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Summary of Findings

Brewster Municipal Vulnerability Preparedness Workshop

Brewster, Massachusetts

March 28, 2019

Prepared for:
Town of Brewster
Attn: Ryan Bennett, Town Planner
Brewster Town Offices
2198 Main Street
Brewster, MA 02631

Prepared by:
Horsley Witten Group, Inc.

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Brewster Municipal Vulnerability Preparedness (MVP) Workshop *Summary of Findings*

Acknowledgements:

Funding to support the Brewster Municipal Vulnerability Preparedness (MVP) workshop was provided by the Massachusetts Executive Office of Energy and Environmental Affairs through an MVP Planning Grant, issued to the Town of Brewster during the fiscal year of July 2018 through June 2019. The Town of Brewster contracted with the Horsley Witten Group, Inc. to provide MVP-certified staff to support the Town with planning and facilitation of the workshop.

The core planning team would like to thank Captains Golf Course for providing a workshop facility, the Town of Brewster for providing refreshments and the Cape Cod Commission for providing GIS layers to develop critical infrastructure maps.

Suggested Citation:

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Executive Summary

On March 28, 2019, the Town of Brewster (the Town) held a Municipal Vulnerability Preparedness (MVP) workshop. The goal of the workshop was to identify the natural hazards threatening the Town that are exacerbated by climate change, and to prioritize mitigation actions that can be taken to reduce the negative effects. The MVP workshop, planned by a core team of organizers and the Horsley Witten Group, Inc. (HW), was the first step towards full MVP certification. Once certified, the Town can access additional State grants for projects related to climate change resiliency. Twenty-two community members attended the workshop, representing a wide cross section of Town departmental representatives, non-governmental organizations and private citizens.

Participants concluded that the most relevant climate change hazards to Brewster were coastal flooding and storm surge, sea level rise, hurricanes and Nor'easters, and intense rain and flooding. Working in four small groups, with the assistance of an HW facilitator and volunteer scribe, participants identified features of Brewster that may be impacted by climate change (referred to as vulnerabilities), and features that may help the community cope with climate-related hazards (referred to as strengths). The groups then developed actions that could be taken to protect Brewster's infrastructure, people and environment from the impacts of climate-related hazards. From the small and large group discussions, the workshop participants selected the following seven high priority action items, in no particular order:

1. Review and update Town bylaws and regulations to mitigate projected climate change impacts.
2. Develop and initiate projects to increase resilience to projected climate change impacts (e.g., intense rain, storm surge, sea level rise) for critical infrastructure including, but not limited to:
    - Route 6A from the intersection with Paines Creek Road west across causeway dividing the marsh
    - Stormwater drainage throughout Town
    - Potentially vulnerable utility infrastructure
3. Identify and initiate projects to provide back-up power at the Town Hall, Water Department and drinking water wells to provide critical infrastructure resilience to power outages.
4. Conduct a stormwater infrastructure inventory and assessment to prioritize and initiate improvements (e.g., increased catch basin maintenance, culvert replacement) based on projected climate change impacts.
5. Develop a Preparedness Campaign for the general public (i.e., residents and seasonal guests) and the private sector that includes guidance and checklists, as well as recommendations to increase community resilience to the impacts of climate change (e.g., extreme weather, health impacts).
6. Develop a Local Multi-Hazard Mitigation Plan that includes considerations for projected climate change impacts.
7. Review and update the Brewster Community Emergency Management Plan to include considerations for projected climate change impacts.
8. Conduct a vulnerability assessment, develop plans and initiate improvements at critical public beach access points in the community (e.g., town landings) to increase resilience to projected climate change impacts.

These high priority action items will be incorporated into ongoing municipal planning efforts. High priority action items identified in this process are also eligible for future grant funding under the MVP Action Grants Program administered by the Massachusetts Executive Office of Energy and

Environmental Affairs (EEA). By undertaking the MVP workshop and preparing this report, the Town of Brewster is also initiating its certification as an MVP Certified Community, which elevates the scoring profile for corresponding project proposals within State grant programs.

Table of Contents

Attachments

1. Introduction

The Municipal Vulnerability Preparedness (MVP) program is a Massachusetts state program designed to increase municipality-level resilience to natural hazards being exacerbated by climate change. This program helps municipalities identify their vulnerabilities, strengths, and opportunities to take action to reduce risk and build resilience. MVP workshops use the Community Resilience Building (CRB) Framework, a system of discussion and note-taking developed by The Nature Conservancy and prescribed by the MVP Program. The Town of Brewster (the Town) received a grant to participate in the MVP program in order to build on its prior resiliency planning efforts and develop a list of priority actions for the immediate future.

Workshop Planning and Core Team

Following the award of the technical assistance grant, Town departmental and committee representatives formed a core planning team. Team members included the following individuals, who were assisted by Will Keefer of the Horsley Witten Group, Inc. (HW) acted as Brewster's MVP Provider by guiding the Planning Team (listed below) during the workshop development process.

- Paul Anderson, Water Department
- Ryan Bennett, Planning Department
- Susan Broderick, Town Administration
- Robert Crowley, Water Department
- Heath Eldredge, Police Department
- R. Patrick Ellis, Department of Public Works
- Pat Hughes, Coastal Committee
- Donna Kalinick, Town Administration
- Chris Miller, Natural Resources
- Robert Moran, Fire Department
- Victor Staley, Building Department
- Kevin Varley, Fire Department

Team members formally met five times between November 2018 and March 2019, additional coordination took place via email and telephone. Responsibilities of the core team included:

- Confirming workshop logistics (e.g., date, location).
- Reviewing the workshop agenda.
- Providing reference material, context and background for the MVP effort.
- Reviewing maps and reference materials for use in workshop discussion groups.
- Identifying a group of representative stakeholders to invite to the workshop.

- Reaching out to invitees to encourage attendance.

The Team also participated in the workshop as discussion facilitators, note takers and stakeholders.

Workshop Attendees and Materials

Brewster's MVP workshop was held on March 28, 2019 at Captains Golf Course, 1000 Freemans Way, Brewster, Massachusetts. A total of 60 stakeholders were invited to the workshop and 22 stakeholders attended. Participants represented a cross section of the Town departments, as well as representatives from Halcyon Farm, Brewster Conservation Trust, Barnstable County Regional Emergency Planning Committee, Brewster Ponds Coalition, Stonybrook Elementary, the Association to Preserve Cape Cod, realtors, and volunteers from local boards and commissions. **Attachment A** includes a list of participants and their organizational affiliation. On the day of the workshop, participants were provided with the following materials:

- Workshop agenda
- Overview Presentation PowerPoint slides with note taking space
- Summary of climate projections for the Cape Cod Basin provided by EEA and prepared by the Northeast Climate Science Center
- Summary of Brewster demographic data
- Handout summarizing actions previously identified and recommended for Brewster in the following Town and regional plans, many of which are available online:
    - 2018 Brewster Vision Plan – available at http://records.brewster-ma.gov/WebLink/DocView.aspx?dbid=0&id=90826&page=1&cr=1
    - 2016 Coastal Adaptation Strategy – available at http://records.brewster-ma.gov/weblink/0/doc/75572/Page1.aspx
    - 2013 Brewster Integrated Water Resources Management Plan (IWRMP), Phase 2 Report – available at https://horsleywitten.com/brewsterIWRMP/reports/130128_Final%20IWRMP%20Report_Brewster.pdf
    - 2014 Brewster Open Space and Recreation Plan – available at http://records.brewster-ma.gov/weblink/0/edoc/75800/2014%20Open%20Space%20%20Recreation%20Update.pdf
    - 2010 Barnstable County Multi-Hazard Mitigation Plan – available at http://www.capecodcommission.org/resources/coastalresources/Final_RegMHM_031910.pdf
    - 2006 Water Department Study
- Example vulnerabilities and strengths excerpted from the CRB guidance document

Attachment B provides a copy of the participant workshop materials. Participants were also provided with Brewster base maps showing critical infrastructure along with FEMA floodplain data, hurricane surge inundation data, and sea level rise inundation data (**Attachment C**).

Workshop Overview

Ryan Bennett, Brewster Planning Department, provided opening remarks, welcomed everyone to the workshop and reiterated the important role that the invited stakeholders had in determining a way

forward in the community with regards to preparing for future climate change. Following introductions and an overview of the MVP program and workshop agenda, participants listened to a presentation by MVP-certified facilitator Will Keefer, of HW, regarding climate change projections and their current and potential impacts on Brewster. Mr. Keefer shared the following workshop objectives:

- Define top local natural and climate-related hazards of concern.
- Identify existing and future strengths and vulnerabilities.
- Develop prioritized actions for Brewster.
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Additionally, the presentation highlighted specific challenges currently facing the Town in the light of climate change. Challenges discussed included weather events (e.g., Nor'easters, severe weather) that have caused power outages and flooded roads. The population of the community triples in size during the summer months, so the weather events and public health impacts exacerbated by climate change present major challenges during this time of year. Following this introduction, HW led a large group discussion to confirm the four primary climate change hazards identified by stakeholders through an online poll administered prior to the event. These hazards were used to frame the rest of the workshop. Further information regarding this topic is provided in Section 2.

The next phase of the workshop was conducted as small discussion groups. Groups were made up of an HW facilitator, a notetaker from the community or HW and five to six community stakeholders. The small groups began their discussions by listing environmental, societal and infrastructural features that represent either a vulnerability or a strength of the community with regards to anticipated climate change hazards. The notetaker in each group listed these items within the CRB Risk Matrix, a system for note taking developed as a part of the CRB Framework. Groups listed multiple features for each category, along with information about their location, ownership, and if the feature is a strength or vulnerability for the Town. **Attachment D** includes transcribed copies of each groups' risk matrices. When appropriate, the groups also marked these features on the base maps provided at each table (**Attachment E**).

Following a midday break, the small groups discussed action items for each feature. Action items could either be a way to protect a vulnerable feature from a negative impact, or a way to better utilize one of Brewster's strengths. Common action items suggested by participants included protecting critical infrastructure, mitigating stormwater challenges, developing plans and determining the best ways to prepare residents for the future impacts of climate change.

Each group then came to an agreement on four to six action items that they felt would most effectively address infrastructural, societal and environmental vulnerabilities in the Town or build on existing strengths. Then, a representative from each group presented their recommended action items, along with a brief summary of their group's discussion. Duplicative responses between groups were merged to generate a combined list of recommended action items from the four groups (**Attachment F**). From this list of recommended action items, workshop participants voted to generate a final list of seven high

priority action items that the Town of Brewster should embark upon to increase the resilience of the community in the face of anticipated climate change hazards.

These high priority action items are provided in **Attachment G** and are listed below, in no particular order:

1. Review and update Town bylaws and regulations to mitigate projected climate change impacts.
2. Develop and initiate projects to increase resilience to projected climate change impacts (e.g., intense rain, storm surge, sea level rise) for critical infrastructure including, but not limited to:
    - Route 6A from the intersection with Paines Creek Road west across causeway dividing the marsh
    - Stormwater drainage throughout Town
    - Potentially vulnerable utility infrastructure
3. Identify and initiate projects to provide back-up power at the Town Hall, Water Department and drinking water wells to provide critical infrastructure resilience to power outages.
4. Conduct a stormwater infrastructure inventory and assessment to prioritize and initiate improvements (e.g., increased catch basin maintenance, culvert replacement) based on projected climate change impacts.
5. Develop a Preparedness Campaign for the general public (i.e., residents and seasonal guests) and the private sector that includes guidance and checklists, as well as recommendations to increase community resilience to the impacts of climate change (e.g., extreme weather, health impacts).
6. Develop a Local Multi-Hazard Mitigation Plan that includes considerations for projected climate change impacts.
7. Review and update the Brewster Community Emergency Management Plan to include considerations for projected climate change impacts.
8. Conduct a vulnerability assessment, develop plans and initiate improvements at critical public beach access points in the community (e.g., town landings) to increase resilience to projected climate change impacts.

The results of each stage of the workshop are presented in the subsequent sections of this report and its attachments.

2. Top Climate Change Hazards of Concern

Prior to the March 28, 2019 workshop, the Team decided to provide an opportunity for stakeholders to choose the top four climate change hazards of concern through an online poll. This was done to build consensus prior to the workshop and to allow more time for small group discussion during the event. The following list presents the potential climate change hazards proposed to the stakeholder in the online poll:

- Intense rain/flooding
- Wind events
- Hurricanes or Nor'easters
- Winter storms
- Extreme cold
- Extreme heat/heat waves
- Fire
- Drought
- Coastal flooding/storm surge
- Sea level rise

Many of the attendees answered the poll and based on the survey results (**Figure 1**), the following climate change-related hazards were identified as the most significant to Brewster:

- Coastal flooding/storm surge
- Sea level rise
- Hurricanes or Nor'easters
- Intense rain/flooding

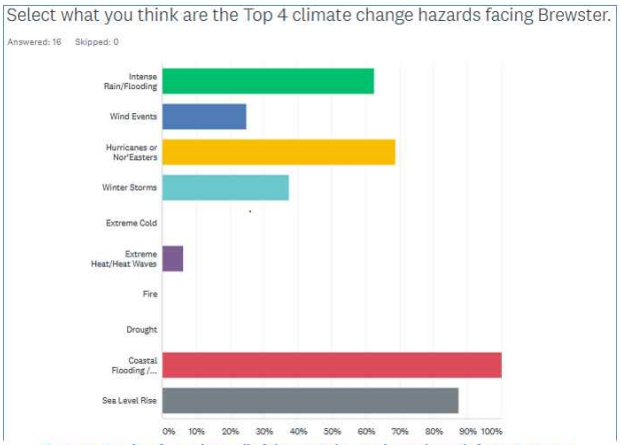

Figure 1: Results of an online poll of the top 4 climate change hazards facing Brewster.

HW led a large group discussion to confirm the four climate change hazards prior to the start of the small group breakout sessions. The participants agreed that the workshop should focus on these hazards but felt that it would be important to discuss additional long-term health hazards (e.g., increased insect borne disease) in the small groups if they came up as well.

3. Current Concerns and Challenges Presented by Climate Change Hazards

Brewster has experienced a number of climate- and weather-related challenges in recent years, and can expect to experience more severe events in the years to come due to climate change. For example, intense rain storms in 2017 and 2018 caused street flooding that limits the ability of people to get around. In March 2018 there were four Nor'easters that led to coastal flooding, storm surge, power outages and major travel disruptions. In addition, portions of Main Street (Route 6A) can flood during king tides (e.g., especially high spring tide).

