

HARWICH

2017 Hazard Mitigation Plan





Table of Contents

Contents

■ Figures.....	4
■ Tables.....	5
■ Introduction	6
■ Review Tool Description:	7

The Planning Process

■ Planning Team.....	10
■ Outreach Strategy.....	12
■ Incorporation with Town Plans.....	16
■ Contents of Chapter 1 Appendix	20

Natural Hazards

■ Hazard Identification.....	24
■ Hazard Profiles	27
■ Climate Change	88
■ Hazards Selected for Risk Assessment	91

Asset Inventory

■ People	96
■ Base Map of Harwich.....	96
■ Natural Environment.....	98
■ Built Environment.....	98
■ New Developments in Harwich.....	102

Vulnerability Assessment

■ Methodology:	106
■ Results: Vulnerability Assessment.....	109
■ Vulnerable Populations	125
■ Summary of Vulnerable Infrastructure	127

Mitigation Strategy

■ Mitigation Goals	130
■ Progress On 2011 Mitigation Actions	131
■ 2017 Mitigation Actions.....	135
■ Participation in NFIP	149
■ Capability Assessment	150

Plan Evaluation and Maintenance

■ Who is involved?	156
■ How will the plan be maintained?.....	156
■ When will the plan be maintained?	157

Plan Adoption

■ Timeline for Plan Adoption.....	160
■ Plan Adoption	160

Appendix **161**

Figures

Figures

CHAPTER 2

- **Figure 2.1** | Historic shoreline change along the coast of Harwich. Map was created using data from the Massachusetts Ocean Resource Information System.....28
- **Figure 2.2** | Map of Harwich showing the locations of culverts and one dike.....32
- **Figure 2.3** | 2014 Simplified earthquake hazard risk map for the United States. A circle was used to identify the planning area on the map.....38
- **Figure 2.4** | Town of Harwich Wildfire Risk map from the Barnstable County Wildfire Preparedness Plan.....43
- **Figure 2.5** | FEMA flood hazard area map.....46
- **Figure 2.6** | Schematic of the generic differences between mean sea level, normal high tide, storm surge and storm tide. This graphic is for educational purposes only. The numbers shown (2, 15, 17 feet) are not specific to Harwich.49
- **Figure 2.7** | SLOSH map for Harwich50
- **Figure 2.8** | Hurricanes and major hurricanes in the Atlantic Basin (above) and in Barnstable County from 1851-2013, National Hurricane Center (right).52
- **Figure 2.9** | Hurricanes Making Landfall in New England, 1851-2008.....53
- **Figure 2.10** | Map of frequency and strength of windstorms in the United States. Planning area is highlighted with a red circle. Map is from the 2013 Massachusetts State Hazard Plan.....65
- **Figure 2.11** | Schematic of how lightning develops, from Thunderstorms, Tornadoes and Lightning: Nature's Most Violent Storms.....67
- **Figure 2.12** | Map of the average number of thunderstorms per year in the United States. Planning area is highlighted with a red circle. Map is from the 2013 Massachusetts State Hazard Plan..68
- **Figure 2.13** | Tornado occurrence and density for Massachusetts. Map is from the 2013 Massachusetts State Hazard Plan75

- **Figure 2.14** | Number of drought emergencies per 100 years for Massachusetts. Map is from the 2013 Massachusetts State Hazard Plan.....78
- **Figure 2.15** | How winter storms form.....82
- **Figure 2.16** | Annual Snow Totals in inches from 1971-2000 (top) and 1981-2010 (bottom). Maps are from the 2013 Massachusetts State Hazard Plan.....83
- **Figure 2.17** | Sea level rise maps for Harwich89

CHAPTER 3

- **Figure 3.1** | Base map of Harwich97

CHAPTER 7

- **Figure 7.1** | Certificate of Adoption signed by the Harwich Board of Selectmen 160

Tables

CHAPTER 1

- **Table 1.1** | Harwich Hazard Planning Team.....10
- **Table 1.2** | Planning Team Responsibilities11

CHAPTER 2

- **Table 2.1** | List of relevant natural hazards for Harwich.....25
- **Table 2.2** | Modified Mercalli Scale, from Earthquake Causes and Characteristics, Chapter 3 of Emergency Management Institute Training Guide.....37
- **Table 2.3** | Saffir-Simpson Hurricane Wind Scale (National Hurricane Center).....48
- **Table 2.4** | History and extent of tropical storms and hurricanes for Barnstable County.....54
- **Table 2.5** | Drought Indices as defined in the 2013 Massachusetts Drought Management Plan79
- **Table 2.6** | Major Disaster Declarations for Barnstable County for Winter Storms. Data is from the FEMA Disaster Declaration website and from the 2013 Massachusetts State Hazard Plan ...84
- **Table 2.7** | List of Hazards selected for a risk assessment92

CHAPTER 3

- **Table 3.1** | Number and type of housing units in Harwich.....98
- **Table 3.2a** | Estimated Number and Value of Harwich Businesses.....99
- **Table 3.2b** | Estimated Number Employees by Industry.....99
- **Table 3.3** | List of Critical Facilities in Harwich..... 101
- **Table 3.4** | Exposure Assessment of New Developments..... 104

CHAPTER 4

- **Table 4.1** | The proportion and value in a A zone. 110
- **Table 4.2** | The proportion and value in a V zone. 111
- **Table 4.3** | The proportion and value of buildings exposed to 1 foot of sea level rise. 112
- **Table 4.3** | The proportion and value in Category 1 SLOSH zone..... 112
- **Table 4.4** | The proportion and value of buildings exposed to 2 feet of sea level rise. 113
- **Table 4.5** | The proportion and value of buildings exposed to 1 foot of sea level rise. 114
- **Table 4.6** | The proportion and value in Category 4 SLOSH zone..... 115
- **Table 4.7** | The proportion and value of buildings exposed to 1 foot of sea level rise. 116
- **Table 4.8** | The proportion and value of buildings exposed to 2 feet of sea level rise. 117
- **Table 4.9** | The proportion and value of buildings exposed to 3 feet of sea level rise. 118
- **Table 4.10** | The proportion and value of buildings exposed to 4 feet of sea level rise 119
- **Table 4.11** | The proportion and value of buildings exposed to 5 feet of sea level rise. 120
- **Table 4.12** | The proportion and value of buildings exposed to 6 feet of sea level rise. 121
- **Table 4.13** | Parcels and value of buildings that share a physical boundary with sea water.. 122
- **Table 4.14** | Exposure Assessment for Critical Facilities..... 124

CHAPTER 5

- **Table 5.1** | Progress on 2011 Mitigation Actions..... 134-135
- **Table 5.2** | Capability Assessment 151

Introduction

Introduction

The purpose of hazard mitigation is to reduce loss from future natural disasters. Storms and other natural disasters can cause loss of life, damage to buildings and infrastructure and have devastating consequences to a community's economic, social and environmental well-being. One step to reducing loss in a community is to have a plan for the future. To accomplish this task, most communities develop a local Hazard Mitigation Plan, also known as a single jurisdiction Hazard Mitigation Plan. It is drafted and reviewed by town officials and residents and then approved by the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA).

The purpose of the Harwich Hazard Mitigation Plan is to reduce damages resulting from natural hazards by implementing sustained actions to reduce or eliminate long-term risk to human life and property from hazards. The Harwich Hazard Mitigation Plan Update is also about building a successful, long-term outreach strategy to educate residents about natural hazards that could affect the town, to prepare them in case a storm impacts the town, and to create a resilient town that can recover after a storm event. Town staff and the residents of Harwich worked together for over two years to meet FEMA requirements for developing a new single jurisdiction hazard plan while maintaining the character and individuality of Harwich.

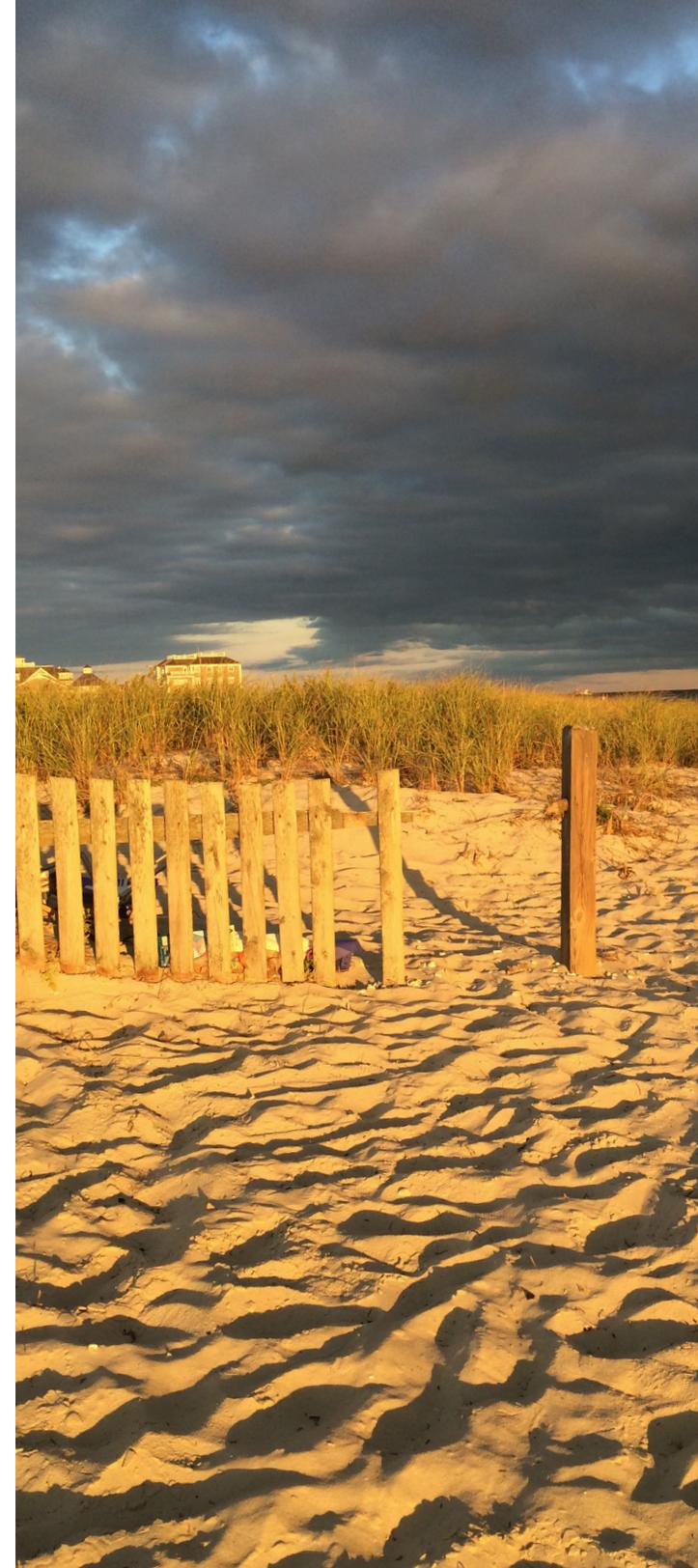
A1, A1b

It is important to note that if and when the 2017 Harwich Hazard Plan Update is approved by FEMA and adopted by the Board of Selectman, the town becomes eligible to receive funding from FEMA's Hazard Mitigation Assistance (HMA) program, which includes the following programs:

- **Hazard Mitigation Grant Program (HMGP):** assists in implementing long-term, "forward thinking" hazard mitigation measures following a major disaster
- **Pre-Disaster Mitigation (PDM):** provides funds for hazard mitigation planning and projects on an annual basis
- **Flood Mitigation Assistance (FMA):** provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.

Review Tool Description:

FEMA developed a "Local Mitigation Review Guide" to help Federal and State officials assess Local Hazard Mitigation Plans in a fair and consistent manner and to ensure approved local plans meet the requirements of the Stafford Act and Title 44 Code of Federal Regulations (CFR) 201.6. The "Local Mitigation Review Guide" was used as guidance in updating the Harwich Hazard Plan. When text in the Harwich Hazard Mitigation Plan Update meets an element identified in the Review Guide, it is called out in a colored box in the margin.



The Planning Process

CHAPTER ONE

Municipal plans require expertise from a core team of Town officials and input from stakeholders, the public and neighboring communities. When community-wide plans have the support from a diverse cross-section of stakeholders, residents and Town officials, the final plan becomes a “living” document that is useful for the community on a long-term basis. A hazard plan, in particular, is considered successful if it educates residents about the risk and vulnerability related to natural hazards and builds support for policies, actions and tools that reduce future losses from natural hazards. **Chapter 1 is a narrative on the hazard planning team and the outreach process used to develop the 2017 Harwich Hazard Mitigation Plan Update.**

Planning Team

Planning Team

Members and Responsibilities

The Planning Team is an interdisciplinary group of town staff members with expertise to develop the plan and the authority and expertise to implement its action items. Staff members from the Cape Cod Commission provided technical support to the Planning Team. *Table*

Name	Title	Department
Lee Culver	Emergency Management Director	Police Department
Paula Champagne	Health Director	Health Department
Amy Usowski	Conservation Agent	Conservation Department
Chris Clark	Town Administrator	Town Administration
Charleen Greenhalgh	Assistant Town Administrator	Town Administration
Ray Chesley	Building Commissioner	Building Department
Heinz Proft	Natural Resources Director	Natural Resources
Norm Clarke	Fire Chief	Fire Department

1.1 lists the names, titles and affiliations of the Harwich Hazard Planning Team.

This core group was responsible for developing and reviewing drafts of the Hazard Plan, creating the mitigation strategies and submitting the plan for adoption by the Federal Emergency Management Agency (FEMA) and the Harwich Board of Selectman. *Table 1.2* outlines the responsibilities of each member of the Planning Team (or department he/she represented).

Name	Title	Department
Chris Nickerson	Maintenance Manager	Public Works Department
Paul Sweetser	Town Surveyor	Engineering Department
Bob Cafarelli	Town Engineer	Engineering Department
John Rendon	Harbormaster	Harbormaster Department
Dan Pelletier	Superintendent	Water Department
Lincoln Hooper	Public Works Director	Public Works Department
Aly Sabatino	Town Planner	Planning Department
Cally Harper (through January 2017)	Planner	Cape Cod Commission
Martha Hevenor	Planner	Cape Cod Commission

Table 1.1 | Harwich Hazard Planning Team

Planning Team

Department	Responsibilities
Police Department	Developed critical facilities list, assisted with vulnerability assessment; reviewed/developed mitigation actions, attended team meetings.
Health Department	Reviewed/developed mitigation actions, attended team meetings
Conservation Department	Reviewed/developed mitigation actions, attended team meetings
Town Administration	Developed/reviewed mitigation actions, attended team meetings
Building Department	Developed/reviewed mitigation actions, attended team meetings
Natural Resources	Provided data on weather/hazard impacts, developed/reviewed mitigation actions, attended team meetings
Fire Department	Provided data on weather/hazard impacts, attended team meetings
Public Works Department	Developed/reviewed mitigation actions, attended team meetings; provided data on weather/hazard impacts
Engineering Department	Developed/reviewed mitigation actions, attended team meetings; provided data on weather/hazard impacts
Harbormaster Department	Developed/reviewed mitigation actions, attended team meetings
Water Department	Developed/reviewed mitigation actions, attended team meetings
Planning Department	Developed critical facilities list; provided data on weather/hazard impacts, assisted with vulnerability assessment assisted with public outreach strategy, attended team meetings
Planner, Cape Cod Commission	Facilitated group meetings with Planning Team; coordinated the development of the hazard plan.
GIS Analyst, Cape Cod Commission	Prepared maps for the town hazard plan; used GIS software to conduct a risk assessment for the town.

Table 1.2 | Planning Team Responsibilities

Outreach Strategy

Meeting Schedule and Involvement

The Planning Team worked collaboratively in large and small group meetings. The Planning Team held a kick-off meeting in February 2014. CCC staff met with individual members of the team in the summer and fall of 2014. Full Planning Team meetings resumed in December 2014 and after a hiatus in 2015, continued during the winter and spring of 2016 to develop sections of the hazard plan. The project team reconvened in 2017 to complete the plan.

Below is a list of dates and topics covered at each of these large group meetings.

- **February 4, 2014:** overview of hazard planning goals, purpose, and process; establishment of planning team.
- **December 2, 2014:** review of draft hazard profiles, discussion of probability of future hazard events; and assessment of vulnerabilities in planning area.
- **February 10, 2016:** review of draft public survey, outreach plan, mitigation strategy, objectives.
- **March 3, 2016:** Progress/review of 2011 goals, objectives, actions;
- **March 23, 2016 :** survey results, new mitigation actions, priorities, implementation strategy.
- **May 31, 2017:** Capabilities assessment, mitigation action priorities.

As noted above, meetings also occurred with a subset of the Planning Team for discussions that did not necessitate the full group's participation. These meetings typically involved the Town Planner, Emergency Management Director, and CCC staff.

Outreach Strategy

A1a, d

With the Public

A3a, b

The public was engaged at two different times during the planning process: during plan development and just prior to submission of the draft plan for MEMA/FEMA review.

During Plan Development

A3a, b

The Planning Team developed an online survey to gather data on the significance/relevance of the natural hazards identified in the Massachusetts State Hazard Plan to Harwich, the impact of those significant natural hazards, and preparedness efforts in Harwich. The survey also gathered data on how residents would like to be engaged in the future. The survey was launched in March 2016, and the public was given over three weeks to fill out the survey. A link to the survey was available to residents and to the people who work in Harwich through the main page of the Town website and posted to the Police Department's Facebook page, the Emergency Management Department Facebook page, and shared

elsewhere through social media. Survey information was also distributed along with the semi-annual bills issued by the Harwich Water Department in spring 2016. The Harwich Chamber of Commerce also sent out the survey link via email. 1,151 people responded to the public survey. For a copy of the survey, see “Public Survey on Hazard Mitigation” in **Appendix 1**. Documentation for the launch of the survey can be found in the “Survey Documentation” section of **Appendix 1**.

The process for incorporating public input into the hazard plan was as follows:

1. The Planning Team reviewed comments and responses in the online survey during an in-person meeting held on March 23, 2016.
2. The Planning Team incorporated these comments in the plan in the following ways:
 - The public was asked to identify specific hazards they experienced or are most concerned about while living or working in Harwich. They were presented with the 11 hazards identified in the Massachusetts State Hazard Plan and could select as many of these hazards as they wanted. These selections were used to determine whether or not a hazard is significant to the town (*see Column 3, Table 2.2*).
 - The public was asked to identify steps that the local government could take to reduce risk from natural hazards and protect the buildings and

people of Harwich. They were presented with a list of mitigation actions to reduce risk and loss and given the opportunity to suggest additional actions. These actions were incorporated into the Mitigation Actions of the hazard plan.

Prior to Submission to MEMA/FEMA

A31

The CCC provided a draft of the hazard plan on its website for a two week public comment period in July 2017, prior to submission to the Board of Selectmen.

The Town of Harwich posted a link to the draft Harwich Mitigation Plan on the Town of Harwich website and on the Harwich Emergency Management Department Facebook page. The page provided contact information for providing comments on the plan. The following comments were received:

Mark Dennen, resident: Concern that the town is not prepared for significant failure to the power grid and that should a hurricane occur it could be catastrophic to Harwich residents, particularly elderly and vulnerable population.

The Harwich Hazard Mitigation Plan was presented at the Board of Selectmen’s meeting on August 21, 2017. During the meeting, the public had the opportunity to provide verbal comments.

Outreach Strategy

With Stakeholders

A stakeholder is someone who may be affected by or have an interest in the Harwich Hazard Mitigation Plan Update but did not participate in the Planning Team meetings. Stakeholders for hazard planning efforts might be public officials, agency heads, members of neighborhood/civic organizations, business associations or staff from academic institutions.

Stakeholders were engaged in updating the Harwich Hazard Mitigation Plan Update. The stakeholder process involved three steps:

1. Stakeholders were identified by the Planning Team
2. The Planning Team designed a strategy to engage and gather input from stakeholders
3. The planning process allowed for stakeholder input throughout the planning process and just prior to plan approval.

Identification of Stakeholders

Members of the Planning Team identified stakeholders and staff at the Cape Cod Commission assisted in identifying stakeholders at the County, State and Federal levels.

Stakeholders included employees and volunteers from organizations and groups in Harwich and across Cape Cod, including:

- Harwich Chamber of Commerce
- Harwich Conservation Trust
- Friends of the Harwich Council on Aging
- Barnstable County Regional Emergency Planning Committee
- Cape Cod Cooperative Extension
- Barnstable County Health and Environment

Stakeholder Participation

A2c

Stakeholders were engaged twice during the planning process – once during plan development and again just prior to submission of the draft plan to MEMA and FEMA.

During plan development, stakeholders were invited to complete an online survey (to view the survey, see “Public Survey on Hazard Mitigation” in **Appendix 1**). Stakeholder input from the survey resulted in the following:

A2c

A3d

- Provided data on whether or not specific hazards were significant to the town (*See Table 2.1*)
- Identified problem areas in town and specific projects that they wanted to see implemented (i.e. creation of an evacuation plan) and those actions were incorporated into the Mitigation Actions of the Hazard Plan

Prior to plan submission, the Planning Team distributed a draft of the 2017 Harwich Hazard Mitigation Plan to the stakeholders.

The following comment was received:

Shannon Jarbeau, Community Rating System (CRS) & Floodplain Coordinator Barnstable County/Cape Cod Cooperative Extension: Provided additional information about repetitive loss properties and suggested additional language to enhance the town's CRS level.

A2a

With Neighboring Communities

A2b

Neighboring communities were given opportunities to participate in the planning process at Barnstable County Regional Emergency Planning Committee meetings.

A2c

Barnstable County Regional Emergency Planning Committee (BCREPC)

The Planning Team gathered input from representatives of towns across Cape Cod during the March 2, 2016 meeting of the Barnstable County Regional Emergency Planning Committee. During the meeting, Cally Harper, Planner at the Cape Cod Commission, informed the committee that several towns, including Harwich, were updating their Hazard Plans and asked committee members to comment on the history and impact of specific hazards on Cape Cod and their level of concern for future hazard events. The presentation and survey

results are located in the “BCREPC Presentation” and “BCREPC survey results” section in **Appendix 1**.

The process for incorporating input from the BCREPC meeting into the hazard plan was as follows:

1. The Town Planner, Emergency Management Director, and Planner from the Cape Cod Commission reviewed the impact and probability ranking and the comments from the BCREPC meeting
2. The rankings and comments were incorporated into the plan and used to determine whether a hazard is significant to the town (*see Column 3, Table 2.7*).

Incorporation with Other Town Plans and Report

Continuing Outreach Efforts During Plan Maintenance

A5a

Once the 2017 Harwich Hazard Mitigation Plan Update is approved by MEMA and FEMA, it will be forwarded to the Harwich Board of Selectmen for adoption. Once adopted, the plan enters into the “Maintenance Period” and will be active for five years. During this maintenance period, FEMA requires the Planning Team to continue engaging with the public.

A5a

The following is a list of engagement activities that the Planning Team will complete during this five-year maintenance period:

- **Online surveys** to gather data on whether or not Harwich residents are prepared for nor'easters, hurricanes and severe winter weather.
- **Presentations** to school and community groups about the science of hazards and/or how to prepare for specific weather events.
- Press releases, social media, and public service announcements to inform the public of hazard related educational workshops and hazard planning information.

Incorporation with Other Town Plans and Report

Technical Information Used in the Plan

A4a

The 2017 Harwich Hazard Mitigation Plan Update was drafted using existing plans, studies, reports and technical information from local, county, state and federal agencies. Technical data used to formulate the Hazard Profile is cited under each Hazard Profile and is not explicitly cited in the list below.

Below is a list of the resources from Federal, State and Local agencies that were used and incorporated into the 2017 Harwich Hazard Mitigation Plan Update:

■ Technical Information from Federal Agencies:

- Local Mitigation Planning Handbook (2013) prepared by FEMA
- How-To Guide: Getting Started – Building Support for Mitigation Planning (FEMA 386-1, 2002) prepared by FEMA
- How-To Guide: Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA 386-2, 2001) prepared by FEMA
- How-To Guide: Developing the Mitigation Plan (FEMA 386-3, 2003) prepared by FEMA

Incorporation with Other Town Plans and Report

- How-To Guide: Bringing the Plan to Life – Implementing the Hazard Mitigation Plan (FEMA 386-1, 2002) prepared by FEMA
 - Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) prepared by FEMA
 - Hazard Mitigation Assistance Guidance (2015) prepared by FEMA
 - National Flood Insurance Program Community Rating System Coordinator’s Manual (FIA-15/2013 prepared by FEMA
 - National Flood Insurance Program Floodplain Management Requirements: Study Guide and Desk Reference for Local Officials (FEMA 480, February 2005) prepared by FEMA
 - Risk Management Series Design Guide for Improving Critical Facility Safety from Flooding and High Winds (FEMA 543, January 2007) prepared by FEMA
 - Mitigation Assessment Team Report Hurricane Ike in Texas and Louisiana : Building Performance Observations, Recommendations, and Technical Guidance (FEMA P-757, April 2009) prepared by FEMA
 - Recommended Residential Construction for Coastal Areas: Building Strong and Safe Foundations (FEMA P-550, 2nd Edition, December 2009) prepared by FEMA
 - Wind Retrofit Guide for Residential Buildings (FEMA P-804, December 2010) prepared by FEMA
 - Home Builder’s Guide to Coastal Construction Technical Fact Sheets Series (FEMA P-499, December 2010) prepared by FEMA
 - Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas Volume I and II (4th edition, FEMA P-55, August 2011) prepared by FEMA
 - Highways in the Coastal Environment: Assessing Extreme Events (2014) prepared by the U.S. Department of Transportation and the Federal Highway Administration
 - National Climate Assessment (2014)
- **Technical Information from State Agencies:**
- Massachusetts State Hazard Mitigation Plan (2013) prepared by Tetra Tech on behalf of the Massachusetts Emergency Management Agency and the Department of Conservation and Recreation
 - Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers, and Municipal Officials (2003) prepared by Franklin, Hampden, Hampshire Conservation Districts

Incorporation with Other Town Plans and Report

- Massachusetts Climate Change Adaptation Report (2011) prepared by Executive Office of Energy and Environmental Affairs and the Adaptation Advisory Committee
- Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning (2013) prepared by the Massachusetts Office of Coastal Zone Management
- Massachusetts Coastal Erosion Commission Report (draft released in 2015) prepared by Coastal Erosion Commission
- Commonwealth of Massachusetts All Hazards Disaster Debris Management Plan (2010) prepared by the Massachusetts Emergency Management Agency
- Massachusetts Homeowner's Handbook to Prepare for Coastal Hazards (2014) prepared by Barnstable County, Woods Hole Sea Grant and MIT Sea Grant
- **Technical Information from County Agencies:**
 - Barnstable County Multi-Hazard Mitigation Plan (2010) prepared by the Cape Cod Commission
 - Barnstable County Wildfire Preparedness Plan (2012) prepared by Barnstable County and the Cape Cod Cooperative Extension

- **Technical Information from Harwich:**

- Harwich Multi Hazard Mitigation Plan (2011)
- Harwich Local Comprehensive Plan (2011)
- Town of Harwich Zoning Bylaws
- Harbor Management Plan
- Harwich Comprehensive Emergency Management Plan
- Town of Harwich Open Space and Recreation Plan (2009)

How Technical Information was incorporated

The technical information listed above was incorporated into the 2017 Harwich Hazard Mitigation Plan Update in the following ways:

- Federal documents, especially FEMA documents, were used to:
 - guide the activities of the planning process
 - provide technical guidance on successful mitigation practices in coastal communities
 - help the Planning Team develop mitigation actions
 - provide current data on climate change and adaptation strategies

A4b

Incorporation with Other Town Plans and Report

- State and County documents were used to:
 - provide current data on hazard events affecting Massachusetts and Barnstable County especially climate change, sea level rise and coastal erosion
 - guide the Planning Team on current state mitigation actions and plans; these documents were used as reference for the Planning Team
- Harwich specific documents were used to:
 - ensure that mitigation actions in the 2017 Hazard Mitigation Plan were consistent with current activities and plans already in place in Harwich
 - provide technical data for the hazard profiles, risk assessment and mitigation actions

Integrating the Hazard Plan into other Town Plans

The Mitigation Goals identified in the 2017 Harwich Hazard Mitigation Plan will be incorporated into the objectives and policies of the Harwich Local Comprehensive Plan (LCP).

- **Harwich Local Comprehensive Plan:** The Harwich LCP describes the town's goals, policies and actions on land use, growth management, natural resources, open space and recreation, historic preservation and community character, economic development, affordable housing, and community facilities and services. Mitigation Goals and Actions will be

incorporated in the Natural Resources and Open Space and Recreation when the town updates the LCP. Below are a few examples of Mitigation Goals that will be integrated in the update of the Harwich LCP:

- Reduce the potential for loss of life, property, infrastructure, and environmental, cultural and economic resources in Harwich from natural disasters.
- Ensure that mitigation measures are sensitive to the natural features, historic resources, and community character of Harwich.

New FEMA guidance requires that the 2017 Hazard Mitigation Plan Update describe how the plan was integrated with other plans over the last five years. Because this is a new requirement, Harwich does not have a process in place to collect such information. Going forward, Harwich will keep a running list of the new and updated town plans on its website and the Town Planner will be responsible for ensuring that town planning efforts are consistent with the 2017 Harwich Hazard Mitigation Plan.

