections for Nashua Basin

Rising Temperatures

- Winter average temperatures are likely to increase more than in the summer.
- More extreme heat days (maximum temperature over 90°F) are expected.
- More frequent droughts (due to less rainfall and higher projected temperatures).

Climate Projections for Nashua Basin

Rising Temperatures

	Baseline (1971-2000)	Mid-Century (2040-2069)	End of Century (2080-2099)
Average annual temperature (°F)	47.6°F	↑ 3.0 to 6.4°F	↑3.9 to 10.9°F
Days per year > 90°F	4.37	↑ 9 to 30 days	↑12.5 to 69.9 days
Days per year > 95°F	0.23	↑ 2 to 13 days	↑ 4 to 42 days
Days per year > 100°F	<1 day	↑ 0 to 3 days	↑ 0 to 17 days
Days per year < 32°F	156 days	↓ 19 to 38 days	↓ 23 to 64 days
Days per year < 0°F	9 days	↓ 3.7 to 6.6 days	↓ 4 to 7.7 days

Potential Impacts from Rising Temperatures

- Increasing risk related to public health issues.
  - Heat exposure & heat-related illnesses.
  - Poor air quality due to increase in warmer temperature and extended heatwaves.
- Precipitation during winter months will more likely be rainfall rather than snowfall due to warmer winters.
- Increasing demand for cooling during summer days.
  - Increasing risk and frequency of power outages.
- Increasing stress on transmission lines, substations, train tracks, roads, bridges, and other critical infrastructure due to more intense heat.
- Increasing risk of wildland fires.
- Weakening tree root systems due to droughts, more susceptible to toppling during high wind events.

Climate Projections for Nashua Basin

Changing Precipitation Patterns

- More precipitation may be expected during spring and winter seasons.
- Increasing consecutive dry days may be expected during summer and fall seasons.
- Winter precipitation could be more snow by mid-century, but most likely be rainfall by end of century.
- Increasing frequency of high-intensity rainfall events through mid- and end of century

***Note: Seasonal projections for total precipitation vary, and there is less certainly specifically in the Nashua Basin.*

Climate Projections for Nashua Basin

Changing Precipitation Patterns

	Baseline (1971-2000)	Mid-Century (2040-2069)	End of Century (2080-2099)
Total annual precipitation	46 in.	↑ 1 to 6 in.	↑ 1.2 to 8.3 in.
Days per year with over 1" rainfall	7 days	↑ 0.5 to 3.3 days	↑ 1 to 4 days
Days per year with over 2" rainfall	< 1 day	↑ 0 to 0.4 day	↑ 0 to 0.6 day
Days per year with over 4" rainfall	< 1 day	↑ by <1 day	↑ by <1 day
Annual consecutive dry days	16 days	↑ 0 to 2 days	↑ 0 to 3 days

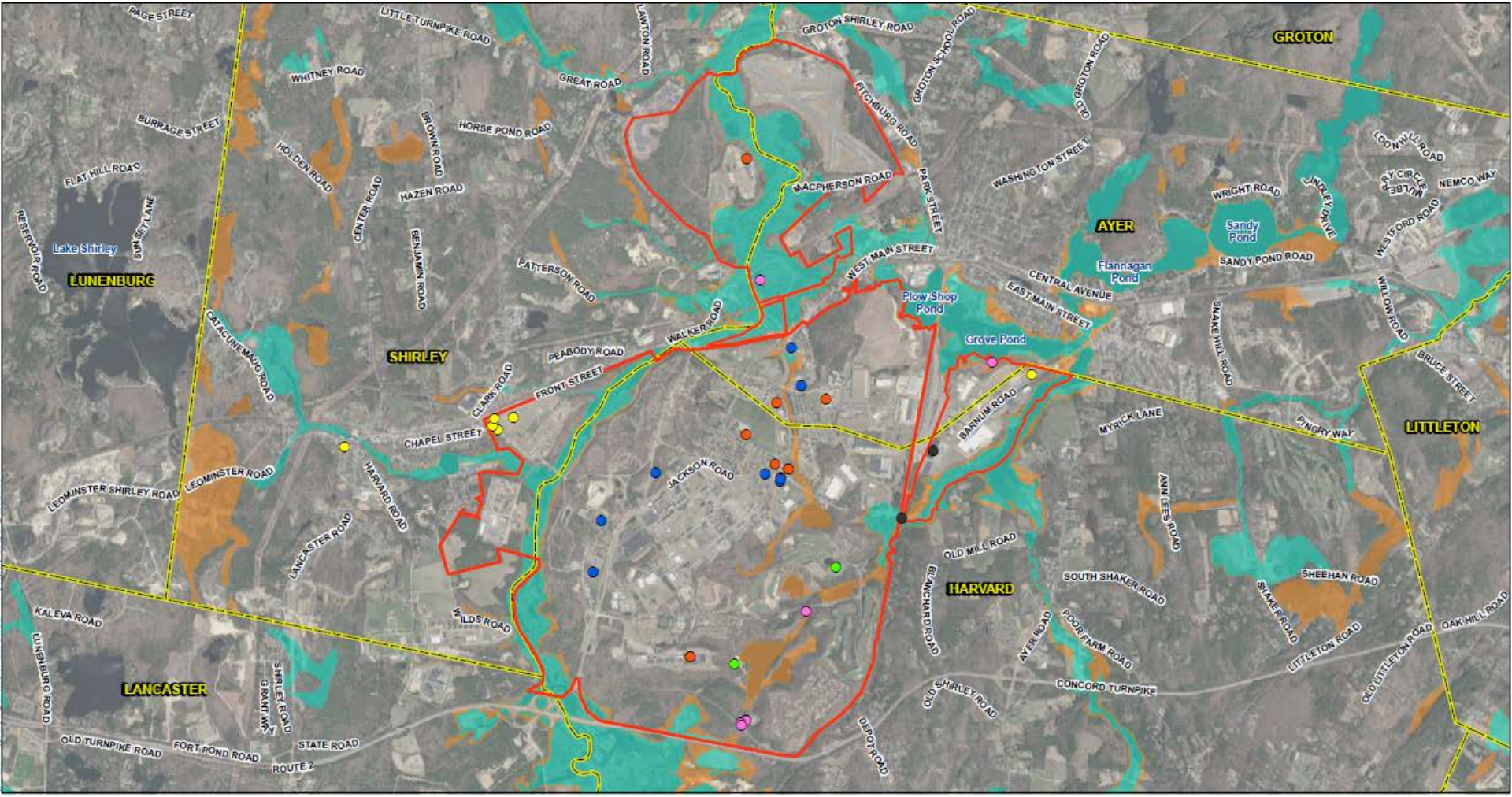
Climate Projections for Nashua Basin

Increase in Extreme Weather Events

- North Atlantic hurricane activities are projected to increase in frequency, intensity and duration.
  - However, the projected number of hurricanes reaching MA is uncertain.
- High winds (due to tropical storms, tornadoes, severe thunderstorms, Nor'easters, etc.) are highly likely to occur.

Potential Impacts from Changing Frequency & Intensity of Precipitation

- Increase in sediment and contaminants in water bodies.
  - Risk of deteriorating soil conditions due to flooding & heavy downpours
- Potential sanitary sewers and stormwater management systems overflow.
  - Increasing stress on stormwater infrastructure.
- Potential damage and mold problems in critical facilities, homes, and businesses.
- Travel and commute delays
- Potential damage and/or obstruction to roadways, rail lines during extreme weather events



0 1500 3000 6000 Feet

Legend

- Devens
- Municipal Boundary
- Current 100-yr Floodplain (FEMA)
- 2085 - Mean Projection - Approximate 100-year Floodplain (Current 500-year Floodplain)

Key Assets and Infrastructure

- City/Town Facilities
- Institutions/Education Facilities
- Infrastructure
- Other Critical Facilities
- Recreational/Open Space
- Public Health Office

Devens Regional Enterprise Zone (DREZ) | Ayer, Harvard, Lancaster & Shirley, MA

Year 2085 – Mean Projection – Approximate 100-year Floodplain and Key Assets and Infrastructure

Source: FEMA, VHB, ESRI

Devens' Critical Assets & Infrastructure

- Municipal/Public Buildings and Facilities
- Army/Military Facilities
- Institutions and Education Facilities
- Infrastructure
- Commercial Facilities and Businesses
- Public Health Resources and Social Services
- Recreational and Open Space Resources
- Other Critical Facilities

Pre-Workshop Stakeholder Engagement Survey Findings

- Total of 14 survey responses
- Approx. 43% of participants indicated their businesses & organizations have an emergency operations or response plan/protocol in place.
- Top concerns & issues for businesses and organizations should there be damages or disruption due to major weather events (flooding, prolonged heatwaves, extreme storms, etc.):
  - Loss of revenue
  - Property damage and associated recovery costs
  - Injuries, illness, or other safety impacts to employees
- Additional resources needed for effective preparedness:
  - Early warning system
  - Shelter and medical response
  - Reliability and stability of utility systems
  - Transportation assistance for residents without cars, especially during extreme hot or cold days
  - Ability for telecommuting

Community Resiliency Building Risk Matrix

Break-Out Session

Step 1: Identify Top Priority Hazards

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

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

Step 2: Identify Community Vulnerabilities and Strengths

Community Resilience Building Risk Matrix

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

Features	Location	Ownership	V or S
Infrastructural			
Societal			
Environmental			

- List of key assets & infrastructure applicable to each category
- Describe location for each asset & infrastructure
- Identify ownership
- Determine whether identified asset and/or infrastructure is a vulnerability or a strength

Step 3: Assessing Level of Urgency, Actions, Priorities,

Community Resilience Building Risk Matrix 

www.CommunityResilienceBuilding.org

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

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

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

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MUNICIPAL VULNERABILITY PREPAREDNESS KICK OFF MEETING 2/6/18

John Marc-Aurele	Devens Engineering
DAVID T. BLAZON	Devens DPW
Chief J. LeBlanc	Devens Fire
NEIL ANGUS	DEC
Kari Hewitt	VHB

Municipal Vulnerability Preparedness Program

Devens Meeting
March 29, 2018

Sign-In Sheet

Name	Organization	E-Mail
Tim Kilhart	Harvard DPW	tkilhart@harvard.ma.us
Mark Archambault	Ayer Planning	marchambault@ayer.ma.us
Scott Adams	Devens Fire	sadams@Massdevelopment.com
Robert Pedrazzi	Ayer Fire	firechief@ayer.ma.us
Joe LeBlanc	Devens Fire	JLeBlanc@MASSDevelopment.com
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Mona Moen	TRAVISTA Behavioral Health Center	MMOEN@TRAVISTA.CARE
NEIL ANGUS	DEC	NEILANGUS@DEVENSEC.COM
Peter Lowith	DEC	peter lowith@DEVENSEC.COM
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Timothy Kelly	Devens Fire	tkelly@massdevelopment.com
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Phoebe von Conta	student (parker charter)	voncontap@gmail.com
DAN GAINSBORO	DEVENS VILLAGE GREEN	dan@nowcommunities.com
Kari Hewitt	VHB	khewitt@vhb.com
Carissa Lord	VHB	clord@vhb.com
Van Du	VHB	vdu@vhb.com