During the small group discussions at the MVP workshop, many challenges, concerns and vulnerabilities for Brewster were identified and are listed in the CRB matrices in **Attachment D**. The most commonly cited vulnerabilities are summarized below:

- *Inland flooding due to heavy rain and sea level rise:* The stormwater network in Brewster can back up during heavy rain events, causing isolated flooding. Due to Brewster's proximity to the coast and low-lying topography, sea level rise will likely contribute to increased flooding in the future. Stakeholders identified the need for a comprehensive stormwater infrastructure inventory and assessment, including Considine Ditch to Wobbly Barn. For example, during intense rain events the Considine Ditch can flood and restrict access to the elementary schools. Similarly, workshop participants indicated that several Route 6A road projects are necessary to alleviate regular flooding issues, including those at Lower Road/Paine's Creek, at the Dennis line, and at the Orleans line. Raising Route 6A in these locations was recommended, as well as conducting a water flow and culvert analysis, and moving forward with actions recommended as a result of the Stormtide Pathways Project, a new flood mapping and preparedness project by Woods Hole Sea Grant and Barnstable County Cooperative Extension.

- *High wind events:* Winter snow storms and wind events experienced in the early months of 2018 caused widespread power outages throughout the community and drew significant attention to the risks to the power grid from future severe weather events. Many facilities have generators, but participants noted the need for additional generators at several key infrastructure locations including the Town Hall, Water Department and wells.
- *Emergency preparedness and communications:* Extreme weather can impact the communications systems used to reach residents in an emergency. Stakeholders noted the lack of redundancy in Brewster's communications and IT systems. There was an identified need to update Brewster's CEMP and to educate residents about what to do in case of weather-related emergencies. As part of this, participants noted that emergency sheltering needs and resources should be evaluated for both summer and off-season scenarios given the large shifts in population.
- *All hazards planning and regulatory review:* Stakeholders emphasized the need to move forward with the ongoing hazard mitigation planning process for the Town of Brewster to prepare for a variety of emergencies, including those that are weather-related. Similarly, participants indicated that there was a need to review and update regulations through the lens of climate change impacts to ensure that factors such as sea level rise and increased storm frequency are reflected in the bylaws and regulations.
- *Water quality and human health issues exacerbated by climate change:* Climate change, including warming temperatures, can negatively impact both fresh and salt water quality, by introducing excess nutrients during flooding and allowing the proliferation of invasive species. In addition, changes in temperature and weather patterns can increase the prevalence of disease-causing insects and associated illnesses (e.g., Lyme Disease, West Nile Virus). Participants noted the need for incorporating climate change impacts into water resource planning and public health outreach efforts. For example, current planning scenarios use a 25-year storm event, which participants believed was too low.
- *Coastal erosion:* The coastline in Brewster has experienced erosion over the past several decades, putting homes and infrastructure at risk, particularly beach parking lots. Brewster has implemented a managed retreat of parking lots in some areas in response to erosion issues. Participant suggested conducting a feasibility study for installing a living shoreline and mapping out options for marsh migration in response to sea level rise. In addition, sand migration has generally been from west to east, so beach is retreating in the western areas and accumulating in the eastern beaches.

4. Current Strengths and Assets

A number of strengths were also identified among the infrastructural, societal and environmental assets of the Town. These strengths were noted on the CRB Risk Matrices (**Attachment D**) and include:

Infrastructural:

- The Town opened a new fire station in 2018. The facility houses the new Town Emergency Operations Center (EOC) and has an emergency generator. Many other municipal buildings also have generators including the Brewster Ladies Library, the Police Department and the elementary schools.
- Most departments have a radio system to add a level of redundancy to the cell phones they normally rely on.
- Brewster has been involved in mapping stormtide pathways, a flood mapping and preparedness project.
- National Grid has begun gas line replacement in Brewster.
- Brewster is requesting bids for the construction of a new 10,000-gallon fuel depot.

Societal:

- Barnstable County has identified six regional emergency shelters as part of the Barnstable County Regional Sheltering Plan. The two that are closest to Brewster are Cape Cod Regional Technical High School and Nauset Regional High School. These have opened as a result of winter storms.
- The Town has many active churches, schools, committees and community organizations.
- The Town has prioritized the updating of its Hazard Mitigation Plan and Community Emergency Management Plan.
- The Brewster Housing Authority and long-term care facilities in the community have developed back up power plans.
- The Town uses Reverse 911, a mass notification system, to communicate with residents during an emergency. The system allows the Town to send emergency alerts through emails, phone calls and text messages to registered users.
- The town departments coordinate very well with each other and schedule annual preparedness exercises. Town departmental representatives staff an EOC when it is activated.

Environmental:

- The non-profit Brewster Conservation Trust seeks to preserve open space, natural resources and the rural character of Brewster.
- The Town relocated the parking lot at Breakwater Beach, restored the coastal beach and dune system to provide a natural buffer to storm and sea level rise impacts. The Town also installed a vegetated swale to help improve water quality by capturing and removing pollutants from stormwater runoff through two coastal resilience grants and matching community funding. More information about the project is available at https://www.mass.gov/service-details/brewster-relocation-of-vulnerable-infrastructure.
- The Town has excellent drinking water and has taken steps to protect its source water and educate customers about water conservation.
- The Brewster Department of Natural Resources sponsors an annual “Beautify Brewster Day” where town employees, friends, and neighbors volunteer to clean up the community.

- The Brewster Coastal Committee is developing a management plan for Brewster's coastal resources
- The Brewster Recreation Department works with local and state partners to provide leisure opportunities at the Town's beaches, parks and recreation facilities.

The identified strengths and assets are examples of features that should be protected and replicated throughout the community to protect against future impacts of climate change.

5. Top Recommendations to Improve Resilience

Following the presentation of each group's recommended action items to address vulnerabilities and build on existing strengths, workshop participants, along with the workshop facilitator, combined duplicative action items between groups to generate a combined list of recommended action items (**Attachment F**). From this combined list of recommended action items, workshop participants then voted to create a final list of seven high priority action items that Brewster should embark upon to increase the resilience of the community in the face of anticipated climate change hazards.

These seven high priority action items are included in **Attachment G** and are listed below, in no particular order:

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6. Conclusion and Next Steps

The Town held a formal public information and listening session at 4:30 PM on April 24, 2019 at the Brewster Ladies Library, 1822 Main Street, in Brewster. This session provided an opportunity for members of the public to learn, ask questions and provide feedback regarding the seven high priority action items that emerged from that March 28, 2019 MVP workshop. **Attachment H** provides a summary of discussion at the public listening session.

High priority action items identified during the March 28, 2019 MVP workshop will be integrated into existing municipal planning efforts and the Town will also consider pursuing grant funding to implement the high priority action items identified through the MVP workshop process to continue to improve the community's resilience to climate change.

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Attachment A: Brewster MVP Workshop Participants

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Attachment A: Brewster MVP Workshop Participants
March 28, 2019

COUNT	FIRST NAME	LAST NAME	AFFILIATION
1	Noelle	Aguiar	Conservation Agent
2	Paul	Anderson	Water Department
3	Abigail	Archer	Coastal Committee
4	Ryan	Bennett	Planning Department
5	Ned	Chatelain	Planning Board/Realtor
6	Lucas	Dinwiddie	Halcyon Farm
7	Heath	Eldredge	Police Department
8	R. Patrick	Ellis	Department of Public Works
9	Amy	Henderson	Brewster Conservation Trust
10	Kari	Hoffmann	Brewster Planning Board/Scribe
11	Jimmy	Jones	Department of Public Works
12	Donna	Kalinick	Town Administration/Scribe
13	Will	Keefer	Horsley Witten Group/Facilitator
14	Brian	Laverriere	Horsley Witten Group/Facilitator
15	Sherrie	McCullough	Health Department
16	Kelly	Moore	Horsley Witten Group/Scribe
17	Chris	Miller	Natural Resources
18	Robert	Moran	Fire Department
19	Tara	Nye Lewis	Horsley Witten Group/Facilitator
20	Sean	O'Brien	Barnstable County Regional Emergency Planning Committee
21	Carl	Simons	Horsley Witten Group/Facilitator
22	Victor	Staley	Building Department
23	Kevin	Varley	Fire Department
24	Tom	Vautin	Brewster Ponds Coalition
25	Tracey	Waters	Stonybrook Elementary
26	Buster	Waters	Stonybrook Elementary
27	April	Wobst	Association to Preserve Cape Cod

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Attachment B: Workshop Handouts

- Workshop Agenda
- Brewster MVP Workshop Overview Presentation Handout
- Climate Change Projections
- Selected Demographic Data
- Example Vulnerabilities and Strengths
- Key Recommendations from Various Local and Regional Plans

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Brewster Municipal Vulnerability Preparedness (MVP) Workshop Agenda

March 28, 2019

Captains Golf Course · 1000 Freemans Way · Brewster, MA 02631

TIME	ACTIVITIES
8:30 AM	**Arrival and Refreshments**
9:00 AM	**Welcoming Remarks** • Ryan Bennett, Brewster Planning Department
9:10 AM	**Introductions and Overview of the Workshop** • Will Keefer, Horsley Witten Group
9:20 AM	**Overview Presentation** on Science, Past Planning Efforts and Outcomes, and Data Resources Review recent climate related events. Present summary of anticipated climate changes. Present summary of recent/existing planning efforts
10:00 AM	**Discussion #1: Large Group** Identify top 4 Climate Change Hazards facing Brewster
10:15 AM	15 Minute Break
10:30 AM	**Discussion #2: Small Group** Identify Features that are Vulnerabilities and Strengths
12:00 PM	Lunch Break
1:00 PM	**Discussion #3: Small Group** Identify Actions to address Vulnerabilities or protect Strengths. Discuss timeframe, responsibility, funding, as time allows. Prioritize top 5-6 Actions
2:45 PM	15 Minute Break
3:00 PM	**Discussion #4: Small Groups Report Out** Each group reports out top 5-6 Priority Actions
3:30 PM	**Final Discussion: Large Group** Select top 5-6 Priority Actions for Municipal Climate Resilience Discuss timeframe, responsibility, funding
4:00 PM	**Wrap Up and Closing Remarks** • Ryan Bennett, Brewster Planning Department • Will Keefer, Horsley Witten Group
4:15 PM	**Adjourn**

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Horsley Witten Group
Sustainable Environmental Solutions

Brewster Municipal Vulnerability Preparedness (MVP) Grant Project:

CLIMATE CHANGE PROJECTIONS[1]

TEMPERATURE

HIGHLIGHTS:

- ✓ Temperature increases could make Brewster feel like present-day Maryland/Kansas by 2050 and present-day Tennessee by 2100.[2]
- ✓ By 2050, we could have 3 to 10 times more very hot days (over 90°F) than we do today. By 2100, we could have 4 to 35 times more.
- ✓ We will have far fewer days with temperatures below freezing.
- ✓ We will have to expend less energy on heating in the winter, and far more on air conditioning in the summer.
- ✓ The growing season could increase by 45% by 2050 and could increase by 87% by the end of the century.

Table 1: TEMPERATURE PROJECTIONS

Cape Cod Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	49.9	52.3 – 55.3	53.0 – 59.4
Maximum Annual Temperature (°F)	57.7	59.9 – 62.9	60.5 – 67.0
Minimum Annual Temperature (°F)	42.1	44.8 – 47.6	45.5 – 51.8
Annual Days with Max Temp over 90°F	1	3 – 10	4 – 35
Annual Days with Min Temp below 32°F	105	63 – 86	38 – 80
Annual Heating Degree-Days (Base 65°F)	5,957	4,583 – 5,271	3,785 – 5,103
Annual Cooling Degree-Days (Base 65°F)	436	660 – 1,037	750 – 1,662
Annual Growing Degree-Days (Base 50°F)	2,421	2,881 – 3,499	3,039 – 4,525

[1] Source: Northeast Climate Adaptation Science Center, 2018. *Massachusetts Climate Change Projections – Statewide and for Major Drainage Basins*. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. March. 215 p. Available at: http://www.resilientma.org/resources/resource::2152/massachusetts-climate-change-projections-statewide-and-for-major-drainage-basins. Data is for the Cape Cod Basin, which includes Brewster.

[2] NOAA National Centers for Environmental Information, Climate at a Glance: Statewide Mapping, Average Temperature Oct 2017 to Sept 2018, accessed November 16, 2018 at http://www.ncdc.noaa.gov/cag/.

PRECIPITATION

HIGHLIGHTS:

- ✓ Average annual precipitation in Brewster will increase up to 10% by 2050 and up to 12% by 2100.
- ✓ The largest increases in precipitation will occur in winter.
- ✓ The greatest increase in consecutive dry days will occur in the summer.

Table 2: PRECIPITATION PROJECTIONS

Cape Cod Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Total Precipitation (inches):			
Annual	44.9	44.5 – 49.4	44.1 – 50.4
Winter	11.6	11.4 – 13.2	11.6 – 14.7
Spring	11.5	11.2 – 13.2	11.6 – 14.0
Summer	10.2	9.1 – 11.9	8.0 – 11.9
Fall	11.6	10.6 – 12.7	10.1 – 12.9
Annual Days with Precipitation Over 1 Inch	7	8 – 10	8 – 10
Annual Days with Precipitation Over 2 Inches	1	1 – 2	1 – 2
Annual Days with Precipitation Over 4 Inches	<1	<1	<1
Annual Consecutive Dry Days	19	18 – 22	19 – 24

Brewster Municipal Vulnerability Preparedness (MVP) Grant Project:

SELECTED DEMOGRAPHIC DATA[1]

Demographic Parameter	Result
Population	9,822 people
Age	0-19 = 18% 20-34= 10% 35-64 = 43% 65+ = 29%
Income	<$40K = 26% $40-60K = 16% $60K+ = 58%
% Below Poverty Line	5%
Race	White = 97% Black = 1% Asian = 1% Other = 2%
Ethnicity	Hispanic = 2% Not Hispanic = 98%
Percent of Population over 65 Living Alone	7.4
Environmental Justice	0.0%
Heart Attack Hospitalizations	16.4 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits	27.7 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	10.7% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits	0.0 (age-adjusted rate per 10,000 people)

[1] Source: MA Dept of Public Health, 2018. MA Environmental Public Health Tracking Community Profile for Brewster. Report Created on November 15, 2018. 10 pages.

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Risk Matrix: Examples of Features that may be identified in this process:

INFRASTRUCTURE

Examples of Vulnerabilities:

- Main road floods during storms, blocking emergency response.
- Power outages during heat waves lead to health concerns.
- Wildfire and high winds resulting in supply chain interruptions.
- Sewer pump stations become submerged and inoperable.

Examples of Strengths:

- Critical road elevated and passable by emergency management
- Hurricane roof installed at school with improved sheltering capacity.
- Hardened utility lines reduce outages due to ice storms.
- Undersized culvert replaced to reduce flooding in key intersection.
- Improvement to communication systems during extreme weather.

SOCIETAL

Examples of Vulnerabilities:

- Senior housing without backup generators during heat waves.
- Residents without access to transportation during hurricane evacuation.
- Household contamination and sewage mobilization during flooding.
- Limited areas of refuge in elementary schools during severe weather.

Examples of Strengths:

- Reliable communications protocols across departments for all employees.
- “Neighbor-helping-neighbor” program aligned with emergency operations.
- Well-supported volunteer organizations (fire, ambulance, CERTs).
- Faith-based and civic groups with hazard preparedness plans.