C6

C6

Contents of Chapter 1 Appendix

A1e

Contents of Chapter 1 Appendix

Contents in the Chapter 1 Appendix include:

- Public Survey on Hazard Mitigation
- Survey Documentation
- Results of Public Survey on Hazard Mitigation
- BCREPC Presentation
- BCREPC Survey Results

Natural Hazards

CHAPTER TWO

Harwich is vulnerable to a range of natural hazards that threaten life and property. Current FEMA regulations and guidance under the Disaster Mitigation Act of 2000 require, at a minimum, an evaluation of a full range of natural hazards identified in the most recent Massachusetts State Hazard Plan. An evaluation of human-caused hazards (i.e. technological hazards, terrorism, etc.) is encouraged but not required for plan approval. Harwich has included an assessment of natural hazards only in the 2017 Harwich Hazard Mitigation Plan Update. **Chapter 2 provides a detailed description of the natural hazards that could impact Harwich in the future or have impacted Harwich in the past.**

Hazard Identification

Hazard Identification

State Hazards

The 2013 Massachusetts State Hazard Plan identifies 11 natural hazards that could have an impact or have a history of impacting communities in the Commonwealth of Massachusetts. These hazards are listed below:

- Coastal Erosion
- Dam Failure
- Earthquake
- Fire (urban and wildland)
- Flood
- Hurricane and Tropical Storms
- Landslide
- Nor'easters
- Severe Weather (includes high winds, thunderstorms, extreme temperatures, tornadoes and drought)
- Severe Winter Weather (includes snow, blizzards and ice storms)
- Tsunami

Selection of Hazards that affect Harwich

As suggested under FEMA planning guidance, the Planning Team reviewed the full range of natural hazards identified in the 2013 Massachusetts State Hazard Plan and identified natural hazards that could impact Harwich in the future or that have impacted Harwich in the past (*Table 2.1*). This determination was made using local expertise from Planning Team members, input from the Barnstable County Regional Emergency Planning Committee, data from the 2013 Massachusetts State Hazard Plan and other resources. All resources are referenced in the text of each hazard profile.

B1a,b

Hazard Identification

B1a,b

Table 2.1 | List of relevant natural hazards for Harwich

Type of Natural Hazard	According to weather data, is there a history of this hazard happening in Harwich?	What resources were used to make that determination?	According to the Planning Team, could this hazard happen in Harwich	Why was this determination made?
Coastal Erosion and Shoreline Change	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Massachusetts Coastal Zone Management Storm Coasts application Local knowledge from Town Staff 	Yes	There is a history of erosion and shoreline change in Harwich
Dam (Culvert) Failure	No	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Ma Department of Dam Safety Local knowledge from Town Staff 	Yes	There are 5 dams in the planning area, but MA Dept of Dam Safety has ranked the severity of dam failure as low or not applicable.
Earthquake	No	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a no history of earthquakes in Harwich but there is a history of earthquakes in Massachusetts
Fire (Urban and Wildland)	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	Fire-adapted vegetation puts the town at risk for wildfire and there is a history of urban fires in Harwich.
Flood	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a history of flooding in Harwich and town's geographic location.
Hurricane and Tropical Storms	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan National Hurricane Center Local knowledge from Town Staff 	Yes	There is a history of hurricanes and tropical storms in Harwich
Landslide	No	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	Lack of history of event and not included in previous hazard plan, but sandy soils could be destabilized from water saturation.

Hazard Identification

Table 2.1 | List of relevant natural hazards for Harwich (cont.)

Type of Natural Hazard	According to weather data, is there a history of this hazard happening in Harwich?	What resources were used to make that determination?	According to the Planning Team, could this hazard happen in Harwich	Why was this determination made?
Nor'easters	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan 2011 Harwich Hazard Plan Local knowledge from Town Staff 	Yes	There is a strong history of nor'easters in New England.
High Winds	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan 2011 Harwich Hazard Plan Local knowledge from Town Staff 	Yes	There is a history of high winds in Harwich
Thunderstorms	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a history of thunderstorms events in Harwich and previous Harwich Hazard Plan lists wind as a threat to the community
Extreme Temperatures	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a history of extreme cold and hot temperatures in Harwich
Tornadoes	No	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is no history of tornadoes in Harwich, but there have been tornado warnings in Barnstable County
Drought	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a history of drought in Barnstable County
Severe Winter Weather	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Yes	There is a history of severe winter weather in Harwich
Tsunami	No	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff 	Unknown	The probability of a damaging tsunami impacting Massachusetts is unknown
Sea Level Rise	Yes	<ul style="list-style-type: none"> 2013 Massachusetts Hazard Mitigation Plan Local knowledge from Town Staff Cape Cod Commission Sea Level Rise Viewer 	Yes	There is a history of sea level rise in Harwich

Hazard Profiles

Coastal Erosion and Shoreline Change

Overview

Coastal shorelines — especially beaches, dunes and banks — change constantly in response to wind, waves, tides and other factors including seasonal variation, sea level rise and human alterations to the shoreline system.¹ Every day, wind, waves and currents move sand, pebbles and other materials along the shore or out to sea. This dynamic and continuous process of erosion, transport and accretion shape the coastal shoreline. Shorelines change seasonally, tending to accrete gradually during the summer months when sediments are deposited by relatively low energy waves and erode dramatically during the winter when sediments are moved offshore by high energy storm waves, such as those generated by nor'easters.

Hazard Location

Through the Shoreline Change Project at the Massachusetts Office of Coastal Zone Management (CZM), the ocean-facing shorelines of Massachusetts were delineated and statistically analyzed to

demonstrate trends from the mid-1800s to 2009. An update of the Shoreline Change Project was completed in 2001 using 1994 National Oceanic and Atmospheric Administration (NOAA) aerial photographs of the Massachusetts shoreline. CZM established an agreement with the U.S. Geological Survey (USGS), the Woods Hole Oceanographic Institution Sea Grant Program, and Cape Cod Cooperative Extension to produce the 1994 shoreline and calculate shoreline change rates. CZM then incorporated the shorelines and shore-perpendicular transects with shoreline change rates into MORIS, the Massachusetts Ocean Resource Information System, to provide better access to the shoreline change data and encourage the public to browse the data using this online mapping tool. To launch the MORIS tool, use the following link: <http://www.mass.gov/eea/agencies/czm/program-areas/mapping-and-data-management/moris/>

Using the data from the Shoreline Change Project, the Planning Team concluded that the entire coastline of the planning area is vulnerable to shoreline change. *Figure 2.1* is a series of three maps of the planning area showing how the shoreline has changed from the mid-1800s to 2009.

B1c

¹ Report of the Massachusetts Coastal Erosion Commission, December 2015

Hazard Profiles



Figure 2.1 | Historic shoreline change along the coast of Harwich. Map was created using data from the Massachusetts Ocean Resource Information System

Previous Occurrences and Extent

Coastal erosion is measured as the horizontal displacement of a shoreline over a specific period of time, measured in units of feet or meters per year.² Shoreline change can be monitored over short-term and long-term time scales. Monitoring shoreline change on a relatively short period of record does not always reflect actual conditions and can misrepresent long-term erosion rates. However, long-term patterns of coastal erosion are difficult to detect because of substantial, rapid changes in coastlines over days or weeks from storms and natural tidal processes.

The Coastal Erosion Commission's 2015 Report¹ states the average shoreline change rates for Harwich, where positive values indicate accretion and negative values indicate erosion, is the following:

- **Short Term Rate:** 0.1 ± 1.9 ft/year
- **Long Term Rate:** 0.8 ± 1.7 ft/year

It is important to note that this data represents averages for shoreline change throughout Harwich, and that within the town there might be areas with greater or lesser erosion and accretion rates.

² Massachusetts State Hazard Plan, Coastal Erosion and Shoreline Change, 2013

Impact

While erosion is a natural process, it causes damage to coastal property and related infrastructure — particularly when development is sited close to the shoreline in unstable or low-lying areas. Below is a list of possible damages that could result from shoreline change¹:

- **People:** public safety is jeopardized when buildings collapse or water supplies are contaminated; erosion can cause roadways to collapse which would reduce the response time of emergency vehicles
- **Infrastructure:** erosion can expose septic systems and sewer pipes risking contamination of shellfish beds and other resources; accreting sand can block storm water pipes, causing urban drainage issues in town
- **Buildings:** erosion reduces the embedment of foundations in the soil, causing shallow foundations to collapse and making buildings on foundations more susceptible to settlement, lateral movement or overturning; once a building moves or is overturned, construction materials and other debris can be swept out to sea; seawalls and other hard structures open downdrift property owners to similar or greater losses
- **Economy:** if businesses are affected by coastal erosion, there could be loss of business function; damage to inventory; relocation costs; wage loss

B3a

Hazard Profiles

- **Natural Systems:** where engineered structures are used to stabilize shorelines, the natural process of erosion is altered, changing the amount of sediment available and erosion rates at adjacent areas; the town's natural ecosystem attractions – beaches, dunes, barrier beaches, salt marshes and estuaries – would also be threatened and could slowly disappear as sand sources that supply and sustain them are eliminated; under conditions of reduced sediment supply, the ability of coastal landforms to provide storm damage and flooding protection would be diminished, increasing the vulnerability of infrastructure and development.
- **Transportation:** roadways and parking lots can become damaged due to shoreline recession.

B2b

Probability

The Planning Team determined that it is **HIGH LIKELY** that a shoreline change will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years

- **Highly Likely:** near 100% probability in the next year

Data from the Shoreline Change Project, local knowledge and the Report of the Massachusetts Coastal Erosion Commission were used to make this probability determination.

(Dam) Culvert Failure

Overview

A dam is an artificial barrier that has the ability to impound water, wastewater or any liquid-borne material for the purpose of storage or control of water.¹³ Dam failure is a catastrophic type of failure characterized by a sudden, rapid and uncontrolled release of impounded water.¹³

A culvert is a structural opening under a roadway that allows water to pass from one side of a roadway to the other.^{3,4}

Water flowing under the road typically comes from two sources – streams and road runoff – and these water resources require different types of culverts⁵:

³ Massachusetts Highway Department: Project Development and Design Guide 2006

⁴ http://water.epa.gov/polwaste/nps/urban/upload/2003_07_24_NPS_unpavedroads_ch3.pdf

Hazard Profiles

B1c

- stream crossing culvert is located where the roadway crosses over a stream channel and the culvert allows water to pass downstream

B2a,c

- runoff management culvert is a strategically placed culvert to manage roadway runoff along, under and away from the roadway. Typically, these culverts are used to transport upland runoff that accumulated in ditches to the lower side of the roadway for disposal.

Culverts are typically made of concrete, steel or aluminum and can have various cross-sectional shapes (i.e. oval, circular, arched or rectangular).⁴ The size of the culvert opening is calculated using location-specific data on the amount of precipitation, snow accumulation and the probability of hurricanes impacting the area. The primary function of a culvert is to prevent flooding during normal and extreme weather conditions and provide proper road and highway drainage.

Culverts can fail and when failure occurs, it can be catastrophic. There are several reasons why culverts fail, including but not limited to⁵:

- buildup of flood waters on the upstream side of the culvert that exceed the capacity of the culvert.

(video of a culvert failure in Maine, see: <https://www.youtube.com/watch?v=NTbhyHNA1Vc>)

- the pipe inside the culvert becomes occluded because of debris or improper maintenance
- the pipe inside the culvert loses its structural integrity and begins to cave in
- culvert and road are washed out during a heavy rain event or from snowmelt runoff
- the soil/material around the culvert pipe begins to move. Without support from such material, the culvert will buckle or sag and the culvert will collapse.

⁵ Failing culverts: Structural problems and economic considerations, Tenbusch, Inc, June 2013, www.tenbusch.com/underground_equipment/files/FailingCulvertsStructuralAndEconomicConsiderations.pdf

Hazard Profiles

Hazard Location

B1c

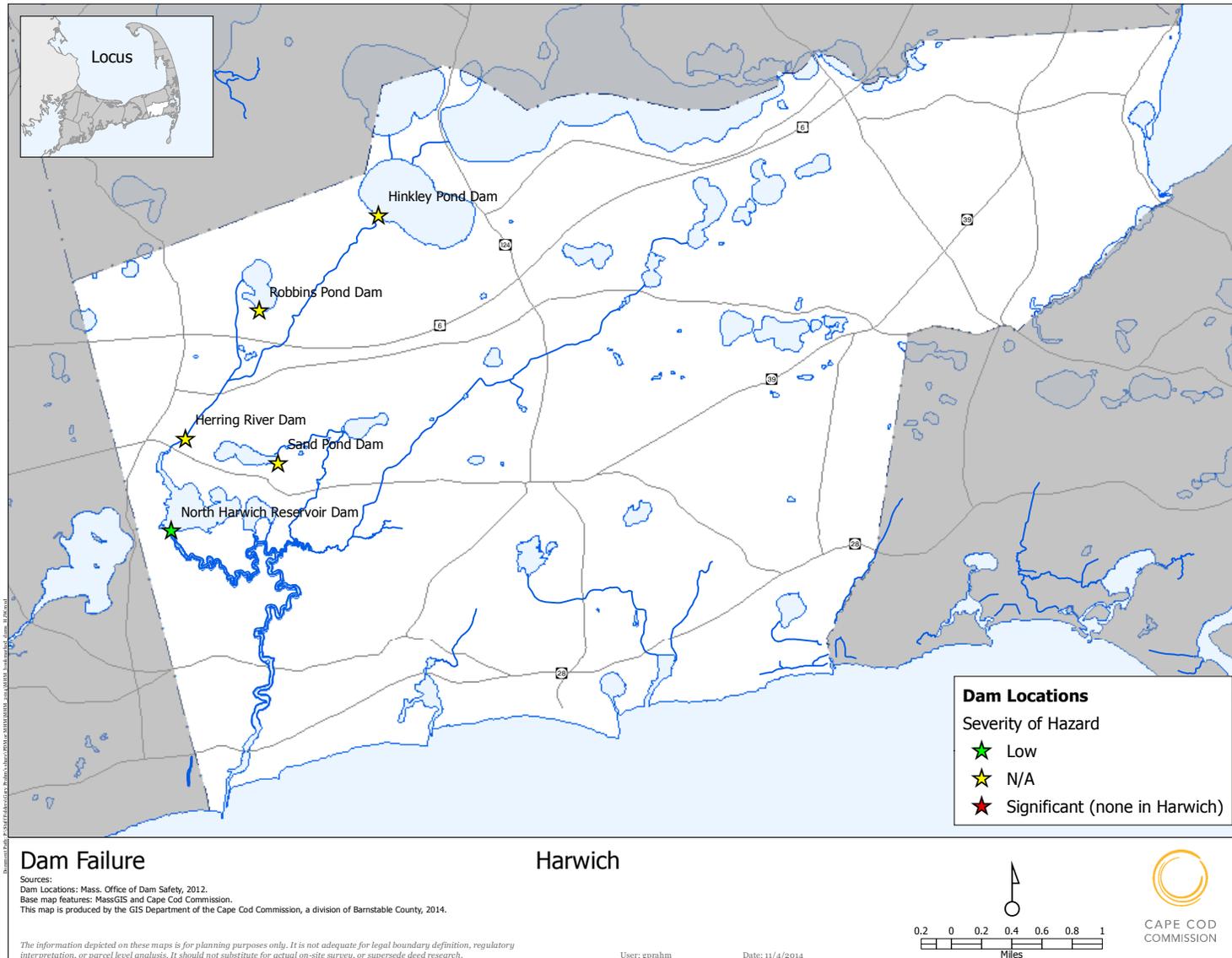


Figure 2.2| Map of Harwich showing the locations of culverts and one dike.

Five dams are located in Harwich (locations shown in *Figure 2.2*).

B1c,
B2a,c

Previous Occurrences and Extent

There is no record of dam or culvert failure in Harwich. Since Harwich has not experienced dam or culvert failure, the following description of the extent of culvert failure is taken from events that occurred in the state of Vermont during Tropical Storm Irene.⁶ In August of 2011, Tropical Storm Irene brought heavy precipitation to New England and eastern New York. During Irene, the state of Vermont incurred damages to state and local infrastructure:

- over 200 state road segments and 200 state-owned bridges were damaged
- 2,000 local road segments, 277 locally-owned bridges and nearly 1,000 locally-owned culverts were damaged

The extent of the culvert and bridge damage in Vermont was:

- large river and stream bank failures delivered a tremendous amount of woody debris downstream and plugged bridges, causing streams to overtop the bridge and wash out the bridge approach

⁶ Gillespie et al., 2014, Flood effects on road-stream crossing infrastructure: economic and ecological benefits of stream simulation designs, Fisheries, volume 39 (2), page 62 - 76

- culverts became plugged with debris and redirected a large volume of water over areas of towns. In Rochester, NH water was redirected onto cemetery grounds – unearthing caskets and scattering human remains throughout the downtown area

Impact

Below is a list of additional possible impacts from culvert failure:

B3a

- **People:** community isolation from impassable roads, often leaving residents without power and water
- **Infrastructure:** power outages from disruption of underground utilities; no water due to disruption of pipes near the failed culvert; the high cost of relief and recovery may adversely affect investment in infrastructure or other development activities
- **Economy:** impacted traffic flow and impassable roads may prevent people from returning to work and tourists from visiting the area; expensive infrastructure repairs, residents will bear the extra cost of circumventing damaged roads
- **Natural Systems:** bank erosion, debris in natural systems
- **Transportation:** impaired traffic flow and impassable roads

Hazard Profiles

B2b

Probability

The Planning Team determined that it is **POSSIBLE** that a culvert failure will impact the planning area. This determination was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

This Planning Team used the Mass xx of Dams and xx to make this determination. The MA Department of Dam Safety ranked the severity of their failure as “low” or “not applicable.”

Earthquake

Overview

An earthquake is movement or trembling of the ground produced by a sudden displacement of rock in the Earth’s crust. Scientists have formulated several theories to explain the causes of earthquakes but the theory of plate tectonics is commonly used to explain much of the earthquake activity in the world.⁷

The theory of plate tectonics postulates that, at one point, the earth was covered by a single crust, or plate, with no oceans. Over time, this plate started to split and drift into separate plates of land or ocean crusts. Now the earth’s surface looks much like a spherical jigsaw puzzle; all the plates fit together. The plates over the earth are in constant slow motion. They generally move in one of three ways—they collide, spread or slide. Any one of these plate movements can cause an earthquake. Maps of earthquake activity throughout the world show that earthquakes most frequently occur at the boundaries of plates.

Plate movement or other forces create tremendous stress on rocks that make up the earth’s outer shell. When rock is strained beyond its limit, it will fracture, and the rock mass on either side will move. This fracture is called a fault. Not all faults will cause earthquakes,

⁷ Earthquake Causes and Characteristics, FEMA Emergency Management Institute Training Guide, <https://training.fema.gov/emiweb/is/is8a/is8a-unit3.pdf>

but if there is a sudden rupture, energy is released that creates the motions associated with an earthquake. Once the sudden rupture occurs, the earth begins to shake. This shaking is caused by a series of waves known as seismic waves moving from the center of the earthquake outward to surrounding areas. Two scales are frequently used to measure earthquakes:

- **THE MODIFIED MERCALLI INTENSITY SCALE** measures the intensity or impact of an earthquake on people and the built environment. It measures the impact of an earthquake by sending out trained observers to look at the damage done to the built environment and the earth (landslides, etc.) and at the reaction of people to the event (*Table 2.2*).
- **THE RICHTER SCALE** measures the maximum recorded amplitude of a seismic wave. This measurement quantifies the ground motion and the energy released at the source of an earthquake, which is referred to as its magnitude.
 - **Richter Magnitude of 3.5 -5.4:** often felt but rarely causes damage
 - **Richter Magnitude of 5.5 - 6.0:** slight damage to well-designed buildings, major damage to poorly constructed buildings
 - **Richter Magnitude of 6.1 – 6.9:** destructive
 - **Richter Magnitude of 7.0 – 7.9 :** major earthquake, causes serious damage over large areas

- **Richter Magnitude of 8.0 or higher:** named Great Earthquakes, cause serious damage over extremely large areas

Both the Modified Mercalli Intensity Scale and Richter Scale are used to describe earthquakes because they utilize different data sets; the Richter Scale describes an earthquake's magnitude while the Modified Mercalli Intensity Scale describes the earthquake's impact on people and structures.

Hazard Location

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines in the central and western states. The eastern United States does experience earthquakes, but they are less frequent and less intense than the ones in the central and western U.S. *Figure 2.3* shows relative seismic risk for the United States.

B1c

Previous Occurrences and Extent

Between 1627 and 2008, there were 366 earthquakes recorded in Massachusetts.¹³ Generally, most earthquakes that occur in the Northeast region of the United States tend to be small in magnitude and cause little damage, however; 104 earthquakes between 1924 and 2012 have measured at a magnitude of 4.5 or greater on the Richter scale. Due to the geologic composition and rock structure in the Northeast seismic

B1c,
B2a,c

Hazard Profiles

shaking for many of these larger earthquakes were felt throughout all of New England.

Below is a list of earthquakes that affected eastern Massachusetts¹³:

B2c

- **August 8, 1847:** no data available on extent of hazard
- **November 27, 1852:** no data available on extent of hazard
- **December 10, 1854:** no data available on extent of hazard
- **September 21, 1876:** no data available on extent of hazard
- **May 12, 1880:** no data available on extent of hazard
- **January 21, 1903:** no data available on extent of hazard
- **April 24, 1903:** no data available on extent of hazard
- **October 15, 1907:** no data available on extent of hazard
- **January 7, 1925:** earthquake occurred off of Cape Ann and the reported felt area extended from Providence, RI to Kennebunk, ME
- **April 24, 1925:** no data available on extent of hazard
- **January 28, 1940:** no data available on extent of hazard
- **October 16, 1963:** Intensity VI, caused plaster to fall in a house, a wall cracked, stones fell from a building foundation, dishes were broken, windows cracked
- **October 30, 1963:** no data available on extent of hazard
- **October 24, 1965:** slight damage to homes on Nantucket, house timbers creaked, doors, windows and dishes rattled
- **December 30, 2012:** Magnitude 1.2 earthquake about 7 miles south of Gardner, MA. No extent data available.
- **April 2012:** a collection of 12 or more earthquakes occurred off of the New England coast about 250 miles east of Boston. The largest of these earthquakes measured a magnitude of 4.4 on the Richter Scale. This collection of earthquakes was of particular concern because of the major earthquake on the continental shelf further north in 1929 that produced a deadly and damaging tsunami in Nova Scotia

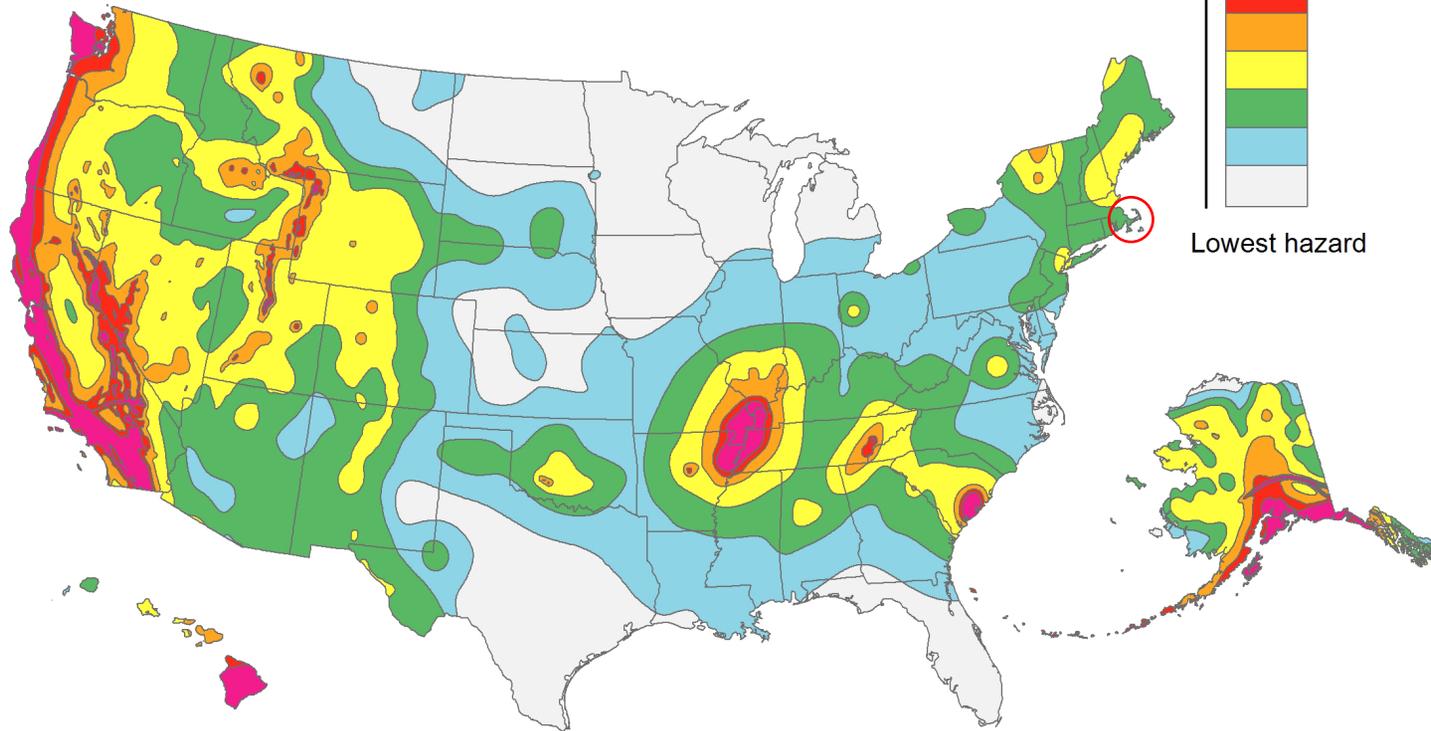
There have been no earthquake declared disasters for Massachusetts. No data is available on the history of earthquakes in Harwich.

Hazard Profiles

Level	Description
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably indoors, especially on upper of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all, many frightened and run indoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rail bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen of ground surface. Lines of sight and level are distorted. Objects are thrown into the air.

Table 2.2 | Modified Mercalli Scale, from Earthquake Causes and Characteristics, Chapter 3 of Emergency Management Institute Training Guide

Hazard Profiles



States. A circle was used to identify the planning area on the map.

B3a

Impact

Earthquakes can affect hundreds of thousands of square miles, cause damage to property, result in loss of life and injury and disrupt the social and economic functioning of

the affected area. Most property damage and earthquake related deaths are caused by the failure and collapse of structures during ground shaking. See *Figure 2.4* for a detailed list of possible damages from earthquakes.

B2b

Probability

Earthquakes cannot be predicted and may occur at any time of the day and any time of the year.¹³ The Planning Team determined that it is **POSSIBLE** that an earthquake will impact Harwich. Probabilities were defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used data collected from the 2013 Massachusetts State Hazard Plan and historical earthquake data in Massachusetts to make this probability determination.

Fire: Urban and Wildland

Overview

This portion of the Harwich Hazard Mitigation Plan Update assesses two types of fire events: urban fires and wildfires.

Urban fires occur when buildings and structures catch fire and there is potential for the fire to spread to adjoining structures. Urban fires are more common in areas where single family homes, multi-family homes and businesses are clustered closely together, thereby increasing the possibility of rapid spread to nearby structures. Urban fires occur more frequently than wildfires and often result from everyday activities such as cooking, smoking and appliance malfunction.

Wildfires are defined as any non-structural fire that occurs in a vegetative wildland including grass, shrub, leaf litter or forested area.¹³ Wildfires often begin undetected and spread quickly when brush, trees and homes are ignited. In Massachusetts, wildfires are typically caused by lightning, human activity (i.e. smoking, unattended camp fires) or prescribed burns (intentional, controlled burns that are started under the supervision of experienced fire personnel)¹³.

In 2012, the Cape Cod Cooperative Extension and other regional partners developed the Barnstable County Wildfire Preparedness Plan. As stated in this document, Cape Cod is vulnerable to wildfires for several reasons:

- The region has a long history of wildfires. As a result, most of Cape Cod has fire-adapted ecosystems and therefore they are prone to burning. Also pitch pine barrens are the dominant vegetative community on Cape Cod. These ecosystems

Hazard Profiles

contain several highly flammable plant species that are adapted to survive or regenerate post fire.

- Many residents of Barnstable County live in the Wildland Urban Interface (WUI). This zone is defined as the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel. Development in the WUI is dangerous because wildfires can move to surrounding developments and place homes and other buildings at risk for ignition.

B1c

Hazard Location

A team of fire professionals developed the Barnstable County Wildfire Preparedness Plan and conducted a town-wide risk assessment for wildfire in Harwich. This team identified five sites in Harwich that are at risk to wildland fires (**Figure 2.4**): Thompson's Field, Bells Neck Conservation Land, the Punkhorn area, Hawksnest State Park, and Water Department land off of Chatham Road

B1c,
B2a,c

Previous Occurrences and Extent

The following is a list of notable wildland fires that have occurred in Barnstable County since 1887:

- **1887:** A large forest fire burned over 25,000 acres from the Pocasset section of Bourne to Sandwich. This fire destroyed approximately 600 cords of

stacked wood at the Sandwich Glass Company as well as several stands of oak and pine. The Sandwich Glass Company was forced to purchase and burn coal in its furnaces at a substantial financial cost. This, along with a labor union strike, ultimately contributed to the demise of the Sandwich Glass Company, one of the Cape's largest industrial businesses between 1825 and 1894. (www.capecodfd.com)

- **May 30, 1923:** A fire began in the woods of Pocasset village and burned through the day. It was under control by nightfall, only to flare up again and again for seven days. An area of approximately 25,000 acres, between Pocasset village, Sagamore, Sandwich, East Sandwich, and South Sandwich was left blackened. (www.capecodfd.com)
- **April 19, 20, 21, 1927:** 2,500 acres burned in Truro. (Barnstable Patriot, April 28, 1927)
- **1938:** 5,000-acre wildfire kills three Sandwich firefighters on Route 130 (http://www.mashpeema.gov/Pages/MashpeeMA_Fire/MashpeeWildlife.pdf)
- **April 1946:** Slash piles started by German prisoners of war at Camp Edwards blazed out of control and consumed 50,000 acres (http://www.mashpeema.gov/Pages/MashpeeMA_Fire/MashpeeWildlife.pdf)

Hazard Profiles

- **June 1949:** 75 acres or more of brush and woodland burned after a fire started at the Truro Town Dump. Firefighters from Truro, Harwich, Brewster and Orleans helped bring it under control. (Provincetown Banner, June 16, 1949)

The most prevalent type of fire the Harwich Fire Department responds to are fires in single family residences. These fire are typically related to the actions of the occupants or failures of mechanical systems and are rarely are they the result of intentional action.