Municipal Vulnerability Preparedness Program

Devens Meeting
April 4, 2018

Sign-In Sheet

Name	Organization	E-Mail
Bob Fiec	Devens Recycling	RFiec@devensrecycling.com
Carissa Lord	VHB	clord@vhb.com
Kari Hewitt	VHB	KHewitt@vhb.com
Peter Lowitt	DEC	peterLowitt@devensec.com.
NEIL ANGUS	DEC	NEILANGUS@DEVENSEC.COM
Patricia Stern	Loaves + Fishes	director@loavesfishes pantry.org
Gail Grosbeck	JHPS	gail.grosbeck@jmusa.com
DMA Neely	Devens Eco Effic.Co	dmaneely@ecostardevens.com
Christine Bonica	BMS	christine.bonica@bms.com
JohnMarc Aurele	MassDev/Eng.	jmarc-aurele@massdevelopment.com
Rick Gilles	contractor Ft Devens RFTA	rich0112@protonmail.com
George Markt	Fort Devens RFTA	george.h.markt.civ@mail.mil
Phoebe von Conta	Parker School	voncontap@gmail.com
Scott J Adams	Devens Fire Dept.	sadams@massdevelopment.com
Jim Moore	MDFA	JMoore@Massdevelopment.com
Arthur Flynn	DPW	

Appendix B: Pre-Workshop Meeting Summary and Preliminary List of Stakeholders

Meeting Agenda

Date:	February 6, 2018	**Agenda Prepared By:**	Kari Hewitt, VHB
Place:	Devens – DEC, Vicksburg Conf Room		
Project No.:	14145.00	**Project Name:**	Devens MVP Program

1. **Introductions**
   - Peter Lowitt, Director, Devens Enterprise Commission (DEC)
   - Neil Angus, Environmental Planner (DEC)
   - Thatcher Kezer, Devens Operations
   - Chief Joe LeBlanc, Fire Department
   - John Marc-Aurele, Engineering Manager, Devens Engineering
   - David T. Blazon, Manager, Devens Department of Public Works
   - Kari Hewitt, Director of Sustainability, VHB
   - Van Du, Sustainability Planner, VHB

2. **Stakeholders for workshop**
   - Approach:
     - A citizen participation process
     - Facilitate the MVP process for Devens, and will introduce/present the process and findings to community at large (Harvard, Ayer, Shirley, etc.)
       - Potentially a briefing session with other town managers
   - Preliminary list of stakeholders:
     - Devens Operations
     - Safety Management
     - Public Health
     - Municipal Utilities (Jim Moore)
     - Neighborhood/Community groups:
       - HOAs & COAs
       - The Women's Institute
       - Transitions
       - Veterans housing
     - Businesses:
       - Nashoba Valley Chamber of Commerce
       - Devens Eco-Efficiency Center
       - Bristol-Myers Squibb (BMS)
       - Nypro
       - Johnson Matthey Pharma Services

  - GFI Partners (Steve Goodman)
  - Hotels
  - O'Reilly Fulfillment Center
- Institutions
  - Mt. Wachusett Community College
  - Parker School
  - Shriver Job Corps Center – residential campus for job training
- Natural resources/environmental orgs:
  - Nashua River Watershed Association (NRWA)
  - The Trustees of Reservations
  - Forestry Foundation
- U.S. Department of Fish & Wildlife
- U.S. Army
- National Guard
- Federal Medical Center (prison)
- Pan Am Railroads

VHB action item: *Draft invitation to stakeholders*

3. Stakeholder survey and focus group interview

The purpose of this task is to solicit more in-depth input with stakeholders regarding their perspectives on key risks and concerns for Devens' in advance of the MVP workshops. Given the large number of businesses in the community, our approach will be to send a survey targeted to business owners and then, with this input as context, conduct a focus group interview (public utilities, public works/ chief of safety, and public health).

VHB action item: *Prepare draft survey questionnaire (via SurveyMonkey) and focus group interview questions*

4. Scheduling workshops

- Workshop 1: Thursday March 29 (morning)
  - Provide an overview of climate projections, anticipated risks to critical assets & infrastructure; break-out focus groups to discuss vulnerabilities and strengths
  - VHB team will share with Devens in advance a summary of climate data & preliminary list of assets & infrastructure
  - VHB team will prepare maps with key resources (GIS) for workshop discussions. Peter suggested that it would be useful to have future floodplain map (mid-century and end of century)
- Workshop 2: Wednesday, April 4 (morning)
  - Conduct an action evaluation/prioritization exercise based on the discussion of vulnerabilities and strengths identified from Workshop 1

5. **Data needs and sources**
   - Emergency operations plans
   - Key businesses, personnel stats
   - Critical assets and infrastructure – will develop based on hazard mitigation list and review for gaps/changes

VHB action item: *Prepare a preliminary list of assets & infrastructure*

Devens action item: *Provide to VHB any emergency operations plans as well as list of key businesses with personnel stats*

6. **Additional notes:**
   - Most companies have action plan for shelter in place. Can any also serve as a resource to Devens community during emergency events?
   - Military has great transportation resources for mobilizing
   - Nashoba Valley Medical Center – 5 minutes away
   - Senior facility center – coming in 2019
   - Devens demographics: 25% of affordable housing; housing infrastructure are from 1930s, 1950s, and 2008/2011 stocks (all old housing built by the Army; all brought up to code in 1996 when Devens took over)
   - Need to think about cooling centers
   - Hotels have no back-up power; Shriver Job Corps Center has limited power
   - Need to look at CMP –this project will help inform the CMP update
   - Flooding is an issue in places: Saratoga; McPherson (connects to Bishop) railroad bridge gets flooded all the time (though not a critical road)

Appendix C: Pre-Workshop Survey Questionnaire and Results

Q1 Business/Organization:

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	Laddawn, Inc.	3/21/2018 6:24 PM
2	Instrumentation Laboratory	3/16/2018 3:34 PM
3	Johnson Matthey - Devens	3/12/2018 6:38 PM
4	Bristol-Myers Squibb	3/12/2018 4:33 PM
5	Francis W. Parker Charter Essential School	3/12/2018 10:36 AM
6	Evergreen Garden Playschool	3/10/2018 12:47 PM
7	Guild of St. Agnes Child Care Program	3/9/2018 8:59 PM
8	Johnson Matthey	3/9/2018 5:04 PM
9	Our Father's House, Transitions at Devens	3/9/2018 2:12 PM
10	Hilton Garden Inn/SpringHill Suites	3/9/2018 1:02 PM
11	Comrex Corporation	3/9/2018 12:58 PM
12	PCI	3/9/2018 11:56 AM
13	Oxbow Schoolhouse	3/9/2018 11:45 AM
14	WestRock	3/9/2018 11:44 AM

Q2 Your Name:

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	Scott Dunn-Benson	3/21/2018 6:24 PM
2	Jim Ryan	3/16/2018 3:34 PM
3	Sal Ally	3/12/2018 6:38 PM
4	Deanna Trudeau	3/12/2018 4:33 PM
5	Michelle McKenna	3/12/2018 10:36 AM
6	Paula Sousa	3/10/2018 12:47 PM
7	Melissa Nikander	3/9/2018 8:59 PM
8	Gail Grosbeck	3/9/2018 5:04 PM
9	Anne O'Connor	3/9/2018 2:12 PM
10	Jon Mehlmann	3/9/2018 1:02 PM
11	Kris Specht	3/9/2018 12:58 PM
12	Nayan Amin	3/9/2018 11:56 AM
13	Lisa Langevin	3/9/2018 11:45 AM
14	Jody Guinn	3/9/2018 11:44 AM

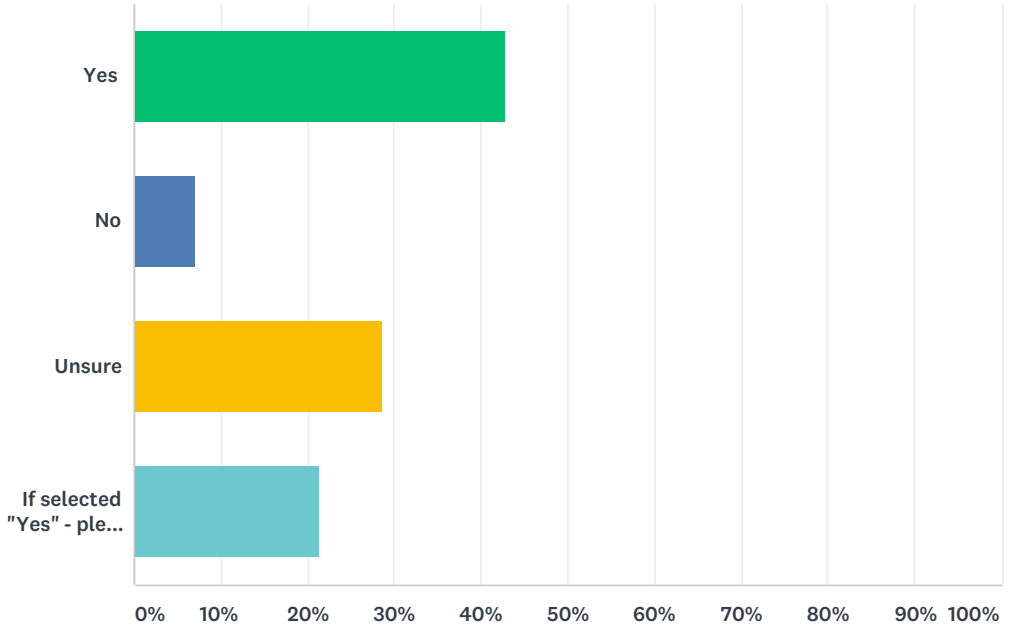
Q3 Your Position:

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	Controller	3/21/2018 6:24 PM
2	Central Distribution Manager	3/16/2018 3:34 PM
3	Operation Director	3/12/2018 6:38 PM
4	Associate Director, Environment, Health & Safety	3/12/2018 4:33 PM
5	Business Manager	3/12/2018 10:36 AM
6	Teacher Director	3/10/2018 12:47 PM
7	Director	3/9/2018 8:59 PM
8	Environmental Coordinator	3/9/2018 5:04 PM
9	Program and Facilities Manager	3/9/2018 2:12 PM
10	General Manager	3/9/2018 1:02 PM
11	President	3/9/2018 12:58 PM
12	Director of R&D	3/9/2018 11:56 AM
13	Administrator	3/9/2018 11:45 AM
14	Plant Manager	3/9/2018 11:44 AM

Q4 Does your business or organization have an emergency operations or response plan/protocol in place?