ENVIRONMENTAL

Examples of Vulnerabilities:

- Beachfront development reducing protection provided by dunes.
- Proliferation of subdivisions in flood prone areas.
- Lack of urban tree canopy increasing heat island effect.

Examples of Strengths:

- Oyster reefs and tidal wetlands help reduce wave damage to property.
- Forested watersheds maintain drinking water supply during droughts.
- Native, vegetated slopes remain stable after intense 24hr rain events.
- Floodplains provide stormwater storage and downstream flood reduction

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Horsley Witten Group
Sustainable Environmental Solutions

Brewster Municipal Vulnerability Preparedness (MVP) Grant Project:

KEY RECOMMENDATIONS FROM PREVIOUS PLANNING DOCUMENTS

PLAN NAME	CATEGORY OF ACTION	RECOMMENDATION	HAZARD
Brewster Vision Plan (2018)	Structural, protection	Adapt to climate change projections and advance adaptation and resiliency techniques that are financially and environmentally sustainable. Identify techniques such as living shorelines, nourishment from dredged material, and land acquisition for retreat locations to adapt to coastal change. Provide outreach and education (signs, field trips, publications) to build awareness of citizens and decision makers about the nature of coastal change.	Hurricanes and nor'easters, sea level rise, coastal flooding, storm surge
Coastal Adaptation Strategy for the Town of Brewster, MA (2016)	Structural, protection	Support and protect coastal access for shellfish aquaculture and harvesting, and for emergency access.	Hurricanes and nor'easters, sea level rise, coastal flooding, storm surge
	Structural, protection	With periodic review of the management plans and methods, continue ongoing beach nourishment and dune protection projects (sand fencing, planting).	Hurricanes and nor'easters, sea level rise, coastal flooding, storm surge
	Structural, adaptation	Identify opportunities to promote and support wetland retreat to preserve the values that coastal wetland provides for mitigating storm impacts.	Hurricanes and nor'easters, sea level rise, coastal flooding, storm surge
	Research	Continue to conduct and gather additional data, research, and analyses on the impacts of climate change.	Hurricanes and nor'easters, sea level rise, coastal flooding, storm surge
	Management	Use adaptive management techniques to evaluate and update strategies.	All hazards

PLAN NAME	CATEGORY OF ACTION	RECOMMENDATION	HAZARD
Brewster Open Space and Recreation Plan (2014)	Land acquisition, protection	Objective 3.C. Acquire and preserve lands that mitigate natural hazards and increase Brewster's resilience to climate change impacts, including projected sea level rise. Action Items: 3.C.1. Finalize and adopt the town's draft Multi-Hazard Mitigation Plan. 3.C.2. Implement the action items identified in Brewster's Multi-Hazard Mitigation Plan. 3.C.3. Ensure that the local floodplain zoning district bylaw is consistent with federal and state regulations and FEMA regulations. 3.C.4. Monitor lands within areas that are vulnerable to coastal erosion, storm event flooding and sea level rise, and consider opportunities for purchasing these lands for open space as a way to minimize damage to structures and property. 3.C.5. Consider amendments to local bylaws and regulations that prohibit development and re-development within areas that are vulnerable to coastal erosion and flooding. 3.C.6. Incorporate climate change projections, including sea level rise and increased storm frequency and duration, into planning decisions for future open space acquisitions as well as development of recreational facilities.	Sea level rise, storm surge, coastal flooding, hurricanes and nor'easters
Barnstable County Cape Cod, MA Multi-Hazard Mitigation Plan (2010)	Government/policy	Formally adopt a County resolution to encourage and support ongoing hazard mitigation planning.	All hazards
	Mapping/inventory	Conduct a needs assessment of privately owned facilities that have regional importance (i.e., hospitals, airports, day care centers).	All hazards
	Government/policy	Establish the Hazard Mitigation Planning Working Group to facilitate and monitor implementation of the 2010 MHM Plan.	All hazards
	Government/policy	Support the development of Regional and Local Climate Adaptation Plans as an extension of the MHM Plan.	All hazards

PLAN NAME	CATEGORY OF ACTION	RECOMMENDATION	HAZARD
Barnstable County Cape Cod, MA Multi-Hazard Mitigation Plan (2010)	Mapping/inventory, emergency response, outreach	Conduct the following activities to prepare and protect Cape Cod's cultural resources from the damaging effects of natural hazards: • Identify key cultural resources for protection in hazard areas (museums, libraries, archival collections, significant public or institutional structures, concentrations of historic structure/districts) • Establish actions to reduce risk to these resources; educate cultural resource owners on how to lessen risk, secure funds for these projects. • Coordinate cultural resource information with emergency response personnel; develop an emergency response plan for prompt treatment of damaged resources.	All hazards
	Research/study	Conduct a Regional Sediment Management Study and develop a general guidance document to inform local sediment management planning and best practice management efforts.	Storm surge, coastal flooding, coastal erosion
Water Department System Study (2006)	Water Supply	Remaining Short-Term Improvement Improvements (Year 2006-2011) • GPW#6 Transmission Main – from GPW#6 to Slough Road via Black Duck Cartway • Red Top Road – water main to complete loop between Stony Brook Road and Satucket Road	All hazards
		Remaining Intermediate-Term Improvements (Year 2011-2020) • Damon and Griffith's Pond Road – water main to connect both roads • Pond Street – cross country water main between Pond Street and Pine Bluff Road • Route 6A (West Brewster) – replace existing 8-inch AC water main with 12-inch DI • Crowell's Bog/Jolly's Crossing/Fisherman's Landing Loop – loop back to Harwich Road	All hazards
		Remaining Long-Term Improvements (Year 2021-2030) • GPW#5 – Punk Horn Reserve gravel packed well, pump station and primary electric • Nickerson State Park Loop – connection between 16-inch main at Millstone Road and Flax Road. 8-inch AC on Cliff Pond and Windswept Roads • Southeast Loop Under Route 6 – water main from Pump Station #3, following cart paths under Route 6 to Timberlane Drive.	All hazards

PLAN NAME	CATEGORY OF ACTION	RECOMMENDATION	HAZARD
Brewster Integrated Water Resources Management Plan (IWRMP) – Phase 2 (2013)	Open Space Protection and Preservations	Continue to protect open space in sensitive watersheds and in Zone IIs to the Town's public supply wells	All hazards
	Water Supply	• Strengthen the water conservation by-law • Strengthen the Zoning By-law provisions for drinking water quality protection	All hazards
	Stormwater	• Implement a Stormwater Management By-law • Encourage Low Impact Development (LID) through Zoning By-laws and Subdivision Rules and Regulations	All hazards

EXISTING PROTECTION MEASURES FROM 2010 BARNSTABLE COUNTY MULTI-HAZARD MITIGATION PLAN

TYPE OF EXISTING PROTECTION MEASURES	DESCRIPTION	HAZARD
Risk and Vulnerability Assessment Map (RVAM)	Identifies critical facilities and infrastructure in a variety of categories.	All hazards
Cape Cod Atlas of Tidally Restricted Salt Marshes	Identifies salt marsh systems impaired by the restriction of tidal flow due to transportation-related facilities and cranberry bog infrastructure. These restrictions are important to hazard mitigation planning because they indicated where flooding could occur during a storm event.	Coastal flooding, sea level rise
Barnstable County Regional Emergency Planning Committee	BCREPC is charged with preparing for intentional and nonintentional hazardous materials emergencies through the development of a hazardous materials response plan, exercising of this response plan, training of first responders and the community to respond to these emergencies and by inventorying and locating reportable amounts of hazardous materials used by industry and other agencies within its jurisdiction. The BCREPC also coordinates preliminary emergency response efforts by communicating shelter and evacuation plans in advance of severe weather related events. The BCREPC, along with the Cape Cod Commission and the Barnstable County AmeriCorps program work to coordinate ongoing hazard mitigation planning efforts throughout the region.	All hazards

TYPE OF EXISTING PROTECTION MEASURES	DESCRIPTION	HAZARD
Barnstable County's AmeriCorps Cape Cod	AmeriCorps Cape Cod is a residential program addressing the regional environmental and disaster preparedness needs of Cape Cod. The program engages 26 trained, dedicated individuals. AmeriCorps members are trained annually in multiple American Red Cross Disaster Services Training Programs, including Disaster Services, Mass Care, Shelter Operations, Family Services, First Aid and CPR. Members are available 24 hours a day to respond to unexpected and emergency situations on an as-needed basis to situations occurring within the County. Community organizations have the opportunity to submit proposals for AmeriCorps assistance on an ongoing basis. In the past members have served as participants in simulations for emergency response teams, taught community disaster education programs, and inventoried emergency shelter kits. Also, members address projects in the realm of natural resources needs for mitigation of disasters such as assisting with the maintenance of herring runs, dune stabilization efforts, dead and down debris removal on conservation lands.	All hazards
Cape Cod Cooperative Extension's Wildfire Assessment and Preparedness Program	The County actively participates and budgets for ongoing maintenance of forest fire protection and preparedness plans. Tasks include maintaining an inventory of public lands for their potential hazard for forest fire, mapping vulnerable areas and surrounding development, compiling related meteorological data, maintaining management plans and educational materials, developing model land management regulations, and providing mini-grants to towns to create management plans.	Fire
Cape Cod Cooperative Extension and Cape Cod Commission – Technical Assistance Staff	The County employs two coastal processes and hazard mitigation specialists through the Cape Cod Cooperative Extension and the Cape Cod Commission. This staff has the expertise to provide technical assistance to towns, specifically related to shoreline change impacts, shoreline hazard mitigation, and coastal geology.	Sea level rise, coastal flooding, storm surge, coastal erosion
Regional Policy Plan	Provides goals and policies to provide both guidelines for evaluating Developments of Regional Impact (DRI) and a framework for the development and implementation of Local Comprehensive Plans (LCPs). The 2009 RPP includes a Coastal Hazard Mitigation goal (CR2) with minimum performance standards that restrict, and/or severely limit development in the coastal zone.	Sea level rise, coastal flooding, storm surge, coastal erosion
District of Critical Planning Concern	Management of critical resources – areas can be designated a DCPC and afforded heightened and targeted levels of protection through the creation of implementing regulations. Hazard districts could be created as the underlying reason for a specific DCPC. Six DCPCs presently exist in Barnstable County: Barnstable Growth Management DCPC, Barnstable; Bournedale DCPC, Bourne; Quivett Neck/Crowe's Pasture, Dennis; Black Beach/Great Sippewissett Marsh, Falmouth; Six Ponds, Harwich; and Three Ponds, Sandwich.	All hazards

TYPE OF EXISTING PROTECTION MEASURES	DESCRIPTION	HAZARD
Regional Intelligent Transportation System	A regional ITS architecture development process for southeastern Massachusetts is under way. ITS systems are defined as the application of advanced sensor, computer, computer technologies, and management strategies in integrated and interrelated systems to deliver transportation services. The architecture is a specific, tailored framework for ensuring integrated communication. The Cape Cod Commission transportation staff is pivotal in the development of this ITS system. Between 2003 and now, EOT/MHD (now MassDOT) has initiated "511" for traffic information, the statewide technical architecture is being updated this year and next so ITS equipment is compatible in communication/ emergency situations. Commission staff are working to get more cameras & real time traffic info available in the Canal area (beginning with the bridges).	All hazards
Cape Cod Emergency Traffic Plan	The Plan and its coordinating committee are organized by MEMA Region 1 in concert with the Massachusetts State Police and many other agencies to facilitate the egress of a high volume of traffic from Cape Cod in the event of a hurricane. As traffic levels build before the hurricane arrives, direct access to and from off-Cape locations will be restricted at the bridges in order to allow vehicles to continue north from the bridges unimpeded. At higher traffic levels, and as bridge flows warrant (e.g., lower demand at Bourne Bridge than at Sagamore Bridge), traffic on Route 6 destined for Routes 25 & 495 would be diverted through the Massachusetts Military Reservation (MMR). When sustained winds reach 80 mph, the bridges will be closed and the motorists will have the option of going to designated emergency parking areas in the MMR and to be shuttled to shelter in the MMR.	All hazards
Barnstable County Hazard Mitigation Working Group	Formation of the Barnstable County Hazard Mitigation Working Group is a recommendation of the 2010 MHM Plan. The working group is comprised of representatives from the BCREPC, the CCC and AmeriCorps. The goal of this working group is to better coordinate implementation of the regional hazard mitigation strategy. Most of the action items from the 2004 PDM Plan have been implemented, or are “ongoing” within various county agencies and departments. The status of these efforts across county agencies is often unclear and educational initiatives and grant pursuits could use better coordination. The working group will meet bi-annually to better communicate educational initiatives, grant opportunities, and general implementation strategy progress.	All hazards
Model Bylaw for Effectively Managing Coastal Floodplain Development	The Cape Cod Commission and the Cape Cod Cooperative Extension, in partnership with the WHOI Sea Grant Program, developed a model coastal floodplain bylaw to comprehensively restrict or severely limit development with the coastal zone. The CCC will be introducing the bylaw to towns to encourage local adoption.	Sea level rise, coastal flooding, storm surge, coastal erosion

REGIONAL GOALS FROM 2010 BARNSTABLE COUNTY MULTI-HAZARD MITIGATION PLAN

1. Increase coordination between the State, the County and the local governments of Cape Cod in pre-disaster planning and continuous hazard mitigation implementation.
2. Assist local governments with the preparation of a Local Multi-Hazard Mitigation Plan to ensure that all 15 towns on Cape Cod qualify for available pre- and post- disaster mitigation grant funding.
3. Increase awareness and support for hazard mitigation among regional agencies, municipalities, private organizations, businesses, and the general public of Cape Cod through a multi-faceted education program. Promote educational opportunities to introduce residents and visitors to the risks of natural hazards, including climate change, and the various appropriate mitigation and adaptation strategies that can be taken.
4. Implement a broad range of programs and projects that promote Cape Cod's mitigation strategy and therefore safeguard the most vulnerable regional populations, critical facilities and infrastructure, and the natural, cultural, and economic resources, and reduce financial losses.
5. Utilize risk assessment, mitigation, and loss estimation modeling technology and software in future hazard mitigation planning work and in future updates of the Barnstable County MHM Plan, as relevant and available.
6. Protect critical public facilities and services from hazard damage.
7. Make efficient use of grant funds for hazard mitigation by protecting critical public facilities and services from hazard damage; prioritizing hazard mitigation activities by utilizing cost-benefit analysis; purchasing property in hazard-prone locations; and preserving natural, cultural, and historic resources in hazard-prone areas.
8. Identify and implement a mitigation strategy to protect the economic vitality of businesses.
9. Utilize existing funding and seek new funding sources to expand the scope of this MHM plan beyond natural hazards to include climate change and adaptation planning, and to make hazard mitigation projects and activities a priority of the region and Barnstable County government.
10. Continually analyze and improve this plan's effectiveness in terms of implementing the mitigation strategy in this plan.
11. Increase the number of Cape Cod towns participating in the Community Rating System.
12. Continue funding and participating in active hazard mitigation programs and initiatives.
13. Assist towns in the identification and development of specific mitigation projects.
14. Increase each town's capacity for dealing with natural hazard events by promoting the adequate provision of emergency services and response capabilities.