Below is a list of the most recent, notable urban fires in Harwich:

11/25/2012 - The Stonehorse Motel, a large vacant structure burned down - a total loss -The cause of the fire was undetermined.

09/25/2015 - 37 Pleasant Lake Avenue, an occupied house with hoarder conditions burned down - a total loss. Combustibles too close to a wood stove caused the fire.

12/12/2015 - 15 Doane Rd, a vacant house, was heavily damaged. The cause of the fire was undetermined

10/12/2016 - 255 Oak Street, an occupied The cause of the fire may have been electrical but was undetermined.

11/22/2016 - 20 Freshwater Drive, an occupied house with attached garage burned down and was a total loss.

A generator for a marijuana growing operation caused the fire.

12/03/2016 - 920 Route 28, a multi-family residential burned. One victim was rescued. Careless smoking caused the fire.

Impact

B3a

Destruction caused by urban fires and wildfires depends on the following factors:

- size of the fire
- landscape
- amount of fuel (i.e. vegetation and structures) in the path of the fire
- direction and intensity of the wind
- response time of fire personnel
- number of firefighters able to respond to the fire
- access to the fire once it starts

Below is a list of possible damages from urban and wildland fires.

- **People:** death or injury to people and animals, smoke can cause health issues for people, even for those far away from the fire

Hazard Profiles

- **Infrastructure:** gas, power and communications may be disrupted, flying embers can set fire to buildings more than one mile away from the initial fire
- **Buildings:** structures can be damaged or destroyed, a large number of buildings can be burned
- **Economy:** indirect economic losses in reduced tourism; as communication and infrastructure systems are damaged and disrupted, economic activities come to a standstill, often resulting in dislocation and dysfunction of normal business activities; when roadways are disrupted, it impacts the customer base for small businesses and leads to slow recovery times for these businesses; the high cost of relief and recovery may adversely affect investment in infrastructure or other development activities
- **Natural Systems:** extensive acreage can be burned, damaging watersheds and critical natural areas, flash flooding and landslides can result from fire damage to the surrounding landscape; wildfires strip slopes of vegetation exposing them to greater runoff and erosion; this will weaken soils and cause failure on slopes, wildfires can affect the land for many years, including causing changes to the soil and therefore increasing the risk of future flooding, contamination of reservoirs, change the permeability of the ground. When fires burn hot and for long periods of time, the soil will bake and become impermeable.

When this happens, runoff and the risk of flooding increases

- **Transportation:** transportation may be temporarily disrupted

Probability

The Planning Team determined that it is **LIKELY** that an urban fire will impact Harwich and **LIKELY** that a wildfire will impact the planning area. Probabilities were defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used data collected from the 2013 Massachusetts State Hazard Plan, the 2012 Barnstable County Wildfire Preparedness Plan and local knowledge of the town to make this probability determination.

B2b

Hazard Profiles

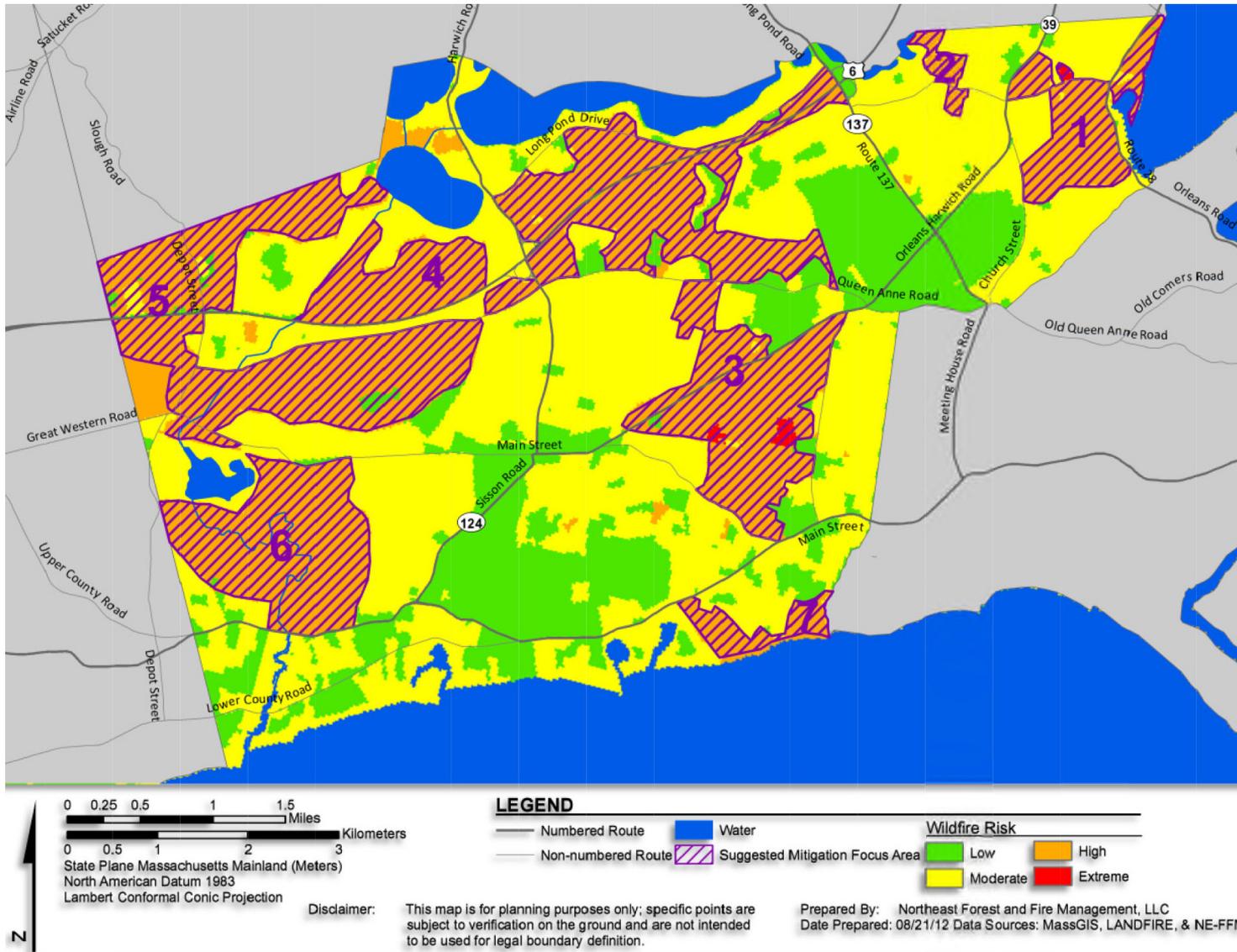


Figure 2.4 | Town of Harwich Wildfire Risk map from the Barnstable County Wildfire Preparedness Plan

Hazard Profiles

Flood

Overview

There are several types of flood hazards that frequently impact Harwich:

- **Flash flooding** occurs when a severe storm like a nor'easter or tropical storm causes a large amount of rain in a short period of time.⁸
- **Coastal flooding** occurs when persistent high wind and changes in air pressure during a hurricane or nor'easter push water towards the shore. This action causes storm surge which raises the level of the water by several feet. Waves can be highly destructive as they move inland, battering structures in its path (*Figure 2.9*). The magnitude of a flood varies with the tides; storm surge that occurs during high tide will flood larger areas than if the same surge occurred at low tide.⁹
- **Urban drainage** occurs in flat areas where runoff or rain collects and cannot drain out. Drainage systems are made up of ditches, storm sewers, retention ponds and other infrastructure that store runoff and carry it into a receiving stream, lake, or ocean. When most of these systems were built, they were designed to handle the amount of water expected during a 10-year storm event. Larger storms

overload the system and result in back-ups. When this system is blocked, water forms temporary ponds. This water will remain in an area until it infiltrates into the soil, evaporates, the blockage is cleared or the water is actively pumped out.⁹

Hazard Location

Flooding in Harwich is also the direct result of coastal storms, nor'easters, heavy rains, tropical storms, and hurricanes. *Figure 2.5* shows the 2014 FEMA Flood Insurance Rate Map (FIRM) for Harwich. This map depicts areas of Harwich in V and A zones and the 2% annual flood areas.

B1c

Previous Occurrences and Extent

Below is a list of rain, flooding and coastal flooding events experienced in Harwich and surrounding locations from 1970 - 2015. Data was collected from NOAA's National Climatic Data Center and local newspapers

- **December 17, 1970:** Lower/Outer Cape Cod: Rain closed schools, heavy rain and melting snow caused local flooding of roads and cellars, storm surge 3 ft above normal and eroded some coastal roads/beaches, utility failures from flooded cable on the
- **June 22, 2009:** An unusually strong coastal storm moved southeast of Nantucket, resulting in coastal

⁸ National Flood Insurance Program, Floodplain Management Requirements, FEMA 480

flooding and strong winds across portions of coastal Massachusetts, including Cape Cod.

- **March 7, 2013:** Minor coastal flooding occurred in Lower Cape communities, including Eastham, Harwich, Brewster, and Chatham.
- **January 3, 2014:** Moderate coastal flooding impacted portions of Cape Cod, creating flooded and impassable roads throughout the region.

B3a

■ *Impact*

Below is a list of the possible impacts for a flooding event in Harwich:

- **People:** people can be knocked down or washed off their feet while walking in floodwaters; injury and death for people who become trapped in their cars during a flood event; often people place themselves in harm's way by ignoring warning signs of water depth on roadways; people can be displaced from their homes because of post-flood safety and health hazards; mold, mildew and bacteria can cause health issues; flooding can cause drinking water to become contaminated.
- **Infrastructure:** flooding can leave large amount of debris and sediment on and around town infrastructure; floods can damage gas lines, utility poles, water infrastructure, wastewater treatment plants; cause sewage spills.
- **Buildings:** moving water can damage the walls of buildings; building foundations on the beach can be undermined by the velocity of floodwaters; floodwaters pick up anything that floats, including logs, lumber, propane tanks and vehicles – when this happens, these objects can act as battering rams and damage buildings; buildings can float off of their foundations if not anchored properly
- **Economy:** as communication and infrastructure systems are damaged and disrupted, economic activities come to a standstill, often resulting in dislocation and dysfunction of normal business activities; roadways disruptions affect the customer base and slow recovery times for small businesses; the high cost of relief and recovery may adversely affect investment in infrastructure or other development activities; there can be losses associated with decreased land value in floodplains
- **Natural Systems:** During flood events, storm water systems cannot handle the high water volume and oftentimes, untreated sewage can enter into the environment, floods can transfer sediment and debris into parks, beaches, estuaries, rivers, etc.
- **Transportation:** floods can wash out bridges and culverts, debris in floodwaters can occlude culverts so much that the culvert acts like a dam; roadways can be washed away in a flood event; there can be major disruptions to transit, train or ferry services

Hazard Profiles

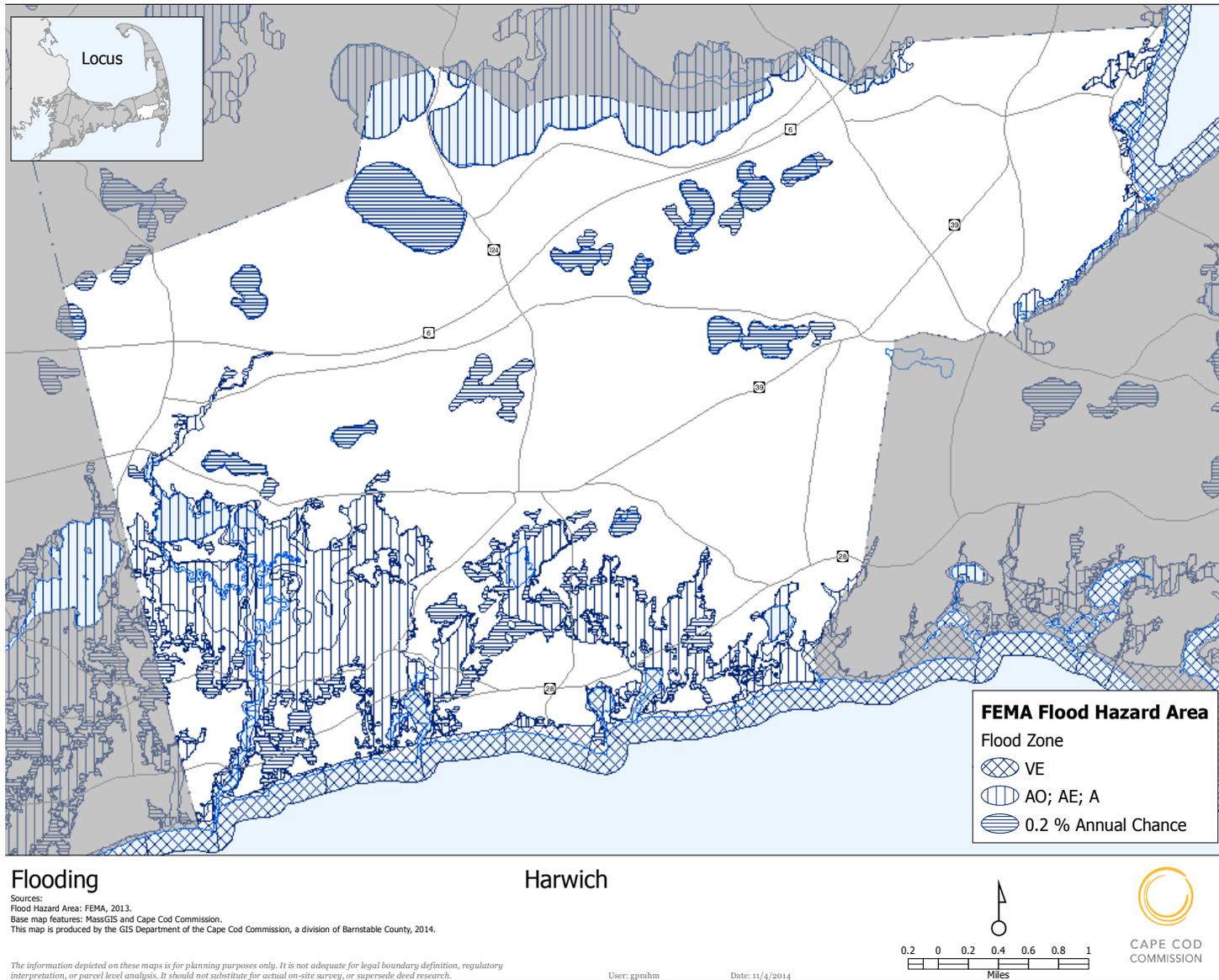


Figure 2.5 | FEMA flood hazard area map

B2b

Probability

The Planning Team determined that it is **HIGHLY LIKELY** flooding will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

B1c,
B2a,c

The Planning Team used the history of hurricanes, tropical storms, nor'easters in Harwich to make this probability designation.

Hurricanes and Tropical Storms

Overview

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters.⁹ In the Atlantic Basin, the hurricane

season “officially” runs from June 1 to November 30; peak activity is in early to mid-September.¹⁰

There are four types of tropical cyclones that can occur in the Atlantic Basin:

- **Tropical Depression:** a tropical cyclone with maximum sustained winds of 38 mph or less
- **Tropical Storm:** a tropical cyclone with maximum sustained winds of 39 to 73 mph
- **Hurricane:** a tropical cyclone with maximum sustained winds of 74 mph or higher
- **Major Hurricane:** a tropical cyclone with maximum sustained winds of 111 winds or higher, corresponding to a Category 3, 4, or 5 on the Saffir-Simpson Hurricane Wind Scale

There are two data sets used to classify tropical cyclones:

1. **Saffir-Simpson Hurricane Wind Scale** is a 1 to 5 rating based on a hurricane’s sustained wind speed¹¹. This scale estimates potential property damage (*Table 2.3*). Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category

⁹ National Hurricane Center Outreach and Education, <http://www.nhc.noaa.gov/climo/>

¹⁰ National Hurricane Center Outreach and Education http://www.srh.noaa.gov/jetstream/tropics/tc_basins.htm

¹¹ <http://www.nhc.noaa.gov/aboutsshws.php>

Hazard Profiles

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
	64-82 kt	
	119-153 km/h	
2	96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
	83-95 kt	
	154-177 km/h	
3 (major)	111-129 mph	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
	96-112 kt	
	178-208 km/h	
4 (major)	130-156 mph	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
	113-136 kt	
	209-251 km/h	
5 (major)	157 mph or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
	137 kt or higher	
	252 km/h or higher	

Table 2.3 | Saffir-Simpson Hurricane Wind Scale (National Hurricane Center)

1 and 2 storms are still dangerous, however, and require preventative measures.

2. Amount and location of storm surge. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around

the storm.¹² This advancing surge combines with

¹² National Weather Service Jetstream – Online School for Weather, Tropical Weather, Tropical Hazards www.srh.noaa.gov/jetstream/tropics/tc_hazards.htm

the normal tides to create the hurricane storm tide, which can increase average water levels 15 feet (4.5 m) or more. In addition, wind-driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides (*Figure 2.6*).

The US Army Corps of Engineers New England Division, in cooperation with FEMA, prepared Sea, Lake and

Overland Surge from Hurricanes (SLOSH) inundation maps.¹³ SLOSH mapping represents potential flooding from worst-case combinations of hurricane direction, forward speed, landfall point, and high astronomical tide. It does not include riverine flooding caused by hurricane surge or inland freshwater flooding. The model, developed by the National Weather Service to forecast

¹³ Massachusetts State Hazard Mitigation Plan, 2013

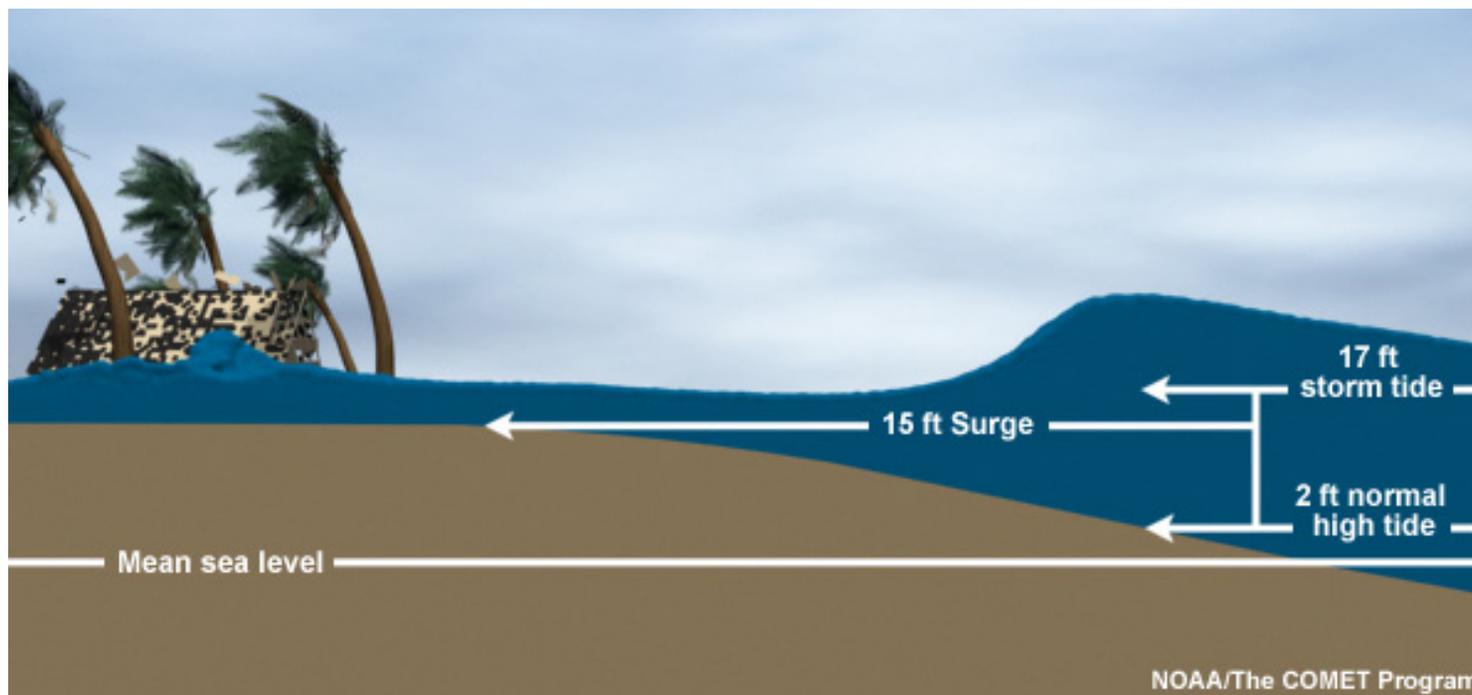


Figure 2.6 | Schematic of the generic differences between mean sea level, normal high tide, storm surge and storm tide. This graphic is for educational purposes only. The numbers shown (2, 15, 17 feet) are not specific to Harwich.

Hazard Profiles

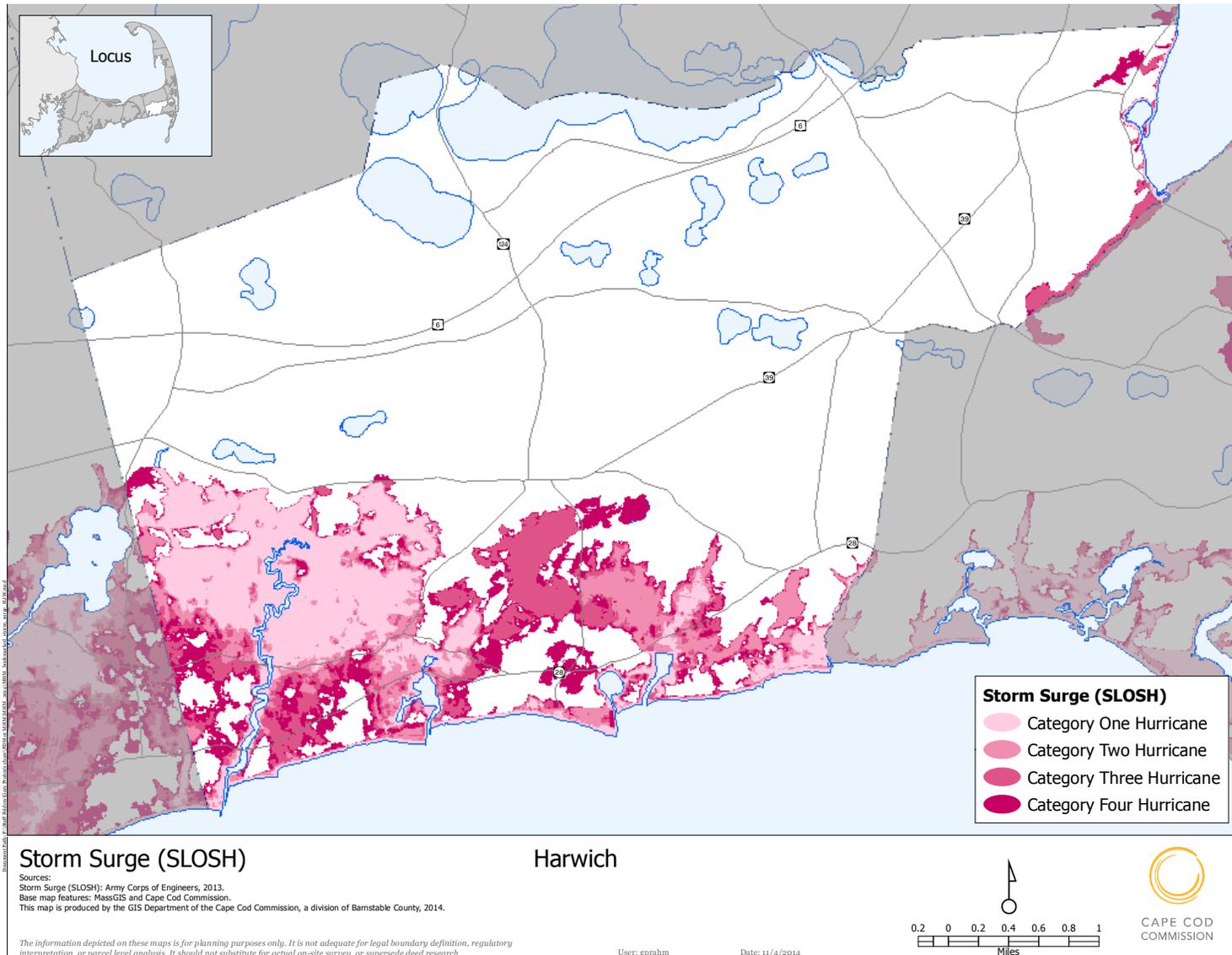


Figure 2.7 | SLOSH map for Harwich

surges that occur from wind and pressure forces of hurricanes, considers only storm surge height and does not consider the effects of waves. The mapping was developed for New England coastal communities using the computer model, Long Island Sound bathymetry, and New England coastline topography. The resulting inundation areas are grouped into Category 1 and 2, Category 3, and Category 4. The hurricane category refers to the Saffir-Simpson Hurricane Intensity Scale. The Army Corps of Engineers considered the highest wind speed for each category, the highest surge level, combined with worst-case forward motion and developed a model to depict areas that would be inundated under those combined conditions.

B1c

Hazard Location

The entire planning area is vulnerable to tropical cyclones. Coastal areas are extremely susceptible to damage because of wind and storm surge. Inland areas can also be affected by flooding, strong wind and heavy rain associated with tropical cyclones. *Figure 2.7* shows the predicted storm surge in the planning area for the Category 1-4 storms.

Previous Occurrences and Extent

B1c,
B2a,c

The National Hurricane Center created maps showing the tracks of all known North Atlantic hurricanes and major hurricanes between the years 1851 and 2013 (*Figure 2.8*). These maps indicate that there is a strong history of hurricanes affecting the Atlantic Coast of the United States, including Barnstable County.

The Moris tool and data from NOAA was used to plot hurricane tracks making landfall in New England between 1851 and 2008 (*Figure 2.9*)

Data collected from the FEMA disaster declaration website, the 2013 MA State Hazard Plan, and local experts (including the Planning Team and the Barnstable County Emergency Planning Committee) was also used to document the previous occurrences of tropical cyclones that affected Cape Cod. *Table 2.4* describes the major disaster declarations and most memorable cyclones to affect Barnstable County and thus, the planning area.

Impact

B3a

The National Hurricane Center describes the types of damages that a community could experience during a Category 1-5 storm.¹⁴

¹⁴ National Hurricane Center Outreach and Education, Saffir-Simpson Hurricane Wind Scale Extended Table, <http://www.nhc.noaa.gov/aboutsshws.php>

Hazard Profiles

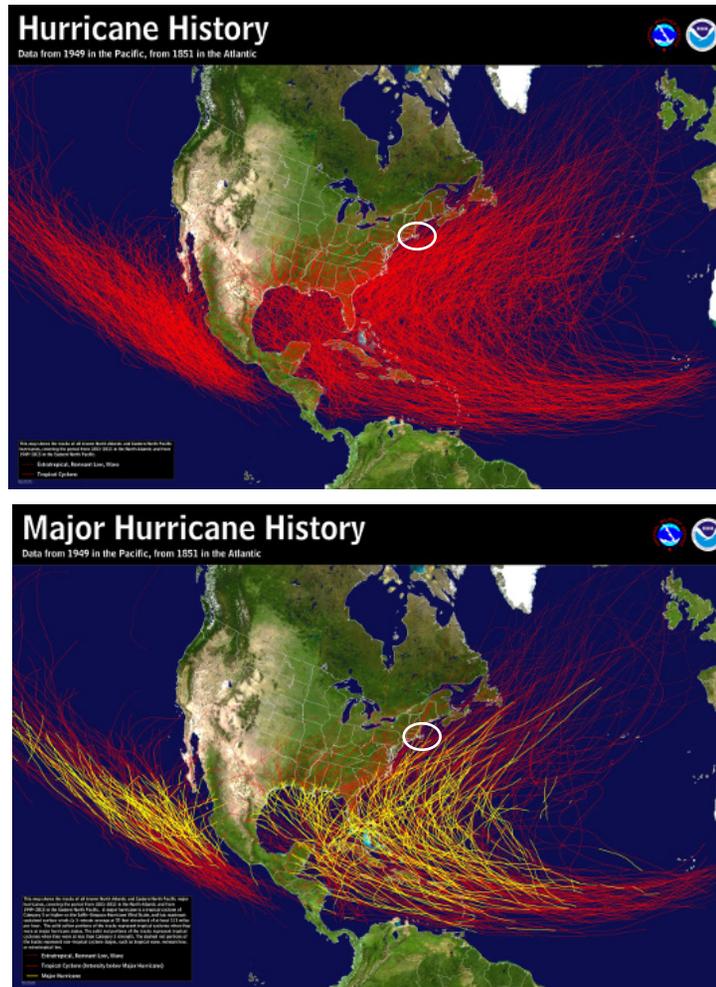


Figure 2.8 | Hurricanes and major hurricanes in the Atlantic Basin (above) and in Barnstable County from 1851-2013, National Hurricane Center (right).

CATEGORY 1: 74-95 mph 1 minute sustained winds

■ Impact to People/Pets/Livestock:

- Could result in injury or death from flying or falling debris.

■ Impact to Frame Homes:

- Some poorly constructed frame homes can experience major damage, involving loss of the roof covering, damage to gable ends, removal of porch coverings and awnings.
- Unprotected windows may break if struck by flying debris.
- Masonry chimneys can be toppled.
- Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels and gutters.
- Failure of aluminum, screened-in, swimming pool enclosures can occur.

■ Impact to Apartments, Shopping Centers, and Industrial Buildings

- Some apartment building and shopping center roof coverings could be partially removed.
- Industrial buildings can lose roofing and siding especially from windward corners, rakes and eaves.