Answered: 14 Skipped: 0

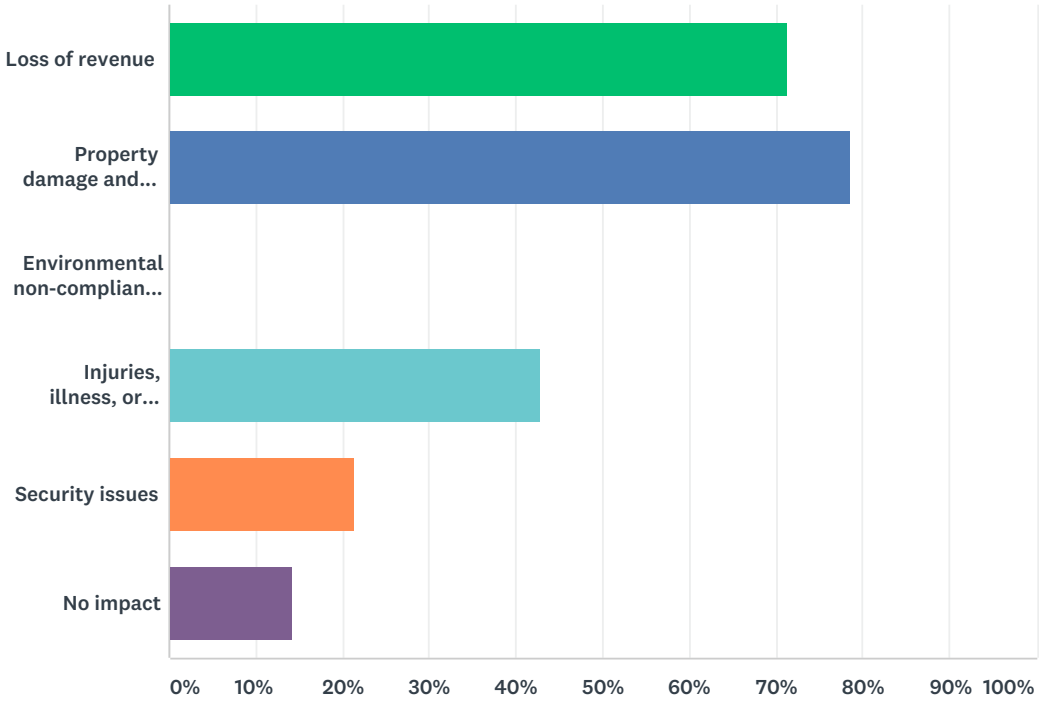


ANSWER CHOICES	RESPONSES	
Yes	42.86%	6
No	7.14%	1
Unsure	28.57%	4
If selected "Yes" - please provide an overview of measures being included in the plan (e.g., emergency response procedures, communications protocol with employees, recovery in place procedures, etc.):	21.43%	3
TOTAL		14

#	IF SELECTED "YES" - PLEASE PROVIDE AN OVERVIEW OF MEASURES BEING INCLUDED IN THE PLAN (E.G., EMERGENCY RESPONSE PROCEDURES, COMMUNICATIONS PROTOCOL WITH EMPLOYEES, RECOVERY IN PLACE PROCEDURES, ETC.):	DATE
1	Company has Standard Operating procedure in place for emergency response. Practice fire drill twice a year	3/16/2018 3:34 PM
2	We have an emergency response plan that identifies protocols regard to a chemical spill to Weather interruption that require a shutdown.	3/12/2018 6:38 PM
3	Emergency Response Procedures	3/10/2018 12:47 PM

Q5 How might your business or organization be affected, should there be damages or disruptions due to a major flooding event in Devens? Please select all implications that may apply.

Answered: 14 Skipped: 0

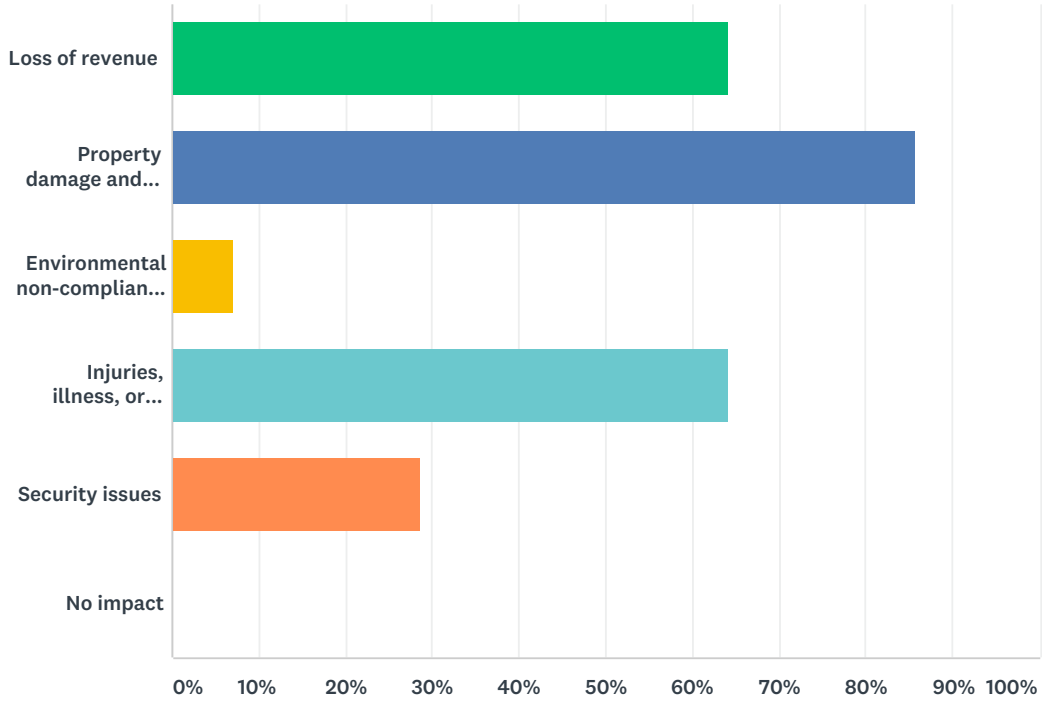


ANSWER CHOICES	RESPONSES	
Loss of revenue	71.43%	10
Property damage and associated recovery costs	78.57%	11
Environmental non-compliance issues	0.00%	0
Injuries, illness, or other safety impacts to employees	42.86%	6
Security issues	21.43%	3
No impact	14.29%	2
Total Respondents: 14		

#	OTHER (PLEASE SPECIFY)	DATE
1	No impact. We are on high ground.	3/21/2018 6:24 PM
2	We are not in a flood zone	3/12/2018 10:36 AM
3	We would have 13 homeless families needing food, shelter, clothing and other services.	3/9/2018 2:12 PM
4	Impact on equipment	3/9/2018 11:56 AM

Q6 How might your business or organization be affected, should there be damages or disruptions due to extreme weather events (thunderstorms, tornadoes, micro-bursts, etc.) in Devens? Please select all implications that may apply.

Answered: 14 Skipped: 0

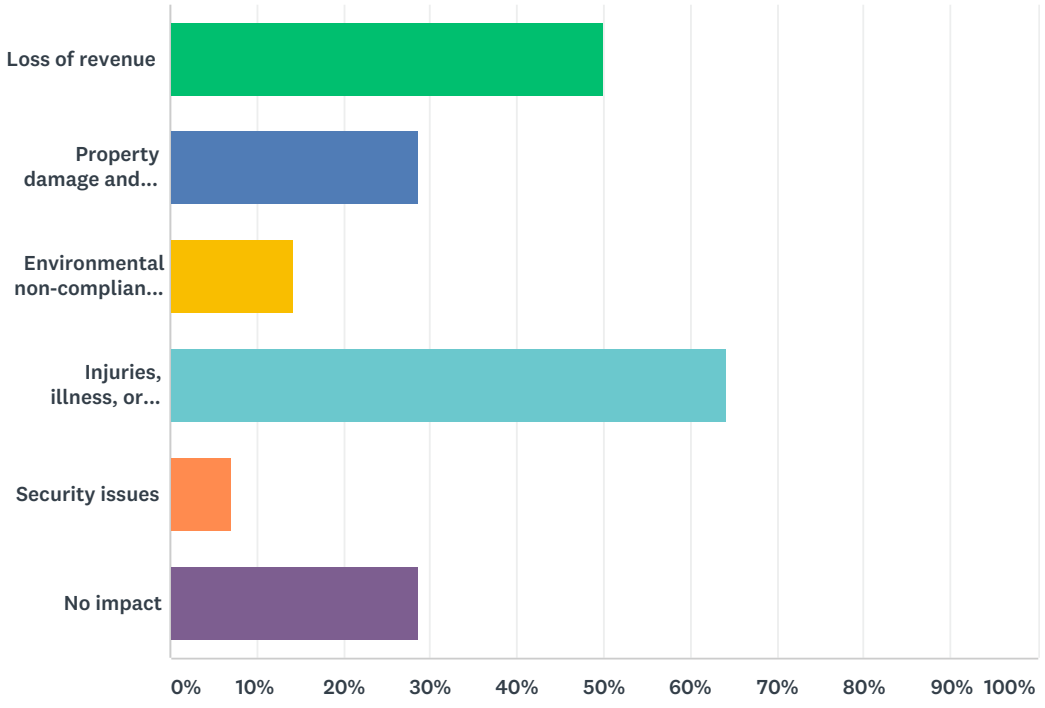


ANSWER CHOICES	RESPONSES	
Loss of revenue	64.29%	9
Property damage and associated recovery costs	85.71%	12
Environmental non-compliance issues	7.14%	1
Injuries, illness, or other safety impacts to employees	64.29%	9
Security issues	28.57%	4
No impact	0.00%	0
Total Respondents: 14		

#	OTHER (PLEASE SPECIFY)	DATE
1	Extreme weather events would impact our customers from a customer experience perspective.	3/21/2018 6:24 PM
2	Our company does have back up power that will supply the entire warehouse. Flooding of roads and or closure would affect our customers. Many in Critical care environments.	3/16/2018 3:34 PM
3	This assumes a relatively short impact - as in a day or so loss of school	3/12/2018 10:36 AM
4	Injuries and illness impacts to residents	3/9/2018 2:12 PM
5	Equipment shut down	3/9/2018 11:56 AM

Q7 How might your business or organization be affected, should there be damages or disruptions due to more intense and prolonged heatwaves in Devens? Please select all implications that may apply.