Municipal Vulnerability Preparedness Program Workshop - Brewster

Will Keefer, MVP Certified
Senior Environmental Planner

Horsley Witten Group
March 28, 2019

1

Administration and Housekeeping

- Sign-in sheet and name badges
- Location of emergency exits
- Location of restrooms
- Refreshments and Lunch – Thank you Brewster!

2

Brewster Core Planning Team

Name	Representing
Paul Anderson	Water Department
Ryan Bennett	Planning Department
Susan Broderick	Town Administration
Robert Crowley	Water Department
Heath Eldredge	Police Department
R. Patrick Ellis	Department of Public Works
Pat Hughes	Coastal Committee
Donna Kalinick	Town Administration
Chris Miller	Natural Resources
Robert Moran	Fire Department
Victor Staley	Building Department
Will Keefer	Horsley Witten Group (HW)

3

Introductions

- ✓Name
- ✓Organization

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4

Handouts – handy reference info

- Agenda
- Overview Presentation Slides
- Climate Change Projections Data (Temp, Precipitation, Sea Level Rise)
- Examples of Vulnerabilities and Strengths
- Selected Demographic Data about Brewster
- Prior Recommendations from the multiple town and regional plans
- Maps

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Vulnerability, Resilience & Adaptation

Vulnerability:	the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes
Resilience:	the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions
Adaptation:	the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities

Horsley Witten Group (Source: IPCC Definitions)

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Governor Baker's Executive Order 569 & Recent Climate Change Legislation

- September 2016, directed the state to assist municipalities to reduce vulnerability and improve resilience to climate change
- March 15, 2018: *An Act Promoting Climate Change Adaptation, Environmental and Natural Resource Protection and Investment in Recreational Assets and Opportunity*
  - $1.4B to climate change preparedness, environmental protection and community investments

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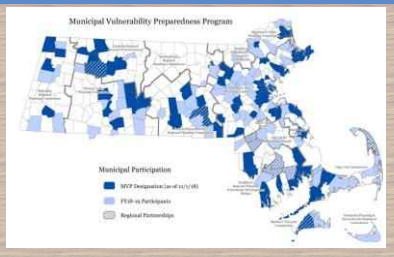
MVP Grantees



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Why Conduct an MVP Workshop?

- The Municipal Vulnerability Preparedness grant program (MVP) provides support for cities and towns in Massachusetts to begin the process of planning for climate change resiliency and implementing priority projects.
- Brewster received a $20,000 grant for this workshop.
- Communities who complete the MVP program become certified as an MVP community and are eligible for MVP Action grant funding and other opportunities.
- June 2018 – State awarded $5 million in funding with grants ranging from $8,000 - $400,000

- Examples of MVP Action Grant Funding:
  - Detailed Vulnerability and Risk Assessment
  - Public Education and Communication
  - Local Bylaws, Ordinances, Plans, and other Management Measures
  - Redesigns and retrofits
  - Nature-Based Storm-Damage Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques
  - Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
  - Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
  - Ecological Restoration and Habitat Management to Increase Resiliency

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www.resilientma.org

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Massachusetts State Hazard Mitigation and Climate Adaptation Plan

Completed in September 2018

Available at: https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan

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Purpose of today's workshop

Draw upon YOUR knowledge…..

What are the

MOST IMPORTANT THINGS

that Brewster should be doing

to reduce vulnerability and increase resilience?

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Resilience & Adaptation

Goal for the Day

To identify the 5-6 Highest Priority actions
that the Town of Brewster should take
to increase ***resilience*** and ***adapt*** to climate change

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The Plan for Today – vibrant small group discussions

- Presentation to **set the stage** for our discussion
- Determine which **climate change hazards** to focus on
- Identify the most **vulnerable features** in Brewster
- Identify the **features that provide strength**
- Develop **actions** – what can the Town do to address vulnerabilities and protect/enhance strengths?
- Prioritize the **most important actions** for Brewster

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SO, who's in the room today? Who….

- Has had a conversation in the past week about weird weather?
- Has had to respond to a weather-related emergency on the job? At home?
- Has ever been diverted on their way to work/home by flooded roads?
- Is employed by the Town of Brewster?
- Volunteers your time on a Town board or committee?
- Participated in the development of a town or regional plan?

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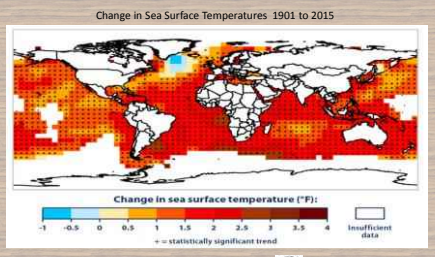
Climate Change - Global



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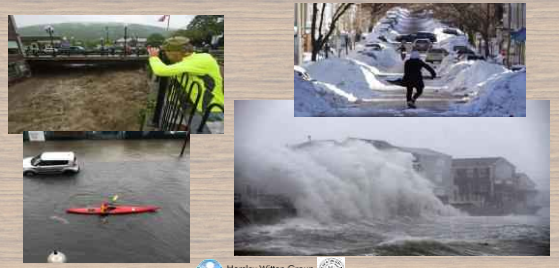
Climate Change – New England



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Local Impacts of Climate Change – Intense Rain

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Local Impacts of Climate Change – Winter Storms

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Local Impacts of Climate Change – Sea Level Rise and Coastal Flooding

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Local Impacts of Climate Change – Coastal Erosion

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Barnstable County – Presidential Major Disaster Declarations

- April 15 – 25, 2007: Severe Storms
- August 27 – 29, 2011: Hurricane Irene
- October 27 – November 8, 2012: Superstorm Sandy
- February 8 – 9, 2013: Winter Storm
- January 26 – 28, 2015: Winter Storm
- March 2 – 3, 2018: Winter Storm

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Climate Projecti

Similar to Maryland

Similar to Tennessee

Massachusetts

Table 1: TEMPERATURE PR

Cape Cod Basin Climate Par			End of Century (2090s)
Average Annual Temperatur			53.0 – 59.4
Maximum Annual Temperat			60.5 – 67.0
Minimum Annual Temperatu			45.5 – 51.8
Annual Days with Max Temp			4 – 35
Annual Days with Min Temp 32°F			38 – 80
Annual Heating Degree-Days (Base 65°F)		71	3,785 – 5,103
Annual Cooling Degree-Days (Base 65°F)		7	750 – 1,662
Annual Growing Degree-Day (Base 50°F)		99	3,039 – 4,525

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Climate Projections

3-10X as many very hot days

4-35X as many very hot days

Table 1: TEMPERATURE PROJECTIONS

Cape Cod Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	49.9	52.3 – 55.3	53.0 – 59.4
Maximum Annual Temperature (°F)	57.7	59.9 – 62.9	60.5 – 67.0
Minimum Annual Temperature (°F)	42.1	44.8 – 47.6	45.5 – 51.8
Annual Days with Max Temp over 90°F	1	3 – 10	4 – 35
Annual Days with Min Temp below 32°F	105	63 – 86	38 – 80
Annual Heating Degree-Days (Base 65°F)	5,957	4,583 – 5,271	3,785 – 5,103
Annual Cooling Degree-Days (Base 65°F)	436	660 – 1,037	750 – 1,662
Annual Growing Degree-Days (Base 50°F)	2,421	2,881 – 3,499	3,039 – 4,525

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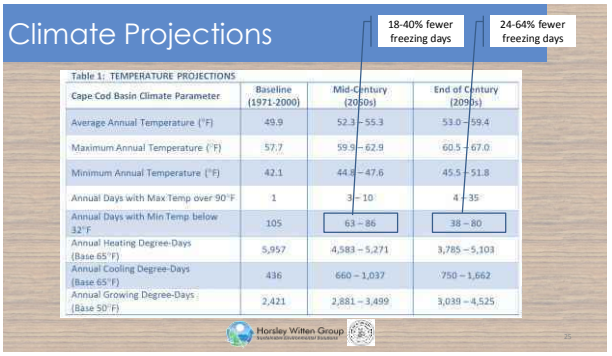
Climate Projections
18-40% fewer freezing days
24-64% fewer freezing days
Table 1: TEMPERATURE PROJECTIONS
Cape Cod Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
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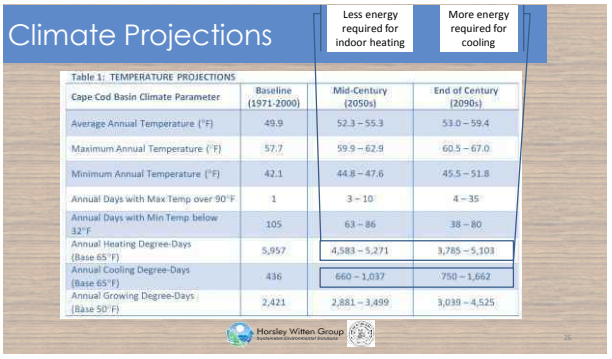
Climate Projections
Less energy required for indoor heating
More energy required for cooling
Table 1: TEMPERATURE PROJECTIONS
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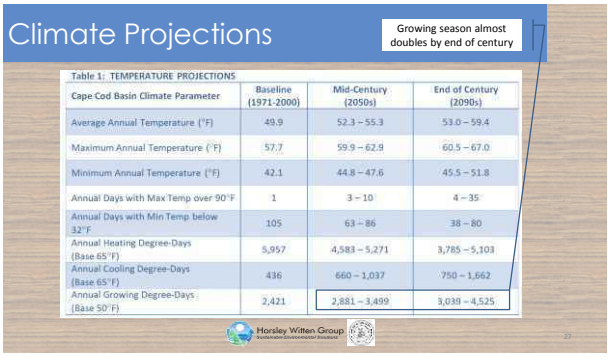
Climate Projections
Growing season almost doubles by end of century
Table 1: TEMPERATURE PROJECTIONS
Cape Cod Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
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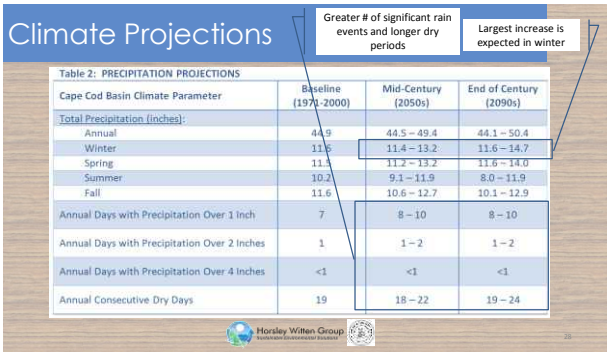
Climate Projections
Greater # of significant rain events and longer dry periods
Largest increase is expected in winter
Table 2: PRECIPITATION PROJECTIONS
Cape Cod Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
Total Precipitation (inches):
Annual | 44.9 | 44.5 – 49.4 | 44.1 – 50.4
Winter | 11.5 | 11.4 – 13.2 | 11.6 – 14.7
Spring | 11.5 | 11.2 – 13.2 | 11.6 – 14.0
Summer | 10.2 | 9.1 – 11.9 | 8.0 – 11.9
Fall | 11.6 | 10.6 – 12.7 | 10.1 – 12.9
Annual Days with Precipitation Over 1 Inch | 7 | 8 – 10 | 8 – 10
Annual Days with Precipitation Over 2 Inches | 1 | 1 – 2 | 1 – 2
Annual Days with Precipitation Over 4 Inches | <1 | <1 | <1
Annual Consecutive Dry Days | 19 | 18 – 22 | 19 – 24
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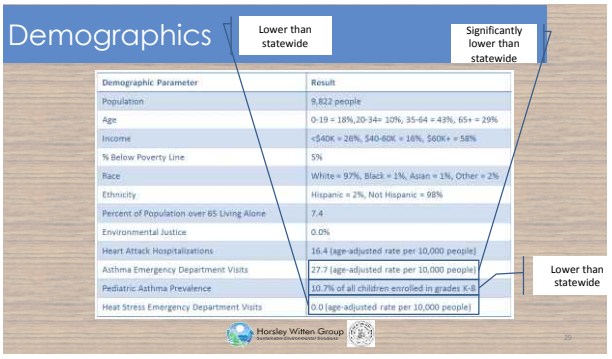
Demographics
Lower than statewide
Significantly lower than statewide
Demographic Parameter | Result
Population | 9,822 people
Age | 0-19 = 18%, 20-34= 10%, 35-64 = 43%, 65+ = 29%
Income | <$40K = 26%, $40-60K = 16%, $60K+ = 58%
% Below Poverty Line | 5%
Race | White = 97%, Black = 1%, Asian = 1%, Other = 2%
Ethnicity | Hispanic = 2%, Not Hispanic = 98%
Percent of Population over 65 Living Alone | 7.4
Environmental Justice | 0.0%
Heart Attack Hospitalizations | 16.4 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits | 27.7 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence | 10.7% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits | 0.0 (age-adjusted rate per 10,000 people)
Lower than statewide
Horsley Witten Group

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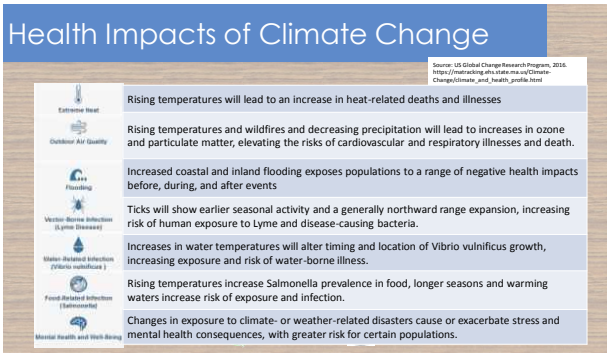
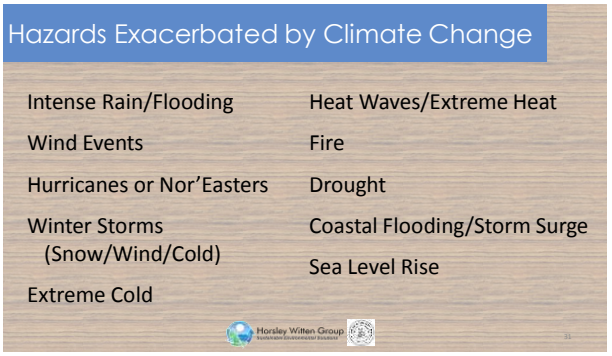

Health Impacts of Climate Change
Source: US Global Change Research Program, 2016. https://matracking.ehs.state.ma.us/Climate-Change/climate_and_health_profile.html
Extreme Heat
Rising temperatures will lead to an increase in heat-related deaths and illnesses
Outdoor Air Quality
Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding
Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events
Vector-Borne Infection (Lyme Disease)
Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme and disease-causing bacteria.
Water-Related Infection (Vibrio vulnificus)
Increases in water temperatures will alter timing and location of Vibrio vulnificus growth, increasing exposure and risk of water-borne illness.
Food-Related Infection (Salmonella)
Rising temperatures increase Salmonella prevalence in food, longer seasons and warming waters increase risk of exposure and infection.
Mental Health and Well-Being
Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