Hazard Profiles

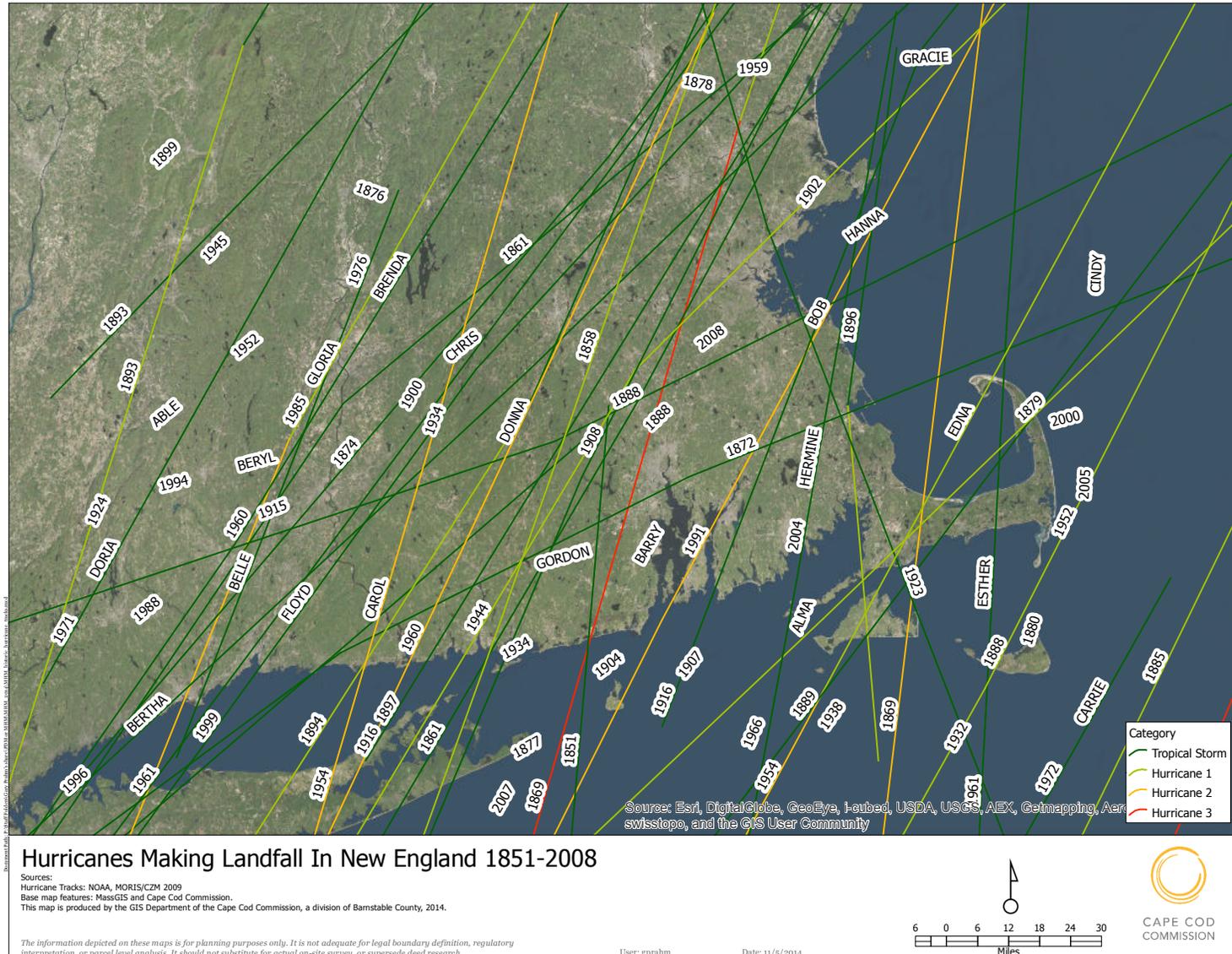


Figure 2.9 | Hurricanes Making Landfall in New England, 1851-2008

Hazard Profiles

Major Disaster Declarations and Most Memorable Tropical Cyclones for Barnstable County from 1954 - 2012							
Number	Storm Name	Safrir-Simpson Classification	Landfall	Incident period	Declaration Date	Comments	References
	Tropical Storm Arthur	TS		July 4, 2014			Barnstable County Regional Emergency Planning Committee
EM-3350	Tropical Storm Sandy	TS	yes	October 27 to November 8, 2012	October 28, 2012	Barnstable County was designated for Category B Public Assistance	FEMA Disaster Declaration website
DR-4097	Tropical Storm Sandy	TS	yes	October 27 to November 8, 2012	December 19, 2012	HMGP Assistance was provided for Barnstable County	FEMA Disaster Declaration website
EM-3330	Tropical Storm Irene	Category 2		August 26 to September 5, 2011	August 26, 2011	Barnstable County was designated for Category B Public Assistance	FEMA Disaster Declaration website
DR-4028	Tropical Storm Irene	Category 2		August 27 to August 29, 2011	September 3, 2011	HMGP Assistance was provided for Barnstable County	FEMA Disaster Declaration website
EM-3315	Hurricane Earl	Category 4		September 1 to September 4, 2010	September 2, 2010		FEMA Disaster Declaration website
DR-914	Hurricane Bob	Category 3	yes	August 19, 1991	August 26, 1991		FEMA Disaster Declaration website
DR-751	Hurricane Gloria	Category 4		September 27, 1985	October 28, 1985		FEMA Disaster Declaration website
	Hurricane Donna	Category 5	yes	September 12 to September 13, 1960	not declared		FEMA Disaster Declaration website
	Hurricane Carol	Category 2-3		August 31, 1954	not declared		Barnstable County Regional Emergency Planning Committee
	Hurricane Edna	Category 3	yes	September 11, 1954	not declared		Barnstable County Regional Emergency Planning Committee
	1938 Hurricane	Category 3	yes	September 1938	not declared		Barnstable County Regional Emergency Planning Committee
	1944 Hurricane	Category 4	yes	September 1944	not declared		Barnstable County Regional Emergency Planning Committee

Table 2.4 | History and extent of tropical storms and hurricanes for Barnstable County

- Failures to overhead doors and unprotected windows will be common.
- **Impacts to Signage, Fences and Canopies:**
 - There will be occasional damage to commercial signage, fences and canopies.
- **Impacts to Trees:**
 - Large branches will snap.
 - Shallow-rooted trees will be toppled.
- **Impacts to Power and Water Infrastructure:**
 - Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.

CATEGORY 2: 96-110 mph 1 minute sustained wind

- **Impact to People/Pets/Livestock:**
 - There is substantial risk of injury or death due to flying or falling debris.
- **Impact to Frame Homes:**
 - Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly.
 - Unprotected windows will have a high probability of being broken by flying debris.
 - Well-constructed frame homes could sustain major roof and siding damage.

- Failure of aluminum, screened-in, swimming pool enclosures will be common.
- **Impact to Apartments, Shopping Centers, and Industrial Buildings**
 - There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings.
 - Unreinforced masonry walls can collapse.
- **Impacts to Signage, Fences and Canopies:**
 - Commercial signage, fences, and canopies will be damaged and often destroyed.
 - Impacts to Trees:
 - Many shallow-rooted trees will be snapped or uprooted.
 - Roads will be blocked by toppled trees.
- **Impacts to Power and Water Infrastructure:**
 - Near total power loss is expected with outages that could last from several days to weeks.
 - Potable water could become scarce as filtration systems begin to fail.

Hazard Profiles

CATEGORY 3: 111-129 mph 1-minute sustained wind

- **Impact to People/Pets/Livestock:**
 - There is high risk of injury or death due to flying and falling debris.
- **Impact to Frame Homes:**
 - Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls.
 - Unprotected windows will be broken by flying debris.
 - Well-built frame homes can experience major damage involving the removal of roof decking and gable ends.
- **Impact to Apartments, Shopping Centers, and Industrial Buildings**
 - There will be a high percentage of roof coverings and siding damage to apartment and industrial buildings.
 - Isolated structural damage to wood or steel framing can occur.
 - Complete failure of older metal buildings is possible.
 - Older unreinforced masonry buildings can collapse.

- **Impacts to Signage, Fences and Canopies:**

- Most commercial signage, fences, and canopies will be destroyed.

- **Impacts to Trees:**

- Many trees will snap or become uprooted.
- Numerous roads will be blocked.

- **Impacts to Power and Water Infrastructure:**

- Electricity and water will be unavailable for several days to a few weeks after the storm passes

CATEGORY 4: 130-156 mph 1-minute sustained wind

- **Impact to People/Pets/Livestock:**

- There is a very high risk of injury or death due to flying and falling debris.

- **Impact to Frame Homes:**

- Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure.
- Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls.
- Extensive damage to roof coverings, windows, and doors will occur. Large amounts of wind-borne debris will be lofted into the air.

- Wind-borne debris will break most unprotected windows and penetrate some protected windows.
- **Impact to Apartments, Shopping Centers, and Industrial Buildings:**
 - There will be a high percentage of structural damage to the top floors of apartment buildings.
 - Steel frames in older industrial buildings can collapse.
 - There will be a high percentage of collapse to older unreinforced masonry buildings.
- **Impacts to Signage, Fences and Canopies:**
 - Nearly all commercial signage, fences, and canopies will be destroyed.
- **Impacts to Trees:**
 - Most trees will snap or become uprooted.
 - Power poles will be downed.
 - Numerous roads will be blocked.
 - Fallen trees and power poles will isolate residential areas.
- **Impacts to Power and Water Infrastructure:**
 - Power outages will last for weeks to possibly months.
 - Long term shortages will increase human suffering.

- Most of the area will be uninhabitable for weeks to months.

CATEGORY 5: 157 mph or higher 1-minute sustained wind

- **Impact to People/Pets/Livestock:**
 - There is a very high risk of injury or death due to flying and falling debris even if indoors in mobile or framed homes.
- **Impact to Frame Homes:**
 - A high percentage of frame homes will be destroyed, with total roof failure and wall collapse.
 - Extensive damage to roof covers, windows, and doors will occur.
 - Large amounts of wind-borne debris will be lofted into the air.
 - Wind-borne debris damage will occur to nearly all unprotected windows and many protected windows.
- **Impact to Apartments, Shopping Centers, and Industrial Buildings:**
 - Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing.
 - Complete collapse of many older metal buildings can occur.

Hazard Profiles

- Most unreinforced masonry walls will fail, which can lead to building collapse.
- A high percentage of industrial buildings and low-rise apartment buildings will be destroyed.
- **Impacts to Signage, Fences and Canopies:**
 - Nearly all commercial signage, fences, and canopies will be destroyed.
- **Impacts to Trees:**
 - All trees will snap or become uprooted.
 - All power poles will be downed.
 - Fallen trees and power poles will isolate residential areas.
- **Impacts to Power and Water Infrastructure:**
 - Power outages will last for weeks to possibly months.
 - Long term shortages will increase human suffering.
 - Most of the area will be uninhabitable for weeks to months.

Probability

B2b

The Planning Team determined that it is **HIGHLY LIKELY** that a hurricane or tropical storm will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used the history of tropical cyclones in Barnstable County and local knowledge to make this probability designation.

Landslides

Overview

A landslide is a general term used to describe the downslope movement of soil, rock and organic materials under the effect of gravity.¹⁵

Below is a list of the most common causes of landslides in Massachusetts¹³:

- **Water saturation** on a slope occurs after intense rainfall, snow melt, changes in level of groundwater and water level changes along coasts and banks. Water from a rain event adds weight to the slope and reduces the strength of slope materials.
- **Undercutting of slopes by flooding and wave action** occurs when streams and waves erode the base of slopes, causing them to over-steepen and eventually collapse. Areas where this type of failure occurs includes Cape Cod, Nantucket and Martha's Vineyard.¹³
- **Construction related failures** occur during construction activities such as cut and fill construction for highways and roads and when vegetation on a slope is removed during the construction of buildings. These activities can

increase slope angle and decrease lateral support which can sometimes lead to landslide.¹⁶

Hazard Location

Landslides occur in every state in the U.S., but the majority of Massachusetts has a low incidence of landslides.

B1c

Previous Occurrences and Extent

There have been no federally declared landslide disasters in Massachusetts from 1954 to 2012. To date, there have been no significant landslides in Harwich.

B1c,
B2a,c

Based on reports from the USGS website, the extent of a landslide is quantified as the estimated amount of material in cubic yards that was deposited from a higher elevation. There is no history of a landslide in Harwich, therefore there is no data on the worst conditions experienced in Harwich from a landslide.

Impact

Below is a list of possible impacts that could result from a landslide.

- **People:** people, cars and homes can become buried, delays in emergency services, isolated residents

B3a

¹⁵ The Landslide Handbook – A Guide to Understanding Landslides USGS Circular 1325, 2008

¹⁶ Landslide Loss Reduction: A Guide for State and Local Government Planning, FEMA-182, 1989

Hazard Profiles

- **Infrastructure:** damaged power lines
- **Buildings:** unstable foundations of structures, damage and destruction to buildings because of the movement of sediment and flooding
- **Economy:** isolated businesses
- **Natural Systems:** downed trees, decreased water quality
- **Transportation:** road closures, damage to road segments and/or culverts, transportation delays because of blocked access to roadways

B2b

Probability

The Planning Team determined that it is **UNLIKELY** that a landslide will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used the history of landslides in the planning area to make this probability determination.

Nor'easters

Overview

A nor'easter is a cyclonic storm that forms outside of the tropics and moves along the east coast of North America.¹⁷ It is called a nor'easter because the winds over coastal areas blow from a northeasterly direction. These storms usually develop between Georgia and New Jersey within 100 miles of the coastline and then move north or northeastward. Once these storms reach New England, they usually become more intense. These storms can occur at any time of year but are most frequent between September and April. The years with the most nor'easters tend to coincide with El Niño events.¹⁸

The east coast of North America provides an ideal breeding ground for nor'easters.¹⁷ During the winter, the polar jet stream transports cold Arctic air southeast across Canada, the United States and the Atlantic Ocean. In addition, warm air from the Gulf of Mexico and the Atlantic moves northward, keeping the coastal waters relatively mild during the winter. This difference in temperature between the warm air over the water and cold Arctic air over the land is the area where nor'easters are born.

Nor'easters bring heavy rain and snow, gale force winds, rough seas, coastal flooding and can cause beach erosion.

¹⁷ NOAA: Know the dangers of nor'easters, http://www.noaa.gov/features/03_protecting/noreasters.html

Hazard Profiles

Sustained wind speeds of 20-40 mph are common during a nor'easter with short-term wind speeds gusting up to 50-60 mph.¹³ Wind gusts associated with these storms can exceed hurricane force in intensity. Nor'easters are notorious for producing heavy snow, rain, and oversized waves that crash onto Atlantic beaches, often causing beach erosion and structural damage. Nor'easters may also sit stationary for several days, affecting multiple tide cycles and producing extended periods of heavy precipitation. The level of damage in a strong hurricane is often more severe than a nor'easter, but historically Massachusetts has suffered more damage from nor'easters because of the greater frequency of these coastal storms (one or two per year).

Traditionally, nor'easters are not given names like hurricanes and tropical storms. This changed recently as a result of The Weather Channel adopting a naming protocol in 2012 that gained popularity in defining storm systems. Nor'easters do not have their own categorization scheme; instead aspects of a nor'easter are categorized. For example, the Beaufort Scale is used to categorize the wind speed of a nor'easter (small craft advisory, gale warning, storm warning, hurricane force wind warning) and the Regional Snowfall Index is used to categorize snowfall during a nor'easter.

Hazard Location

Coastal areas of Harwich are susceptible to damages from wind, snow and surge during a nor'easter. However, it is also important to note that nor'easters can also bring heavy snow and flooding to the entire planning area.

B1c

Previous Occurrences and Extent

Since nor'easters are not categorized like Hurricanes and Tropical Storms, it is difficult to track their history. Also, it is important to note that hurricanes and tropical storms can transform into nor'easters,¹⁸ making it especially difficult to track the history of nor'easters in a particular area.

B1c,
B2a,c

The following is a list of some of the nor'easters that affected Barnstable County, but it is not a complete list because of the reasons mentioned above¹³:

- **February 1978:** this blizzard/nor'easter produced 8-12 inches of snow as well as ice and flooding and 92 mph winds in Chatham. It damaged buildings and infrastructure across Barnstable County including battering the bathhouse and parking lot at Coast Guard Beach in Eastham; waves flooded and flattened dunes on barrier beaches in Chatham, Eastham and Orleans; Monomoy Island off of Chatham split in several places; homes were destroyed; the Outer Cape was an island for a few hours when a 16-foot storm tide flooded Route 6 at Fort Hill with three feet of water; Bridge Road

Hazard Profiles

flooded in Eastham.¹⁸ This event resulted in a federal disaster declaration (FEMA DR-546).

- **October-November 1991:** This large nor'easter was an unusual event because it moved south and strengthened when it joined with Hurricane Grace – producing what some would call the “Perfect Storm.” Winds measured over 80 mph with waves over 30 feet high in some parts of the coastline. This event resulted in a federal disaster declaration (FEMA DR-920).
- **December 1992:** A strong nor'easter affected the Commonwealth from December 11 to 13, 1992. Impacts included deep and intense snowfall, freezing rain, heavy rainfall near the coast, coastal flooding and damaging winds. The weight of the snow taxed snow removal equipment in many communities and caused roof damage. Precipitation totals for this storm were extraordinary. Much of southern New England received up to 5 inches of liquid equivalent precipitation during a 2 to 3 day period, with locally close to 8 inches recorded in parts of southeast Massachusetts. Along coastal sections of Massachusetts, much of the precipitation fell as rain or rain/snow mix. This caused considerable ponding and localized flooding in poorly drained areas. The greatest damage from this storm was due to coastal flooding. Most east-facing shoreline communities from Chatham to Harwich and Plymouth to the North Shore, as well as Nantucket Island, experienced some level of coastal flood damage. As much as 20 feet of dune was lost in Sandwich. Many coastal roads closed and docks and cottages were damaged.
- **March 1994:** A strong nor'easter passed to the southeast of Cape Cod, resulting in heavy snow and drifting snow. Over southeast Massachusetts, between three and six inches of snow fell before it changed to rain. Wind gusts of up to 40 and 60 mph resulted from this event and created snow drifts of up to three feet. Buildings were damaged, businesses and schools were closed, and road travel was disrupted.
- **January 22-23, 2005:** A major winter storm brought heavy snow, high winds, and coastal flooding to southern New England. In Massachusetts, blizzard conditions were reported on Nantucket. Near-blizzard conditions were reported in areas and brought between one and three feet of snow and produced wind gusts of up to 65 mph. The highest snowfall totals were reported in eastern Massachusetts (between two and three feet). Minor to moderate coastal flooding was observed around high tide in eastern Massachusetts coast. Roads were inundated and evacuations occurred.
- **April 2007:** an intense coastal storm brought rain and coastal/inland flooding to eastern Massachusetts. The storm was primarily a rain event due to warmer

¹⁸ “Storm of the Century” by Susan Milton, Cape Cod Times, reported in the February 3, 2008 issue

temperatures. For this Patriot's Day Storm, the surge peaked on a high tide on April 16, 2007 and the time period of one foot surge lasted more than four high tides (~47 hours). Major coastal flooding and storm damage resulted not only from the severity of the storm but also due to the timing of the Perigean spring tides. The 2007 nor'easter hit during highest predicted tide of the month which was also the top 0.2% of the year. This 2007 storm breached the barrier beaches at both Pleasant Bay on the Lower Cape and Katama Bay on Martha's Vineyard. While some breaches will close by themselves in a short amount of time, both of these 2007 breaches became new inlets for the bays.¹⁹ This event resulted in a federal disaster declaration (FEMA DR-1701). Counties included in this disaster received over \$8 million in public assistance from FEMA.

- **January 2015:** Winter storm Juno was a powerful nor'easter that impacted the northeast and New England.¹⁹ Governor Baker declared a state of Emergency and issued travel bans in preparation for this storm; all shelters in Barnstable County were opened; transit and ferry services were canceled; winds gusted to 75 mph; rain/snow mix transitioning to 15-18 inches of snow; thundersnow occurred in various regions across Cape Cod; storm

¹⁹ <http://capeandislands.org/post/blizzard-2015-delivers-high-wind-more-snow-forecast>

surge and coastal flooding caused erosion in many areas on Cape Cod; Pilgrim Nuclear Power Station shutdown in response to degrading offsite electrical grid conditions; dune break at Ballston Beach in Truro; significant damage to coastal areas in Cape Cod National Seashore. This event resulted in a Federal Disaster Declaration (FEMA DR-4214).

Impact

Below is a list of possible impacts that could occur in Harwich during a nor'easter:

B3a

- **People:** longer response time for emergency personnel; see also impact on people in the Flood Hazard Profile
- **Infrastructure:** damages to water infrastructure; utility outages
- **Buildings:** wind damage to buildings, see also damages to buildings in the Flood Hazard Profile
- **Economy:** loss of business function; damage to inventory; relocation costs; wage loss
- **Natural Systems:** snow and ice accumulation can negatively impact vegetation and natural habitat, downed trees and fallen branches; coastal landscape can be reshaped by storm surge
- **Transportation:** roadways can become impassable from storm surge and debris; culverts damaged from storm surge

Hazard Profiles

B2b

Probability

The Planning Team determined that it is **HIGHLY LIKELY** that a nor'easter will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used the history of nor'easters impacting Harwich to make this probability designation.

High Winds

Overview

Wind is air in motion relative to the ground surface.¹³ High winds can occur as an isolated event or it can accompany other weather events such as:

- before and after frontal systems
- hurricanes and tropical storms
- severe thunder and lightning storms
- tornadoes
- nor'easters

The National Weather Service issues warnings and advisories for high wind events as follows¹³:

- **Wind Advisory:** for non-tropical events over land, sustained winds of 31-39 mph for at least one hour or any gusts up to 46-57 mph
- **High Wind Warning:** for non-tropical events over land, sustained winds of 40-73 mph or any gusts 58+ mph
- **Small Craft Advisory:** for non-tropical events over water, sustained winds of 29-38 mph.
- **Gale Warning:** for non-tropical events over water, sustained winds of 39-54 mph
- **Storm Warning:** for non-tropical events over water, sustained winds of 55-73 mph

Hazard Profiles

- **Hurricane Force Wind Warning:** for non-tropical events over water, sustained winds of 74+ mph
- **Tropical Storm Warning:** for tropical systems, any inland or coastal area with expected sustained winds from 39-73 mph
- **Hurricane Warning:** for tropical systems, any inland or coastal area with expected sustained winds of 74+ mph.

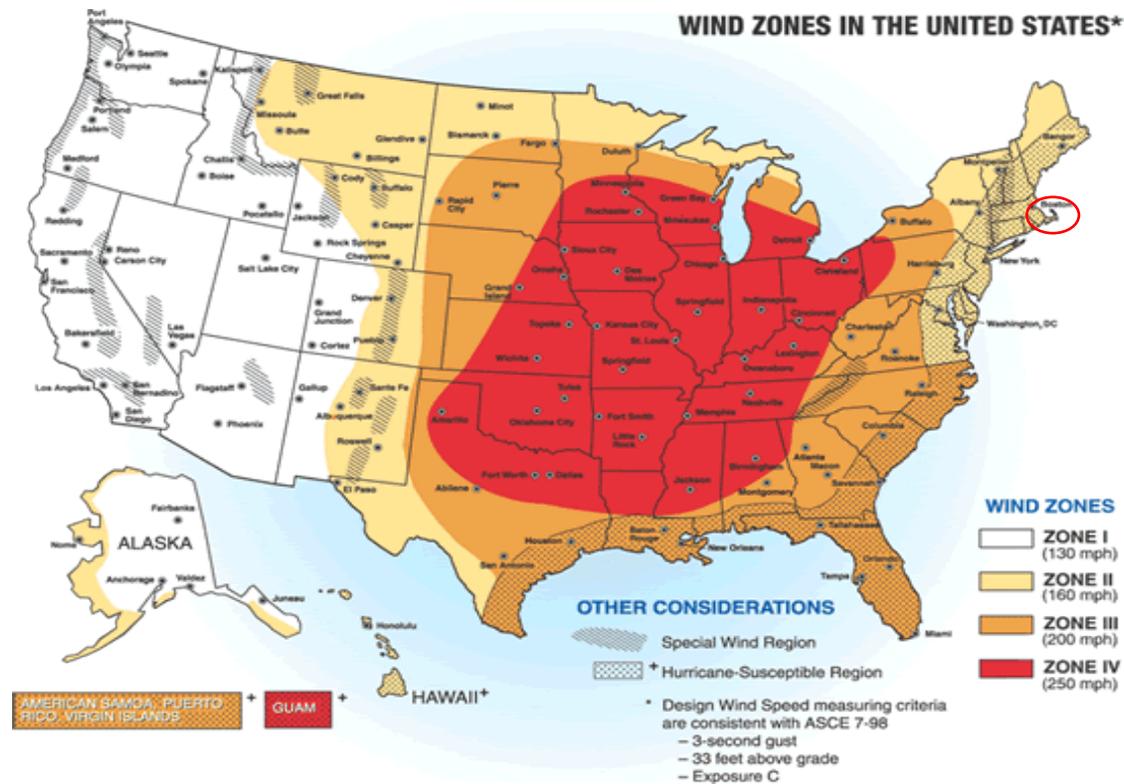


Figure 2.10 | Map of frequency and strength of windstorms in the United States. Planning area is highlighted with a red circle. Map is from the 2013 Massachusetts State Hazard Plan.

Hazard Profiles

B1c

Hazard Location

FEMA compiled 40 years of tornado history and 100 years of hurricane history to generate a map of the frequency and strength of windstorms in the United States (*Figure 2.10*).

The map shows that Harwich is located in Wind Zone II with maximum wind speeds of 160 mph. Since this map includes hurricane and tornado winds, it does not capture wind advisories, high wind warnings, small craft advisories, and gale warnings; it generalizes data at the local level.

The planning team decided that the entire planning area is vulnerable to high winds, especially the coastline of Harwich.

Previous Occurrences and Extent

According to the NOAA National Climatic Data Center (NCDC), Barnstable County experienced the following wind events between January 1, 1950 and July 21, 2015:

- **71 days of High Wind**
- **28 days of Thunderstorm Wind**

However, specific information on the extent of these NCDC wind events in Harwich is not available.

Impact

Table 2.8 lists possible damages that can result from high wind events.

- **People:** power outages can affect vulnerable populations especially if outages occur during the winter months
- **Infrastructure:** downed power lines, power outages (wind gusts of only 40 to 45 mph have caused scattered power outages from downed trees and wires), high wind events can generate rough seas which can cause damage to coastal infrastructure
- **Buildings:** damage to roofs, windows
- **Economy:** loss of power can cause businesses to close temporarily until power is restored
- **Natural Systems:** downed trees and branches

B1c,
B2a,c

B2c

B3a

Probability

The Planning Team determined that it is **HIGHLY LIKELY** that a high wind events will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used Harwich's history of high wind, hurricanes/tropical storms, and nor'easters as well as the

B2b proximity to the ocean to make this probability determination.

Thunderstorms

Overview

A thunderstorm is a storm that produces lightning and thunder and is usually accompanied by gusty winds, heavy rain and sometimes hail.¹³ The National weather service considers a thunderstorm to be severe if it produces any of the following: hail at least one inch in diameter, winds of 58+ mph or a tornado.

Three basic "ingredients" are required for the formation of a thunderstorm: moisture that forms clouds and rain, unstable air that rises rapidly and lift caused by cold or warm fronts, sea breezes or heat from the



Figure 2.11 | Schematic of how lightning develops, from Thunderstorms, Tornadoes and Lightning: Nature's Most Violent Storms

cloud becomes negatively charged. When the charge difference between the ground and the cloud becomes large, a charge starts moving toward the ground and a powerful discharge occurs between the cloud and the ground (*Figure 2.11*).

This discharge is seen as a bright, visible flash of lightning. The channel of air through which lightening passes can be heated to 50,000°F. The rapid heating and cooling of the air near this lightning channel causes a shock wave that results in the sound of thunder. Compared to hurricanes and winter storms, thunderstorms affect a relatively small area. The typical thunderstorm is 15 miles in diameter and lasts on average for 30 minutes.²¹

B1c

Hazard Location

According to a map presented in the Massachusetts State Hazard Plan, Barnstable County experiences about approximately 20 thunderstorm days per year (see *Figure 2.12*).

B1c,
B2a,c

Previous Occurrences and Extent

Using local knowledge, the Planning Team concluded that at least 1-2 thunderstorms occur every year in Harwich. However, data on these storm events are not consistently recorded at the local level. The thunderstorm profile relies on data from the NOAA

National Climatic Data Center (NCDC) but this website does not have searchable data at the town level

The following is a list of historical thunderstorms that occurred on Cape Cod; although it is not a complete list:

- **August 19, 2008:** A cold front moved through Southern New England producing showers and thunderstorms that became severe as they moved through the Commonwealth. Large hail and damaging winds affected Cape Cod. Trees were downed by thunderstorm winds.
- **August 4, 2015:** A line of thunderstorms developed across Long Island, NY and raced towards RI and southeastern MA. These storms caused significant wind damage knocking down a significant number of trees.

Impact

Below is a list of impacts that could occur during a Thunderstorm:

- **People:** power outages can affect vulnerable populations especially if outages occur during the winter months, injury or death can occur because people are often caught outdoors during a thunderstorm and do not have enough time to run inside, people can become stuck if area flooding occurs

B3a

Hazard Profiles

- **Infrastructure:** downed power lines and power outages, heavy rain associated with a thunderstorm can overwhelm drainage systems, causing area flooding and property destruction
- **Buildings:** damage to roofs and windows, heavy rain associated with a thunderstorm can overwhelm drainage systems, causing area flooding and property destruction, lightning strikes can cause buildings to catch on fire
- **Economy:** loss of power can cause businesses to close temporarily until power is restored; lightning strikes are possible during thunderstorm events which can cause economic loss to businesses
- **Natural Systems:** downed trees and branches

B2b

Probability

The Planning Team determined that it is **LIKELY** that thunderstorms will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years

- **Highly Likely:** near 100% probability in the next year

The Planning Team used Harwich's history of thunderstorms to make this probability determination.