Answered: 14 Skipped: 0

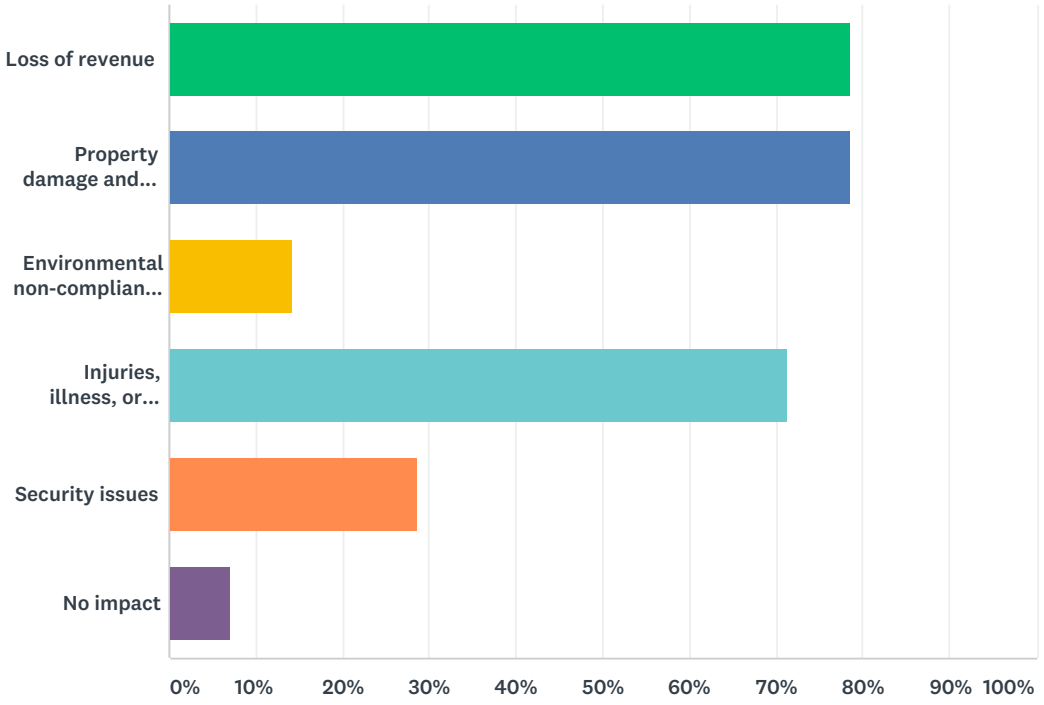


ANSWER CHOICES	RESPONSES	
Loss of revenue	50.00%	7
Property damage and associated recovery costs	28.57%	4
Environmental non-compliance issues	14.29%	2
Injuries, illness, or other safety impacts to employees	64.29%	9
Security issues	7.14%	1
No impact	28.57%	4
Total Respondents: 14		

#	OTHER (PLEASE SPECIFY)	DATE
1	Increased electrical expenses due to air conditioning.	3/21/2018 6:24 PM
2	As long as the air conditioning works, residents can stay mostly inside. Both residents and staff may face safety or health impacts if they go outside which cannot be totally avoided.	3/9/2018 2:12 PM

Q8 How might your business or organization be affected, should there be damages or disruptions due to more frequent hurricanes or major snowstorms in Devens? Please select all implications that may apply

Answered: 14 Skipped: 0

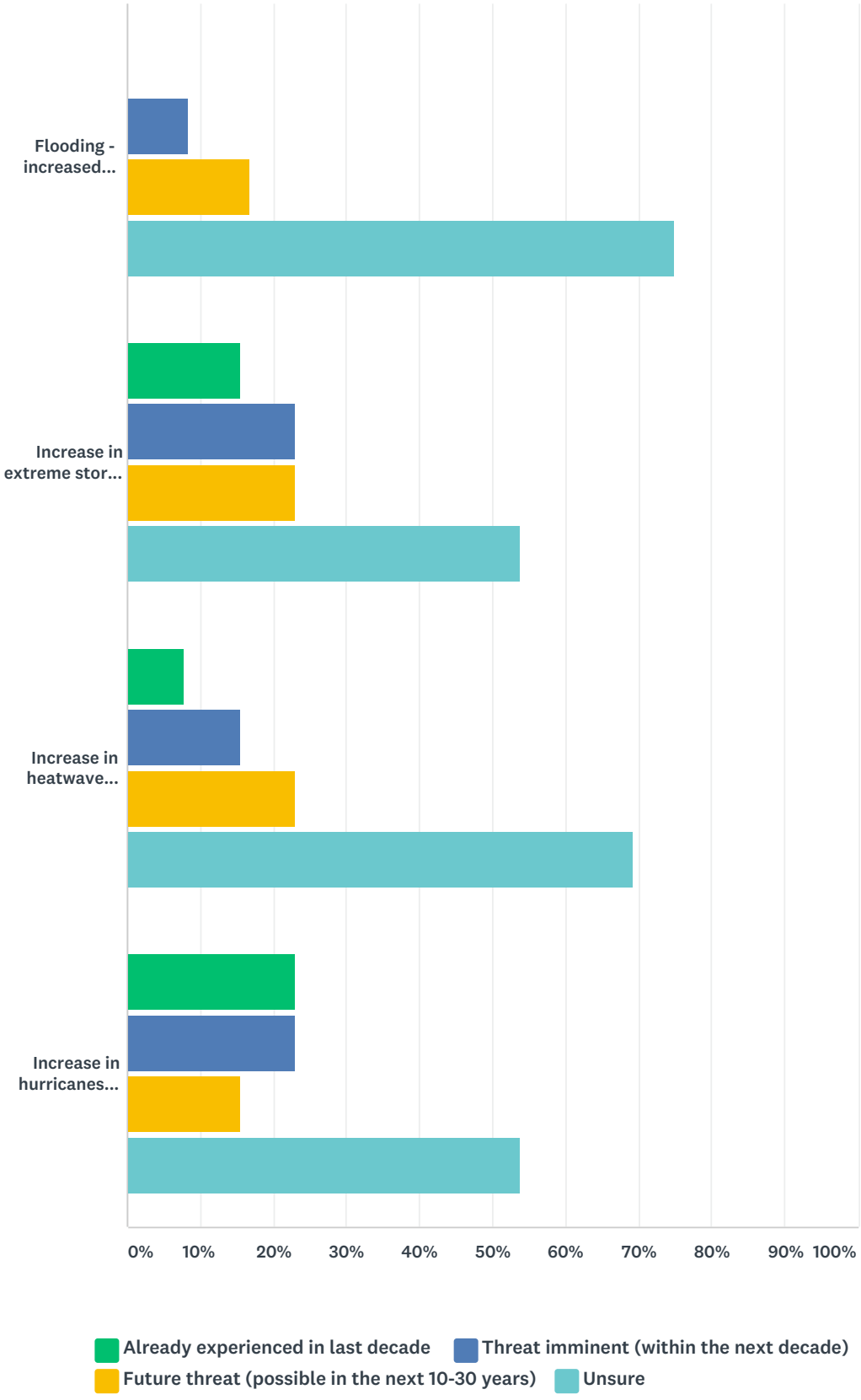


ANSWER CHOICES	RESPONSES	
Loss of revenue	78.57%	11
Property damage and associated recovery costs	78.57%	11
Environmental non-compliance issues	14.29%	2
Injuries, illness, or other safety impacts to employees	71.43%	10
Security issues	28.57%	4
No impact	7.14%	1
Total Respondents: 14		

#	OTHER (PLEASE SPECIFY)	DATE
1	We have a back-up generator but major damage would again affect our abilities to timely respond to our customers.	3/21/2018 6:24 PM
2	Assumes we have to extend school days	3/12/2018 10:36 AM
3	Essential employees may be unable to get to work, forcing employees to remain on duty past their scheduled shifts.	3/9/2018 2:12 PM

Q9 In the case of these scenarios, has your business or organization experienced any impacts or do you anticipate experience impacts in the near or distant future? Select all that apply.

Answered: 13 Skipped: 1



	ALREADY EXPERIENCED IN LAST DECADE	THREAT IMMINENT (WITHIN THE NEXT DECADE)	FUTURE THREAT (POSSIBLE IN THE NEXT 10-30 YEARS)	UNSURE	TOTAL RESPONDENTS
Flooding - increased precipitation	0.00% 0	8.33% 1	16.67% 2	75.00% 9	12

Increase in extreme storm events (thunderstorms, tornadoes, micro-bursts, etc.)	15.38% 2	23.08% 3	23.08% 3	53.85% 7	13
Increase in heatwave intensity and frequency	7.69% 1	15.38% 2	23.08% 3	69.23% 9	13
Increase in hurricanes and/or snowstorms	23.08% 3	23.08% 3	15.38% 2	53.85% 7	13

#	IF YOUR BUSINESS OR ORGANIZATION HAS ALREADY EXPERIENCED ANY OF THE ABOVE IMPACTS IN THE PAST, PLEASE DESCRIBE THE SPECIFIC EVENT IN MORE DETAIL, INCLUDING THE DISRUPTIONS AND IMPLICATIONS OF THE EVENT:	DATE
1	We have recently installed a back-up generator that allows us to continue operations in the event of a power loss. As this is our corporate office, it's very important that we are up and running from 7:00 am to 8:00 pm Monday through Friday regardless of the weather outside. Before we had a back-up generator, thunderstorms primarily would result in power losses and shut our operation down.	3/21/2018 6:24 PM
2	Program closed on snow days - loss of care to families. This year has a higher number than usual of closings. After a certain number, staff need to make up days, increasing calendar days worked into the summer.	3/10/2018 12:47 PM

Q10 What additional resources do you need to effectively prepare and protect your business (physically and financially) as well as your employees from weather-related emergency events or changing future climate conditions?

Answered: 7 Skipped: 7

#	RESPONSES	DATE
1	I feel that we effectively deal with weather-related impacts today. We have the technology in place to allow a large percentage of our employees to work from home as if they are at work, which gives us great flexibility.	3/21/2018 6:24 PM
2	None at this time	3/16/2018 3:34 PM
3	Transportation, settler, and medical response may be critical.	3/12/2018 6:38 PM
4	None identified at this time	3/12/2018 4:33 PM
5	Not sure.	3/10/2018 12:47 PM
6	Honestly, I don't know. As a residential facility, as long as we utilities we can run.	3/9/2018 2:12 PM
7	Early warning would be helpful.	3/9/2018 11:56 AM

Q11 Please provide any additional thoughts or comments you may have. Thank you for completing the survey.