30


Hazards Exacerbated by Climate Change
Intense Rain/Flooding
Wind Events
Hurricanes or Nor'Easters
Winter Storms (Snow/Wind/Cold)
Extreme Cold
Heat Waves/Extreme Heat
Fire
Drought
Coastal Flooding/Storm Surge
Sea Level Rise
Horsley Witten Group

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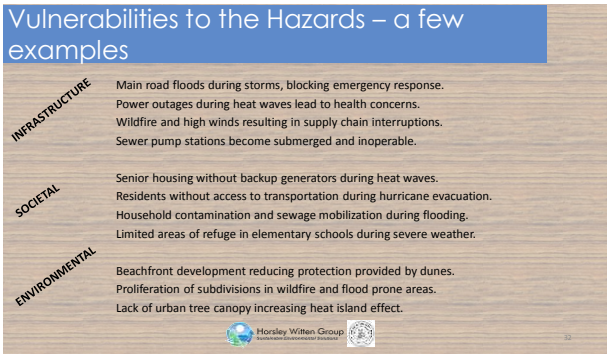
Vulnerabilities to the Hazards – a few examples
INFRASTRUCTURE
Main road floods during storms, blocking emergency response.
Power outages during heat waves lead to health concerns.
Wildfire and high winds resulting in supply chain interruptions.
Sewer pump stations become submerged and inoperable.
SOCIETAL
Senior housing without backup generators during heat waves.
Residents without access to transportation during hurricane evacuation.
Household contamination and sewage mobilization during flooding.
Limited areas of refuge in elementary schools during severe weather.
ENVIRONMENTAL
Beachfront development reducing protection provided by dunes.
Proliferation of subdivisions in wildfire and flood prone areas.
Lack of urban tree canopy increasing heat island effect.
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Strengths that help mitigate impacts – a few examples
INFRASTRUCTURE
Critical road elevated and passable by emergency management
Hurricane roof installed at school with improved sheltering capacity.
Hardened utility lines reduce outages due to ice storms.
Undersized culvert replaced to reduce flooding in key intersection.
SOCIETAL
Reliable communications protocols across departments for all employees.
"Neighbor-helping-neighbor" program aligned with emergency operations.
Faith-based and civic groups with hazard preparedness plans.
ENVIRONMENTAL
Oyster reefs and tidal wetlands help reduce wave damage to property.
Forested watersheds maintain drinking water supply during droughts.
Native, vegetated slopes remain stable after intense 24hr rain events.
Floodplains provide stormwater storage and downstream flood reduction
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What Types of Actions Could We Take?

Engineering/Construction
Protection/Conservation
Retreat/Avoidance
Preparations/Planning
Policy/Regulatory Changes
[Short-term, Long-term, ongoing]

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Some Recommendations From Town and Regional Plans

- Adapt to climate change projections and advance adaptation and resiliency techniques that are financially and environmentally sustainable
- With periodic review of the management plans and methods, continue ongoing beach nourishment and dune protection projects (sand fencing, planting)
- Identify opportunities to promote and support wetland retreat to preserve the values that coastal wetland provides for mitigating storm impacts
- Acquire and preserve lands that mitigate natural hazards and increase Brewster's resilience to climate change impacts, including projected sea level rise.
- Conduct a needs assessment of privately owned facilities that have regional importance (i.e., hospitals, airports, day care centers).

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Ground Rules for Small Group Discussions

Share the stage: Everyone should have an equal opportunity to talk.

Focus: Focus on the questions asked and your group's discussion.

Land the plane: Respect limited time.

Respect: Listen, be honest, and avoid criticizing others' ideas.

One mic: One person speaks at a time.

Phone etiquette: Phones are off or on vibrate, take calls in the hall.

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Large Group Discussion #1:

Let's confirm the 4 natural hazards that are most important to Brewster to focus on today.

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What Natural Hazards are most important to Brewster?

- Intense Rain/Flooding
- Wind Events
- Hurricanes or Nor'Easters
- Winter Storms (Snow/Wind/Cold)
- Extreme Cold
- Heat Waves/Extreme Heat
- Fire
- Drought
- Coastal Flooding/Storm Surge
- Sea Level Rise

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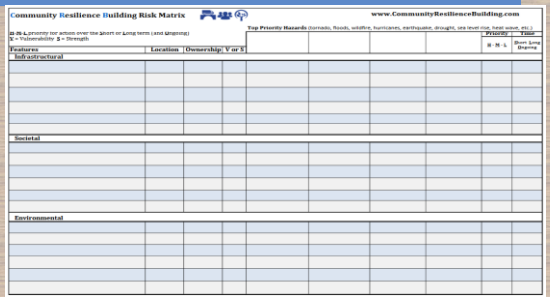
Discussion Matrix


Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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

Priority: H - M - L

Time: Short Long Ongoing

Features | Location | Ownership: Y or N

Infrastructural

Societal

Environmental

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Maps Provided

Horsley Witten Group

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Thank You!

Will Keefer, MVP Certified
Senior Environmental Planner
wkeefer@horsleywitten.com

Horsley Witten Group

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Attachment C: Brewster Base Maps

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ID #	Critical Facilty or Infrastructure	Address	Town	Facility Type
1	Police Department	631 Harwich Road	Brewster	A,B
2	Eddy Elementary School	2298 Main Street	Brewster	A,G,I
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5	Cape Cod Sea Camps	3057 Main Street	Brewster	A,I
6	Our Lady of the Cape Catholic Church	468 Stonybrook Road	Brewster	A
7	Fire Department/Emergency Operations Center	1671 Main Street	Brewster	A,B,C
8	Brewster Medical Association	20 Granite State Court	Brewster	C
9	Town Hall	2198 Main Street	Brewster	D
10	Department of Public Works/Brewster Recycling Center/Solar Array	201 Run Hill Road	Brewster	D,F
11	Water Department/Solar Array	165 Commerce Park Road	Brewster	D
12	Housing Authority	11 Frederick Way	Brewster	D
13	Brewster Ladies' Library	1822 Main Street	Brewster	D
14	Latham School	1646 Main Street	Brewster	G,I
15	The Family School and Salt Box School	3570 Main Street	Brewster	G,I
16	EPOCH Senior Healthcare of Brewster	873 Harwich Road	Brewster	H
17	The Woodlands at Pleasant Bay/Pleasant Bay Nursing and Rehabilitation Center/Owl Moon Child Care Center	383 South Orleans Road	Brewster	H,I
18	ABC Nursery School	2896 Main Street	Brewster	I
19	The Laurel School	1436 Long Pond Road	Brewster	I
20	Camp Favorite	208 Crowells Bog Road	Brewster	J
21	Camp Nan Ki Rafe	165 Nan-Ke-Rafe Path	Brewster	J
22	Camp Mitton	46 Featherbed Lane	Brewster	J
23	Animal Rescue League of Boston - Brewster Shelter	3981 Route 6A	Brewster	K
24	Wild Care	84 Underpass Road	Brewster	K
25	Brewster Veterinary Hospital	56 Underpass Road	Brewster	K
26	Council on Aging	1673 Main Street	Brewster	J
27	Maplewood Memory Care Facility	820 Harwich Road	Brewster	I,J
28	Brewster Baptist Church (Election Center)	1848 Main Street	Brewster	J
29	Ocean Edge Resort - Mansion	2907 Main Street	Brewster	J
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31	Nickerson State Park	3488 Main Street	Brewster	J
32	Brewster Water Standpipes (Storage Tanks)	23 Yankee Drive	Brewster	E
33	Brewster Well #1/Lime Station #1	546 Freemans Way	Brewster	E
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35	Brewster Well #3/Lime Station #3	811 Freemans Way	Brewster	E
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37	Brewster Well #6	379 West Gate Road	Brewster	E
38	Captains Golf Course	1000 Freemans Way	Brewster	J
39	MA-6A/Stony Brook Culvert	15 Lower Rd	Brewster	E
40	MA-6A/Stony Brook Tributary Culvert	869 Main Street	Brewster	E

Critical Facilities and Infrastructure:

- **A** Emergency Facilities/Shelters
- **B** Public Safety Facilities
- **C** Hospitals/Acute Care Facilities
- **D** Town Government Facilities
- **E** Water Infrastructure
- **F** Hazardous Materials Facilities
- **G** Schools
- **H** Nursing Homes/Elderly Housing
- **I** Group Day Care Facilities
- **J** Senior/Youth/Recreation Centers
- **K** Designated Emergency Animal Shelters/Hospitals
- **L** Marinas/Boat Yards

Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

N

W

E

S

0 0.375 0.75 1.5 Miles

Legend

- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Flood Hazard Area
eff. 07/16/2014

- 100 Year Flood Area (AE Zone)
- 100 Year Flood Area (VE Zone)
- 500 Year Flood Area

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90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Brewster, MA
Critical Infrastructure and FEMA Flood Zones

Date: 3/19/2019

Figure 1

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- L Marinas/Boat Yards

Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

DENNIS

HARWICH

ORLEANS

N W E S

0 0.375 0.75 1.5 Miles

Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Hurrican Surge Inundation
SLOSH, 2013 (NWS)
- Category 1
- Category 2
- Category 3
- Category 4

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Brewster, MA
Critical Infrastructure and Hurricane Surge Inundation

Date: 3/19/2019 Figure 2

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Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

N W E S

0 0.375 0.75 1.5 Miles

Legend

- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

3 foot Sea Level Rise

Cause of Flooding

- Connected to Coast
- Depression

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Brewster, MA
Critical Infrastructure and Sea Level Rise

Date: 3/19/2019 Figure 3

Attachment C: Brewster Base Maps

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Attachment D: All Groups – Completed Risk Matrices

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Community Resilience Building Risk Matrix

Group 1: Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
New fire station, new generator, EOC	Route 6A	Town	S	EOC puts out policy statement and public info, coordination planning (*)					
Community systems radios	Town-wide	Town, county emergency services	S	Verify all generators fuel source, efficiency and life span and clean energy, coordination planning (*)					
Public information system, how do you push info out, police, reverse 911	Town-wide	Town	S/V	Expand reverse 911 to cell phones, public info campaign to sign people up/expand regionally, coordination planning (*)					
Route 6 at Lower Road near CC Museum, people get stuck	West Brewster	State, town	V	Roadway elevation project				H	
Brewster Ladies Library (has generator)	Route 6A	Town	S						
Nursing homes, assisted living	Close to PD, more remote	Maplewood, Wingate, Woodlands/PB	S/V	Coordinate needs and concern with town, coordination planning (*)					
Police department generator(former EOC)	124	Town	S						
Elementary schools (generators), Eddy School and Stony Brook Elementary	Route 6A	Town	S/V	Explore access between schools (Considine ditch flooding)					
Beach landings	Along 6A	Town, private	V	Coordinated study, beach nourishment, public/private					
Considine ditch, CC mosquito control	Town-wide	Town, private	V	Feasibility study of capacity issues in light of new risks				H	
Elderly housing (Brewster Housing Authority), common room generator	Brewster Rd, off 6A	Housing authority, state, federal	S/V	Coordinate needs and concerns with town, coordination planning (*)					
Energy/solar battery storage	Various Locations	Town, private	S/V	Understand how all solar can be used to create backup energy storage					
Water systems, wells, treatment plants, water mains in dunes, outfall pipes	Town-wide	Town	S/V	Map and relocate pipes, long term plan					
Coastal properties	Bayfront	Town, private	S/V	Designate coastal hazard zone or conservancy district					

Community Resilience Building Risk Matrix

Group 1: Action Items

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time Short Long Ongoing
Societal									
Community networking, public education and outreach about emergency resources (by precinct)	Town-wide	Public, private	S/V						
Camps, sea camps, boy scouts, family school	6A	Private	V	Understand their preparedness, plans and coordinate (larger summer population), issues: sheltering, evacuation, and roles					
Nickerson State Park (shelter in place), overflow for county shelters	6A	DCR State	V	Understand their preparedness, plans and coordinate (larger summer population), issues: sheltering, evacuation, and roles					
Ocean Edge, shelter in place	6A	Private	S/V	Understand their preparedness, plans and coordinate (larger summer population), issues: sheltering, evacuation, and roles					
Path between schools	Stony/Eddy	Town	V	Improve access					
Shelters, (County), transportation, focused on winter	CC tech NHS	Regional	S/V	Review of sheltering plans: are we taking into consideration summer population, more focused on winter? What about locally in town				H	
Public policy regarding long term public health issues		Town/state							
Churches (a lot), what are their independent plans - emergency	Town-wide		S/V	Levels of preparedness					
No harbor access, water goes out, how do you get out/Sesuit Rock Harbor				Maintain and strengthen mutual aid agreements, coordinate with Dennis and Orleans					
Hazard Mitigation Plan		Town	S/V	2010 needs to be updated (already in progress)					
Environmental									
Ponds, algae blooms, communication about sampling, similar to the bloomWatch application (https://cyanos.org/bloomwatch/)	Town-wide	Public, private	S/V	bloomWatch App, public info education warning response system - toxic blooms, framework platform for communication				H	
Increased tick/mosquito born illnesses	Town-wide	Regional	V	Framework platform for communication, public info and education (summer visitors)					
Erosion at beaches/landing, public access	Coast	Town, private	V	See infrastructure solution/action, coordination public/private, evaluation and analysis					
Renourishment efforts/soft solutions, restoration of dunes/retreat, sand moving west to east	Coast	Public, private	S/V	See infrastructure solution/action, coordination public/private, evaluation and analysis, more coordinated effort					
Shellfishing		Town, private, placement	S						

Community Resilience Building Risk Matrix

Group 1: Action Items

www.CommunityResilienceBuilding.org

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time Short Long Ongoing
Culverts (flooding by design)	Crosby, Paines Creek, Bettys curve, Route 6A/Lower Road intersection, Town triangle area			Conduct a vulnerability assessment of catch basins, culverts, indentify green solutions, use GIS overlays (MS4)				H	
Stormwater catch basins, more green solutions	Town-wide		S/V						
Town bylaw zoning, current 25 year storm event threshold			V	Update zoning bylaw 25 year storm event, increase to 100 year					
Pests: gypsy moths, winter moths, tree canopies, spraying (Punkhorn and Nickerson hit hard)	Town-wide		V	Framework platform for communication, public info and education, forest management plan					
Zoning - revise in coastal zones to handle vulnerability, limit size				Looking at zoning redevelopment in coastal zones				H	
Wetlands Act, Conservation Commission				Model climate change bylaw (Wellfleet), analyze Conservation Commission permits, how much sand has been used and areas, analyze Conservation Commission permits, convert to data reports					