Extreme Temperatures

Overview

Extreme temperatures are defined as temperatures that are far outside the normal ranges for the season in a specific area. Extreme cold events occur when temperatures drop well below normal in an area. Extreme cold temperatures are generally characterized in temperate zones by the ambient air temperature dropping to approximately 0°F or below. Excessive summer temperatures are often identified as the number of days with maximum temperatures greater than or equal to 90°F and greater than or equal to 100°F.

Hazard Location

The entire planning area is vulnerable to extreme temperatures.

B1c

Previous Occurrences and Extent

According to NOAA's National Climatic Data Center (NCDC), the following extreme heat and extreme cold

B1c,
B2a,c

events were reported for Barnstable County between January 1, 1950 and July 31, 2015:

- **August 22, 2011:** Extreme heat event. A strong upper level ridge brought very hot temperatures to Southern New England and increased humidity levels such that heat index values rose above 105 degrees for a period of a few hours. The Automated Weather Observation System at Coast Guard Air Station Cape Cod (KFMH) near Falmouth, recorded heat indexes of 105 over a three hour period. The Automated Weather Observation System at Provincetown Municipal Airport (KPVC) also recorded heat indexes of 105 during this time frame.

B3a

Impact

Below is a list of possible impacts that could occur during extreme temperature events¹³:

- **People:** children and elderly are particularly at risk to health problems associated with extreme temperature; heat-induced illness such as sunburn, heat cramps, heat exhaustion and heat stroke; cold-induced illness such as frost bite and hypothermia; air quality can be affected during extreme heat events which can cause health hazards; residents can be displaced if warming/cooling centers are opened during extreme temperature events

- **Infrastructure:** power failure; salt water freezes in bays/harbors and can damage coastal infrastructure; extreme temperatures can cause school closings
- **Buildings:** in extreme cold temperature, urban fire risk increases as people often use space heaters, generators and candles to stay warm
- **Economy:** extreme cold temperatures can inhibit fishing operations and the transport of goods and services
- **Natural Systems:** saltwater freezing can occur in coastal bays and harbors
- **Transportation:** icy roads make travel difficult

Probability

B2b

The Planning Team determined that it is **POSSIBLE** that extreme temperatures will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

Hazard Profiles

The Planning Team used Harwich's history of extreme temperatures in town to make this probability determination.

Tornadoes

Overview

A tornado is a violently rotating column of air extending from a thunderstorm cloud to the ground.²¹ Tornadoes are not always visible as funnel clouds because they are nearly translucent until they pick up dust and debris. The average tornado moves from southwest to northeast, but they can move in any direction and can suddenly change direction. The average speed of a tornado is 30 mph, but they can be stationary or move as fast as 70 mph. The strongest tornadoes have rotating winds of more than 200 mph.

Tornadoes can form from a variety of sources:

- accompany tropical storms and hurricanes as they move onto land
- form from individual cells within severe thunderstorms squall lines
- form from an isolated super-cell thunderstorm
- spawn from tropical cyclones or even their remnants that are passing through
- form when air converges and spins upward

Hazard Location

The entire planning area is vulnerable to tornadoes, especially the coastline. Compared to the rest of Massachusetts, Barnstable County has a very low tornado density, defined as the number of tornadoes per 20 square miles¹³ (*Figure 2.13*).

B1c

Previous Occurrences and Extent

According to the NOAA National Climatic Data Center, Barnstable County experienced the following tornado and waterspouts events between January 1, 1950 and July 21, 2015:

B1c,
B2a,c

- **August 9, 1968:** F1 tornado was reported for Barnstable County. Many trees felled, destructive wind and hail, fruit and vegetable crops damaged, utility lines damaged, power outages, roof was lifted from a fruit stand (account taken from NCDC Storm data for August 1968)
- **August 22, 1977:** F1 tornado was reported for Barnstable County, a small tornado touched down in Yarmouth and destroyed an art gallery and signs on the street. It also picked up two buildings and two people were inside the building. It spawned very large thunderstorms across Cape Cod.
- **August 20, 1997:** Showers developed during the afternoon in southeastern Massachusetts and these went on to produce three waterspouts, at least one confirmed weak tornado (F0) and numerous

funnel clouds. The first waterspout occurred just east of the Sagamore Bridge, over Cape Cod Bay, at 1:30 p.m. Another waterspout was reported just west of Bourne, over Buzzards Bay, at 3:20 p.m. Throughout the afternoon, there were numerous reports of funnel clouds, some of which appeared in newspaper photos and documented via amateur radio operators' videos. Many of the funnels came as far a half-way down before retreating up into the cloud. There were no reports of damage or injury as a result of these events.

According to the NOAA National Climatic Data Center (NCDC), there were no specific reports of tornadoes in Harwich from 1950 to the July 31, 2015.

B3a

Impact

Below is the Fujita Tornado Damage Scale developed in 1971 by T. Theodore Fujita²¹:

- **Scale F0, <73 mph winds, light damage:** some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
- **Scale F1, 73- 112 mph winds, moderate damage:** Peels surface off roofs; mobile homes pushed off

foundations or overturned; moving autos blown off roads.

- **Scale F2, 113- 157 mph winds, considerable damage:** Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
- **Scale F3, 158- 206 mph winds, severe damage:** Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
- **Scale F4, 207-260 mph winds, devastating damage:** Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
- **Scale F5, 261-318 mph winds, incredible damage:** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; incredible phenomena will occur.

Probability

The Planning Team determined that it is **POSSIBLE** that a tornado will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years

B2b

²¹ NOAA's National Weather Service, Storm Prediction Center: <http://www.spc.noaa.gov/faq/tornado/f-scale.html>

Hazard Profiles

- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used Harwich’s propensity for tropical weather and Cape Cod’s history of tornadoes to make this probability determination.

Drought

Overview

Drought is a period characterized by long durations of below normal precipitation.¹³ Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region.

Hazard Location

The entire planning area could be affected by drought. *Figure 2.14* shows how Barnstable County compares to the rest of the Commonwealth of Massachusetts for the number of months in a drought emergency per 100 years.

B1c

Previous Occurrences and Extent

According to the Massachusetts Drought Management Plan, a determination of drought level is based on seven indices:

- **Standardized Precipitation Index (SPI)** reflects soil moisture and precipitation conditions; calculated monthly using Massachusetts Rainfall Database at DCR, Office of Water Resources. SPI values are calculated for “look-back” periods of 1 month, 3 months, 6 months, and 12 months.

B1c,
B2a,c

Hazard Profiles

- **Crop Moisture Index (CMI)** reflects short-term soil moisture conditions as used for agriculture; available from the National Climate Data Center.
- **Keetch-Byram Drought Index (KBDI)** is designed specifically for fire potential assessment. The KBDI attempts to measure the amount of precipitation necessary to return the soil to full field capacity.
- **Precipitation Index** is a comparison of measured precipitation amounts (in inches) to historic normal precipitation. Cumulative amounts for 3-, 6-, and 12-month periods are factored into the drought determination.
- **Groundwater Level Index** is based on the number of consecutive months groundwater levels are below normal (lowest 25% of period of record for

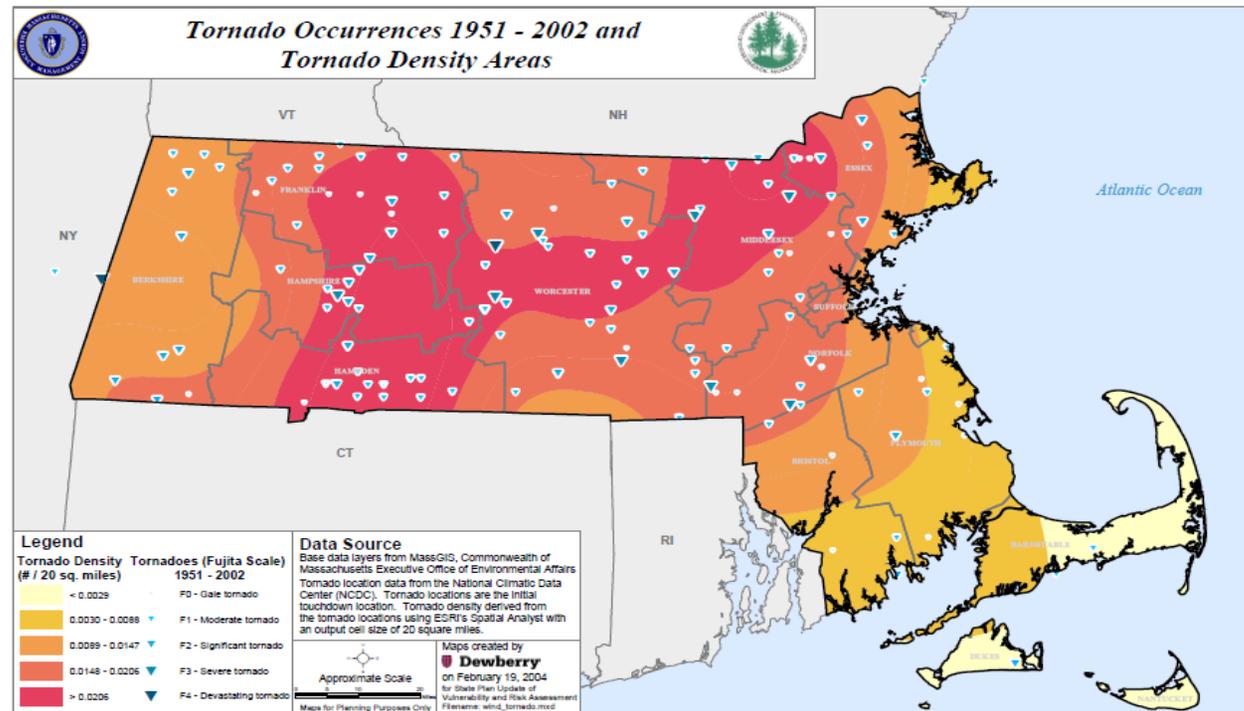


Figure 2.13 | Tornado occurrence and density for Massachusetts. Map is from the 2013 Massachusetts State Hazard Plan

Hazard Profiles

the respective months). The U.S. Geological Survey (USGS) monitors groundwater levels in a network of monitoring wells throughout Massachusetts.

- **Streamflows Index** is based on the number of consecutive months that streamflow levels are below normal (lowest 25% of period of record for the respective months). The USGS monitors streamflow in a network of gages throughout Massachusetts.
- **Reservoir Index** is based on the water levels of small, medium and large index reservoirs across the state. The reservoir level relative to normal conditions for each month of the year will be considered. As part of its monthly conditions report, DCR, Office of Water Resources maintains a list of index water supply reservoirs and the percentage at which they are at capacity as well as non-water supply index reservoir levels, as available.

Using these indices, the Massachusetts Drought Management Plan uses five levels to characterize drought severity. (See *Table 2.5*)

These drought levels are intended to provide information on the current status of water resources in distinct regions of Massachusetts (Western, Central, Connecticut River Valley, Northeast, Southeast and Cape and Islands). The levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions. They begin with a normal situation where data are routinely collected and distributed, move

to heightened vigilance with increased data collection during an advisory, to increased assessment and proactive education during a watch.

The following list of dates and drought levels/descriptions for Barnstable County was compiled from data in the Massachusetts State Hazard Mitigation Plan, US Drought Monitor website and the Department of Conservation and Recreation Drought Management website:

- **1991:** drought conditions in Barnstable County but no data is available on the Drought Level as described above. The observation well located in the vicinity of the Barnstable Airport set a record monthly low for two months. Local and state officials were concerned with water table levels primarily because of the impacts of low pond levels (i.e. Mary Dunn Pond) on wildlife and vegetation.
- **2001:** Drought Advisory in December
- **2002:** Drought Advisories and Watches from February to December
- **2012:** January to May of 2012 was the driest start to any year on record for the Commonwealth of Massachusetts, with only 6 inches of total precipitation. Most areas in southern New England were running 6-8 inches below normal. In April 2012, most of the Commonwealth was again under drought conditions that lasted until May 2012. Rivers and streams were most affected as most

ran at record low levels during the spring run-off season. The main impact of the meteorological drought was periods of very high fire danger. In addition, small pond levels were reduced. While soil moisture was well below normal, this drought occurred prior to the beginning of the growing season. Thus, no agricultural impacts were realized.

- **2014:** Drought Advisory in October

There is no data on the extent of drought for Harwich specifically; all drought levels are reported at the County level.

B3a

Impact

The following is a list of impacts that are possible with drought¹³:

- **People:** migration from a community, increased conflicts between water users, reduction in drinking water, food shortages
- **Infrastructure:** reduced water levels, soil erosion
- **Buildings:** soil erosion could cause damage to foundations and buildings
- **Economy:** reduced crop yield, increased prices for food
- **Natural Systems:** increased fire hazard, damage to water quality, damage to wildlife and fish habitat, degradation of landscape quality, loss of biodiversity, soil erosion, loss of wetlands

Probability

B2b

The Planning Team determined that it is **POSSIBLE** that a drought will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used Barnstable County's history of drought to make this probability designation.

Hazard Profiles

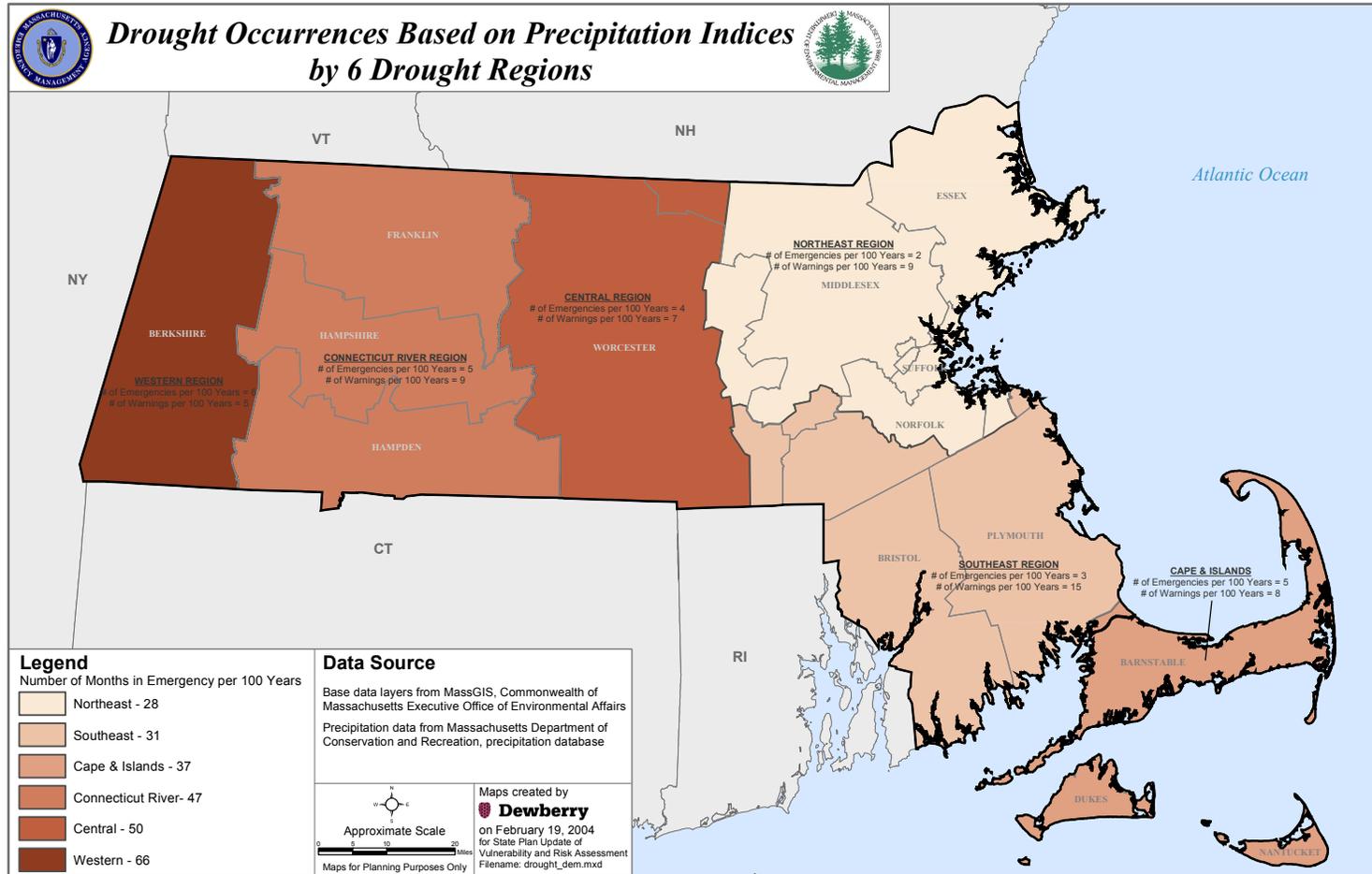


Figure 2.14 | Number of drought emergencies per 100 years for Massachusetts. Map is from the 2013 Massachusetts State Hazard Plan

Hazard Profiles

Drought Level	Standardized Precipitation Index	Crop Moisture Index*	Keetch-Byram Drought Index*	Precipitation	Groundwater	Streamflow	Reservoir***
Normal	3-month > -1.5 <u>or</u> 6-month > -1.0 <u>or</u> 12-month > -1.0	0.0 to -1.0 slightly dry	< 200	1 month below normal	2 consecutive months below normal**	1 month below normal**	Reservoir levels at or near normal for the time of year
Advisory	3-month = -1.5 to -2.0 <u>or</u> 6-month = -1.0 to -1.5 <u>or</u> 12-month = -1.0 to -1.5	-1.0 to -1.9 abnormally dry	200-400	2 month cumulative below 65% of normal	3 consecutive months below normal**	At least 2 out of 3 consecutive months below normal**	Small index Reservoirs below normal
Watch	3-month < -2.0 <u>or</u> 6-month = -1.5 to -3.0 <u>or</u> 12-month = -1.5 to -2.0	-2.0 to -2.9 excessively dry	400-600	1 of the following criteria met: 3 month cum. < 65% <u>or</u> 6 month cum. < 70% <u>or</u> 12 month cum. < 70%	4-5 consecutive months below normal**	At least 4 out of 5 consecutive months below normal**	Medium index Reservoirs below normal
Warning	6-month < -3.0 <u>or</u> 12-month = -2.0 to -2.5	< -2.9 severely dry	600-800	1 of the following criteria met: 3 month cum. < 65% and 6 month cum. < 65%, <u>or</u> 6 month cum. < 65% and 12 month cum. < 65%, <u>or</u> 3 month cum. < 65% and 12 month cum. < 65%	6-7 consecutive months below normal**	At least 6 out of 7 consecutive months below normal**	Large index reservoirs below normal
Emergency	12-month < -2.5	< -2.9 severely dry	600-800	Same criteria as Warning and previous month was Warning or Emergency	>8 months below normal**	>7 months below normal**	Continuation of previous month's conditions

* The Crop Moisture Index is subject to frequent change. The drought level for this indicator is determined based on the repeated or extended occurrence at a given level.

** Below normal for groundwater and streamflow are defined as being within the lowest 25th percentile of the period of record.

*** Water suppliers should be consulted to determine if below normal reservoir conditions are due to operational issues.

Table 2.5 | Drought Indices as defined in the 2013 Massachusetts Drought Management Plan

Hazard Profiles

Severe Winter Weather: Snow, Blizzards and Ice Storms

Overview

A winter storm occurs when there is significant precipitation during periods of low temperatures.²²

Winter storms typically occur from early autumn to late spring and can include any of the following events^{13,23}:

- **Blizzards:** defined as winter storms with sustained or frequent wind gusts to 35 miles per hour or more, accompanied by falling or blowing snow that reduces visibility to or below one-quarter mile. Severe blizzards are defined as winter storms with temperatures near or below 10°F, winds exceeding 45 miles per hour and visibility near zero miles¹³
- **Blowing snow:** wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground that is picked up by the wind
- **Snow squalls:** brief, intense snow showers accompanied by strong gusty winds. Snow accumulation may be significant
- **Snow showers:** snow falling at varying intensities for brief periods of time, some accumulation is possible

- **Snow flurries:** light snow falling for short durations with little to no accumulation
- **Ice pellets and sleet:** composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. A Winter Storm Warning is issued for sleet or a combination of sleet and snow based on total accumulation which is locally defined by area.
- **Icing:** occurs when liquid rain falls and freezes on contact with structures and objects on the ground, causing a coating of ice on a solid object or surface
- **Coastal flooding:** winds generated from intense winter storms can cause widespread tidal flooding and severe beach erosion along coastal areas
- **Ice jams and floes:** long cold spells can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks which become jammed at man-made and natural obstructions. Ice jams act as a dam, resulting as severe flooding
- **Snow melt:** sudden thaw of a heavy snow pack, often leads to flooding

Winter storms form when cold air, moisture and lift are present (*Figure 2.15*).

²² How to Prepare for a Winter Storm, www.ready.gov/prepare

²³ Winter Storms, The Deceptive Killers, A Preparedness Guide, U.S. Department of Commerce, NOAA, National Weather Service, American Red Cross, June 2008

B1c

Hazard Location

The entire planning area is at risk for snow, blizzards and ice storms. During these events, the coastline of Harwich experiences higher snow accumulations and higher winds than other areas of town.

B1c,
B2a,c

Previous Occurrences and Extent

Snow and other forms of winter precipitation occur frequently in Harwich. The Northeast Regional Climate Center compiled normal 30-year average annual snow totals in New England and in the eastern U.S. (*Figure 2.16*). These maps show normal snow totals for Harwich to be within 14-40 inches per year from 1971-2000 and from 1981-2010.¹³

Below is a list of federally-declared disasters from winter storm events in Barnstable County (*Table 2.6*). The Blizzard of 1978 crippled most of the Commonwealth of Massachusetts, including Barnstable County. This event included blizzard conditions, extreme snowfall, high winds and devastating coastal flooding. As stated in the Massachusetts Hazard Mitigation Plan, the worst conditions in this storm event were

- Snowfall rates of at least 3 inches per hour, 1-3 feet of snowfall, zero visibility
- Wind peaked at 93 mph in Chatham

- Major coastal flooding occurred over multiple high tide cycles

Impact

Below is a list of impacts likely to occur during a winter storm event^{13,24}:

B3a

- **People:** walking and driving can become extremely hazardous due to icy conditions, snow accumulation, low visibility and extreme cold which causes people to shelter in place without utilities or other services until driving is safe or utilities are restored; injury from slipping and falling, overexertion during shoveling, frostbite; death from hypothermia, carbon monoxide poisoning (when gas powered furnaces and alternative heating sources are used inappropriately indoors during power outages); people become isolated in their homes
- **Infrastructure:** ice and heavy snowfall can knock out heating, power, and communication services for several hours or days; pipes and water mains may break due to extremely cold temperatures; large sections of ice can cause damage to floating docks
- **Buildings and Property:** structural failure of buildings due to heavy snow loads; roof failure; structural damage to buildings because of high wind; damage to fishing vessels, recreational boats and kayaks because of ice floes and coastal flooding

Hazard Profiles

- **Economy:** as people are immobilized by the storm, they are unable to go to work, leading to economic losses; excessive costs to the town and residents because of increased plowing, snow removal, salting and sanding
- **Transportation:** roadways can become extremely hazardous due to icy conditions, snow accumulation, low visibility and extreme cold; car accidents can occur if people attempt to travel in unsafe conditions; Transit and airport facilities will close temporarily because of severe winter weather; snow storms halt the transport of supplies, goods and services because of unsafe roadways

It is important to note that not all winter storms affecting Harwich were declared federal disasters. Therefore, Harwich likely experienced more severe winter weather than documented above.

There are many ways for winter storms to form; however, all three have key components.

COLD AIR: For snow and ice to form, the temperature must be below freezing in the clouds and near the ground.

MOISTURE: Water evaporating from bodies of water, such as a large lake or the ocean, is an excellent source of moisture.

LIFT: Lift causes moisture to rise and form clouds and precipitation. An example of lift is warm air colliding with cold air and being forced to rise. Another example of lift is air flowing up a mountainside.

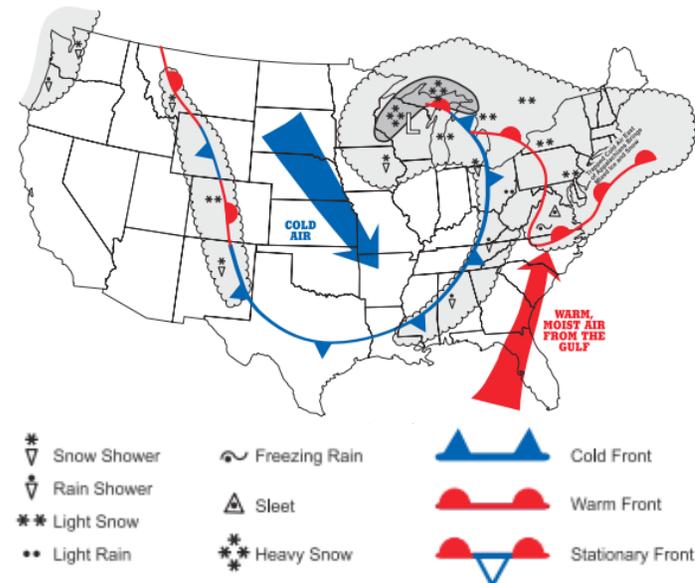


Figure 2.15 | How winter storms form²⁴

B2b

Probability

The Planning Team determined that it is **HIGHLY LIKELY** that a winter storm (snow and blizzard) will impact the planning area. High probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used Harwich's history of snow storms and blizzards to make this probability designation.

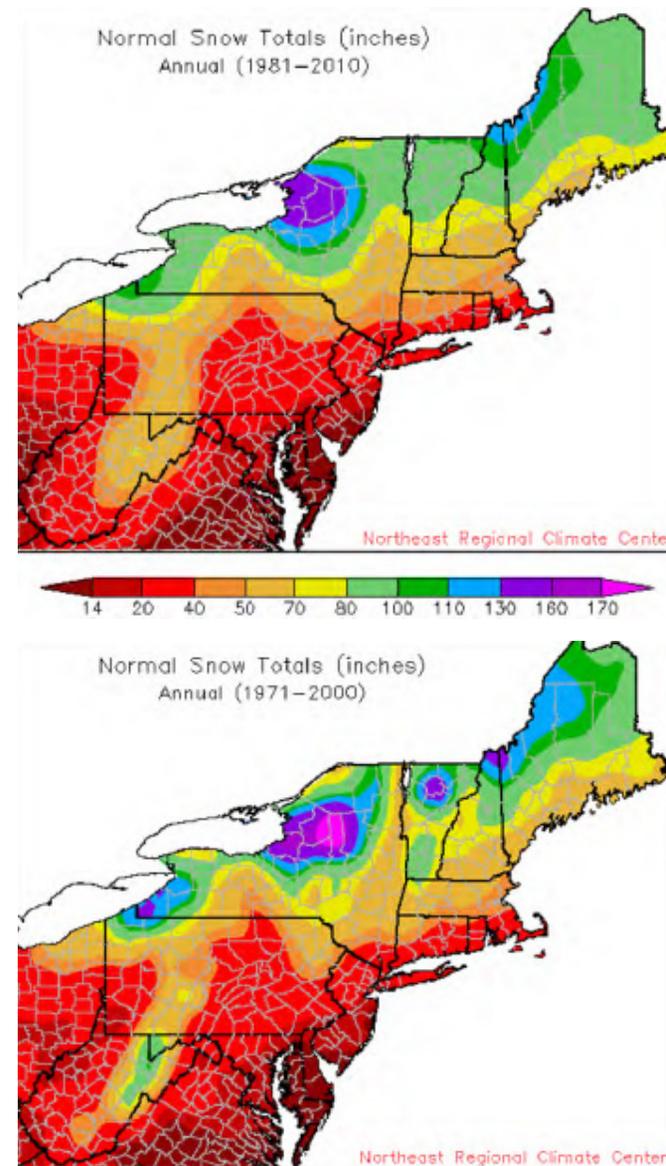


Figure 2.16 | Annual Snow Totals in inches from 1971-2000 (top) and 1981-2010 (bottom). Maps are from the 2013 Massachusetts State Hazard Plan

Hazard Profiles

Major Disaster Declarations for Winter Storms in Barnstable County from 1954 - 2015

Number	Disaster Type	Incident period	Declaration Date
DR-546	coastal storms, flood, ice, snow	February 6 - 8, 1978	February 10, 1978
DR-975	winter coastal storm	December 11 - 13, 1992	December 21, 1992
EM-3103	blizzards, high winds and record snowfall	March 13-17, 1993	March 16, 1993
DR-1090	blizzard	January 7-13, 1996	January 24, 1996
EM-3175	snowstorm	February 17 - 18, 2003	February 11, 2003
EM-3191	snow	December 6 - 7, 2003	January 15, 2004
EM-3201	snow	January 22-23, 2005	February 17, 2005
DR-1701	severe storms, inland and coastal flooding	April 15 - 25, 2007	May 16, 2007
DR-4110	severe winter storm, snowstorm, flooding	February 8-10, 2013	April 19, 2013
DR-4214	severe winter storm, snowstorm, flooding	January 26 - 29, 2015	April 13, 2015

Table 2.6 | Major Disaster Declarations for Barnstable County for Winter Storms. Data is from the FEMA Disaster Declaration website and from the 2013 Massachusetts State Hazard Plan

Tsunami

Overview

A tsunami is a series of traveling ocean waves of extremely long wavelength usually caused by displacement of the ocean floor, seismic or volcanic activity or underwater landslides. Tsunamis generate a devastating onshore surge of water.¹³ The waves associated with a tsunami move hundreds of miles per

hour in the open ocean and can come ashore with wave heights of 100 feet or more.