Answered: 4 Skipped: 10

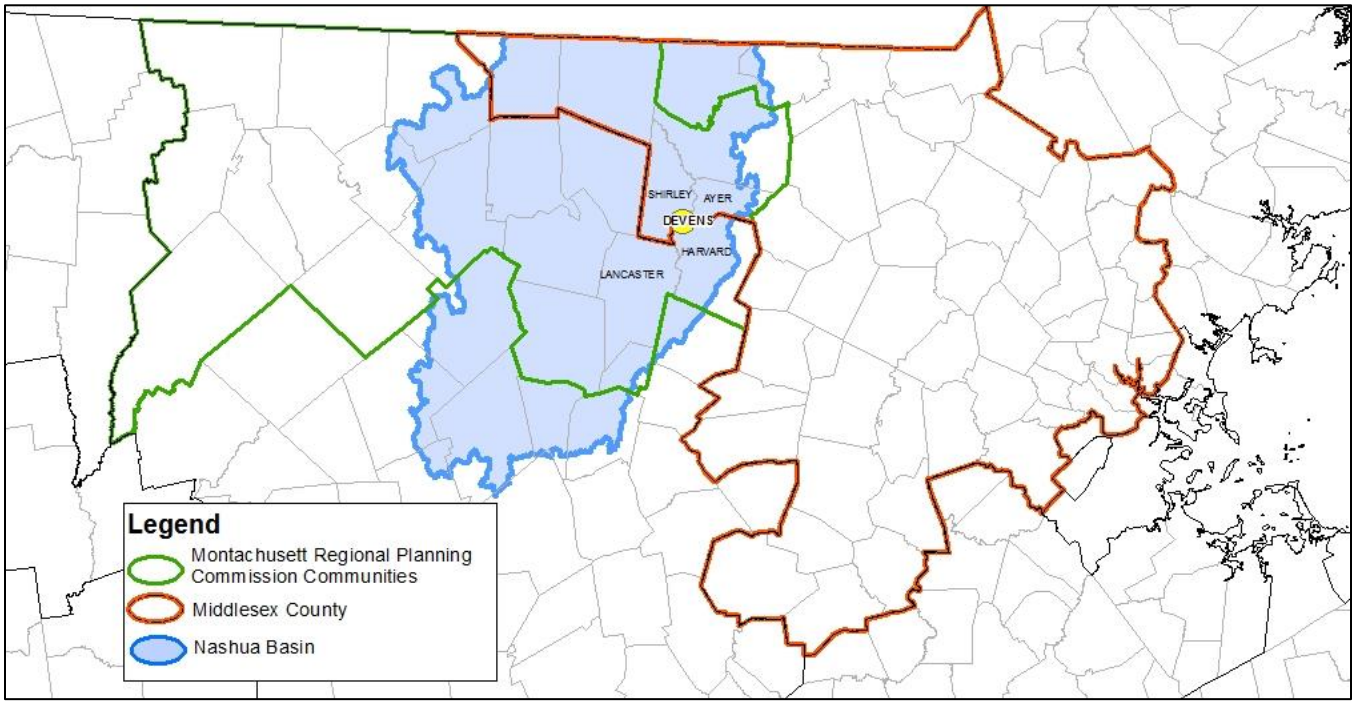
#	RESPONSES	DATE
1	As previously mentioned, the introduction of VDI (Virtual Desktop Interface) throughout all departments at our company allows us to run our business from our homes if we were not able to do so at our facility in Devens. Couple this with our back-up generator at our corporate office in Devens and our redundant offsite data center, we are fairly well positioned for most non-catastrophic situations.	3/21/2018 6:24 PM
2	Thank you.	3/10/2018 12:47 PM
3	Many of our residents don't have vehicles and the only store within walking distance is the convenience store. During an extended event, they could have a harder time than most when getting basic necessities.	3/9/2018 2:12 PM
4	Have been on this location for over 15 years and had none of the above incidence. Place was only shutdown for a day during a ice storm.	3/9/2018 11:56 AM

Appendix D: Summary of Climate Change Trends and Projections & Identified Critical Assets for Devens, MA

Summary of Climate Change Trends & Projections for Devens, MA

The following summary provides key climate change trends and projections for the U.S. Northeast, and more specifically for Massachusetts, the Nashua Basin, and Devens, MA where possible, based on existing climate data and reports. This information, along with previously identified critical assets and systems defined in the Montachusett Regional Hazards Mitigation Plan, will help evaluate the potential climate change impacts on the built, natural, and social environments of Devens in near- and long-term. Figure 1 shows the location of Devens relative to the various regions and/or regional planning efforts referenced in this document.

Figure 1 - Devens, Massachusetts



Source: VHB

CLIMATE TRENDS & OBSERVED CONDITIONS

According to the National Oceanic and Atmospheric Administration's (NOAA's) State Climate Summary for Massachusetts,[1] the state has already experienced the following changing climate conditions:

- The average annual temperature for Massachusetts ranges between 46°F (inland) to 50°F (along coastal areas; averages can vary from place to place depending on elevation, topography and other

[1] Runkle, J., K. Kunkel, R. Frankson, D. Easterling, A.T. DeGaetano, B. Stewart, and W. Sweet, 2017: Massachusetts State Summary. NOAA Technical Report NESDIS 149-MA, 4 pp. Access from: https://statesummaries.ncics.org/sites/default/files/downloads/MA-screen-hi.pdf

environmental factors including urbanization. Between 1900 and 2014, the state's average annual temperatures have increased by approximately 3°F.

- The long-term average number of days with maximum temperature above 90°F in Massachusetts is approximately 9 days between 1900-2014. The number of hot days with maximum temperature above 90°F has been consistently above average since the 1990s. It should also be noted the state experienced the highest number of days with maximum temperature above 90°F in the most recent period between 2010-2014.
- The Commonwealth of Massachusetts has experienced above-average precipitation in the last 10 years, averaging approximately 51 inches per year (compared to the overall long-term average of 45 inches per year between 1895-2009). Furthermore, since 2005, Massachusetts has reportedly been experiencing more extreme precipitation events (days with 2+ inches of rainfall), approximately 30 percent above the overall long-term average.

More specifically, Middlesex County, where Devens is located, has been experiencing storms that warrant FEMA disaster declarations more regularly since 2010. Table 1 shows the FEMA disaster declarations for Middlesex County within the past 60 years from 1952 to date.

Table 1 – FEMA Disaster Declarations for Middlesex County

Incident Date	Disaster Declarations (1952-2017)
January 26, 2015	Severe Winter Storm, Snowstorm, and Flooding (DR-4214)
February 8, 2013	Severe Winter Storm, Snowstorm, and Flooding (DR-4110)
October 29, 2011	Severe Storm and Snowstorm (DR-4051)
January 11, 2011	Severe Winter Storm and Snowstorm (DR-1959)
March 12, 2010	Severe Storm and Flooding (DR-1895)
May 12, 2006	Severe Storms and Flooding (DR-1642)
October 7, 2005	Severe Storms and Flooding (DR-1614)
December 11, 1992	Winter Coastal Storm (DR-975)

Source: FEMA Disaster Declarations www.fema.gov/disasters

CLIMATE PROJECTIONS FOR MASSACHUSETTS AND THE NASHUA BASIN

The Massachusetts Climate Change Projections, published by the Executive Office of Energy and Environmental Affairs (EEA), provides a standard, peer-reviewed set of temperature and precipitation projections to help municipal officials, state agency staff, land managers, and others to identify potential impacts due to changing climate conditions. Climate projections are based on the latest information from the International Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) in 2013. AR5 uses four Representative Concentration Pathways (RCP) as basis for the report's climate projections; each RCP represents a different trajectory of potential greenhouse gas (GHG) concentration levels by the year 2100. In the EEA's statewide climate projections, two specific scenarios—RCP 4.5 (medium GHG concentration scenario) and RCP 8.5 (high GHG concentration scenario)—were chosen for analysis. These RCPs are commonly utilized to display a range of GHG concentration that is most likely to occur based on current global trends and policies.

In addition to statewide projections, this data is also extrapolated to the state's major watershed basins. Due to regional differences, the MVP program recommends focusing on the basin data for more locally

specific data rather than statewide data. The Nashua Basin, located in north-central Massachusetts encompasses 26 municipalities either partially or entirely, and Devens, bordered by Ayer, Shirley, and Lancaster, is located on the eastern side of this watershed basin. Table 2 presents a summary of climate change conditions projected for the Nashua Basin in Massachusetts. This is also the most locally specific climate projections available for Devens.

Table 2 – Summary of Climate Change Projections for the Nashua Basin

Climate Conditions	Timeframes		
	Baseline (1971-2000)	**Mid-Century (2040-2069)**	**End-of-Century (2080-2099)**
Average annual temperature (°F)	47.6°F	↑ 3.0 to 6.4°F	↑3.9 to 10.9°F
Days per year > 90°F	4.37	↑ 9 to 30 days	↑ 12.5 to 69.9 days
Days per year > 95°F	0.23	↑ 2 to 13 days	↑ 4 to 42 days
Days per year > 100°F	<1 day	↑ 0 to 3 days	↑ 0 to 17 days
Days per year < 32°F	156 days	↓ 19 to 38 days	↓ 23 to 64 days
Days per year < 0°F	9 days	↓ 3.7 to 6.6 days	↓ 4 to 7.7 days
Total annual precipitation (inches)	46 in.	↑ 1 to 6 in.	↑ 1.2 to 8.3 in.
Days per year with over 1" rainfall	7 days	↑ 0.5 to 3.3 days	↑ 1 to 4 days
Days per year with over 2" rainfall	< 1 day	↑ 0 to 0.4 day	↑ 0 to 0.6 day
Days per year with over 4" rainfall	< 1 day	↑ by <1 day	↑ by <1 day
Annual consecutive dry days	16 days	↑ 0 to 2 days	↑ 0 to 3 days

Rising Temperatures

Temperatures across the state are projected to increase significantly over the next century. Winter average temperatures are likely to increase more than those in summer. During the warmer months, residents can expect more extreme heats days (over 90°F). And overall, with less rain in the summer and generally higher temperatures, regions across Massachusetts could see more frequent droughts.

Similarly, temperatures within the Nashua Basin are projected to increase throughout the 21st century, such that Devens may expect to see:

- Maximum summer and fall temperatures increase: approximately 3°F to 7°F by mid-century, and 4°F to 13°F by end of the century;
- Minimum winter and fall temperatures increase: approximately 3°F to 8°F by mid-century, and 4°F to 11°F by end of the century;
- Increase in the number of days with maximum temperatures over 95°F: approximately 2 to 13 more days by mid-century, and almost 4 to 42 days by end of the century; and
- Decrease in cold weather days: approximately 18 to 38 less days with minimum temperature below 32°F and 3 to 7 less days with minimum temperatures below 0°F by mid-century, and approximately 23 to 64 less days with minimum temperature below 32°F and 4 to 8 days with minimum temperatures below 0°F.

Changes in Precipitation Patterns

The spring and winter months in Massachusetts are expected to see more precipitation while the summer and fall days are expected to continue to experience the highest number of consecutive dry days. By mid-

century (2040-2069) the winter precipitation could mean more snow but by the end of the century, it will likely fall as rain.

In the Nashua Basin specifically, there is some uncertainty. Seasonal projections for total precipitation vary, such that summer and fall seasons could see either more or less total precipitation throughout the 21st century. Overall, based on the projections for precipitation, Devens may see:

- Total annual average precipitation increases up to 6 inches by mid-century, and up to 8 inches by end of the century;
- Slight increase in days with precipitation over 1" during winter and spring seasons, but either a slight increase or decrease with precipitation over 1" during summer and fall seasons by mid- and end of century; and
- Increase in number of consecutive dry days during fall and summer seasons, with highest increase of up to three additional days during fall season by end of the century.