Community Resilience Building Risk Matrix

Group 2: Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
Stony Brook Culvert #39 and #40, flooding - causeway!!	Route 6A	State	V	Elevate sections of roads					
Quivet Creek culvert/Bound Creek undersized culvert	6A Brewster/ Dennis line	State	V	Elevate sections of road/increase flow					
Majority of 6A has elevation	6A	State	S				State: ongoing monitoring of elevated areas		
Stormtide Pathway Project	North side of Cape Cod	County	S	Further study and implementation					
Major drainage ditch areas, Considine ditch/Swamp Road, Freeman's Pond (undersized, aged, private property)	Breakwater, Freeman's Pond	Town	V	Further study of Considine ditch and other drainage ditches and implementation			Reduce flooding in residential and commercial areas of north central Brewster		
Current stormwater system aging, undersized for current weather events		Town	V	Redefine stormwater parameters, implement during on going maintenance and upgrades/road reconstruction					
Town bylaws need updating (development/top priority hazards)		Town	V	TOB Board representatives and department reps review town bylaws, policies, regulations through the lens of climate change					
Flooding 124 Rte Brewster/Harwich (shelter route, route to route 6 EMS)	124 Route Brewster/ Harwich	Town	V	Coordinate with Harwich on solution to flooding zone of 124; encourage Harwich to become MVP					
Hardening of power source; dated systems on Cape	Brewster and all Cape	Eversource	V	Coordinate with Eversource; work with them; prioritize issues					
Fueling issues, personal and town employees		Brewster	V	Move forward with town fuel depot plans, prioritize, ID alternative fuel sources					
Societal									
Police wellness check system YOYO-72!!	Town-wide	Brewster	S	Educate, educate, communication, check on neighbors, be familiar with special needs populations, emergency notification systems, reverse 911, outreach, pre-planning					
Continuous education, aging population, self identifying, disabilities, special needs populations, hearing impaired, medical needs (O2), meds, blind, traffic management, involving other communities, regional approach	Town-wide	Brewster	S/V						
Seasonal populations - who hire, when (Ocean edge camps, Nickerson)			V						
Resilient power/communications			V						
Education, school, police, safety, fire, communication			S						
Long term care facilities, back up plans, housing authorities			S/V	Examine emergency plans, update, drill, etc.					
Basic emergency supplies for extending emergency, food, gas, pharmacies, etc.		Town	V	Education; teaching population that they need to learn to be prepared as best they can					
Volunteer #s, lack of			V	Education; promoting the good volunteer groups can do, est. a CERT team in town					
Beach parking lot access (economical issues)			V	Continue planning for alternative parking; satellite parking - more accessible (bike trails)					
Private property vulnerabilities, ability to respond, homeowner responsibility				Maintaining trees on private property for storm events and emergency passage					
Environmental									

Community Resilience Building Risk Matrix

Group 2: Action Items

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time Short Long Ongoing
Salt marsh provides protection	6A	Town	S/V	Prevent storm damage to some extent and evaluate thin layer deposition					
Stormwater "run off" not flooding		Town/state	V	ID greatest vulnerability - BMPs, demonstration projects, private property = educate					
Beach - fresh and salt water closures, shellfish bed contamination		Town/state	V	More of an issue for fresh water				L	
Hardening of coastline, revetments, private actions affecting public lands			V	Education and regulation, revisions					
Ponds - rising temps, run off up, nutrients => eutrophication, groundwater rising			V	Septic system regulation changes, nutrient management in ponds, long term					L/O
Septic systems - discharges to fresh and salt water			V	Septic system regulation changes, nutrient management in ponds, long term					L/O
Regulation review and revisions to and implementation; bring up to speed, update			V	Applies to all categories, same as above					
Cyanobacterial issues in ponds, protocols			V	Protocols for early detection, response plan					
Wild fire management plans ($$), drought, winds, response, maintenance, Dead Fall			S/V	Update, fund and implement fire protection, reimplement County Fire Management Plan					
Climate change; invasive species issues, insects			V						
The Flats provide storm protection			S						

Attachment D: All Groups - Completed Risk Matrices

Community Resilience Building Risk Matrix

Group 3: Action Items

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Rt. 6A and Lower Road/Paine's Creek, road flooding, severe, road closures		State	V	Raise road surface, study water flow solutions on Paine's Creek and Spring Lane marsh				H	
Rt. 6A at Dennis line severe flooding, road closures		State	V	Raise road surface, study water flow, Bound Brook area, consult with Dennis				H	
Lower Road/Spring Lane floods/freezes		Local	V				Facilitating water flow	M-L	
Rt. 6A flooding near "clayworks", dangerous road conditions, freeze/splash		State	V				Facilitating water flow, study drainage solutions	M	
Culvert conditions		Town	S/V	Culvert inventory, maintenance plan, study how it impacts problems in other areas (upstream)				H	
Beach parking lots, retreats	Breakwater, Paine's	Town	S/V	Relocated parking inland, bioretention to capture stormwater, constructed dune to mitigate coastal erosion					
Beach parking lots, losses, needs retreat?	Crosby, Mants Landing, Robbins Hill	Town, state	V	Facilitating other transportation to beaches, dune stabilization, living shoreline concepts, oyster grants, feasibility study for 2 beaches				H	
Power outages septic/water, wells, town water, special septic	Town-wide	Public, private	V	Sewering vulnerable areas, extend municipal water, generators - back up, homeowners rebates/loans (private and county)				M	
Gas lines, replacements in process, National Grid	Town-wide	Private	S					M	
Electrical grid, old, internet/emergency generators	Cape-wide	Private	V			Eversource infrastructure improvement, underground utilities, wire hardening		M	
Inventory stormwater runoff catch basin, maintain-overflow	Tracy Lane, town-wide, neighborhood	Public, private, HOAs	V			Inventory catch basins, O&M plans for catch basins		M	
Societal									
Evacuations, vehicles/staff response, citizen resistance, off Cape vs. shelters	Cape Cod Regional Tech	County	V			Education re: regional plan, shelters (and pets), identify and research, heating and cooling centers, innovative outreach and education, community center		M-H	
Red Cross shelters: staffing, transportation, improvement needed, COA vans	Cape Cod Regional Tech, local schools as needed	County, town	V			Education re: regional plan, shelters (and pets), identify and research, heating and cooling centers, innovative outreach and education, community center		M-H	
No neighbor-to-neighbor plan, "MACC", communication, reverse 911 (land line only for now), social media, "Eversource" operation command center	Internet	Local, county, state, private	S/V	County wide conferencing with stakeholders to coordinate response, reverse 911 - outreach enrollment				M-L	
Transportation in emergency event (lack of transport too)		Local, county	V			Purchasing vehicles for town evacuation (and beach shuttles), develop a list of vulnerable people (Meals on Wheels, etc)		M	
Equipment, need inventory, town hall, lack of generators, gas fill ups?	Town buildings	Town	V			Purchasing generators for town buildings, senior housing, solar panels		H	
Seniors - vulnerable population, lack of generators, med. fragile, housing	Senior housing, private housing	Private	V			Rebate or low interest loans from grants or businesses - private home generators		M	
Lack of volunteers, people (and wildlife) emergency response training		Town	V	Community outreach and development of CERT program				H	
Education/outreach, flood zones etc, info sources	Town-wide	Town, private	V	Posters, maps, church bulletins, community boards, notices, school curriculum enhancement, disaster preparedness, Red Cross pillowcase project				L	
Neighbor to neighbor communication	Town-wide	Private	V	HOA Outreach, phone trees				L	
Churches/schools/clubs/community organizations	Town-wide	Private, public	S						
Chamber of Commerce (communications/town relations)				Hire emergency management director (FT/PT?)					

Attachment D: All Groups - Completed Risk Matrices

Community Resilience Building Risk Matrix

Group 3: Action Items

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time S Long O
Environmental									
Mass strandings whales/dolphins etc.	Beaches	Town, state	V	Phone number - emergency, education outreach, volunteer outreach requirement				M	
Conservation lands in critical resource areas	Town-wide	Town, private	S	Purchase more land				H	
Topography - bay side flooding, fewer waves	Coast	Town, private, state	S						
Zone 2 - water overlay with industrial zone	Freemans	Town	V		New bylaws to limit development, further education of business owners/home owners			H	
Zone 2 - water protected area, forested canopy, landowner relations, replanting, bylaw oversight	Freemans	Town	V						
Development concerns (master plan) in areas of vulnerability	Town-wide		V	New bylaws on development				M	
Insect control - mosquitoes, ticks, moths	Town-wide	Town, private, public	V			Mosquito control	Water flow, stormwater management, public education	M	
Dune restoration	Coastal	Town, private, state	S						
Marsh migration - inventory, flood storage, impact of redevelopment	Marsh	Town, private	S/V	Inventory of marshes that can migrate				H	
Living shoreline shellfish/oyster/aqua culture			S/V	Feasibility study to develop options				H	
Ponds, pollution - nutrient loading, climate, rain				Look at runoff - rain garden, fertilizer bylaws, stormwater bylaws					

Community Resilience Building Risk Matrix

Group 4: Action Items

www.CommunityResilienceBuilding.org

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High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
Roadway reconstruction/bridge vs. culverts like Scorton Creek in Sandwich?	6A Paine's Creek	Town/State?	V	State idenfity the need - via report (CCC), bridge construction					
Inundated private septic	Breakwater		V	Rebuild culvert under breakwater and add one way check valve					
Water Main	Crossing Paine's Creek	Town	V						
Back up to fiber optics	Police station main (current)	Town	V	Install redundant system					
Low tank alarm, isolated gate valves	Ocean edge and 6A at Paine's	Town	S						
Water Department generators	Main building, Well #6, Treatment Plant	Town	S						
Generators needed and OTR wells	Well #1 , 2, 3, 4 on Freeman's Way	Town	V	Purchase generators #1, #2, and #3					
Proposed fuel depot, includes generator	DPW facility	Town	S						
New fire station	Main St.	Town	S						
Town Hall needs generator	Town Hall	Town	V	Purchase generators #1, #2, and #3					
Signal services near Dennis town line		Town	V	Upgrade signal service					
Decentralized wastewater treatment			V	Public/private partnership					
Societal									
Modern building codes, materials	Town-wide		S						
Brewster Conservation Trust, land purchasing	Town-wide		S						
Strong dept. chemistry	Town		S						
Camps - schools evacuation, sea camps, 2 public, several private	Town-wide		V	Summer camp comprehensive plan - communicate with emergency management director, table top exercise?					
Evacuation concerns	Robbins Hill Rd.		V	Educate homeowners					
Town-wide vulnerabilities: floods, SW, coastal areas	Town-wide		V	Public info and educational sessions, BMPs literature and problem awareness and understanding maps, marketing campaign					
Environmental									
Progressive zoning bylaw (flood zone)	Town-wide	Town	S						
Herring Run protection (water withdrawal)	Town	Town	S						
Well head protection zone (Punkhorn)	Town	Town	S						
Water protection bylaw, WQRC committee	Town	Town	S						
State parks - waterbodies, ponds	State/town	State/Town	S						
Coastal erosion (high density neighborhoods)	Bay side	Town, private	V						
Stormwater issues	Town Hall, Robbins Hill Rd.	Town, private	V						
Wells #1 and #2 water quality	Freeman's well field	Town	S						

Attachment E: Annotated Brewster Base Maps

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(1)

ID #	Critical Facilty or Infrastructure	Address	Town	Facility Type
1	Police Department (Generator)	631 Harwich Road	Brewster	A,B
2	Eddy Elementary School (Generator-old)	2298 Main Street	Brewster	A,G,I
3	Stony Brook Elementary School (Generator-old) (warming center during Nemo)	384 Underpass Road	Brewster	A,G,I
4	Brewster VFW	989 Freemans Way	Brewster	A
5	Cape Cod Sea Camps	3057 Main Street	Brewster	A,I
6	Our Lady of the Cape Catholic Church	468 Stonybrook Road	Brewster	A
7	Fire Department/Emergency Operations Center → cell Tower capacity?	1671 Main Street	Brewster	A,B,C
8	Brewster Medical Association	20 Granite State Court	Brewster	C
9	Town Hall → Helipad	2198 Main Street	Brewster	D
10	Department of Public Works/Brewster Recycling Center/Solar Array	201 Run Hill Road	Brewster	D,F
11	Water Department/Solar Array	165 Commerce Park Road	Brewster	D
12	Housing Authority	11 Frederick Way	Brewster	D
13	Brewster Ladies' Library (Generator)	1822 Main Street	Brewster	D
14	Latham School	1646 Main Street	Brewster	G,I
15	The Family School and Salt Box School	3570 Main Street	Brewster	G,I
16	~~EPOCH~~ Senior Healthcare of Brewster Wingate → Generator?	873 Harwich Road	Brewster	H
17	The Woodlands at Pleasant Bay/Pleasant Bay Nursing and Rehabilitation Center/Owl Moon Child Care Center	383 South Orleans Road	Brewster	H,I
18	ABC Nursery School	2896 Main Street	Brewster	I
19	The Laurel School	1436 Long Pond Road	Brewster	I
20	Camp Favorite	208 Crowells Bog Road	Brewster	J
21	Camp Nan Ki Rafe	165 Nan-Ke-Rafe Path	Brewster	J
22	Camp Mitton	46 Featherbed Lane	Brewster	J
23	Animal Rescue League of Boston - Brewster Shelter	3981 Route 6A	Brewster	K
24	Wild Care	84 Underpass Road	Brewster	K
25	Brewster Veterinary Hospital	56 Underpass Road	Brewster	K
26	Council on Aging → (Generator)	1673 Main Street	Brewster	J
✓ 27	Maplewood Memory Care Facility → Generator?	820 Harwich Road	Brewster	I,J
28	Brewster Baptist Church (Election Center)	1848 Main Street	Brewster	J
29	Ocean Edge Resort - Mansion	2907 Main Street	Brewster	J
30	Ocean Edge Resort - White House	1 Villages Drive	Brewster	J
31	Nickerson State Park	3488 Main Street	Brewster	J
32	Brewster Water Standpipes (Storage Tanks)	23 Yankee Drive	Brewster	E
33	Brewster Well #1/Lime Station #1	546 Freemans Way	Brewster	E
34	Brewster Well #2	544 Freemans Way	Brewster	E
35	Brewster Well #3/Lime Station #3	811 Freemans Way	Brewster	E
36	Brewster Well #4/Greensand Filtration Facility	699 Run Hill Road	Brewster	E
37	Brewster Well #6	379 West Gate Road	Brewster	E
38	Captains Golf Course	1000 Freemans Way	Brewster	J
39	MA-6A/Stony Brook Culvert	15 Lower Rd	Brewster	E
40	MA-6A/Stony Brook Tributary Culvert	869 Main Street	Brewster	E

(39–40: Roadway Elevation project?)