Hazard Location

All of the coastal communities of Massachusetts are exposed to the threat of tsunamis, but at the present time, it is unknown what the probability is of a damaging tsunami along the Massachusetts coast.¹³

B1c

B1c,
B2a,c

Previous Occurrences and Extent

According to the NOAA National Climatic Data Center, Barnstable County did not experience any tsunamis between January 1, 1950 and July 31, 2015.

The US Atlantic coast and Gulf Coast states have experienced six tsunamis in the last 200 years – only a total of six tsunamis have been reported¹³:

- Three tsunamis were generated in the Caribbean. Tsunamis are more likely to occur at convergent margins and there is a convergent plate in the Caribbean Sea. Thus, this area has a higher probability of generating earthquakes that could produce a tsunami.
- Two tsunamis were related to a magnitude 7+ earthquake along the Atlantic coast.
- One tsunami was reported off the mid-Atlantic states and may be associated with an underwater landslide.
- There is no data on the extent of these tsunamis for Barnstable County or Harwich.

Impact

Below is a list of potential impacts of a tsunami:

B3a

- **People:** hydraulic forces of the tsunami injure people or lead to death, floating debris can endanger human lives, people and businesses will be without fuel, food or employment
- **Infrastructure:** floating debris can batter infrastructure, breakwaters and piers collapse, scouring actions sweep away infrastructure, oil fires often result because the waves carry away oil tanks therefore damaging infrastructure
- **Buildings:** hydraulic forces of the tsunami will destroy buildings, floating debris can batter inland structures, scouring actions sweep away buildings, oil fires often result because the waves carry away oil tanks therefore damaging buildings
- **Economy:** public utilities will be damaged and therefore the economy will suffer, especially for the fishing industry, disruption of coastal systems will have far-reaching economic effects
- **Natural Systems:** trees and plants are uprooted; animal habitats such as nesting sites for birds are destroyed. Land animals are killed by drowning and sea animals are killed by pollution if dangerous chemicals are washed away into the sea, thus poisoning marine life.
- **Transportation:** roads, bridges and culverts buckle or are swept away

Hazard Profiles

B2b

Probability

The Planning Team determined that it is **unknown** and **UNLIKELY** that a tsunami will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years
- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used the low frequency of tsunamis in Barnstable County to make this probability designation

Sea Level Rise

Overview

Sea level rise refers to the increase in mean sea level over time.²⁴ Relative sea level rise is a combination of eustatic and isostatic contributions:

- **Eustatic contributions to sea level rise** are global-scale changes and include thermal expansion of seawater as it warms and the addition of water volume from melting land-based glacial ice sheets.
- **Isostatic contributions to sea level rise** are more localized changes in land surface elevations, such as subsidence or sinking.

Sea level has been rising around the globe for thousands of years since the end of the last Ice Age. For a little over a century, tidal gauges and satellites have been measuring changes in sea level. Tide gauge stations measure the height of water referenced to a horizontal control point, or benchmark, and gauges are used to track and predict tide levels and longer term sea level. Long-term data sets from tide stations have been used to understand local and global sea level trends. The National Oceanic and Atmospheric Administration's (NOAA) Center for Operational Oceanographic Products

²⁴ Sea level rise: understanding and applying trends and future scenarios for analysis and planning, Massachusetts Office of Coastal Zone Management, December 2013

and Services maintains several tide gauge stations across coastal Massachusetts, including long-term stations at Boston, Woods Hole and Nantucket. The sea level data recorded by NOAA and other tide gauges produce trends in relation to fixed reference levels on land, and therefore the data from these stations includes variation in local land elevations.

There is high confidence that the warming atmosphere associated with global climate change is expected to accelerate both the thermal expansion of seawater and the melting of glaciers and ice sheets and will lead to increasing rates of sea level rise.²⁶

B1c

Hazard Location

The entire coast of Harwich is vulnerable to sea level rise (*Figure 2.17*).

In 2014, the Cape Cod Commission developed a bathtub model to visualize Cape Cod's vulnerability to sea level rise (see Sea Level Rise Viewer at www.capecodcommission.org/blackbox). The Sea Level Rise data was derived from classified Digital Elevation Model (DEM) data collected through Light Detection and Ranging (LiDAR) in 2011 by the USGS. The elevation data is accurate to 18 cm at a 95% confidence level with a 1 meter resolution. This elevation data was adjusted to Mean Higher High Water (MHHW) using the NOAA VDatum Software. The Sea Level Rise is shown as a simple representation of a change in elevation,

commonly referred to as a “bathtub” model. No account has been made for the effects of velocity and resulting erosion caused by wave action.

Previous Occurrences and Extent

Mean sea level trends from the Boston, Woods Hole and Nantucket long-term stations are listed below²⁶:

B1c,
B2a,c

- **Boston, MA tide gauge station:**
 - 0.11 ± 07 inches per year, measured over the period of 1921-2012
 - Century rate at the Boston tide gauge: 0.92 feet per 100 years
- **Woods Hole, MA tide gauge station:**
 - 0.11 ± 07 inches per year, measured over the period of 1932-2012
 - Century rate at the Woods Hole tide gauge: 0.92 feet 100 years
- **Nantucket, MA tide gauge station:**
 - 0.14 ± 0.017 inches per year, measured over the period of 1965-2012
 - Century rate at the Nantucket tide gauge: 1.15 feet per 100 years

Climate Change

B3a

Impact

As relative sea level rises, high water elevations will move landward, areas of coastal shorelines will retreat, and low-lying areas will be increasingly exposed to erosion, tidal inundation, and coastal storm flooding. Developed parts of the coast are especially vulnerable because of the presence of infrastructure, homes and businesses that can be damaged or destroyed by coastal storms. In addition, development often impedes the ability of natural coastal systems to buffer inland areas from storm damage, further exacerbating the problem. Many coastal habitats are also vulnerable to rising sea levels, including salt marshes, beaches and dune systems, and floodplains, because they are generally at or within a few feet of existing sea elevations. These areas provide significant environmental benefits, including habitat value, filtering of pollutants for improved water quality, protection of inland areas from flooding and storm surge, and extensive recreational opportunities.²⁶

B2b

Probability

The Planning Team determined that it is **HIGHLY LIKELY** that sea level rise will impact the planning area. Probability was defined based on the frequency of occurrence:

- **Unlikely:** less than a 1% probability over the next 100 years

- **Possible:** 1-10% probability in the next year or at least one chance in the next 100 years
- **Likely:** 10-100% probability in the next year or at least one chance in the next 10 years
- **Highly Likely:** near 100% probability in the next year

The Planning Team used the history of sea level rise in Massachusetts to make this probability designation.

Climate Change

Climate is defined as average temperature and precipitation and it also includes the type, frequency, and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of extremes such as storms, including those which may bring precipitation, high winds, and tornado events. While predicting changes of storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment.²⁵

The following changes in hazard frequency and intensity are expected to occur with changes in climate¹³:

²⁵ United States Environmental Protection Agency, 2006

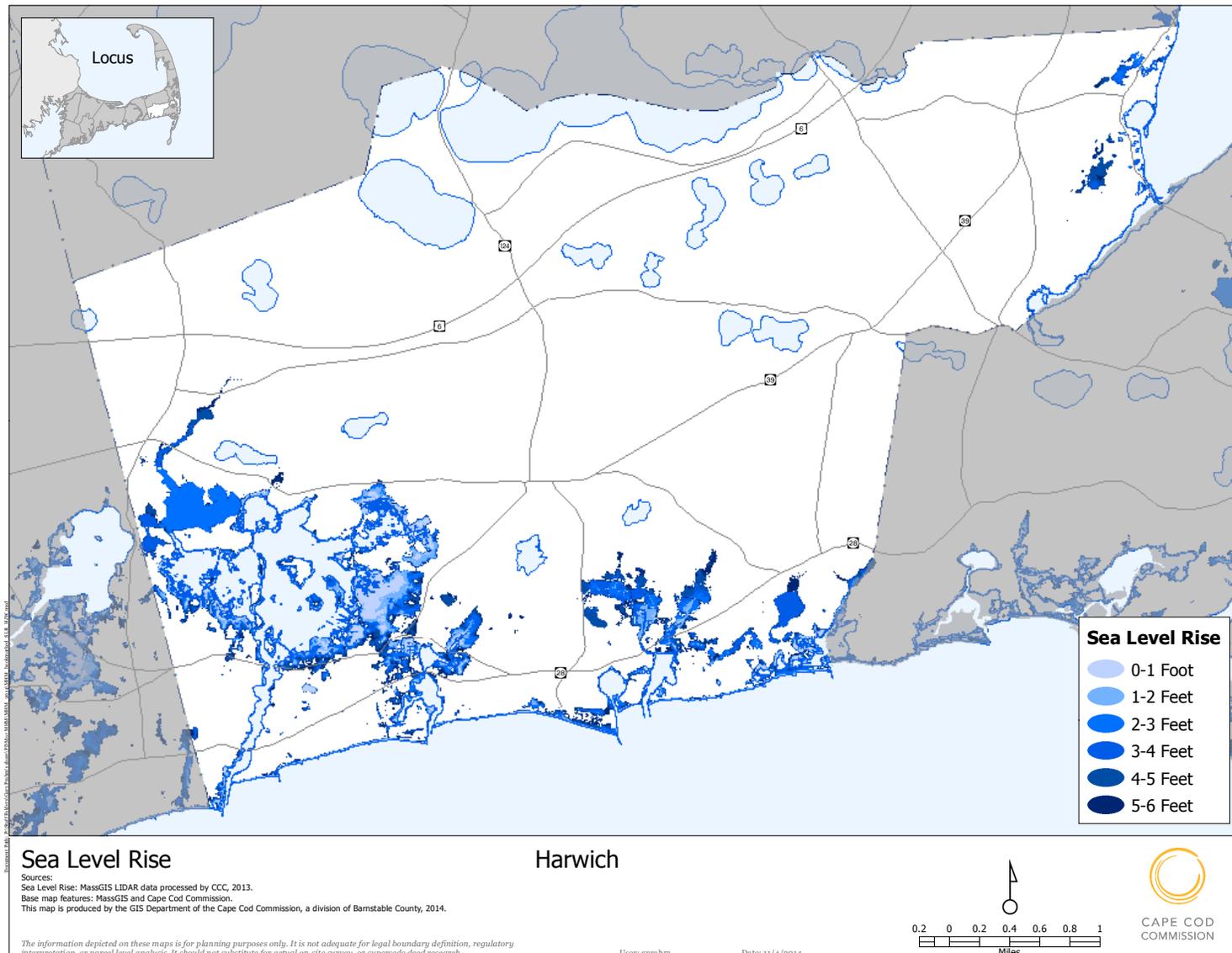


Figure 2.17 | Sea level rise maps for Harwich

Climate Change

Coastal Erosion: Climatic trends can change a beach from naturally accreting to eroding due to increased episodic erosion events caused by waves from an above-average number of storms and high tides, or the long-term effects of fluctuations in sea or lake level. The coastal zone is being severely impacted by erosion and flooding due in part to climate change and sea-level rise. It is likely that the impact will increase in the future as sea levels continue to rise at the current rate or rises at an accelerated rate.

Earthquakes: The impacts of global climate change on earthquake probability are unknown. Some scientists feel that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska might be opening the way for future earthquakes.

Fire: Climate change has the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. When climate alters fuel loads and fuel moisture, forest susceptibility to wildfires changes. Climate change also may increase winds that spread

fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Flooding: While it is not known if the number of storms will increase in the future as the result of climate changes, it is anticipated that the intensity of tropical and extra-tropical storms may increase as the storm intensity is a function of sea surface temperature, which continue to rise. Thus, we may experience more intense storms with greater rainfall in the future.

Tropical Cyclones: Although there is still some level of uncertainty, research indicates the warming climate may double the frequency of Category 4 and 5 hurricanes by the end of the century, and decrease the frequency of less severe hurricane events.

Nor'easters and Winter Storms: Weather extremes are likely to become more frequent and cause more damage under a changing climate. Although no specific storm is directly linked to climate change, an increasing number of events could become more common. New England is expected to experience changes in the amount, frequency, and timing of precipitation. Along with rising temperatures, it is expected that annual precipitation will increase by 14%, with a slight decrease in summer totals and a 30% increase in winter totals. Winter precipitation is predicted to be in the form of rain rather than snow. This change in precipitation will have significant effects on the amount of snow cover, winter recreation, spring snowmelt and peak stream flows, water supply, aquifer

Hazards Selected for Risk Assessment

recharge, and water quality. Snow is also predicted to fall later in the winter and cease falling earlier in the spring.

Severe Weather (wind, extreme temperature, thunderstorms, tornadoes, drought): Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data show that the probability for severe weather events increases in a warmer climate. With a warmer climate, droughts could become more frequent, more severe, and longer-lasting.

Hazards Selected for Risk Assessment

After profiling the hazards in the 2013 Massachusetts Hazard Mitigation Plan and assigning a probability to each hazard, the Planning Team sought input from members of the public and stakeholders through an online survey. In the survey, members of the public were asked if they had experienced any of the hazards identified in the 2013 Massachusetts State Hazard Plan (Question 2 and 3 of the online survey – see “Public Survey on Hazard Mitigation” in *Appendix 1*). Public and stakeholder input was then used to determine if specific

hazards were significant to Harwich (see Column 2 of *Table 2.7*)

Table 2.7 documents the evaluation process used for determining which of the 11 Massachusetts State hazards are considered significant enough to warrant further evaluation in the risk assessment. A hazard was further evaluated for a risk assessment if the following criteria were met:

- the Planning Team determined that the probability of the hazard was highly likely
- the public and stakeholders have experienced the hazard in the past

Using the process described above, the following hazards were selected for risk assessment in Chapter 4:

- Coastal Erosion/Shoreline Change
- Flood
- Hurricanes and Tropical Storms
- Nor'easters
- High Winds
- Severe Winter Weather
- Sea Level Rise

Introduction

	COLUMN 1	COLUMN 2	COLUMN 3
Type of Natural Hazard	What is the future probability of the hazard as determined by the Planning Team?	Did the public/stakeholders/ neighboring communities experience the hazard in the past?	Was the hazard further evaluated in the risk assessment in Chapter 4?
Coastal Erosion and Shoreline Change	HIGHLY LIKELY	Yes	Yes
Dam (Culvert) Failure	POSSIBLE	No	No
Earthquake	POSSIBLE	No (<1% said yes)	No
Urban Fire	LIKELY	Yes	No
Wildfire	LIKELY	Yes	No
Flood	HIGHLY LIKELY	Yes	Yes
Hurricane and Tropical Storms	HIGHLY LIKELY	Yes	Yes
Landslide	POSSIBLE	No (<1% said yes)	No
Nor'easters	HIGHLY LIKELY	Yes	Yes
High Winds	HIGHLY LIKELY	Yes	Yes
Thunderstorms	LIKELY	Yes	No
Extreme Temperatures	POSSIBLE	Yes	No
Tornadoes	POSSIBLE	Yes	No
Drought	POSSIBLE	Yes	No
Severe Winter Weather	HIGHLY LIKELY	Yes	Yes
Tsunami	UNLIKELY	No (<1% said yes)	No
Sea Level Rise	HIGHLY LIKELY	Yes	Yes

Table 2.7 | List of Hazards selected for a risk assessment

Asset Inventory

CHAPTER THREE

Chapter 2 profiled natural hazards that have affected Harwich in the past or could affect the town in the future. The next step in the hazard planning process is to determine the types of assets and people that are located in Harwich. Once this asset inventory is complete, the Planning Team can determine which of these assets and populations are vulnerable to the impacts of natural hazards. **Chapter 3 is an inventory of the people and natural and built environments in Harwich.**

People

People

Population: Year-round and Seasonal

Approximately 12,200 year-round residents live in Harwich (according to the 2010-2014 U.S. Census American Community Survey estimate). The median household income for this population is \$68,267 and the average household income is \$86,889.

Like other Cape Cod towns, Harwich's population grows significantly from winter to summer. Seasonal population includes household occupants, second home owners or residents, and transient renters of hotels/motel rooms. The Harwich Local Comprehensive Plan estimates total peak seasonal/summer population at about 28,000 people.¹ (For the purposes of this plan, seasonal population seeks to address how many individuals may need to be accounted for within Harwich, regardless of resident, visitor or transient status.)

The peak season estimate of individuals in Harwich with overnight accommodations is approximately 13,900. In addition to the year-round population, there are approximately 190 rooms available to book at Harwich's hotels, motels, bed and breakfasts, inns and lodging houses. Using a conservative estimate of two occupants per available room and the Cape Cod Chamber of

Commerce's July occupancy rate of 80 percent for the month of July, an additional 300 individuals in Harwich accommodations during the peak tourism season.

In addition, an accounting of Harwich's high percentage of seasonally-used second homes is needed. Using an occupancy rate of 4.5 individuals for each unit, as determined in the Cape Cod Commission Second Homeowner Survey (2008) and the Cape Cod Chamber's 80 percent occupancy rate, Harwich's 4,250 seasonally-vacant homes represent the possibility of another 15,300 individuals with overnight accommodations at peak times. The occupancy rate from the Commission's second-homeowner survey is less than the 7.8 person average occupancy advertised by more than 360 short-term rental properties listed for Harwich on VRBO.com (Vacation Rentals By Owner).

Base Map of Harwich

Figure 3.1 is a base map for the Town of Harwich; it is a map showing the geographic area of Harwich and includes features such as roads, rivers, coastlines. The base map acts as a frame of reference for the reader and reviewer of the Harwich Hazard Mitigation Plan Update.

1 Harwich LCP

Natural Environment

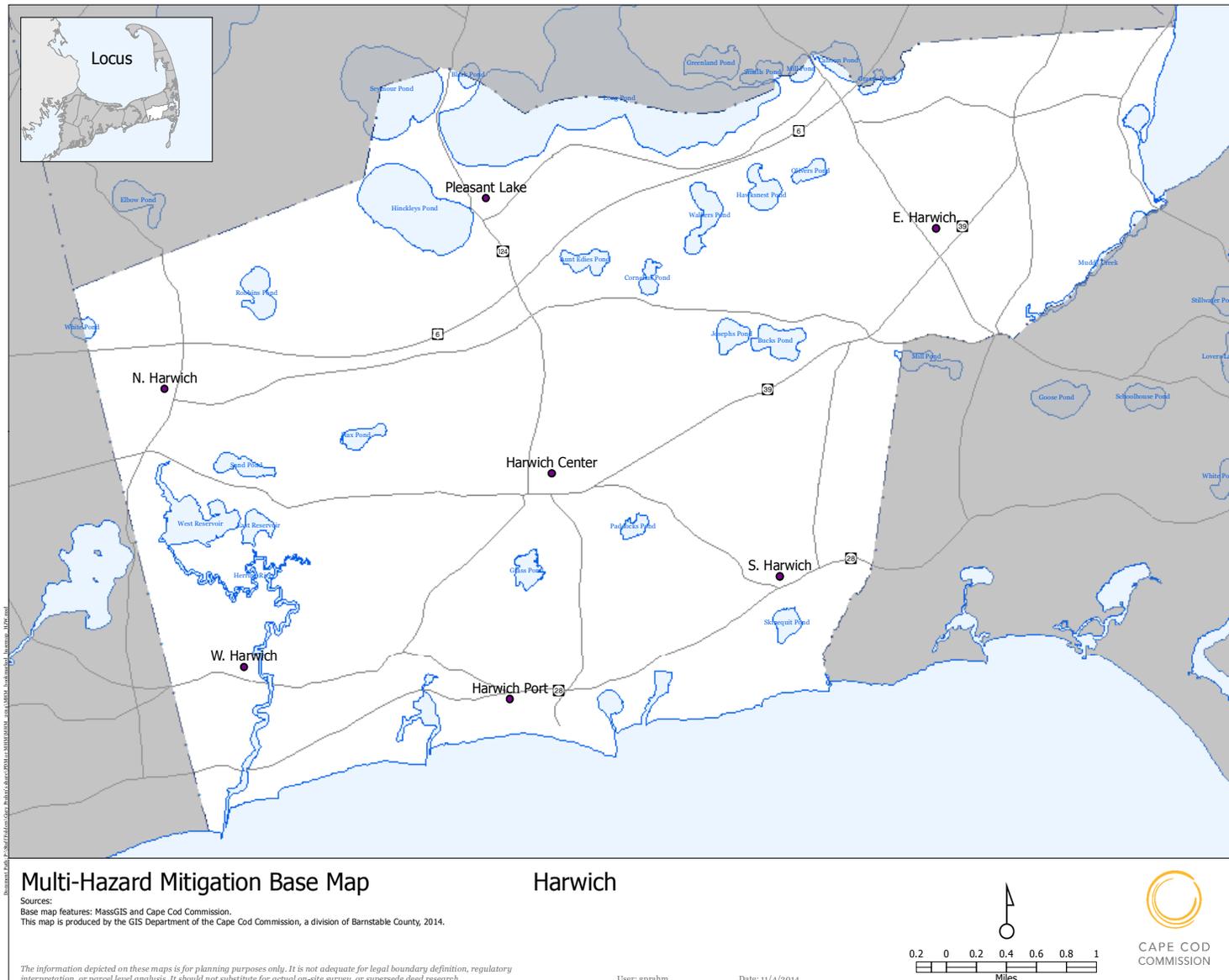


Figure 3.1 | Base map of Harwich

Natural Environment

Natural Environment

Harwich is located in the Lower Cape area, approximately 24 miles from the Cape Cod Canal and roughly 27 miles from Provincetown, the tip of the Cape. It shares borders with Dennis to the west, Brewster to the north and Chatham to the east. A common boundary with Orleans (to the northeast) exists in Pleasant Bay.

Harwich encompasses 20.93 square miles of land area with 10.9 miles of tidal shoreline. With miles of rivers and marshes and a coastline of sandy beaches dotted with the Town's four picturesque harbors, Harwich provides every form of aquatic activity available.

Harwich is generally within 20 minutes driving time of Hyannis and Orleans, two nearby centers of economic activity. It is also along the way to the Cape Cod National Seashore and Chatham, which are visited each year by a great number of tourists. Cape Cod.

Built Environment

Homes

Harwich has 20,108 total housing units *Table 3.1* is a list of the type and number of housing units in Harwich.

Close to more than 80 percent of the town's housing units were built after 1950. The median number of

UNITS IN STRUCTURE	Estimate
1-unit, detached	10,054
1-unit, attached	8,639
2 units	271
3 or 4 units	233
5 to 9 units	130
10 to 19 units	210
20 or more units	317
Mobile home	254
Boat, RV, van, etc.	0
Total Housing Units	20,108

Table 3.1 | Number and type of housing units in Harwich, U.S. Census American Community Survey, 2011-2015 5-year estimate.

rooms in Harwich residences is 5.8, which is larger than the 5.6 Cape-wide (ACS).

The Town's proximity to existing employment centers and the continued growth of its own commercial and industrial base will provide continued pressure for housing development for quite some time. Added to this is the existing and potential pressure for more retirement housing due to Harwich's location in resort/retirement areas. While the number of new homes being built in Harwich every year has declined, the search for available land to develop for housing, commercial and industrial uses continues.

Built Environment

Businesses and Employment

Harwich's business landscape is dominated by tourism-supported service industries, primarily Retail and Accommodations/Food Service (*Table 3.2*).

Industry	Number	Values, 000s
Wholesale trade	11	13,566
Retail trade	68	198,128
Information	7	8,102
Finance and insurance	6	N
Real estate and rental and leasing	10	N
Professional, scientific, and technical services	14	D
Administrative and support and waste management and remediation services	27	D
Educational services	54	24,023
Health care and social assistance	37	32,002
Arts, entertainment, and recreation	14	5,686
Accommodation and food services	53	51,028
Other services (except public administration)	32	19,038

Table 3.2a| Estimated Number and Value of Harwich Businesses, 2012 Economic Census of the United States,

D=Withheld to avoid disclosing data for individual companies
N=Data not available or not comparable

Industry	Number Employed
Management, business, and financial occupations:	268
Computer, engineering, and science occupations:	43
Education, legal, community service, arts, and media occupations:	276
Healthcare practitioner and technical occupations:	105
Service occupations:	181
Sales and office occupations:	149
Natural resources, construction, and maintenance occupations:	241
Production, transportation, and material moving occupations:	119
Total employed population 16 years and over	1,382

2010-2014 American Community Survey
5-Year Estimates

Table 3.2b| Estimated Number Employees by Industry, U.S. Census American Community Survey,

Built Environment

Critical Facilities

Table 3.3 is a list of the Critical Facilities in Harwich.

Type of Critical Facility	Name of Critical Facility	
Essential Facilities Assets that are essential to the health and welfare of the whole population and are especially important following hazard events. The potential consequence of losing these assets is so great that they were carefully inventoried. The building, contents and function/ services provided to the community are significant. Source: FEMA How-to Guide 2/ FEMA 386-2	Harwich Town Hall	Harwich Public Safety Facility (Fire and Police Departments)
	Harwich Fire Station Co. #2	Department of Public Works
	Harwich Community Center	Monomoy Regional High School
	Brooks Free Library	Harwich Elementary School (Monomoy Regional School District)
	Fontaine Medical Center	Cranberry Pointe Rehab and Skilled Critical Care Center/ Cranberry Pointe Child Care Center
	Saquatucket Harbor/Department of Natural Resources/ Harbor Master	Disposal Area
	Pleasant Bay Animal Hospital	Allen Harbor town dock
	The Royal of Harwich	Rosewood Manor Rest Home
	Wychmere Harbor town dock	Wychmere Harbor Harwichport Boat Works
	Pine Oaks Village I	Pine Oaks Village II
	Cape Cod Regional Technical High School	Pine Oaks Village III
	Harwich Water Department and Facilities	

Built Environment

Type of Critical Facility	Name of Critical Facility	
Transportation Systems	Critical assets in all 5 modes of transportation (air, road, transit, rail, sea). Source: FEMA How-to Guide 2/ FEMA 386-2	Herring River Bridge on Route 28 Allen Harbor Yacht Club
		Route 28 Culvert at the Harwich/Chatham town line Wychmere Harbor Harwichport Boat Works
Lifeline Utilities	Includes wastewater, water, oil, natural gas, electric power, and communication systems	Cape Discount Oil Cell Tower at HFD #2
		Crown Castle USA Cell Tower located at the Pilgrim Congregational Church
		Solar Field Cell Tower at Harwichport Golf Course
		Eversource Substation

Table 3.3 | List of Critical Facilities in Harwich (continued)

Built Environment

B4a

Repetitive Loss Properties

Repetitive Loss Properties are those for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any ten year period since 1978.

There are three repetitive loss properties in Harwich, all of which are single-family residential dwellings and located on the waterfront. One property is located in the Pleasant Bay area and the other two are located along the Herring River. All three are in A or V zones as of 2017, though when the losses occurred only one was in the A-Zone; one was X, and the last was B.

In the area of Pleasant Bay, the Perfect Storm in 1991 caused widespread flood damage and levelled protective barrier beach dunes. The dunes took a few years to regenerate, leaving the area open to additional damage in 1992, when a nor'easter caused extensive flood damage throughout the northeast and in other parts of Pleasant Bay. This repetitive loss area is primarily susceptible to storm surge and a moderate funneling effect from the Bay.

Along the Herring River, flood damage resulted from the Perfect Storm, the 1992 nor'easter, and a heavy rain and wind storm in 1990. Both impacted properties along the Herring River are waterfront, but were likely affected by rain and stormwater as well as storm surge. The river has the ability to funnel surge onto adjacent properties, and

a combination of storm surge and heavy rain may have reduced drainage capacity.

The Town has implemented several mitigation actions to help reduce future impacts from floods, wind, sea level rise, and erosion in the repetitive loss locations (as described above) that also are beneficial to residents and properties located in other vulnerable areas, including the following: the town has provided and continues to provide educational materials to residents and property owners on preparedness and hazard mitigation and conducted an educational workshop for coastal and riverfront landowners and contractors on hazard mitigation; the Town participates in the NFIP and reviews the zoning bylaw to ensure it is as protective as possible and reflects current floodplain science and policy; the Town participates in NFIP's Community Rating System (CRS) through enhanced floodplain management. The 2017 Hazard Mitigation Plan update includes the following new actions to reduce loss from flooding and wind: continue the beach nourishment projects with dredge spoils.

New Developments in Harwich

New Developments in Harwich

Below is a list of new developments in Harwich:

- **16 SAQUATUCKETS BLUFFS RD:** Construct new 4,718 square foot, two story, four bedroom single family dwelling.
- **3 HULSE POINT RD:** Construct additions and alterations totaling 906 square feet.
- **20 CROCKER RISE:** Construct a new two story, four bedroom, 2,599 square foot, single family dwelling.
- **316 LOWER COUNTY ROAD:** Remodel kitchen, construct a new 70 square foot laundry room.
- **18 SNOW INN ROAD:** New single family dwelling.
- **4 WATERS EDGE:** Construct new bedroom in basement, remodel basement.
- **35 SNOW INN ROAD:** Remove and rebuild boat house and deck.
- **25 HARBOR WAY:** Construct a new, four bedroom, two story, single family dwelling.
- **110 GREY NECK ROAD:** Construct a new 24' x 28' detached two car garage.
- **142 LONG POND DRIVE:** New two story, five bedroom, single family dwelling.
- **90 NORTH ROAD:** Construct a new 2,484 square foot, single story three bedroom single family dwelling.
- **473 DEPOT STREET:** Construct a new two story 1,863square foot, three bedroom single family dwelling on a full foundation.
- **2059 ROUTE 28:** Construct a new 2,970 square foot, three bedroom single family dwelling on a full foundation.
- **181 ROUTE 28:** Raze and replace fire damaged portion of building.
- **25 COTTAGE AVE:** New accessory cottage
- **2 A SEA STREET:** Move newly constructed portion of dwelling to new foundation.
- **2A SEA STREET:** Construction of a new two story, five bedroom, single family dwelling.
- **69 SMITH STREET:** Demolish existing 24' x 24' one story structure to make room for new 32' x 24' one story addition on a full foundation.
- **89 SHORE ROAD:** Construct a new 27' x 27' two car detached garage on a shallow foundation.