Climate models examined in the EEA report also indicate that the frequency of high-intensity rainfall events will increase over time throughout the 21st century.

Increase in extreme weather events

The MA statewide climate projections in the EEA report did not include data on extreme weather events. Therefore, climate data from the National Climate Assessment's Northeast Region Report as well as the Montachusett Regional Hazard Mitigation Plan was used for this section. Climatologists are predicting that North Atlantic hurricane intensity and rainfall are projected to increase as the climate continues to warm.[2] Warming local sea surface temperature is one of the many factors that may influence the frequency, intensity and duration of hurricane activities in North Atlantic. Therefore, the Northeast is expected to continue to be impacted by tropical storms and hurricanes.[3] Although the projection of hurricanes and coastal storm events reaching Massachusetts is not as certain, it should be noted that the state has already been impacted by three major winter coastal storms in the first couple months of 2018.

High winds which accompany tropical storms, tornadoes, severe thunderstorms, Nor'easters, and blizzards are perceived as highly likely to occur in the Montachusett Region. On a larger scale, recent data indicates that there is a link between increasing global temperatures, atmospheric instability and increases in wind speed with altitude.[4]

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[2] Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 16-1-nn. Accessed from http://s3.amazonaws.com/nca2014/low/NCA3_Full_Report_16_Northeast_LowRes.pdf?download=1.

[3] Montachusett Regional Planning Commission (MRPC). 2015. *Montachusett Regional Natural Hazard Mitigation Plan 2015 Update*. Access from: http://www.mrpc.org/sites/montachusettrpc/files/file/file/montachusett_region_natural_hazard_mitigation_plan_2015_update_adopted_by_communities.pdf.

[4] US National Climate Assessment, US Global Change Research Program. 2014. *Climate Change Impacts in the United States*. Access from: http://s3.amazonaws.com/nca2014/high/NCA3_Climate_Change_Impacts_in_the_United%20States_HighRes.pdf.

Regional and Local Flood Projections

The Boston Research Advisory Group (BRAG)'s *2016 Climate Change and Sea Level Rise Projections for Boston Report* was considered as the basis for future flood projections. The Report uses four (4) regional studies and projections to estimate the magnitude of future flooding events. Table 3 highlights the best available estimates for changes in river floods.

Table 3 – Estimates for Changes in River Floods

Flood Type	2055	2085
Small floods (e.g., 2-year recurrence interval)	0 to 20%	20% to 50%
Design floods (e.g., 100-year)	-10% to 35%	15% to 70%

Source: Reproduced from BRAG's *2016 Climate Change and Sea Level Rise Projections for Boston Report*

Based on available data from this Report, it shows that the approximate mean forecasted "design flood" (one-percent flood) has an approximate mean increase of 43 percent in flood flows for the year 2085.

It should be noted that, based on some climate models, design floods may decrease as a result of climate change. Some projections for springtime flooding in New England show a significant decrease in the amount of snowpack, which could reduce springtime flooding. This accounts for the -10 percent possible change in flooding presented in Table 3.

Additionally, some of the studies used by BRAG to develop the flood flow estimates have known methodological shortcomings, which are detailed in their reports. Further, the future amounts of emissions, and potential future legislation effecting those totals is not known, and will have a large influence over the amount of warming anticipated over the next century. Such uncertainty is inherent in the prediction of future climate, and the range of events analyzed herein seeks to alleviate some of this concern. Given these shortcomings and uncertainty, the mean increase of 43 percent should be interpreted as a broad approximation of the increase in flood flows in the year 2085 using best available information.

FEMA Flood Insurance Study

The Federal Emergency Management Agency (FEMA) has completed a Flood Insurance Study (FIS), Number 25017CV001C revised July 6, 2016, for Middlesex County to investigate the existence and severity of flood hazards. The FIS was used in development of the FEMA Flood Insurance Rate MAP (FIRM) Map Number 25017C0211E, dated June 4, 2010, which delineates the Special Flood Hazard Area's (SFHA's) within Devens, MA. Nonacoicus Brook, and the Nashua River represent the main waterways that contribute to flooding within Devens. Table 4 represents the FIS flood flows at the referenced locations:

Table 4 - FEMA FIS Flood Flows and Elevations for Standard Design Storm Events

Nashua River (at confluence of Mulpus Brook)

Percent-Annual-Chance Flood	Flow (Cubic feet per second)
10-Percent	5,650
2-Percent	9,600

1-Percent	12,200
0.2-Percent	18,600

Nonacoicus Brook 1 (at Main Street)

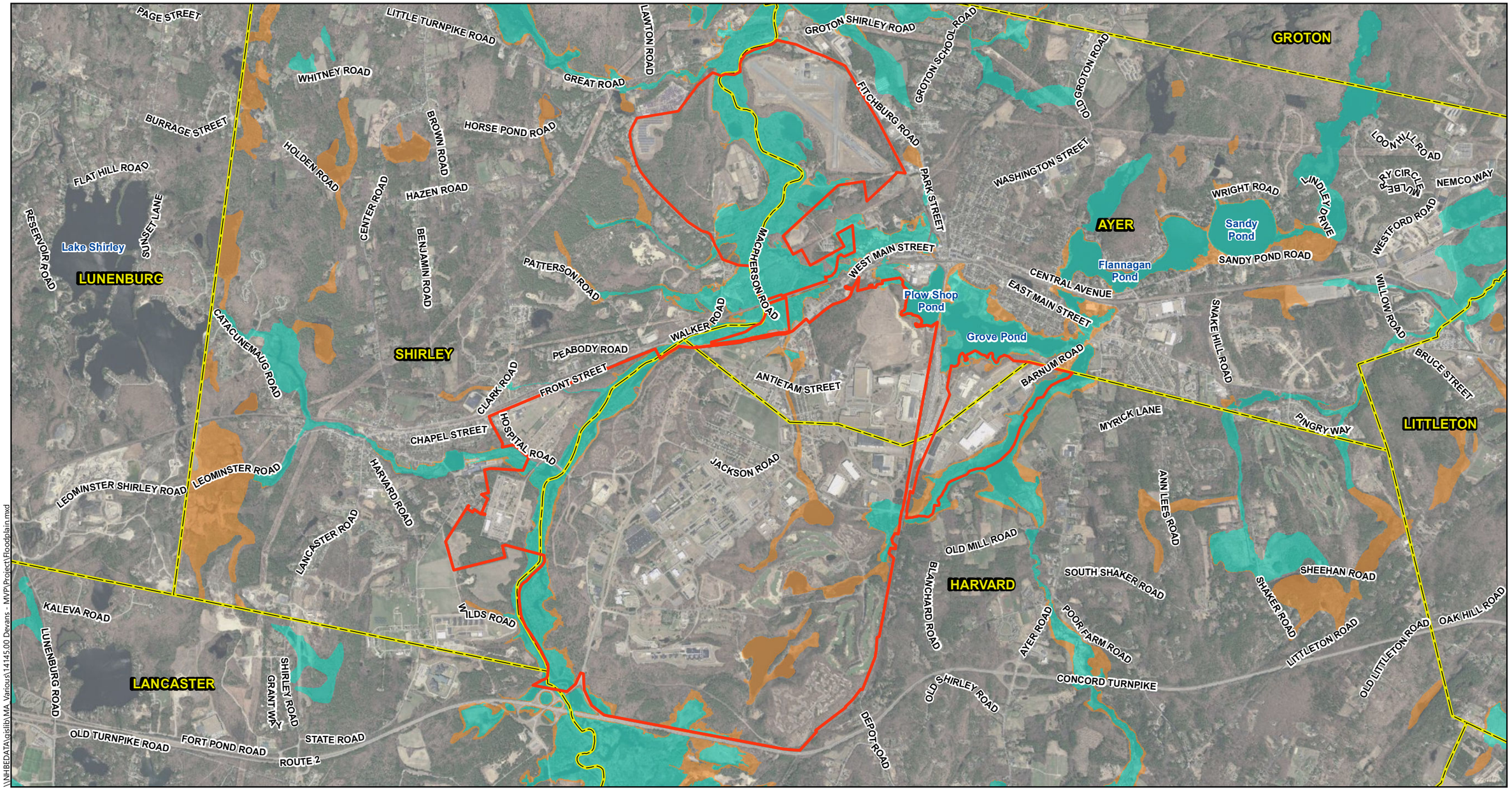
Percent-Annual-Chance Flood	Flow (Cubic feet per second)
10-Percent	400
2-Percent	670
1-Percent	720
0.2-Percent	1070

It should be noted that the FIS presents several flood flows within Devens. However, to simplify this analysis, the above two locations were selected as a general representation of the current flood flows within Devens.

Flood Projection

FEMA FIS flows were used as a basis to develop forecasted flood projections. The current one-percent annual chance (i.e. 100-year flood) in comparison to the current 0.2-percent flood (i.e. 500-year flood) represents an approximate 50 percent increase in flood flows. This approximate 50 percent increase is comparable to the BRAG projection for flood flows (43 percent increase) for the mean projection for 2085. Therefore, the current 0.2-percent flood (i.e. 500-year flood) is approximately equal to the BRAG forecasted 2085 mean projection for the one-percent flood (i.e. 100-year flood event).

Figure 2 illustrates the extents of the current 0.2-percent flood (500-year flood) and forecasted approximate one-percent flood (100-year flood) within Devens. The projected increase in flood flows and flooding extents is approximate and is for preliminary planning purposes only. A detailed hydrologic/ hydraulic analysis and further study on projected increases in flood flows is necessary to refine forecasted flood limits.



\\NH\BEDATA\gisllib\MA Various\14145.00 Devans - MVP\Project\Floodplain.mxd

0 1500 3000 6000 Feet

Legend

- Devens
- Current 100-yr Floodplain (FEMA)
- 2085 - Mean Projection - Approximate 100-year Floodplain (Current 500-year Floodplain)
- Municipal Boundary

Devens Regional Enterprise Zone (DREZ) | Ayer, Harvard, Lancaster & Shirley, MA

Note: This map is an approximate representation of the forecasted limits of flooding. The map does not provide information regarding changes in base flood elevations that may occur over time.

Year 2085 – Mean Projection – Approximate 100-year Floodplain

Source: FEMA, VHB, ESRI

Potential Impacts from Projected Climate Change Conditions

The following section highlights some of the potential impacts as a result of the projected changes in climate conditions described above. This high-level list presents a broad range of possible impacts, including possible damages to environmental resources, existing buildings and infrastructure, limitations of future development, as well as health-related risks that may compromise the well-being of all workers, residents, and visitors.