Critical Facilities and Infrastructure:
- A Emergency Facilities/Shelters
- B Public Safety Facilities
- C Hospitals/Acute Care Facilities
- D Town Government Facilities
- E Water Infrastructure
- F Hazardous Materials Facilities
- G Schools
- H Nursing Homes/Elderly Housing
- I Group Day Care Facilities
- J Senior/Youth/Recreation Centers
- K Designated Emergency Animal Shelters/Hospitals
- L Marinas/Boat Yards

Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Flood Hazard Area
eff. 07/16/2014
- 100 Year Flood Area (AE Zone)
- 100 Year Flood Area (VE Zone)
- 500 Year Flood Area

0 0.375 0.75 1.5 Miles

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Sustainable Environmental Solutions
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508-833-6600 • horsleywitten.com

Brewster, MA Critical Infrastructure and FEMA Flood Zones

Date: 3/19/2019

Figure 1

Attachment E: Annotated Brewster Base Maps

ID #	Critical Facilty or Infrastructure	Address	Town	Facility Type
1	Police Department	631 Harwich Road	Brewster	A,B
2	Eddy Elementary School	2298 Main Street	Brewster	A,G,I
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5	Cape Cod Sea Camps	3057 Main Street	Brewster	A,I
6	Our Lady of the Cape Catholic Church	468 Stonybrook Road	Brewster	A
7	Fire Department/Emergency Operations Center	1671 Main Street	Brewster	A,B,C
8	Brewster Medical Association	20 Granite State Court	Brewster	C
9	Town Hall	2198 Main Street	Brewster	D
10	Department of Public Works/Brewster Recycling Center/Solar Array	201 Run Hill Road	Brewster	D,F
11	Water Department/Solar Array	165 Commerce Park Road	Brewster	D
12	Housing Authority	11 Frederick Way	Brewster	D
13	Brewster Ladies' Library	1822 Main Street	Brewster	D
14	Latham School	1646 Main Street	Brewster	G,I
15	The Family School and Salt Box School	3570 Main Street	Brewster	G,I
16	EPOCH Senior Healthcare of Brewster	873 Harwich Road	Brewster	H
17	The Woodlands at Pleasant Bay/Pleasant Bay Nursing and Rehabilitation Center/Owl Moon Child Care Center	383 South Orleans Road	Brewster	H,I
18	ABC Nursery School	2896 Main Street	Brewster	I
19	The Laurel School	1436 Long Pond Road	Brewster	I
20	Camp Favorite	208 Crowells Bog Road	Brewster	J
21	Camp Nan Ki Rafe	165 Nan-Ke-Rafe Path	Brewster	J
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23	Animal Rescue League of Boston - Brewster Shelter	3981 Route 6A	Brewster	K
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- J Senior/Youth/Recreation Centers
- K Designated Emergency Animal Shelters/Hospitals
- L Marinas/Boat Yards

Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

3 foot Sea Level Rise

Cause of Flooding
- Connected to Coast
- Depression

0 0.375 0.75 1.5 Miles

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Brewster, MA
Critical Infrastructure and Sea Level Rise

Date: 3/19/2019

Figure 3

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- K Designated Emergency Animal Shelters/Hospitals
- L Marinas/Boat Yards

Storm Surge

add Landings

Breakwater Beach

Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

N W E S

0 0.375 0.75 1.5 Miles

Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Hurrican Surge Inundation
SLOSH, 2013 (NWS)
- Category 1
- Category 2
- Category 3
- Category 4

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Brewster, MA
Critical Infrastructure and Hurricane Surge Inundation

Date: 3/19/2019 Figure 2

Attachment E: Annotated Brewster Base Maps

ID #	Critical Facilty or Infrastructure	Address	Town	Facility Type
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5	Cape Cod Sea Camps	3057 Main Street	Brewster	A,I
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7	Fire Department/Emergency Operations Center	1671 Main Street	Brewster	A,B,C
8	Brewster Medical Association	20 Granite State Court	Brewster	C
9	Town Hall	2198 Main Street	Brewster	D
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12	Housing Authority	11 Frederick Way	Brewster	D
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14	Latham School	1646 Main Street	Brewster	G,I
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18	ABC Nursery School	2896 Main Street	Brewster	I
19	The Laurel School	1436 Long Pond Road	Brewster	I
20	Camp Favorite	208 Crowells Bog Road	Brewster	J
21	Camp Nan Ki Rafe	165 Nan-Ke-Rafe Path	Brewster	J
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Critical Facilities and Infrastructure:

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- L Marinas/Boat Yards

Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

N W E S

0 0.375 0.75 1.5 Miles

Legend

- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

3 foot Sea Level Rise

Cause of Flooding

- Connected to Coast
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Brewster, MA Critical Infrastructure and Sea Level Rise

Date: 3/19/2019

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Legend
- Town Boundary
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Flood Hazard Area
eff. 07/16/2014
- 100 Year Flood Area (AE Zone)
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Brewster, MA
Critical Infrastructure and FEMA Flood Zones

Date: 3/19/2019

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Legend
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Hurrican Surge Inundation
SLOSH, 2013 (NWS)
- Category 1
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Brewster, MA
Critical Infrastructure and Hurricane Surge Inundation

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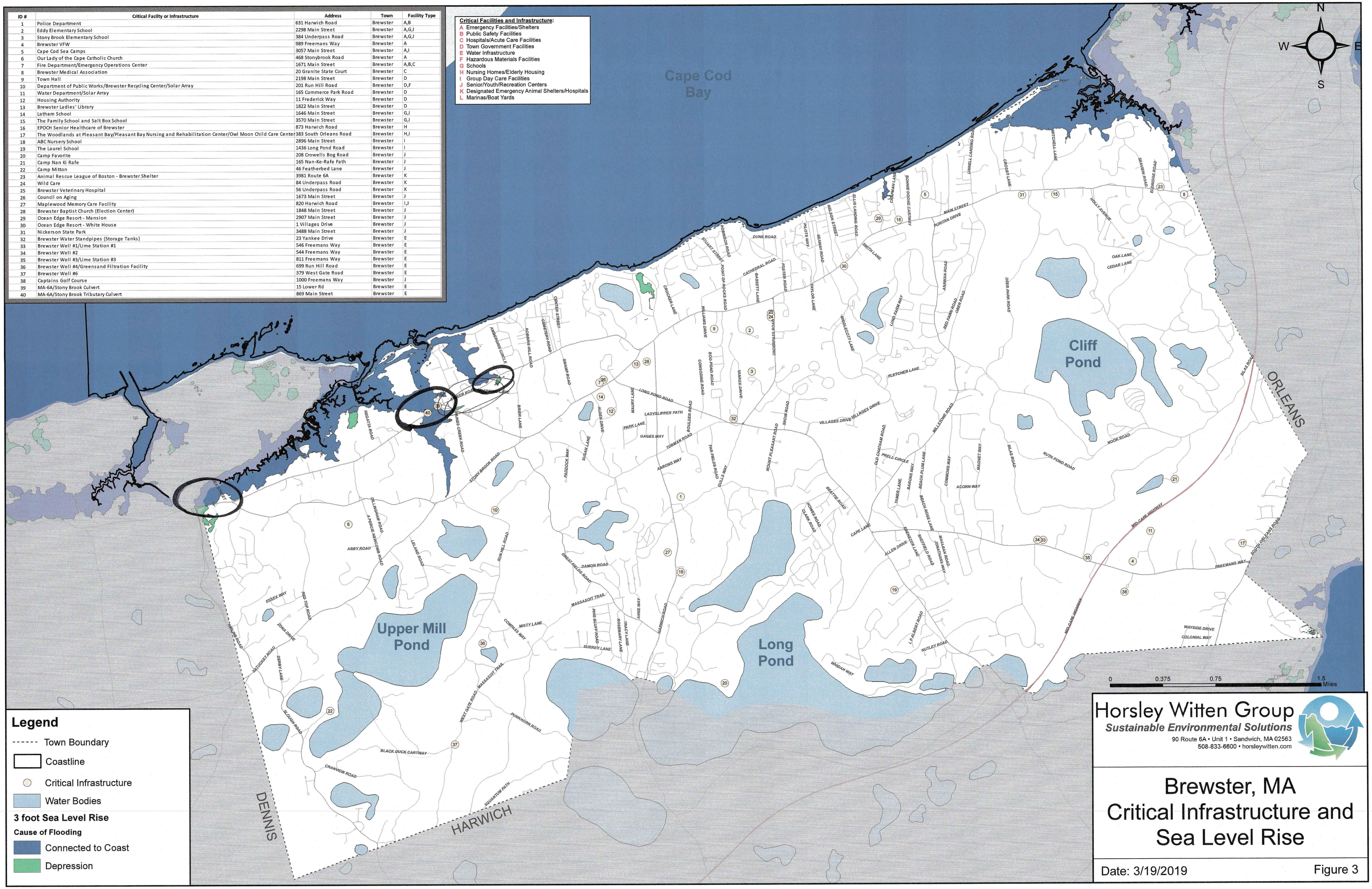

Legend

- Town Boundary
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3 foot Sea Level Rise

Cause of Flooding

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Brewster, MA
Critical Infrastructure and Sea Level Rise

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Figure 3

Add Wetlands Layer

3

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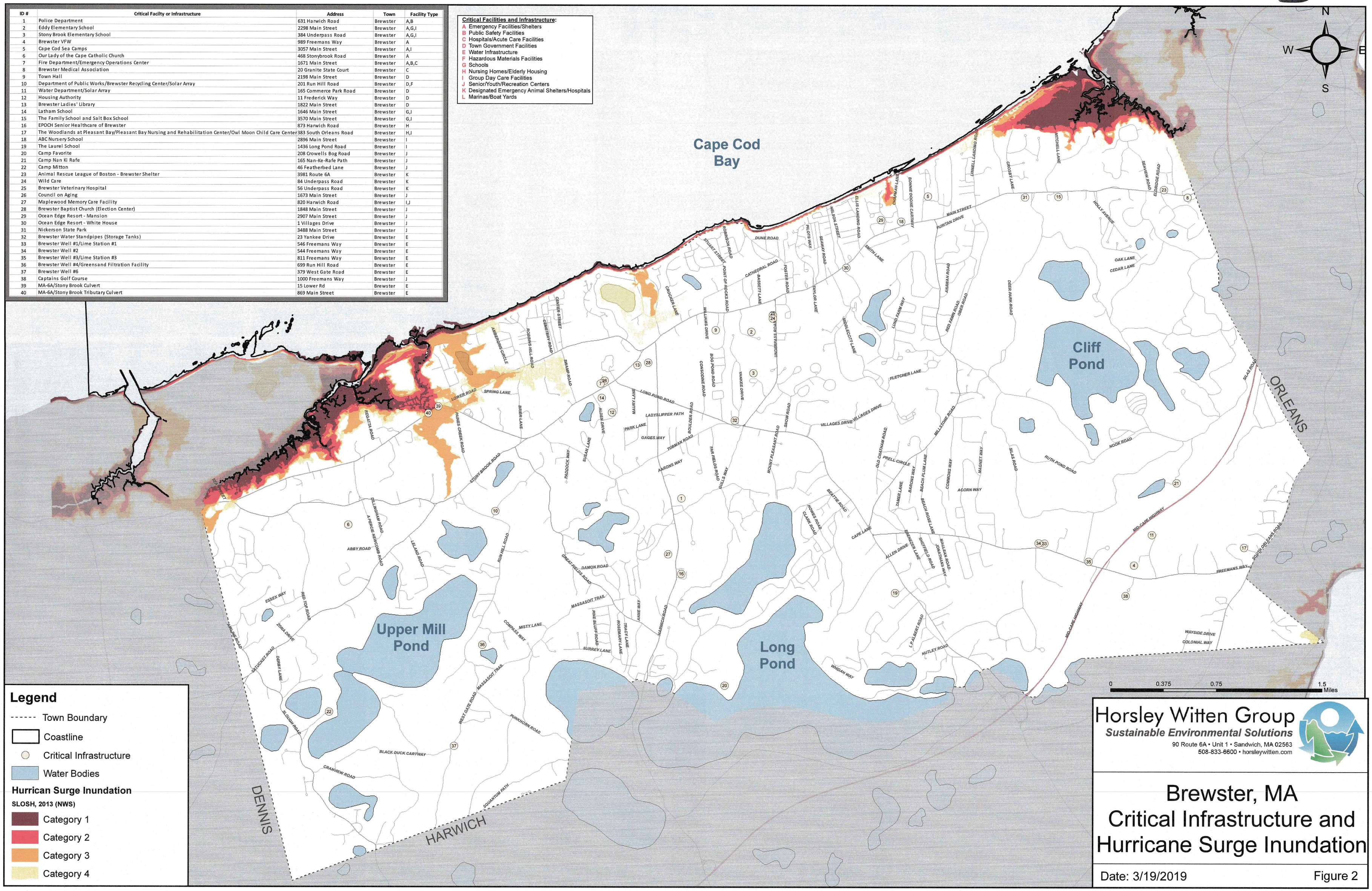

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19	The Laurel School	1436 Long Pond Road	Brewster	I
20	Camp Favorite	208 Crowells Bog Road	Brewster	J
21	Camp Nan Ki Rafe	165 Nan-Ke-Rafe Path	Brewster	J
22	Camp Mitton	46 Featherbed Lane	Brewster	J
23	Animal Rescue League of Boston - Brewster Shelter	3981 Route 6A	Brewster	K
24	Wild Care	84 Underpass Road	Brewster	K
25	Brewster Veterinary Hospital	56 Underpass Road	Brewster	K
26	Council on Aging	1673 Main Street	Brewster	J
27	Maplewood Memory Care Facility	820 Harwich Road	Brewster	I,J
28	Brewster Baptist Church (Election Center)	1848 Main Street	Brewster	J
29	Ocean Edge Resort - Mansion	2907 Main Street	Brewster	J
30	Ocean Edge Resort - White House	1 Villages Drive	Brewster	J
31	Nickerson State Park	3488 Main Street	Brewster	J
32	Brewster Water Standpipes (Storage Tanks)	23 Yankee Drive	Brewster	E
33	Brewster Well #1/Lime Station #1	546 Freemans Way	Brewster	E
34	Brewster Well #2	544 Freemans Way	Brewster	E
35	Brewster Well #3/Lime Station #3	811 Freemans Way	Brewster	E
36	Brewster Well #4/Greensand Filtration Facility	699 Run Hill Road	Brewster	E
37	Brewster Well #6	379 West Gate Road	Brewster	E
38	Captains Golf Course	1000 Freemans Way	Brewster	J
39	MA-6A/Stony Brook Culvert	15 Lower Rd	Brewster	E
40	MA-6A/Stony Brook Tributary Culvert	869 Main Street	Brewster	E

Critical Facilities and Infrastructure:
- A Emergency Facilities/Shelters
- B Public Safety Facilities
- C Hospitals/Acute Care Facilities
- D Town Government Facilities
- E Water Infrastructure
- F Hazardous Materials Facilities
- G Schools
- H Nursing Homes/Elderly Housing
- I Group Day Care Facilities
- J Senior/Youth/Recreation Centers
- K Designated Emergency Animal Shelters/Hospitals
- L Marinas/Boat Yards

Cape Cod Bay

Cliff Pond

Long Pond

Upper Mill Pond

ORLEANS

DENNIS

HARWICH

Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Flood Hazard Area
eff. 07/16/2014
- 100 Year Flood Area (AE Zone)
- 100 Year Flood Area (VE Zone)
- 500 Year Flood Area