The Planning Team mapped these new developments and determined if they are located in the floodplain according the most recent FIRMs, vulnerable to storm surge using SLOSH models or vulnerable to sea level rise using the Cape Cod Commission's sea level rise viewer. (*Table 3.4*). The exposure assessment shows whether the following assets are vulnerable to flooding, storm surge and sea level rise.

New Developments in Harwich

Name of New Development	Special Flood Hazard Area	SLOSH zone	Sea Level Rise
16 SAQUATUCKET BLUFFS RD, Harwich, MA	Y	Y	Y
3 HULSE POINT RD, Harwich, MA	Y	Y	Y
20 CROCKER RISE, Harwich, MA	N	N	N
316 LOWER COUNTY RD, Harwich, MA	Y	Y	Y
18 SNOW INN RD, Harwich, MA	N	N	N
4 WATERS EDGE, Harwich, MA	N	N	N
35 SNOW INN RD, Harwich, MA	N	N	N
25 HARBOR WAY, Harwich, MA	Y	Y	Y
110 GREY NECK RD, Harwich, MA	Y	Y	Y
142 LONG POND DR, Harwich, MA	N	N	N
90 NORTH RD, Harwich, MA	Y	Y	Y
473 DEPOT ST, Harwich, MA	N	Y	N
2059 RT 28- HEAD OF THE BAY RD, Harwich, MA	Y	Y	Y
181 ROUTE 28, Harwich, MA	Y	Y	Y
25 COTTAGE AV, Harwich, MA	Y	Y	Y
2 SEA ST, #A, Harwich, MA	Y	Y	Y
69 SMITH ST, Harwich, MA	Y	Y	Y
89 SHORE RD, Harwich, MA	Y	Y	Y

Table 3.4| Exposure Assessment of New Developments in Harwich

Vulnerability Assessment

CHAPTER FOUR

Chapter 2 of the Harwich Hazard Mitigation Plan Update profiled natural hazards that could impact the town in the future or have impacted Harwich in the past. Chapter 3 inventoried the assets that could be damaged during a hazard event, such as buildings, infrastructure and critical facilities. Chapter 4 ties together the hazard profiles and asset inventories to estimate the potential losses that Harwich could experience during a natural hazard event. **Chapter 4 answers the question: How will assets in Harwich be affected by hazard events?**

Methodology: Vulnerability Assessments

Methodology: Vulnerability Assessments

Chapter 4 of the 2017 Harwich Hazard Mitigation Plan Update includes the following two assessments:

- **Vulnerability Assessment of Parcels and Buildings:** this assessment was completed by the Town of Harwich and the Cape Cod Commission (i.e. the Planning Team) using data from the Town Assessor's office.
- **Exposure Assessment of Critical Facilities:** the Planning Team used Geographic Information System (GIS) analysis to identify whether critical facilities could be exposed to flooding, storm surge, sea level rise and coastal erosion.

The methods of both assessments are provided in the remaining part of this section.

Methods of the Vulnerability Assessment of Parcels and Buildings:

1. To estimate the total number of parcels and value of buildings located in Harwich, the Planning Team used Town Assessing data from 2015. This 2015 data set contains information about parcels such as use codes, building characteristics and assessed value. The 2015 parcel data is also linked to geometry data for specific parcels on the ground. The 2015 data was used because it is the most

current data set that contains both the parcel and the geometry data. This large data set was grouped into categories using Massachusetts Property Type Classification Codes. Parcel numbers and building values were totaled for each category.¹ It is important to note that the category titles were not selected by members of the Planning Team; instead category names are based on the State's Classification Code. Below is a list of examples of asset types in each category.

- **Agriculture:** agricultural land/farms, greenhouses, farm buildings
- **Banks:** bank buildings
- **Entertainment and Recreation:** includes eating and drinking establishments, indoor recreation, recreational land
- **General Services:** includes warehouses and distributional facilities, post office, housing authority, municipal property
- **Medical Office/Clinics:** includes medical office buildings
- **Multi-Family Dwelling:** includes condos, 2-3 family homes, multiple houses on a single property, 4-8 unit homes and 8+ units

¹ Property type classification codes, non-arm's length codes and sales report spreadsheet specifications, prepared by the Bureau of Local Assessment, revised March 2015, <http://www.mass.gov/dor/docs/dls/bla/classificationcodebook.pdf>

Methodology: Vulnerability Assessments

- **Non-Profit/Municipal:** government or town owned properties, public parking lots, libraries, museums, fraternal offices
 - **Parking:** commercial parking lots
 - **Personal/Repair Services:** includes buses and funeral homes
 - **Retail Trade:** includes hardware stores, shopping malls, supermarkets, small retail
 - **Single Family Dwelling:** single family homes
 - **Temporary Lodging:** includes motels, inns, resorts
 - **Theaters:** includes theaters and stadiums
 - **Vacant:** includes developable land, undevelopable land, residential open land, underwater land or marshes not under public ownership
 - **Wholesale Trade:** includes tanks holding fuel and oil products for retail distribution, bottled gas and propane tanks, lumber yards
2. Next, the Planning Team used GIS to overlay maps of hazard areas onto parcel and value data. Only a subset of natural hazards was identified for further vulnerability assessment (see *Table 2.6* for rationale). Below is a list of hazards selected for the vulnerability assessment and a description of the available data used for the assessment.
- **Flooding:** FEMA flood hazard maps, adopted by Harwich in 2014
 - **Hurricanes and Tropical Storms:** The storm surge that occurs during tropical cyclones is assessed using the SLOSH (Sea, Lake, and Overland Surges from Hurricanes) model. Currently, there is no model available for the impact of wind from tropical cyclones. *Figure 2.14* in Chapter 2 shows a SLOSH map for the Town of Harwich.
 - **Sea Level Rise:** Bathtub model developed by the Cape Cod Commission was used to model the impacts of sea level rise on Harwich. *Figure 2.23* in Chapter 2 shows a Sea Level Rise map for the Town of Harwich.
 - **Coastal Erosion/Shoreline Change:** The Planning Team used GIS to identify which properties had a physical connection to saltwater. Properties that share a boundary with saltwater was identified as “coastal property.” Parcel and building values were identified. The Planning Team recognizes that this method is not perfect.
 - **Nor’easters:** Data is not available. A detailed vulnerability assessment could not be completed at this time.
 - **High Winds:** Data is not available. A detailed vulnerability assessment could not be completed at this time.

Methodology: Vulnerability Assessments

- **Severe Winter Weather:** Data is not available. A detailed vulnerability assessment could not be completed at this time.

It is important to note that SLOSH and Sea Level Rise models are coarse models to illustrate vulnerability to storm surge and sea level rise using the best available data. Both of these models have their strengths and their weaknesses:

- **Sea, Lake and Overland Surges from Hurricanes (SLOSH) model:** SLOSH is a computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data². These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features. However, the SLOSH model does not explicitly model the impacts of waves on top of the surge nor does it account for normal river flow or rain flooding. Future

advancements in the SLOSH model will allow for the resolution of some of these limitations.²

- **Cape Cod Commission's Sea Level Rise model:** Sea Level Rise data was derived from classified Digital Elevation Model (DEM) data collected through Light Detection and Ranging (LiDAR) in 2011 by the United States Geological Society (USGS). The elevation data is accurate to 18 cm at a 95% confidence level with a 1 meter resolution. This elevation data was adjusted to Mean Higher High Water (MHHW) using the NOAA VDatum Software. The Sea Level Rise is shown as a simple representation of a change in elevation, commonly referred to as a "Bathtub" model. No account has been made for the effects of velocity and resulting erosion caused by wave action.

2 <http://www.nhc.noaa.gov/surge/slosh.php>

Methodology: Vulnerability Assessments

Methods of Exposure Assessment of Critical Facilities:

For this exposure assessment, the Team compiled a list of critical facilities and mapped them in GIS. Sea level rise, flooding, storm surge maps were overlaid on the map of critical facilities. If a critical facility was located in a hazard area, the Planning Team determined that it was exposed and therefore vulnerable. To assess exposure to coastal shoreline change, the Planning Team determined if the parcel boundary of the critical facility was adjacent to salt water. As mentioned in the previous section, maps for nor'easters, high winds, severe winter weather and are not available and therefore their impact on critical facilities was not determined.

Methodology: Vulnerability Assessments

Results: Vulnerability Assessment

Parcels and Buildings in Hazard Areas

Parcels and Buildings Vulnerable to Flooding

Flooding (A Zone)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Entertainment and Recreation	48	4	8%	\$1,830,700	\$1,392,900	76%
General Services	102	4	4%	\$36,071,700	\$116,200	0%
Multi-family Dwelling	375	25	7%	\$319,261,600	\$133,786,400	0%
Single Family Dwelling	8,560	185	2%	\$2,079,169,300	\$123,015,400	6%
Temporary Lodging	15	3	20%	\$19,045,500	\$13,714,300	72%
Wholesale Trade	46	1	2%	\$11,168,000	\$16,500	0%
COLUMN TOTAL:	9,450	300		\$2,665,091,600	\$272,041,700	

Table 4.1 | The proportion of buildings and value of buildings located in a A zone.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Flooding (V Zone)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	67	35%	\$35,320,800	\$9,826,200	28%
Entertainment and Recreation	48	11	23%	\$1,830,700	\$1,678,400	92%
General Services	102	24	24%	\$36,071,700	\$8,605,400	24%
Medical Office/Clinic	18	3	17%	\$11,465,500	\$1,029,100	9%
Multi-family Dwelling	375	100	27%	\$319,261,600	\$198,205,000	0%
Nursing Home	4	1	25%	\$11,517,100	\$80,100	1%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	23	32%	\$39,354,700	\$9,275,400	24%
Schools	7	1	14%	\$91,613,600	\$187,600	0%
Single Family Dwelling	8,560	1,151	13%	\$2,079,169,300	\$385,945,400	19%
Professional/Tech. Services	4	3	75%	\$599,200	\$519,000	87%
Temporary Lodging	15	5	33%	\$19,045,500	\$1,884,700	10%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	1,746		\$2,665,091,600	\$618,264,700	

Table 4.2 | The proportion of buildings and value of buildings located in a V zone.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Parcels and Buildings Vulnerable to Sea Level Rise

Sea Level Rise (1 foot)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Church/Non-Profit Offices	189	35	19%	\$35,320,800	\$2,148,400	6%
Entertainment and Recreation	48	5	10%	\$1,830,700	\$1,392,900	76%
General Services	102	11	11%	\$36,071,700	\$2,685,100	7%
Medical Office/Clinic	18	1	6%	\$11,465,500	\$476,700	4%
Multi-family Dwelling	375	39	10%	\$319,261,600	\$150,417,400	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	8	11%	\$39,354,700	\$1,958,700	5%
Single Family Dwelling	8,560	312	4%	\$2,079,169,300	\$152,951,100	7%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	1	7%	\$19,045,500	\$12,525,700	66%
Wholesale Trade	46	2	4%	\$11,168,000	\$178,700	2%
COLUMN TOTAL:	9,450	589		\$2,665,091,600	\$325,376,000	

Table 4.3 | The proportion of buildings and value of buildings exposed to 1 foot of sea level rise.

Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Sea Level Rise (2 feet)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	1	20%	\$3,054,400	\$247,700	8%
Church/Non-Profit Offices	189	36	19%	\$35,320,800	\$2,148,400	6%
Entertainment and Recreation	48	7	15%	\$1,830,700	\$1,646,300	90%
General Services	102	12	12%	\$36,071,700	\$2,783,400	8%
Medical Office/Clinic	18	2	11%	\$11,465,500	\$726,000	6%
Multi-family Dwelling	375	46	12%	\$319,261,600	\$152,832,700	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	11	15%	\$39,354,700	\$7,126,500	18%
Single Family Dwelling	8,560	383	4%	\$2,079,169,300	\$179,069,100	9%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	2	13%	\$19,045,500	\$12,908,000	68%
Wholesale Trade	46	3	7%	\$11,168,000	\$577,600	5%
COLUMN TOTAL:	9,450	699		\$2,665,091,600	\$360,707,000	

Table 4.4 | The proportion of buildings and value of buildings exposed to 2 feet of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Sea Level Rise (3 feet)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	1	20%	\$3,054,400	\$247,700	8%
Church/Non-Profit Offices	189	42	22%	\$35,320,800	\$2,440,500	7%
Entertainment and Recreation	48	10	21%	\$1,830,700	\$1,678,400	92%
General Services	102	13	13%	\$36,071,700	\$2,963,300	8%
Medical Office/Clinic	18	2	11%	\$11,465,500	\$726,000	6%
Multi-family Dwelling	375	58	15%	\$319,261,600	\$158,409,200	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	17	24%	\$39,354,700	\$8,384,100	21%
Single Family Dwelling	8,560	482	6%	\$2,079,169,300	\$207,266,100	10%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	4	27%	\$19,045,500	\$13,470,700	71%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	847		\$2,665,091,600	\$396,860,800	

Table 4.5 | The proportion of buildings and value of buildings exposed to 1 foot of sea level rise.

Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Sea Level Rise (4 feet)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	47	25%	\$35,320,800	\$2,440,500	7%
Entertainment and Recreation	48	11	23%	\$1,830,700	\$1,817,400	99%
General Services	102	18	18%	\$36,071,700	\$4,691,400	13%
Medical Office/Clinic	18	2	11%	\$11,465,500	\$726,000	6%
Multi-family Dwelling	375	71	19%	\$319,261,600	\$167,057,400	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	19	26%	\$39,354,700	\$8,603,100	22%
Single Family Dwelling	8,560	615	7%	\$2,079,169,300	\$249,916,100	12%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$15,599,000	82%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	1,038		\$2,665,091,600	\$452,398,300	

Table 4.6 | The proportion of buildings and value of buildings located in Category 4 SLOSH zone.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Sea Level Rise (5 feet)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	52	28%	\$35,320,800	\$2,573,400	7%
Entertainment and Recreation	48	12	25%	\$1,830,700	\$1,929,400	105%
General Services	102	22	22%	\$36,071,700	\$7,393,000	20%
Medical Office/Clinic	18	2	11%	\$11,465,500	\$726,000	6%
Multi-family Dwelling	375	73	19%	\$319,261,600	\$167,699,800	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	22	31%	\$39,354,700	\$9,164,200	23%
Single Family Dwelling	8,560	750	9%	\$2,079,169,300	\$291,004,400	14%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$15,599,000	82%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	1,214		\$2,665,091,600	\$497,636,600	

Table 4.7 | The proportion of buildings and value of buildings exposed to 1 foot of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Sea Level Rise (6 feet)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	58	31%	\$35,320,800	\$4,387,800	12%
Entertainment and Recreation	48	13	27%	\$1,830,700	\$1,929,400	105%
General Services	102	26	25%	\$36,071,700	\$8,426,500	23%
Medical Office/Clinic	18	3	17%	\$11,465,500	\$1,029,100	9%
Multi-family Dwelling	375	80	21%	\$319,261,600	\$181,783,400	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	23	32%	\$39,354,700	\$9,275,400	24%
Single Family Dwelling	8,560	860	10%	\$2,079,169,300	\$325,922,700	16%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$15,599,000	82%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	1,375		\$2,665,091,600	\$549,900,700	

Table 4.8 | The proportion of buildings and value of buildings exposed to 2 feet of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Parcels and Buildings Vulnerable to Storm Surge During hurricanes

SLOSH (Category 1 Storm)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	30	16%	\$35,320,800	\$1,977,800	6%
Entertainment and Recreation	48	8	17%	\$1,830,700	\$1,547,700	85%
General Services	102	15	15%	\$36,071,700	\$3,761,800	10%
Medical Office/Clinic	18	2	11%	\$11,465,500	\$726,000	6%
Multi-family Dwelling	375	55	15%	\$319,261,600	\$157,439,700	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	19	26%	\$39,354,700	\$8,561,700	22%
Single Family Dwelling	8,560	441	5%	\$2,079,169,300	\$194,198,800	9%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$15,599,000	82%
Wholesale Trade	46	4	9%	\$11,168,000	\$633,500	6%
COLUMN TOTAL:	9,450	771		\$2,665,091,600	\$385,359,900	

Table 4.9 | The proportion of buildings and value of buildings exposed to 3 feet of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

SLOSH (Category 2 Storm)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	2	40%	\$3,054,400	\$272,600	9%
Church/Non-Profit Offices	189	43	23%	\$35,320,800	\$5,002,900	14%
Entertainment and Recreation	48	7	15%	\$1,830,700	\$1,345,200	73%
General Services	102	25	25%	\$36,071,700	\$8,426,500	23%
Medical Office/Clinic	18	3	17%	\$11,465,500	\$1,029,100	9%
Multi-family Dwelling	375	85	23%	\$319,261,600	\$182,791,900	0%
Personal/Repair Services	3	1	33%	\$331,300	\$122,300	37%
Retail Trade	72	23	32%	\$39,354,700	\$9,275,400	24%
Schools	7	1	14%	\$91,613,600	\$187,600	0%
Single Family Dwelling	8,560	887	10%	\$2,079,169,300	\$334,464,100	16%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$15,599,000	82%
Wholesale Trade	46	3	7%	\$11,168,000	\$617,000	6%
COLUMN TOTAL:	9,450	1,294		\$2,665,091,600	\$559,652,600	

Table 4.10 | The proportion of buildings and value of buildings exposed to 4 feet of sea level rise
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

SLOSH (Category 3 Storm)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Banks	5	1	20%	\$3,054,400	\$247,700	8%
Church/Non-Profit Offices	189	59	31%	\$35,320,800	\$10,796,000	31%
Entertainment and Recreation	48	10	21%	\$1,830,700	\$1,138,800	62%
General Services	102	32	31%	\$36,071,700	\$10,366,800	29%
Medical Office/Clinic	18	6	33%	\$11,465,500	\$3,579,900	31%
Multi-family Dwelling	375	113	30%	\$319,261,600	\$207,543,500	0%
Nursing Home	4	1	25%	\$11,517,100	\$80,100	1%
Retail Trade	72	25	35%	\$39,354,700	\$9,624,900	24%
Schools	7	1	14%	\$91,613,600	\$187,600	0%
Single Family Dwelling	8,560	1,445	17%	\$2,079,169,300	\$476,661,300	23%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	8	53%	\$19,045,500	\$16,623,900	87%
Wholesale Trade	46	3	7%	\$11,168,000	\$689,300	6%
COLUMN TOTAL:	9,450	1,969		\$2,665,091,600	\$738,058,800	

Table 4.11 | The proportion of buildings and value of buildings exposed to 5 feet of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

SLOSH (Category 4 Storm)						
Type of Structure	Number of Parcels			Value of Buildings		
	# in town	# in Hazard area	% in Hazard Area	\$ in town	\$ in Hazard area	% in Hazard Area
Agriculture	34	3	9%	\$307,000	\$0	0%
Church/Non-Profit Offices	189	63	33%	\$35,320,800	\$9,117,800	26%
Entertainment and Recreation	48	10	21%	\$1,830,700	\$1,060,000	58%
General Services	102	33	32%	\$36,071,700	\$9,935,800	28%
Light Industrial	5	1	20%	\$2,285,200	\$59,000	3%
Medical Office/Clinic	18	4	22%	\$11,465,500	\$3,531,800	31%
Multi-family Dwelling	375	152	41%	\$319,261,600	\$233,477,700	0%
Nursing Home	4	1	25%	\$11,517,100	\$80,100	1%
Retail Trade	72	25	35%	\$39,354,700	\$11,491,200	29%
Schools	7	1	14%	\$91,613,600	\$187,600	0%
Single Family Dwelling	8,560	1,955	23%	\$2,079,169,300	\$564,550,800	27%
Professional/Tech. Services	4	2	50%	\$599,200	\$519,000	87%
Temporary Lodging	15	10	67%	\$19,045,500	\$16,780,300	88%
Wholesale Trade	46	3	7%	\$11,168,000	\$469,200	4%
COLUMN TOTAL:	9,450	2,522		\$2,665,091,600	\$851,260,300	

Table 4.12 | The proportion of buildings and value of buildings exposed to 6 feet of sea level rise.
Table generated using 2015 Harwich Assessing Data

Methodology: Vulnerability Assessments

Parcels and Buildings Vulnerable to Shoreline Change

Coastal Properties		
	# of Parcels in Hazard area	\$ of Buildings in Hazard area
Coastal	434	\$324,040,800
Not Coastal	10875	\$2,170,564,400

Table 4.13 | The number of parcels and value of buildings on parcels that share a physical boundary with sea water. If a parcel shares a boundary with sea water, it is assumed to be vulnerable to coastal hazards such as shoreline change and erosion .

Exposure Assessment of Critical Facilities by the Planning Team

Name of Critical Facility	SLOSH Cat 1	SLOSH Cat 2	SLOSH Cat 3	SLOSH Cat 4	Sea Level Rise 1 foot	Sea Level Rise 2 feet	Sea Level Rise 3 feet	Sea Level Rise 4 feet	Sea Level Rise 5 feet	Sea Level Rise 6 feet	Special Flood Hazard Area (AE)	Special Flood Hazard Area (VE)	COASTAL (boundary with salt water)
ESSENTIAL FACILITY (POINTS)													
Public Safety Facility (Fire and Police Departments)	N	N	N	N	N	N	N	N	N	N	N	N	N
Fire Station Co. #2	N	N	N	N	N	N	N	N	N	N	N	N	N
Town Hall	N	N	N	N	N	N	N	N	N	N	N	N	N
Brooks Free Library	N	N	N	N	N	N	N	N	N	N	N	N	N
Water Department and facilities (pumping stations, treatment plants)	N	N	N	N	N	N	N	N	N	N	N	N	N
Department of Public Works	N	N	N	N	N	N	N	N	N	N	N	N	N
Disposal Area	N	N	N	N	N	N	N	N	N	N	N	N	N
Community Center	N	N	N	N	N	N	N	N	N	N	N	N	N

Methodology: Vulnerability Assessments

Name of Critical Facility	SLOSH Cat 1	SLOSH Cat 2	SLOSH Cat 3	SLOSH Cat 4	Sea Level Rise 1 foot	Sea Level Rise 2 feet	Sea Level Rise 3 feet	Sea Level Rise 4 feet	Sea Level Rise 5 feet	Sea Level Rise 6 feet	Special Flood Hazard Area (AE)	Special Flood Hazard Area (VE)	COASTAL (boundary with salt water)
Fontaine Medical Center	N	N	N	N	N	N	N	N	N	N	N	N	N
Monomoy Regional High School	N	N	N	N	N	N	N	N	N	N	N	N	N
Harwich Elementary School	N	N	N	N	N	N	N	N	N	N	N	N	N
Cape Cod Regional Tech	N	N	N	N	N	N	N	N	N	N	N	N	N
Wychmere Harbor town dock	N	N	N	N	N	N	N	N	N	N	N	N	N
Saquatucket Harbor/ Department of Natural Resources/ Harbor Master	N	Y	N	N	N	N	N	N	N	N	Y	N	Y
Allens Harbor town dock	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N
Cranberry Pointe Rehab and Skilled Critical Care Center/ Cranberry Pointe Child Care Center	N	N	N	N	N	N	N	N	N	N	N	N	N
Pleasant Bay Animal Hospital	N	N	N	N	N	N	N	N	N	N	N	N	N
Rosewood Manor Rest Home	N	N	N	N	N	N	N	N	N	N	N	N	N
The Royal of Harwich	N	N	N	N	N	N	N	N	N	N	N	N	N
Pine Oaks Village I	N	N	N	Y	N	N	N	N	N	N	N	N	N
Pine Oaks Village II	N	N	N	N	N	N	N	N	N	N	N	N	N
Pine Oaks Village III	N	N	N	N	N	N	N	N	N	N	N	N	N

Methodology: Vulnerability Assessments

Name of Critical Facility	SLOSH Cat 1	SLOSH Cat 2	SLOSH Cat 3	SLOSH Cat 4	Sea Level Rise 1 foot	Sea Level Rise 2 feet	Sea Level Rise 3 feet	Sea Level Rise 4 feet	Sea Level Rise 5 feet	Sea Level Rise 6 feet	Special Flood Hazard Area (AE)	Special Flood Hazard Area (VE)	COASTAL (boundary with salt water)
TRANSPORTATION SYSTEMS													
Herring River Bridge at Lower County Road	N	N	N	N	N	N	N	N	N	N	Y	N	N
Herring River Bridge on Route 28	N	N	N	N	N	N	N	N	N	N	Y	N	N
Route 28 Culvert at the Harwich/Chatham townline	N	N	N	N	N	N	N	N	N	N	N	N	N
Allens Harbor Yacht Club	N	N	N	Y	N	N	N	N	N	N	Y	N	N
Wychmere Harbor Harwichport Boat Works	N	N	N	N	N	N	N	N	N	N	N	N	N
LIFELINE UTILITIES													
Cell Tower at HFD #2	N	N	N	N	N	N	N	N	N	N	N	N	N
Cell Tower located at the Pilgrim Congregational Church	N	N	N	N	N	N	N	N	N	N	N	N	N
Cell Tower at Harwichport Golf Course	N	N	N	Y	N	N	N	N	N	N	N	N	N
Cape Discount Oil	N	N	N	N	N	N	N	N	N	N	N	N	N
Crown Castle USA													
Solar Field	N	N	N	N	N	N	N	N	N	N	N	N	N
Eversource Substation	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 4.14 | Exposure Assessment for Critical Facilities. In the Sea Level Rise section of the table, “Y coast” represents facilities that are inundated by water from the coast, “Y depression” represents facilities that are inundated because they are in low-lying areas. Asterisks indicate that the Planning Team would like to provide additional commentary on the exposure of the asset - See Additional Comments on Asset Exposure Section

Vulnerable Populations

B3b

Vulnerable Populations

Below is a description of segments of the population who are vulnerable to the impacts of natural hazard events³:

Coastal Erosion: Coastal erosion is not generally considered an imminent threat to public safety because shoreline changes are gradual over many years. However, drastic changes to the shoreline may occur in a single storm event which can threaten homes and public safety.

Culvert Failure: All populations in a culvert failure inundation zone would be exposed to the risk of culvert failure. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation².

Earthquake: The entire population of Massachusetts is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of dwelling structures, soil types in which homes are constructed, proximity to fault locations, etc. Further, the time of day also exposes different sectors of the community to the hazard.²

Wildland and Urban Fire: As demonstrated by historical urban and wildfire events, potential losses include human health and life of residents and responders. The most

vulnerable populations include the elderly, children, and disabled as well as emergency responders and those within a short distance of the interface between the built environment and the wildland environment.²

Flooding: The impact of flooding on life, health, and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. Exposure includes the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by a hazard event (e.g., risk while traveling in flooded areas, or compromised access to emergency services during an event). The degree of such impacts will vary and is not strictly measurable.² Of the population exposed, the most vulnerable include the economically disadvantaged and population over the age of 65. Those over the age of 65 are vulnerable because they are more likely to seek or need medical attention, which may not be available due to isolation during a flood event. They also may have more difficulty evacuating.²

Hurricanes and Tropical Storms: The impact of a hurricane or tropical storm on life, health and safety is dependent upon several factors including the severity of the event and whether or not residents received adequate warning time. It is assumed that the entire population of Barnstable County is exposed to this

3 2013 Massachusetts State Hazard Plan

Vulnerable Populations

hazard. Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing.² Of the population exposed, the most vulnerable include the economically disadvantaged and population over the age of 65. Those over the age of 65 are vulnerable because they are more likely to seek or need medical attention, which may not be available due to isolation during a flood event. They also may have more difficulty evacuating.²

Landslides: It is difficult to determine demographics of populations vulnerable to landslides.²

Nor'easters: The impact of a nor'easter on life, health and safety is dependent upon several factors including the severity of the event and whether or not residents received adequate warning time. It is assumed that the entire Commonwealth's population is exposed to this hazard (wind and rain/snow). Of the population exposed, the most vulnerable include the economically disadvantaged and population over the age of 65. Those over the age of 65 are vulnerable because they are more likely to seek or need medical attention, which may not be available due to isolation during a flood event. They also may have more difficulty evacuating.²

Severe Weather (wind, thunderstorms, tornadoes, extreme temperatures, drought): For the purposes of this plan, the entire population of the Harwich is exposed to severe weather events. Residents may be displaced or require temporary to long-term sheltering due to severe weather events. In addition, downed trees, damaged buildings and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. In general, vulnerable populations include the elderly, low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life threatening to those dependent on electricity for life support. Isolation of these populations is a significant concern. These populations face isolation and exposure during severe weather events and could suffer more secondary effects of the hazard.²

Severe Winter Weather (snow, blizzards and ice): According to NOAA's National Severe Storms Laboratory, winter weather indirectly and deceptively kills hundreds of people in the U.S. every year, primarily from automobile accidents, overexertion and exposure. Winter storms are often accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, drifting snow and extreme cold temperatures with dangerous wind chills. These storms are considered

Summary of Vulnerable Infrastructure

deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. Injuries and fatalities may occur due to traffic accidents on icy roads, heart attacks while shoveling snow or hypothermia from prolonged exposure to cold.²

Heavy snow can immobilize a region and paralyze a town, shutting down its transportation network, stopping the flow of supplies, and disrupting medical and emergency services. The elderly are considered most susceptible due to their increased risk of injury and death from falls and overexertion and/or hypothermia from attempts to clear snow and ice, or related to power failures. In addition, severe winter weather events can reduce the ability of these populations to access emergency services. Residents with low incomes may not have access to housing or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply).²

Tsunami: It is difficult to determine demographics of populations vulnerable to tsunamis.²

Summary of Vulnerable Infrastructure

B3b

Below is a description of infrastructure that is vulnerable to the impacts of natural hazard events:

- The following infrastructure is vulnerable to the impacts of natural hazards events:
 - • Saquatucket Harbor/Department of Natural Resources/Harbor Master office is vulnerable to flooding (located in SLOSH and flood hazard area).
 - • Allen Harbor town dock is vulnerable to flooding (located in SLOSH area) and sea level rise. The Allen Harbor Yacht Club is vulnerable to flooding (located in SLOSH area and flood hazard area).
 - • Pine Oaks Village 1 is vulnerable to flooding (SLOSH area Category 4 storm)
 - • Herring River bridges at Lower County Road and Route 28 are vulnerable to flooding (located in flood hazard areas).
 - • The cell tower at the Harwichport golf course is vulnerable to flooding from sea level rise.