Impacts from rising temperatures

- Poor air quality and increasing risk of heat-related illnesses due to increase in warmer temperature days and extended heatwaves.
- Precipitation during winter months will more likely be rainfall and ice rather than snowfall due to warmer winters.
- Increasing stress on transmission lines, substations, train tracks, roads, bridges, and other critical infrastructure due to more intense heat.
- Increasing frequency of power outages due to larger demand for cooling during summer days.
- Increasing risk of wildland fires.[5]

Impacts from changing precipitation conditions

- Increasing rainfall during spring and winter months and longer consecutive dry days in summer and fall months.
- Increases in depth, duration, extent, and frequency of flooding.
- Increasing stress on stormwater infrastructure.
- Increasing risk and/or damages to bridges, culverts, roadways, and other critical infrastructure due to flooding.
- Increasing risk of deteriorating soil conditions due to increasing flooding events and heavy downpours.
- Increasing water demand due to more frequent droughts.

Impacts from increasing frequency and intensity of rainfall, flood-inducing weather events, and storms

- Increasing risk and/or damages to building envelopes of existing buildings and facilities due to extreme weather events, particularly during thunderstorms and high wind conditions.
- Increasing risk of pollutant runoff into water bodies due to increasing flash floods and heavy downpours.
- Weakening tree root systems due to droughts, becoming more susceptible to toppling during high wind events.
- Fallen trees and debris during severe storm events that may damage power lines and result in power outages, as well as pose threats to community safety.

[5] According to the Montachusett Regional Hazard Mitigation Plan, between 2009-2015, Devens has already been experiencing the highest number of acres burned from wildfire in the region.

Identification of Critical Assets and Infrastructure for Devens, MA

Table 5 lists Devens' critical assets and infrastructure to be considered as part of the climate vulnerability assessment. These assets and infrastructure identified here are based on reviews of the Montachusett Hazard Mitigation Plan and Devens 2014 Comprehensive Emergency Management Plan (CEMP). The Project Team will coordinate with stakeholders from the community of Devens, through the Municipal Vulnerability Preparedness (MVP) process, to confirm this list as well as to include any additional critical assets and resources.

Table 5 – Devens' Critical Assets and Infrastructure

Category	Key Assets & Infrastructure	Notes
City/Town Facilities	Devens Fire Station	Emergency operations center
	Devens DPW	Emergency operations center HazMat site
	Communication Tower in back of fire department	
	Devens Community Center	Emergency shelter
	Devens Regional WWTF	HazMat site
	FMC Devens – Federal Medical Center;	HazMat site
	Satellite Camp	Devens top employer (~200)
	Nashoba Valley Regional Emergency Comm. Center	
	State Police Barracks- Devens (Station C-9); MSP Headquarters C-9	
Institutions/Education facilities	Mt. Wachusett Comm. College, Adult Learning Center	
	Guild of St. Agnes - EEC - Devens	
	Applewild Preschool	
	Evergreen Garden Preschool	
	Shriver Job Corps Centers	
	Oxbow Schoolhouse	
	Francis W. Parker Charter Essential	
	Seven Hills Academy Adult day care facility	
Infrastructure	Devens Intermodal Rail Terminal	
	Barnum Bridge	Within 100-year flood zone
Other critical facilities[6]	Shirley Town Hall	
	Shirley Police Station	Emergency operations center
	Shirley Police Station	Emergency operations center
	Hazen Memorial Library	Emergency operations center
	Shirley Middle School	Emergency operations center
	Ayer/ Shirley Middle School (ASRD)	
	Army National Guard Complex	HazMat site

[6] These "other critical facilities" are located within the boundaries of Devens, but are under the jurisdiction of the specified municipality.

Commercials/Businesses	Hilton Garden Inn	Emergency shelter
	SpringHill Suites by Marriott	Emergency shelter
	American Superconductor	HazMat site
	Bionostics	HazMat site
	Bristol Meyers Squibb	HazMat site
		Devens top employer (~800 employees)
	Comrex	HazMat site
	Eglomise Designs	HazMat site
	Integra	HazMat site
	Johnson-Matthey	HazMat site
		Devens top employer (~170)
	Kenco	HazMat site
	MEMA M&C	HazMat site
	Netstal Machinery	HazMat site
	New England Sheets	HazMat site
	Parker Hannifin Aerospace FSD	HazMat site
	RFTA Fort Devens	HazMat site
	Rapid Refill	HazMat site
	Regency Warehouse	HazMat site
	Rock Tenn - Southern Container LLC	HazMat site
	Ryerson Corp.	HazMat site
	Shelpley Hill Treatment facility	HazMat site
		Within 100-year flood zone
	Waiteco Machine	HazMat site
	Xinetics, Inc.	HazMat site
	Quiet Logistics & Quiet Logistics II	HazMat site
		Devens top employer (~400; ~700 w/ part-time seasonal)
	SMC, Ltd.	Devens top employer (~290)
	O'Reilly	Devens top employer (~230)
	Nypro	Devens top employer (~130)
	Bio-Techne	Devens top employer (~100)
	Xinetics	Devens top employer (~90)
	Laddawn	Devens top employer (~90)
	Integra	Devens top employer (~80)
	NE Sheets	Devens top employer (~80)
	West Rock	Devens top employer (~80)
	Parker Hannifin	Devens top employer (~80)
	Patterson Veterinarian	Devens top employer (~70)
Recreational/Open Space	Red Tail Golf Course	HazMat site
	Mirror Lake Recreational Area (Seasonal)	
Public Health Office	Grove Pond Gravel Packed (12 8") Wells	Within 100-year flood zone
	Macpherson Naturally Developed Well	Within 100-year flood zone
	Proposed Sheridan Rd Well (Tw9b-08)	
	Shabokin Replacement Well	
	Patton Replacement Well	
	Shabokin Gravel Packed Well	
	Patton Gravel Packed Well	
	Shabokin Gravel Packed Well	

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Appendix E: Community Resilience Building Risk Matrix for Devens, MA

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Top Priority Hazards: Severe Storm Events	Top Priority Hazards: Extreme Heat	Top Priority Hazards: Wildland Fire	Priority H - M - L	Time Short Long Ongoing
Infrastructure									
Devens Fire Station	Specific	Public	S	**Strength**: More resources than surrounding communties. **Vulnerability**: Flooding of retention pond and roadways; some staff live more than 30 minutes away; MEMA not funding on-call staffing. **ACTIONS**: Regulatory; stage people during storm events; bring to attention of legislature; bring Military into EOC drills.				1. H 2. H	1. S 2. S
Devens DPW	Specific	Public	S	**Strength**: New facility; regular maintenance schedule.				-	-
Devens Recycling	Specific	Public		**ACTION**: Develop a coordination plan or agreement to utilize heavy equipment during and after a storm.				M	L
Communication Tower/Nashoba Valley Regional Dispatch	Back of the Fire Department	Private	S	**Strength**: Hardened and raised equipment; has back-up power; serves 7 communities.				-	-
Communication/Water Tower	Specific	Private	S	**Strength**: Internal communication; has back-up generator.				-	-
Wastewater Treatment Plant	Specific	Devens	S	**Strength**: Outside of the floodplain; has back-up generator. **Vulnerabilities**: Main lift station is in flood zone, if road is flooded, a secondary access will be necessary. **ACTION**: Operational issue. Manageable.				-	O
State Police Barracks (Station C-9); MSP Headquarters C-9	Specific	State	V	**Vulnerability**: Jackson Road flooding concerns; undersized culverts for projected flows. **ACTION**: Seek funding through FEMA for replacement of undersized culverts or road improvements on roads that connect to Jackson.				M	O
Intermodal Rail Terminal	Specific (Ayer)		V	**Vulnerability**: Flooding could lead to environmental risks. Cargo release into receiving waters and wells. Major staging area for freight. Could be a choke point. **ACTION**: Coordinate/communicate with CSX on safety and remediation plans.				M	L

Devens Community Resilience Buildling Workshop Matrix

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V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time S hort L ong O ngoing
Barnum Bridge	Specific	Public	V	**Vulnerability:** Flooding is an issue but cannot raise road due to limited clearance. **ACTION**: Clean and increase culverts running under railroad.				H	O
Roads	Townwide	Public	V	**Vulnerability:** MacPherson Road floods naturally and is closed regularly (redundant). Jackson Road and Barnum Road have flooding concerns. Undersized culverts. **ACTIONS:** Ongoing maintenance and beaver trapping program; preventative maintenance of tree limbs; seek funding for culvert improvements; coordinate with surrounding towns to provide alternative emergency routes.				1. L 2. - 3. H 4. H	1. O 2. O 3. O 4. S
Businesses (Loaves and Fishes, and Women's Shelter, Homeless Veterans Housing, etc.)	Multiple	Private	V	**Strength**: Services provided to the community. **Vulnerability**: Road access **ACTION**: See above for road access as it relates to flooding. Pond can be lowered ahead of events. **ACTION for Loaves and Fishes**: Develop resource and supply emergency relocation plan; figure out if a generator is necessary. **ACTION for Women's Shelter**: Develop a relocation plan; Ongoing actions already in place; Use Military facilities; Identify facilities that need to remain open/staffed during an emergency event.				H	S
FMC Devens - Federal Medical Center; Satellite Camp	Specific	Federal	S	**Strength**: Self-sufficient; nothing critical stored in warehouse.				-	-
Public Water Supply Wells	Multiple	Public	S	**Strength**: One well provides 20% of community needs; wells have not been affected by drought. In floodplain but not critical. Other 2 wells are outside of SFHA.				-	-

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time Short Long Ongoing
Military/Army Facilities	Multiple	Federal	S	**Strength**: Good sharing/exchange of information with Devens; PA system could be used for emergency announcements. **Vulnerability**: South Post is more prone to wildfires in drier months with active shooting range; No communication with 99th and 44th on Barnum Road. **ACTION**: More water fill points and more access to forest for firefighting. Improve communication.				M	O

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority (H - M - L)	Time (Short Long Ongoing)
Societal									
Guild of St. Agnes (Early Education Center)	Specific	Non-profit	V		**Strength**: They have a response plan. Local bus company can be contacted to evacuate if need be; has their own buses. **Vulnerable Population**: Children			-	-
Shriver Job Corps Center	Specific	Federal	S+V	**Vulnerability**: near current 500 yr. floodplain	**Strength**: They have the largest kitchen in Devens, and can be used as backup to turn out meals during/after an emergency event. **Vulnerabilities**: limited backup power, have student housing on campus **ACTION**: Continued communication and coordination on their disaster preparedness and recovery capabilities.			L	O
Seven Hills Academy (adult day care facility for mentally challenged and elderly)	Specific	Private	V		**Strength**: They can evacuate on their own; Have own buses; Day-time operations only. **Vulnerable Population**: Special needs **ACTION**: Follow up whether they can take in evacuees with special needs; Follow up whether air conditioning capabilities are adequate for rising temperatures.			M	S