0 0.375 0.75 1.5 Miles

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Brewster, MA
Critical Infrastructure and FEMA Flood Zones

Date: 3/19/2019 Figure 1

Attachment E: Annotated Brewster Base Maps

ID #	Critical Facilty or Infrastructure	Address	Town	Facility Type
1	Police Department	631 Harwich Road	Brewster	A,B
2	Eddy Elementary School	2298 Main Street	Brewster	A,G,I
3	Stony Brook Elementary School	384 Underpass Road	Brewster	A,G,I
4	Brewster VFW	989 Freemans Way	Brewster	A
5	Cape Cod Sea Camps	3057 Main Street	Brewster	A,I
6	Our Lady of the Cape Catholic Church	468 Stonybrook Road	Brewster	A
7	Fire Department/Emergency Operations Center	1671 Main Street	Brewster	A,B,C
8	Brewster Medical Association	20 Granite State Court	Brewster	C
9	Town Hall	2198 Main Street	Brewster	D
10	Department of Public Works/Brewster Recycling Center/Solar Array	201 Run Hill Road	Brewster	D,F
11	Water Department/Solar Array	165 Commerce Park Road	Brewster	D
12	Housing Authority	11 Frederick Way	Brewster	D
13	Brewster Ladies' Library	1822 Main Street	Brewster	D
14	Latham School	1646 Main Street	Brewster	G,I
15	The Family School and Salt Box School	3570 Main Street	Brewster	G,I
16	EPOCH Senior Healthcare of Brewster	873 Harwich Road	Brewster	H
17	The Woodlands at Pleasant Bay/Pleasant Bay Nursing and Rehabilitation Center/Owl Moon Child Care Center	383 South Orleans Road	Brewster	H,I
18	ABC Nursery School	2896 Main Street	Brewster	I
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35	Brewster Well #3/Lime Station #3	811 Freemans Way	Brewster	E
36	Brewster Well #4/Greensand Filtration Facility	699 Run Hill Road	Brewster	E
37	Brewster Well #6	379 West Gate Road	Brewster	E
38	Captains Golf Course	1000 Freemans Way	Brewster	J
39	MA-6A/Stony Brook Culvert	15 Lower Rd	Brewster	E
40	MA-6A/Stony Brook Tributary Culvert	869 Main Street	Brewster	E

Critical Facilities and Infrastructure:
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- I Group Day Care Facilities
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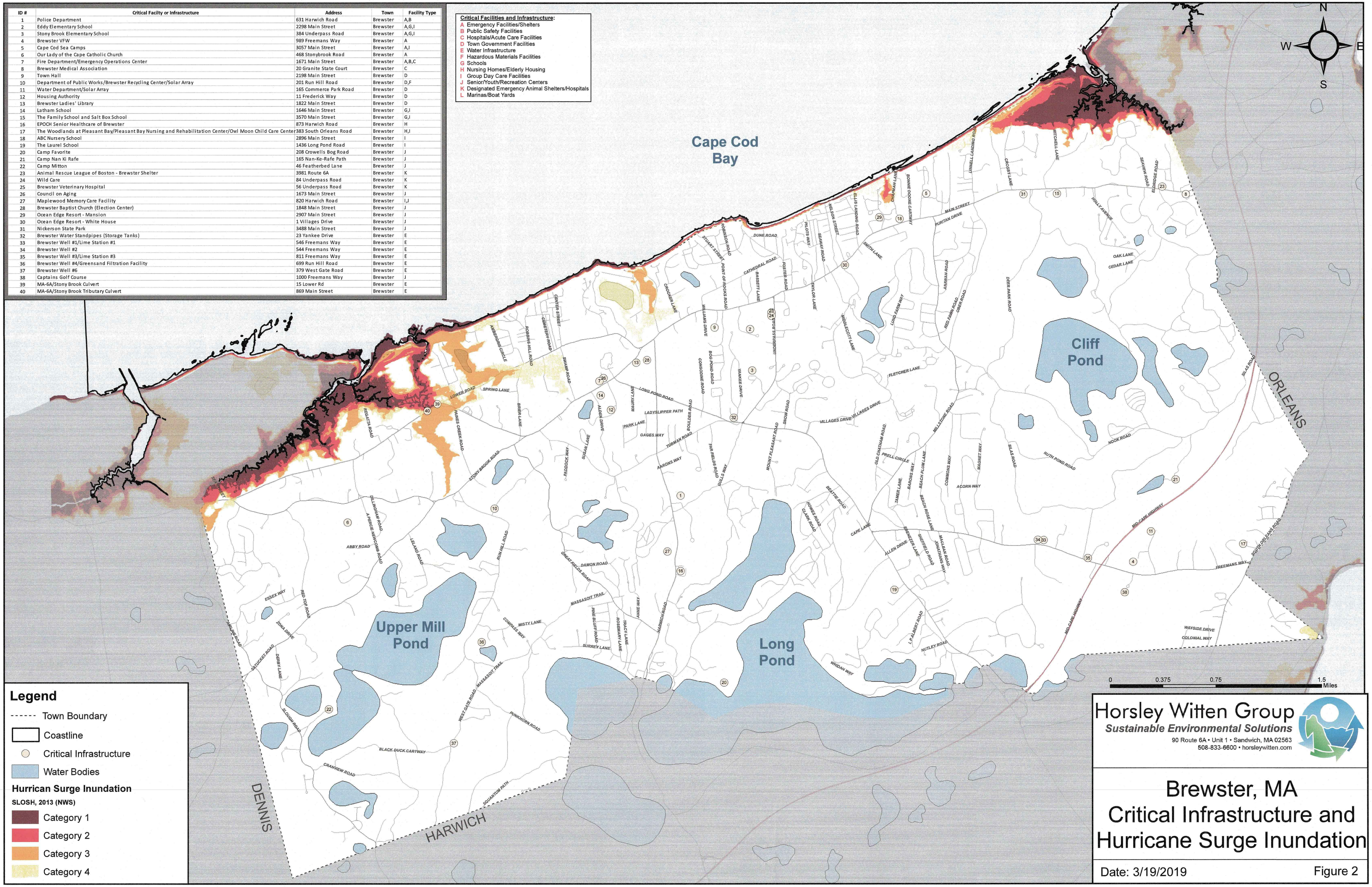
- K Designated Emergency Animal Shelters/Hospitals
- L Marinas/Boat Yards



Legend
- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

Hurrican Surge Inundation
SLOSH, 2013 (NWS)
- Category 1
- Category 2
- Category 3
- Category 4

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Brewster, MA
Critical Infrastructure and Hurricane Surge Inundation

Date: 3/19/2019 Figure 2

Attachment E: Annotated Brewster Base Maps

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Cape Cod Bay

Cliff Pond

Upper Mill Pond

Long Pond

ORLEANS

DENNIS

HARWICH

N W E S

0 0.375 0.75 1.5 Miles

Legend

- Town Boundary
- Coastline
- Critical Infrastructure
- Water Bodies

3 foot Sea Level Rise

Cause of Flooding

- Connected to Coast
- Depression

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Brewster, MA
Critical Infrastructure and Sea Level Rise

Date: 3/19/2019

Figure 3

Attachment F: All Groups - Recommended Action Items

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Community Resilience Building Risk Matrix — **Recommended Action Items** — www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Group 1-4	Priority H - M - L	Time Short Long Ongoing
Infrastructural										
Town bylaws and regulations	Town-wide	Town	V	Review and update town bylaws and regulations in consideration of projected climate change impacts including development in flood prone areas, storm design, coastal vulnerability zone, Zone II industrial overlay,				2		
Stormtide Pathways Project	Town-wide	County	S	Implement further study and action as recommended by the outcomes of the Stormtide Pathways project.				2		
Hazard mitigation planning process	Town-wide	Town, State	V	Move forward with the development of a local multi-hazard mitigation plan that accounts for vulnerable utility infrastructure, flooding on Rt. 124, low-lying flood prone areas on Rt. 6A (Stony Brook and Quivett Creek), access to pharmacies, food, fuel, and evacuation routes.				2		
Rt. 6A road projects	Lower Road/Paine's Creek, Dennis Line, Orleans Line	State	V	Identify and undertake Route 6A (Main Street) roadway improvements that improve resiliency to coastal flooding, storm surge and sea level rise in locations that incorporates lessons learned from the Stormtide Pathways Project, water flow studies and drainage culvert inventories.				3		
Generators for town critical infrastructure	Various	Town	V	Install generators at the Town Hall, Water Department and wells.				3		
Stormwater infrastructure	Town-wide	Town, State	V	Conduct stormwater infrastructure inventory and assessment, including Considine ditch to Wobbly Barn				4		
Communications/IT systems	Town-wide	Town	V	Investigate the prevalence of redundant communications/IT systems.				4		
Societal										
Shelters	Town-wide	Town, County	V	Evaluate emergency sheltering needs (winter/summer) in coordination with churches, camps, Nickerson, etc.				1		
Community education and communication	Town-wide	Town	V	Provide community education and communication about family/community/neighborhood resilience and emergency preparedness plans.				2		
Emergency management planning	Town-wide	Town	V	Coordinate an update of community comprehensive emergency management plan.				4		
Environmental										
Water resources	Town-wide	Town	V	Consider climate change long term impacts to human and environmental and economic health of the Town of Brewster, including: nutrients in estuaries and ponds, fresh and salt water bodies, invasive species, insects, growing seasons, integrated water resource planning, incorporating public outreach (notification tools, campaigns/materials)				2		
Living shoreline/marsh migration	Coast	Town	S/V	Conduct feasibility study to develop options, beach parking lot loss.				3		

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Attachment G: High Priority Action Items

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Community Resilience Building Risk Matrix

High Priority Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Coastal Flooding/Storm Surge	Sea Level Rise	Hurricanes/Nor'easters	Intense Rain/Flooding	Group 1-4	Priority H - M - L	Time Short Long Ongoing
Infrastructural										
Town bylaws and regulations	Town-wide	Town	V	Review and update town bylaws and regulations to mitigate projected climate change impacts.				2	H	
Hazard mitigation planning process	Town-wide	Town, State	V	Develop a Local Multi-Hazard Mitigation Plan and include considerations for projected climate change impacts.				2	H	
Rt. 6A road projects	Lower Road/Paine's Creek, Dennis Line, Orleans Line	State	V	Identify and undertake Route 6A (Main Street) roadway improvements that improve resiliency to coastal flooding, storm surge and sea level rise in locations including, but not limited to from the intersection with Paines Creek Road west across the causeway dividing the marsh, Quivett Creek at the Dennis town line and in the east end of Town.				3	H	
Generators for town buildings	Various	Town	V	Identify and initiate projects to provide back-up power at the Town Hall, Water Department and drinking water wells to provide critical infrastructure resilience to power outages.				3	H	
Stormwater infrastructure	Town-wide	Town, State	V	Conduct a stormwater infrastructure inventory and assessment to prioritize and initiate improvements (e.g., increased catch basin maintenance, culvert replacement) based on projected climate change impacts.				4	H	
Societal										
Community education and communication	Town-wide	Town	V	Develop a Preparedness Campaign for the general public (i.e., residents and seasonal guests) and the private sector that includes guidance and checklists, as well as recommendations to increase community resilience to the impacts of climate change (e.g., extreme weather, health impacts).				2	H	
Emergency management planning	Town-wide	Town	V	Review and update the Brewster Community Emergency Management Plan to include considerations for projected climate change impacts.				4	H	

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Attachment H: April 23, 2019 Public Listening Session Summary

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Attachment H: April 24, 2019 Brewster Public Listening Session Summary

On April 24, 2019 the Town of Brewster held a public listening session from 4:30 p.m. – 5:30 p.m. at the Brewster Ladies Library located at 1822 Main Street in Brewster, MA 02631. There were 10 people in attendance. Will Keefer, MVP certified facilitator from HW, gave a presentation that provided an overview of the MVP Program, MVP Workshop development and facilitation process and introduced seven high priority action items developed as a result of the March 28, 2019 workshop.

The public listening session provided an opportunity for those that were involved in workshop, as well as the public in general to help refine the draft high priority action items. The general sentiment of the audience was that the action items were broad in scope so that the community can develop projects that best suited the town's needs, but there were some adjustments that could be made. For example, an original action item focused on hardening Route 6A (Main Street) against flooding due to intense rain, storm surge and sea level rise; however, several individuals pointed out that resilience could be achieved with nature-based solutions as well. Additional suggestions and comments provided during the listening session included, in no particular order:

- Town landings should be considered critical infrastructure.
- The Town has explored nature-based solutions as part of other projects that have been completed, and they are identified in the Coastal Adaptation Strategy and other plans.
- Include electronic links to other relevant Brewster plans that have identified actions to take based on projected climate change in the report.
- The Fire Department has a lot of emergency preparedness resources available on its website. Most advertising efforts have been to make sure year-round residents are prepared, but it would be valuable to expand efforts during the summer to reach seasonal residents.
- The core team plans to meet once the summary report is finalized to identify and prioritize projects that they would like to apply for in the next round of MVP action grant funding.
- Most of Brewster's coastline is held privately and some properties of have hardened coastal structures. A future state coastal buy-back program could help the Town acquire properties identified as high hazard or storm damaged.

In addition, there were two unanswered questions resulting from the listening session that should be followed up on:

- Will there be opportunities through the MVP program in the future to update the Summary Report and host another workshop?
- How much funding is expected to be available for the next round of MVP action grants that are expected to be issued in Summer 2019?

In closing the public listening session, the MVP facilitator confirmed that the final March 28, 2019 Brewster MVP Workshop summary report would be available for the public to review upon completion.

As a result of the public listening session, the core planning team incorporated suggestions from the public and confirmed the following seven high priority action items, in no priority order:

1. Review and update Town bylaws and regulations to mitigate projected climate change impacts.

2. Develop and initiate projects to increase resilience to projected climate change impacts (e.g., intense rain, storm surge, sea level rise) for critical infrastructure including, but not limited to:
    - Route 6A from the intersection with Paines Creek Road west across causeway dividing the marsh
    - Stormwater drainage throughout Town
    - Potentially vulnerable utility infrastructure
3. Identify and initiate projects to provide back-up power at the Town Hall, Water Department and drinking water wells to provide critical infrastructure resilience to power outages.
4. Conduct a stormwater infrastructure inventory and assessment to prioritize and initiate improvements (e.g., increased catch basin maintenance, culvert replacement) based on projected climate change impacts.
5. Develop a Preparedness Campaign for the general public (i.e., residents and seasonal guests) and the private sector that includes guidance and checklists, as well as recommendations to increase community resilience to the impacts of climate change (e.g., extreme weather, health impacts).
6. Develop a Local Multi-Hazard Mitigation Plan that includes considerations for projected climate change impacts.
7. Review and update the Brewster Community Emergency Management Plan to include considerations for projected climate change impacts.
8. Conduct a vulnerability assessment, develop plans and initiate improvements at critical public access points in the community (e.g., town landings) to increase resilience to projected climate change impacts.