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority (H - M - L)	Time (Short Long Ongoing)
Special needs services and service providers (such as Loaves and Fishes, Transition Women's Shelter, Veterans Housing, etc.).	Specific	Non-profit	S+V	**Vulnerability**: Loaves and Fishes is in 500 yr. floodplain	**Strength**: Both provide key services to the community; Veteran housing; ClearPath- Veterans support. **Vulnerability**: Lack of back-up power at Women's Shelter as well as Loaves and Fishes; Veteran housing (privately run) has limited AC, but no better/worse than neighbors; although less likely to have window units due to costs. **ACTION**: See Infrastructure actions above; Follow up to make sure facilities have Emergency Action Plans.			M	S
Hazen Memorial Library	Specific	Town of Shirley	S		**Strength**: In the same development complex as Town Hall, Police Department and regional middle school; could be used as warming/cooling center; has multiple generators. **ACTION**: Reach out to Town of Shirley to discuss using school as back-up shelter.			M	S
TaraVista Behavioral Health (inpatient psychiatric)	Specific	Private	SV		**Strength**: Has backup generator; could serve as short-term emergency medical facilities; has on-site kitchen; sewer ejector pump attached to generator.			-	-
Parker School (Middle and High)	Specific	Public	S	**Vulnerability**: in current 500 yr. floodplain. **ACTION**: LID/green infrastructure to reduce flooding. Follow-up to see if utilities are located on the roof.	**Strength**: Have generator; can shelter in place. **Vulnerability**: Only has AC in some part of the building. **ACTION**: Need to expand AC; :ook for funding sources for charter schools.			M	O

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time S hort L ong O ngoing
Oxbow Schoolhouse (Elementary and Middle School)/Evergreen Garden (Pre-school)/ Regional Dispatch	Specific	Private	S		**Strength**: During a short-term emergency, parent pick-up at the Devens Recreation Center up the street. **Vulnerability**: No generator for schools **ACTION**: In good shape, maintain operational activities.			-	-
Mount Wachusett Community College	Specific	Public	S		**Strength**: Receive grantsto provide ESL training in the community for local business employees. **Vulnerability**: No generator at MWCC, non-English speaking employees in town **ACTIONS**: Follow up to see whether they need back-up generator; Need to link the language resources to the local community.			M	L
National Guard Center	Specific	State	S		**ACTION**: Follow up on communicaiton about response efforts.			L	O
Federal Prison Hospital	Specific	Federal	S		Go into lockdown during an event. **Strength**: Could provide some meals to community as a back-up.			-	-
Elderly Housing (To Be Built on Hospital Rd.)	Specific	Subsidized	S+V		**Strength**: Will be LEED certified. Managed facility. **Vulnerable Population**: Elderly **ACTIONS**: Create Evacuation plan; Make climate change resiliency and adaptation regulations more specific across the board.			1. M 2. M	1. S 2. L
Citizen Emergency Response Team (CERT)	Townwide	Public	S	**Strength**: Devens no longer has a CERT team but is working with Ayer to utilize their team. Devens has the equipment but not the people. Ongoing project (2015-2020).				-	O

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time S hort L ong O ngoing
Homeowners Associations (3)	Various	Non-profit	S	**Strength**: Redundant communication to members. Devens may be better directly communicating to residents.				-	-
Town Emergency Communications	Townwide	Public	S+V	**Strength**: EMA has a Code Red Reverse 911 system, Military PA System. **Vulnerability**: Only useful for those that sign up. **ACTIONS**: Push the message to local employees. Promote Code Red via adding sign-up on front page of Devens webpage, in newsletter, and at Devens Eco-Efficiency Center.				H	S
Public Health & Safety	Townwide	Public	V	**Vulnerability**: Increase in ticks, pests, poison ivy, heat related health issues, increase in airborne allergens. **ACTION**: Distribute education materials at public facilities, businesses, schools, residents; Install signage at trailheads.			**Vulnerability**: Public and property safety **ACTION**: Host events at FD to educate property owners, develop and distribute materials on fire safety and prevention; Install signage re: fire safety. Devens Eco-Efficiency Center can host quarterly Environmental Health and Safety Roundtables and educate risks related to pest/ticks, etc.	M	S and O
Native American Cultural Society (museum and artifacts)	Specific	Non-profit	V	**Vulnerability**: Large groups of people congregate for events. **ACTION**: Mobilization plan for large groups of people during an emergency; Utilize available mapping applications to simulate real time evacuation scenarios.				M	S
Bob Eisengrein Community Center	Specific	Public	S	**Strength:** Can be used as an emergency shelter. Has a generator hook-up, small kitchen, 100 beds and sleeping bags. Can shelter up to 400 people. **Vulnerability**: Not suited for long term sheltering. **ACTIONS**: Develop a needs list and storage requirements; Arrange bathroom/shower capabilities for long-term sheltering; Purchase privacy curtains and onsite generator; Need infant/toddler resources and special needs accommodations.				M	O

Devens Community Resilience Buildling Workshop Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time Short Long Ongoing
Rogers Fields	Specific	Public	S+V		**Strength**: Community Recreation Director is in constant contact with Fire Department located across the street; Good staging area. **Vulnerability**: Large groups of people/visitors congregate for events. **ACTIONS**: Develop mobilization plan for large groups of people during an emergency; Utilize available mapping applications to simulate real-time evacuation scenarios.			M	O
Military Reservists (10,000 people in the summer)	Various	Federal	V		**Strength**: Devens FD in communication with South Post Range Control in the event of severe weather which may threaten tent camps. **Vulnerability**: Live fire shooting range increases risk of wildfires during droughts. With unexploded rounds, have to fight from perimeter, and can not do water drops **ACTION**: See actions for Military/Army Facilities group under "Infrastructure."			-	-
Non -English speaking employees	Town-wide	-	V	Haven't had a request for translator services for emergency messaging. Have used onsite bi-lingual employees when there is a medical emergency at a business. **Vulnerability**: Non-English speaking employees, shelter residents **ACTION**: ESL services through MWCC; Consider providing bi-lingual EM messaging.				H	O
Hotels	Specific	Private	S+V		Reservists and military officers fill up the two hotels on Devens; not used as shelters. **ACTION**: Ask about back-up power needs during an emergency; Ask whether they can provide EM sheltering; Figure out where non-military personnel can go during evacuation.			M	S

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Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority H - M - L	Time Short Long Ongoing
Environmental									
Mirror Lake Recreational Area (conservation easement, public recreational resource)	Specific	DPW	S	**Strength**: Serve as flood management (minimally), public beach/cooling site.				-	-
Little Mirror Lake (conservation easement, home to rare and endangered species)	Specific	Trustees of Reservation	S+V	**Strength**: The lake has capacity for more water. **Vulnerability**: Extreme precipitation can pose potential risk for stormwater contaminants, and this could be an issue to the nearby pump house, which supplies fresh water to the community. Heavy rain would pose issues for the rare and endangered habitat (habitat washout, etc.). **ACTION**: Continue with conservation efforts.		Lack of water may negative affect the R&E habitat, but more hotter days may also help increase habitat.		-	O
Black Spruce Bog (conservation easement)	Specific	Trustees of Reservation	S	**Strength:** Can serve as flood management asset.					
Eskers	Multiple	Trustees of Reservation; U.S Fish and Wildlife	S+V	**Strength**: Can serve as natural levee due to high elevation & steep slope.		**Vulnerability**: Dry out of vegetation, risk of erosion during heavy rain after dry period **ACTION**: Monitor and plant more vegetation on the eskers		L	L
Robins Pond (headwater of Willow Brook)	Specific	DPW	S	**Strength**: Flood control asset; can store a lot of water; can flood Barnum Road but controllable.				-	-

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Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority (H - M - L)	Time (Short Long Ongoing)
Street Tree Inventory/Forest (majority oak, black spruce, hemlock, and other natives of the Northeast)	Town-wide	DEC, DPW	S+V	**Strength**: Trees can reduce flooding.	**Strength**: Cooling effect of forests, trees absorb CO_2 **Vulnerability**: Branches can take down power lines. **ACTION**: Regularly inspect and cut branches threatening power lines and overhead utilities.	**Vulnerability**: Increase in invasive species **ACTIONS**: Devens development projects are required to conduct tree surveys/inventory; DEC and DPW is working on a tree replacement program to diversify tree species.	**Strength:** Devens has a lot of forest; Approx. 1/3 of Devens land is protected open space **ACTION**: Clear brush to provide access of firefighting.	-	O
Trails (connecting Ayer, Shirley, Harvard, and Devens)	Multiple	Various municipalities	V		**Vulnerability**: Fallen trees & debris make trails impassible; ice issues **ACTION**: DPW managing trails.	**Vulnerability**: Some stretch of pavement is already in bad shape (Ayer Rail Trail). Not a critical resource.		L	
Shepley Hill (disc golf course, hiking trail, conservation restriction - has certified vernal pools)	Next to land owned by the Army	DEC	V	**Vulnerability**: Impact to vernal pools & habitat. **ACTION**: Ongoing monitoring, conservation restrictions.				-	O
Nashua River Corridor	Specific	Mass Wildlife, US Fish & Wildlife	S+V	**Strength**: Flood management asset. **Vulnerability**: Extended hot days or heatwaves can weaken tree roots along the river bank -potential erosion of bank, fallen trees into river and cause back up of water, which might result in upstream flooding during heavy rain. Trees can impact bridges. **ACTION**: Ongoing maintenance by DPW.				-	O

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Features	Location	Ownership	V or S	Top Priority Hazards: Extreme Precipitation Events/Flooding	Severe Storm Events	Extreme Heat	Wildland Fire	Priority (H - M - L)	Time (Short Long Ongoing)
Cold Spring Brook	Townwide		S	**Strength**: Flood management asset. **Vulnerability**: Extended hot days or heatwaves can weaken tree roots along the river bank -potential erosion of bank, fallen trees into river and cause back up of water, which might result in upstream flooding during heavy rain.				-	-
U.S. Fish and Wildlife's Bill Ash Visitor Facility	Specific	US Fish & Wildlife		**Strength**: Low Impact Design showcase.		**Strength**: Asset. Shaded facility and composting toilets, fire pit, boat access.		-	-
Rare & endangered species (Blue-spotted Salamander, Grasshopper Sparrow, Blanding's Turtle)	Multiple	-	S	**Strength:** Most of the land where these R&E species are located are protected from development.				-	-
UXO (Unexploded ordnance) sites	Multiple	-	V	**Strength**: Soil Management Policy which is intended to reduce risk to human health and safety and the environment. **Vulnerability**: Erosion can expose these sites, which many were former contamination sites (Superfund). **ACTION**: Ongoing maintenance.				-	O
Groundwater	Townwide	-	V	**Strength**: No surface water discharge. Water pumped up goes back to groundwater. Enough capacity for expansion of industrial users. Water use regulations used every summer. **Vulnerability:** Contamination issues (former Superfund site). **ACTION:** Good ongoing monitoring and regulations.		**Vulnerability**: Levels may not be sustainable in long term future. **ACTIONS:** Consider alternatives- grey water to potable water; Work with businesses to separate grey water for irrigation; Continue to think forward.		L	L & O