Mitigation Strategy

CHAPTER FIVE

Chapter 2 profiled specific hazards that could affect Harwich and Chapter 4 assessed the losses that could result from those hazard events. The next step in the hazard planning process is to identify actions to reduce risk and loss of life and to develop way to implement these actions. This so-called “Mitigation Strategy” determines broad goals and objectives and outlines specific actions for the next five years. **Chapter 5 outlines a mitigation strategy for the Town of Harwich for the next five years.**

Mitigation Goals

C3a,b

Mitigation Goals

Mitigation goals are broad guidelines that articulate Harwich's desire to protect people and structures, reduce the cost of disaster response and recovery, and minimize disruption to the community following a disaster.¹

Mitigation Goals for the 2017 Harwich Hazard Mitigation Plan Update are:

1. Reduce the potential for loss of life, property, infrastructure, and environmental, cultural and economic resources in Harwich from natural hazards.
2. Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to natural hazards.
3. Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.
4. Competitively position the Town to seek and apply for funding opportunities to implement the actions identified in the Harwich Hazard Mitigation Plan Update.

5. Ensure that mitigation measures are sensitive to the natural features, historic resources, and community character of Harwich.
6. Communicate local hazard mitigation planning activities with Barnstable County, neighboring towns and the Massachusetts Emergency Management Agency.
7. Increase public awareness of existing hazards and encourage hazard mitigation planning as part of the overall municipal planning process.

Mitigation Actions

Mitigation actions are any action, process or project designed to reduce or eliminate long term risk from natural hazards. These mitigation actions are developed by the Planning Team and they must be consistent with the vulnerability and risk assessment performed in Chapter 4 and with the priorities of the Town of Harwich.

Below is a description of how the Planning Team developed the Mitigation Action section of the 2017 Harwich Hazard Mitigation Plan Update:

- 1. A Progress Determination on Mitigation Actions in 2011:** the Team assigned a status to each mitigation action identified in the 2011 Hazard Mitigation Plan and explained why the action was completed, an existing capability, in progress, deferred or deleted (See *Table 5.1*).

¹ FEMA How-to Guide 3: Developing the Mitigation Plan: Identifying mitigation actions and implementation strategies, FEMA 386-3, April 2003

2. Future Mitigation Actions for the 2017 Hazard Mitigation Plan Update:

the list contains:

- new mitigation actions based on the Vulnerability and Risk Assessment in Chapter 4
- “In Progress” actions identified in *Table 5.1* were carried forward into the Future Mitigation Action List

3. Capability Assessment:

the Team reviewed and revised the Capability Assessment from the 2011 Hazard Mitigation Plan. Also, any action designated as an “existing capability” in *Table 5.1* was carried over to the Capability Assessment. (*Table 5.2*)

Progress Determination on 2011 Mitigation Actions

Before identifying new Mitigation Actions for the 2017 Hazard Plan, the Planning Team discussed the status of the mitigation actions identified in 2011 Hazard Mitigation Plan. One of the following status determinations was given to each mitigation action identified from the 2011 plan:

- **Complete:** The project was implemented and completed in 2011 – 2017.
- **Existing Capability:** The project was implemented and completed in 2011 – 2017, and it will continue to be implemented on an annual basis in the future. These action items are also identified in the capability assessment (*Table 5.2*).
- **In Progress:** The project was started in the 2011 – 2017 timeframe and it is still in progress.
- **Deferred:** The project is important, but it was deferred because there was no funding available or it is not feasible to complete the project.
- **Deleted:** The project is no longer relevant to the community.

Mitigation Goals

In 2011 the Planning Team identified Mitigation Actions; and during the plan update, the Planning Team assessed the Town's progress on all of these actions (*Table 5.1*).

Hazard(s) to Mitigate	Action Item Number and Description	Responsible Department	Status	Explanation of Status
Flood	Action Item #1: Continue participation and maintain standing in the NFIP's Community Rating System (CRS) program through enhanced floodplain management activities.	Planning, Building	Existing Capability	Updated November 2015
All	Action Item #2: Continue a standing Multi-hazard Mitigation Committee	Planning Department, Board of Selectmen	Existing Capability	
All	Action Item #3: Use the Town's evolving Geographic Information System (GIS) to maintain current building and parcel data for the purpose of conducting more detailed hazard risk assessments and for tracking permitting/land use.	Planning Department, Water Department, Assessing Department, IT Director	Existing Capability	
All	Action Item #4: Continue to supply educational materials on preparedness/mitigation for property owners, for display and distribution at Town Hall, Brooks Free Library, Community Center.	Conservation, Health, Public Safety, Library, Community Center	Existing Capability	Information currently exists but needs to be updated and available in more locations.
All	Action Item #5: Maintain an inventory of the Town's most at-risk locations identified in the Vulnerability Analysis and evaluate potential mitigation techniques for protecting each location to the maximum extent possible.	Highways and Maintenance, Public Safety, Conservation, Building Department	In progress	An inventory of the Town's critical facilities has been created and should be maintained by the Town and should include information on the risk to each location and possible mitigation measures. Non-town owned at-risk locations should also be inventoried

Table 5.1 | Progress Determination on 2011 Mitigation Actions

Mitigation Goals

Hazard(s) to Mitigate	Action Item Number and Description	Responsible Department	Status	Explanation of Status
All	Action #6: Monitor the Town's emergency services to identify needs in terms of personnel, equipment and/or required resources.	Police Department, Health Department. Fire Department	Existing Capability	Fire Department completed an initial evaluation.
Wind, Snow/Ice	Action Item #7: Incorporate the inspection and management of hazardous trees/limbs into the Town's routine monitoring process.	Highways & maintenance, Public Safety	Existing Capability	
Wind	Action Item #8: Enforce the State Building Code for wind-resistant design and building techniques for new construction and reconstruction during the Town's permitting process. Provide information for homeowners and builders.	Building Department	Existing Capability	Decided against producing brochures. Conducted outreach to homeowners.
All	Action Item #9: Quantify potential losses by estimating such losses at varying degrees of storm surge, wind and stormwater hazard severity, as well as specific impacts on critical facilities. This should be performed for the plan's five year update.	Town Planner	Existing Capability	Building footprint layer piece complete.
Flood, wind, erosion, sea level rise	Action Item #10: Conduct an educational workshop for coastal and riverfront landowners and contractors on hazard mitigation.	Town Planner, Building Department, Conservation Commission.	In progress	

Mitigation Goals

Mitigation Actions for the 2017 Hazard Plan

This section of the plan is the most dynamic because it is heavily influenced by factors such as grant funding and staff capability. The Mitigation Actions section will be updated to ensure that it remains consistent with current Town priorities. The mitigation actions are in no particular order.

C5a

The Planning Team created a prioritization ranking for the Mitigation Actions. Several variables factored into the priority designation:

Life Safety/Social:

- How effective is the action at protecting lives and preventing injuries?
- If the action is to improve structures/infrastructure, will it also protect lives and prevent injury?
- Will the action affect one segment of the population more than another?
- Will the action disrupt the community in any way? (i.e. impact emergency service routes, break up neighborhoods)

Property Protection:

- Will the action eliminate or reduce damage to structures and infrastructure? If so, how?

- What are the secondary impacts of the mitigation action?
- Does it solve a problem or a symptom of the problem?

Technical/Legal/Environmental/Administrative:

- Is the mitigation action technically feasible based on Harwich's current capabilities?
- Is the action a long or short-term solution?
- What are the benefits of the project? What are the costs?
- Does the action support Harwich's Mitigation Goals?
- Does Harwich have the authority to implement the action? If not, who does?
- Is the action consistent with town values and other planning projects?
- What are the environmental impacts of the action?
- Does it comply with environmental regulations?

Political/Local Champion:

- Is there political support to implement and maintain the action?
- Does the public support the mitigation action?
- Is there a strong advocate for the action?

2017 Mitigation Actions

The Priority designations for 2016 Mitigation Actions (high, medium, low) were based on the following factors:

- **High Priority:** ; town will begin or complete these projects within three years.
- **Medium Priority:** ; town will begin or complete these projects within four years.
- **Low Priority:** ; town will begin or complete these projects within five years.

2017 Mitigation Actions

The following is a list of projects recommended by the Planning Team. The list identifies Responsibility, Funding and a Time Frame for the recommended mitigation projects. The actions will begin as soon as the plan is approved and the community is eligible for funding, unless otherwise stated, and will be completed in the amount of time as noted in the “Duration” section.

All

Mitigation Action #1

Continue a standing Multi-hazard Mitigation Committee

Project Type:

Planning

Responsible Dept:

Planning Department,
Board of Selectmen

Funding Source(s):

Operating budget

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: High

2017 Mitigation Actions

All

Mitigation Action #2

Use the Town's evolving Geographic Information System (GIS) to maintain current building and parcel data for the purpose of conducting more detailed hazard risk assessments and for tracking permitting/land use.

Project Type:

Planning

Responsible Dept:

Planning Department,
Water Department,
Assessing Department,
IT Director

Funding Source(s):

Operating budget

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Med

All

Mitigation Action #3

Continue to supply educational materials on preparedness/mitigation for property owners, for display and distribution at Town Hall, Brooks Free Library, Community Center.

Project Type:

Outreach

Responsible Dept:

Conservation, Health,
Public Safety, Library,
Community Center,
Planning Department,
Emergency Management

Funding Source(s):

Operating budget

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Increase public awareness of existing hazards and encourage hazard mitigation planning as part of the overall municipal planning process.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Med

2017 Mitigation Actions

All**Mitigation Action #4**

Maintain an inventory of the Town's most at-risk locations identified in the Vulnerability Analysis and evaluate potential mitigation techniques for protecting each location to the maximum extent possible.

Project Type:

Planning

Responsible Dept:

DPW, Public Safety,
Conservation,
Building Department

Funding Source(s):

Operating budget

Timeframe:

Duration: 2 years

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Med

All**Mitigation Action #5**

Monitor the Town's emergency services to identify needs in terms of personnel, equipment and/or required resources.

Project Type:

Preparedness

Responsible Dept:

Police Department,
Health Department.
(Fire Department completed
an initial evaluation),
Emergency Management

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; Communicate local hazard mitigation planning activities with Barnstable County, neighboring towns, and the Massachusetts Emergency Management Agency.

Consistency With Other Town Plans:

LCP, CEMP

Carry Forward From 2011 Plan

Priority: High

2017 Mitigation Actions

All**Mitigation Action #6**

Quantify potential losses by estimating such losses at varying degrees of storm surge, wind and stormwater hazard severity, as well as specific impacts on critical facilities. This should be performed for the plan's five year update.

Project Type: **Responsible Dept:**

Planning

Town Planner

Funding Source(s):

Operating budget, grants

Timeframe:**Duration:** 1 year, annual thereafter**Consistency With Mitigation Goals:**

Competitively position the Town to seek and apply for funding opportunities to implement the actions identified in the Harwich Hazard Plan. Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to natural hazards;

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Low**All****Mitigation Action #7**

Develop a list of mitigation projects, including but not limited to snow fencing in areas prone to blowing and drifting snow, and regrading and improved drainage in areas prone to flooding.

Project Type: **Responsible Dept:**

Planning

Public Safety,
DPW, Town Planner**Funding Source(s):**

Operating budget, grants

Timeframe:**Duration:** 2-years**Consistency With Mitigation Goals:**

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Low

2017 Mitigation Actions

All**Mitigation Action #8**

Provide communication equipment to emergency management.

Project Type:

Planning

Responsible Dept:

Emergency Management

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 2-years

Consistency With Mitigation Goals:

Communicate local hazard mitigation planning activities with Barnstable County, neighboring towns, and the Massachusetts Emergency Management Agency.

Consistency With Other Town Plans:

LCP, CEMP

Carry Forward From 2011 Plan

Priority: Med

All**Mitigation Action #9**

Conduct vulnerability assessment of town-owned facilities with site analyses that identify potential vulnerabilities to structures (i.e. what could go wrong) and recommendations for prevention of future problems.

Project Type:

Planning

Responsible Dept:

Building Commissioner,
Town Planner, DPW

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 3-years

Consistency With Mitigation Goals:

Ensure that mitigation measures are sensitive to the natural features, historic resources, and community character of Harwich.

Consistency With Other Town Plans:

LCP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

All**Mitigation Action #10**

Upgrade/expand town-wide communications equipment, including radios for inter-department communication, and additional message boards for public communications.

Project Type:

Planning/outreach

Responsible Dept:

Police, Fire, Emergency Management, Water, DPW

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 1 years

Consistency With Mitigation Goals:

Communicate local hazard mitigation planning activities between Town Departments and with Barnstable County, neighboring towns, and the Massachusetts Emergency Management Agency. Notify the public of pending/current conditions.

Consistency With Other Town Plans:

LCP

New for 2017 Plan

Priority: Med

All**Mitigation Action #11**

Upgrade communications system for texting and emailing residents about hazards, including an emergency alert system.

Project Type:

Planning

Responsible Dept:

Police, Fire, Emergency Management, Water, DPW

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 2 years

Consistency With Mitigation Goals:

Communicate local hazard mitigation planning activities between Town Departments and with Barnstable County, neighboring towns, and the Massachusetts Emergency Management Agency. Notify the public of pending/current conditions.

Consistency With Other Town Plans:

LCP, CEMP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

All**Mitigation Action #12**

Install new pilings, dock, and fire suppression system at Saquatucket Harbor.

Project Type: **Responsible Dept:**

Infrastructure Related Fire, Harbormaster

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 1 years

Consistency With Mitigation Goals:

Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities; reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP, Saquatucket Harbor Plan, Harbor Management Plan (HMP)

New for 2017 Plan

Priority: Med**All****Mitigation Action #13**

Work with Coast Guard and state agencies to provide training and practice for incident command system

Project Type: **Responsible Dept:**

Preparedness Harbormaster, Police, Fire

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

CEMP, HMP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

All**Mitigation Action #14**

Upgrade harbormaster weather equipment for early/advance data

Project Type: Planning
Responsible Dept: Harbormaster

Funding Source(s):
Operating budget, grants

Timeframe:

Duration: 3 years

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP, HMP

New for 2017 Plan

Priority: Med**All****Mitigation Action #15**

Update the Comprehensive Emergency Management Plan

Project Type: Planning
Responsible Dept: Emergency Management, Police, Fire

Funding Source(s):
Operating budget, grants

Timeframe:

Duration: 2 years

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP, CEMP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

Fire

Mitigation Action #16

Continue thinning dense growth for wildfire fuel reduction at Thompsons Field and eventually conduct prescribed burn.

Project Type: Preparedness
Responsible Dept: Conservation, Natural Resources, Fire

Funding Source(s):
Operating budget

Timeframe:
Duration: 2-years, thereafter biennially

Consistency With Mitigation Goals:
Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:
LCP, Open Space & Recreation

New for 2017 Plan

Priority: Med

Fire

Mitigation Action #17

Monitor conditions for wildfire and provide information/outreach to the public on wildfire danger.

Project Type: Planning/outreach
Responsible Dept: Fire

Funding Source(s):
Operating budget

Timeframe:
Duration: Annual

Consistency With Mitigation Goals:
Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; Increase public awareness of existing hazards and encourage hazard mitigation planning as part of the overall municipal planning process.

Consistency With Other Town Plans:
LCP, CEMP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

Flood

Mitigation Action #18

Continue participation and maintain standing in the NFIP's Community Rating System (CRS) program through enhanced floodplain management activities.

Project Type: Planning
Responsible Dept: Planning, Building

Funding Source(s):
Operating budget

Timeframe:
Duration: Annual

Consistency With Mitigation Goals:
Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:
LCP

Carry Forward From 2011 Plan

Priority: High

Flood, erosion

Mitigation Action #19

Replace and/or repair town landing ramps at Round Cove and Herring River.

Project Type: Infrastructure Related
Responsible Dept: Harbormaster, Conservation

Funding Source(s):
Operating budget, grants

Timeframe:
Duration: 1 years

Consistency With Mitigation Goals:
Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:
LCP, Open Space & Recreation

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

Flood, wind, erosion, sea level rise**Mitigation Action #20**

Conduct an educational workshop for coastal and riverfront landowners and contractors on hazard mitigation.

Project Type:

Outreach

Responsible Dept:

Town Planner,
Building Department,
Conservation Commission.

Funding Source(s):

Operating budget

Timeframe:

Duration: 1-year

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards. Increase public awareness of existing hazards and encourage hazard mitigation planning as part of the overall municipal planning process.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Low

Flooding, Hurricanes, tropical storms, nor'easters, sea level rise**Mitigation Action #21**

Continue beach nourishment with dredge spoils to mimic natural conditions.

Project Type:

Preparedness

Responsible Dept:

Conservation,
Harbormaster,
Natural Resources

Funding Source(s):

Operating budget

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP

New for 2017 Plan

Priority: High

2017 Mitigation Actions

Sea level rise, wind, erosion

Mitigation Action #22

Repair Allen Harbor jetty and improve boat channel(s).

Project Type: **Responsible Dept:**

Infrastructure Related Harbormaster

Funding Source(s):

Operating budget

Timeframe:

Duration: 2 years, annual

Consistency With Mitigation Goals:

Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:

LCP, HMP

New for 2017 Plan

Priority: Med

Wildfire

Mitigation Action #23

Continue the Town's participation in the Cape Cod Cooperative Extension's Wildfire Assessment and Preparedness Program by submitting an application during each grant round.

Project Type: **Responsible Dept:**

Preparedness Fire Department,
Planning Department

Funding Source(s):

Operating budget, grants

Timeframe:

Duration: 2 years

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Med

2017 Mitigation Actions

Wind

Mitigation Action #24

Enforce the State Building Code for wind-resistant design and building techniques for new construction and reconstruction during the Town's permitting process. Provide information for builders.

Project Type: Planning/outreach
Responsible Dept: Building Department

Funding Source(s):
Operating budget, grants

Timeframe:
Duration: 2-year, annual thereafter

Consistency With Mitigation Goals:
Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards

Consistency With Other Town Plans:
LCP

Carry Forward From 2011 Plan

Priority: High

Wind, erosion, sea level rise

Mitigation Action #25

Protect outer harbor and use it as refuge

Project Type: Infrastructure Related
Responsible Dept: Harbormaster

Funding Source(s):
Operating budget

Timeframe:
Duration: 3 years

Consistency With Mitigation Goals:
Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:
LCP, HMP

New for 2017 Plan

Priority: Med

2017 Mitigation Actions

Wind, Snow/Ice

Mitigation Action #26

Incorporate the inspection and management of hazardous trees/limbs into the Town's routine monitoring process.

Project Type: Planning
Responsible Dept: DPW, Public Safety

Funding Source(s):
Operating budget, grants

Timeframe:

Duration: 2 years, annual thereafter

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards; Reduce the damage to public infrastructure resulting from natural hazards including but not limited to critical facilities, roadways, and water facilities.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Low

Wind, Snow/Ice

Mitigation Action #27

Mitigate the impacts from blowing/drifting snow

Project Type: Planning/
Infrastructure
Responsible Dept: Public safety, DPW

Funding Source(s):
Operating budget, grants

Timeframe:

Duration: Annual

Consistency With Mitigation Goals:

Reduce the potential for loss of life, property, infrastructure, and environmental, cultural, and economic resources in Harwich from natural hazards.

Consistency With Other Town Plans:

LCP

Carry Forward From 2011 Plan

Priority: Med

Participation in NFIP

A6c

Participation in NFIP

B4a

Repetitive Loss Properties

Repetitive Loss Properties are those for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any ten year period since 1978.

Three Repetitive Loss Properties, all single-family residential dwellings, are located in Harwich.

Continued compliance with NFIP

To be approved by the Federal Emergency Management Agency (FEMA), the Harwich Hazard Mitigation Plan Update must describe the Town's participation in the

C2a

Natural Hazard	Explanation of Capability	Responsible Department
All Hazards	Educational Materials: The town distributes educational materials from local, county and State level organizations such as the Barnstable County Regional Emergency Planning Committee (BCREPC) and the Cape Cod Cooperative Extension (CCCE). Materials include but are not limited to: CCCE's "Questions and Answers on Purchasing Coastal Real Estate in MA" and "Homeowner's Handbook to Prepare for Coastal Hazards."	Emergency Management, Planning
All Hazards	Emergency Communication: The town uses variable message boards to notify residents of hazards, lane closures and parking instructions. The Water Department maintains a reverse 911 system for emergency communication. Local access TV, Channel 18, also provides emergency notification.	Emergency Management, Police Department, Fire Departments, DPW, Water
All Hazards	Emergency Planning: Continuous review and practice of the Comprehensive Emergency Management Plan. Town staff determine supplies, equipment and communications needs and prioritize purchases so that Harwich is prepared for any needed emergency response to any natural hazard event.	Emergency Management
All Hazards	Eversource: In 2012, an Act Relative to Emergency Response of Public Utility Companies was signed into law, requiring a more robust response to emergencies from power companies. Additionally, Eversource has MOUs with private companies to provide accommodations for its response during all but the summer seasons.	Emergency Management, Police, Fire

Participation in NFIP

National Flood Insurance Program (NFIP). The NFIP is based on a mutual agreement between the Federal government and the Town of Harwich.¹ Federally backed flood insurance is available in Harwich as long as the Town agrees to regulate development in their mapped floodplain.² To remain compliant with the NFIP, Harwich is committed to the following activities:

- Issue or deny floodplain development/building permits.
- Inspect all developments to ensure compliance with local ordinance.
- Maintain records of floodplain development.
- Assist with floodplain identification and mapping as well as any revision of floodplain maps, including local requests for map updates.
- Help residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction practices.

Capability Assessment

During the development of the 2017 Harwich Hazard Mitigation plan, members of the Planning Team reviewed the capabilities of each town department (*Table 5.1*).

1 National Flood Insurance Program (NFIP) Floodplain Management Requirements: A study guide and desk reference for local officials, FEMA 480, February 2005

Capability Assessment

Natural Hazard	Explanation of Capability	Responsible Department
All Hazards	Generators: An inventory of town owned generators is continually reviewed and monitored by town staff.	Emergency Management, Water, and DPW department heads.
All Hazards	Shelter: Equipment inventories and needs for the regional shelter are assessed during monthly meetings of the Barnstable County Regional Emergency Planning Committee.	Emergency Management
All Hazards	Grant Funding: The Police Department and Town Administration have proactively applied for grant funding for mitigation projects.	Emergency Management, Water, Planning
Fire	Fire Code: Town observes State, Federal and local fire codes. New sprinkler system laws are continually enforced. All plans for new construction and renovation are reviewed by the Fire Department on where to place sprinklers when required.	Fire Department, Building Commissioner
Flooding	Education: The Emergency Management Director collaborates with other town police departments to send out press releases about the locations of regional shelter and natural hazards.	Emergency Management
Flooding	Coastal Infrastructure: Police, Fire, and DPW assess infrastructure that is vulnerable to flooding and storm surge during storms.	Police, Fire, Building, DPW
Flooding	State Building Code: Substantial monitoring and compliance activities are performed under administration of the State Building Code. Inspection and certification of lowest floor elevation is required by state building code. Elevation certificates are required by state building code. The town's floodplain manager receives continual certification that requires annual education and training. Applicants are required to submit plans that include the Special Flood Hazard Area and proposed elevations of the proposed structures.	Building Commissioner, Town Planner
Flooding	Flood Insurance Rate Map (FIRM): voters amended the Harwich Zoning Bylaw to make it consistent with the newly updated Flood Insurance Rate Maps (FIRMs) for Barnstable County.	Town Planner

Table 5.2 | Capability Assessment

Capability Assessment

Natural Hazard	Explanation of Capability	Responsible Department
Flooding	Harwich Zoning Bylaw: This bylaw is consistent with NFIP regulations and the State Building Code. The town reviews the bylaw to ensure it is as protective as possible and reflects current floodplain science and policy.	Town Planner, Building Commissioner
Flooding	Conservation Commission: the Conservation Commission reviews the local regulations and regulates development within and adjacent to wetland resource areas	Conservation Commission
Flooding, Sea Level Rise, Severe Winter Storms, Nor'easters, Hurricanes/Tropical Storms	Essential Records and Cultural Items: Building files are backed up and stored in a building outside of the Special Flood Hazard Area.	Building, Town Clerk
Flooding, Sea Level Rise, Severe Winter Storms, Nor'easters, Shoreline Change, Hurricanes/Tropical Storms	Stormwater: Cleaning out the storm sewers on a regular basis. In addition to cleaning storm water drains, the Department of Public Works also cleans catch basins annually.	DPW
Hurricanes/Tropical Storms, Severe Winter Storms, Nor'easters, Wind	Education: The Harbormaster works directly with boat owners and private marinas to educate them on appropriate actions to take during a storm event, via email and written communication.	Harbormaster
Wind	State Building Code: State Building Code regulates construction for specific wind loads.	Building Commissioner
Flooding	Harwich participates and maintains standing in the NFIP's Community Rating System (CRS) program through enhanced floodplain management activities.	Town Planner
All Hazards	A standing Multi-hazard Mitigation Committee develops hazard plans and oversees implementation	Town Planner
All Hazards	The town maintains current building and parcel data using GIS for the purpose of conducting more detailed hazard risk assessments and for tracking permitting/land use.	Planning Department, Water Department, Assessing Department

Capability Assessment

Natural Hazard	Explanation of Capability	Responsible Department
Flooding, Sea Level Rise, Severe Winter Storms, Nor'easters, Shoreline Change, Hurricanes/Tropical Storms	The town quantifies potential losses by estimating such losses at varying degrees of storm surge, wind and stormwater hazard severity, as well as specific impacts on critical facilities.	Town Planner, Emergency Management

D3

An Assessment of the Changes in Priorities from 2011 to 2017

The Mitigation Actions described in the 2011 Harwich Hazard Mitigation Plan were prioritized based on their feasibility using the STAPLEE method. The Mitigation Actions in the 2017 Hazard Mitigation Plan were prioritized as high, medium, low.

Below is a list of activities that remain a priority for the Town of Harwich in 2017:

- Harwich remains dedicated to public outreach on emergency preparedness, communication with residents and visitors before, during and after a hazard event, and communicating with the public about the impact of natural hazards.
- Harwich remains committed to assessing local infrastructure for damage to coastal hazards such as storm surge, flooding and shoreline change

- Harwich remains committed to their participation in the National Flood Insurance Program and the Community Rating System
- Harwich remains dedicated to reducing the potential for life, property, infrastructure, and environmental, cultural, and economic resources in the Town from natural hazards.

The following goal added to the 2017 Hazard Mitigation Plan represents a new approach and consideration:

- The Town seeks to ensure that mitigation measures are sensitive to the natural features, historic resources, and community character of the town.

Plan Evaluation and Maintenance

CHAPTER SIX

Once the 2017 Harwich Hazard Plan is adopted by the Board of Selection, the plan enters into a five-year “maintenance” phase. **Chapter 6 describes how the Harwich Hazard Plan will be evaluated, updated and enhanced over the next five years.**

A6d

Who is involved?

Each department identified in the Harwich Hazard Mitigation Plan is responsible for implementing specific mitigation actions as listed in the Mitigation Action section of the plan (Chapter 5). Every proposed action listed in the Mitigation Action section is assigned to a specific “lead” department as a way to assign responsibility and accountability and increase the likelihood of subsequent implementation.

The Harwich Assistant Town Administrator will be responsible for ensuring that the plan is monitored, evaluated and updated throughout the next five years.

How will the plan be maintained?

Below is a list of the activities describing how the plan will be maintained and updated over the next five years:

A6a

- Plan Monitoring:
 - Members of the Planning Team will meet annually to discuss the implementation status of each Mitigation Action identified in Chapter 5. During these meetings, the Planning Team will also describe and document any new hazard data that can be incorporated in the Hazard Profile section of the plan; specifically new hazard locations, extent and impacts.

- After the annual meeting, members of the Planning Team will present to the Board of Selectman on the implementation status of the Mitigation Actions identified in Chapter 5. This presentation will occur once per year and will include an evaluation of the appropriateness of Mitigation Actions. If an amendment, change or update is needed, the Board of Selectman can vote to adopt the change and amend the Harwich Hazard Mitigation Plan Update.

■ Plan Evaluation:

- A subset of the Planning Team (Emergency Management, DPW, Town Planner, Assistant Town Administrator) will meet annually to evaluate the stated purpose and goals of the Harwich Hazard Plan. During this annual meeting, this smaller group will ensure that the plan continues to serve its purpose through the following activities:
 - Review the Mitigation Goals in the 2017 Harwich Hazard Mitigation Plan Update
 - Discuss any recent activities to reduce the loss of life and property in Harwich such as grants received/applied for and any completed Mitigation Actions
 - Distribute an online survey to gauge the public’s awareness of the risks posed by natural hazards

A6b

- Discuss ongoing or recent planning efforts that are consistent with the Mitigation Goals and Actions of the 2017 Harwich Hazard Mitigation Plan.

A6c

- Plan Update:
 - The Harwich Hazard Mitigation Plan Update will be reviewed and updated every five years to ensure that there is no lapse in plan coverage. The Hazard Plan update process must begin one to one and half years before the plan is set to expire.

When will the plan be maintained?

A start date and time period were assigned to each Mitigation Action in Chapter 5 to assess whether actions are being implemented in a timely fashion. Also, the Planning Team will also reconvene annually to discuss progress on the Mitigation Actions.

Following a disaster declaration, the Harwich Hazard Plan will be revised as necessary to reflect lessons learned or to address specific issues and circumstances arising from the event. It will be the responsibility of the Planning Team to reconvene the Local Emergency Planning Committee and to ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

Plan Adoption

CHAPTER SEVEN

Once the draft of the Harwich Hazard Mitigation Plan is reviewed by the Planning Team, stakeholders and the general public, the plan is reviewed by the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA). If approved by MEMA and FEMA, the Harwich Board of Selectmen can officially adopt the plan. If and when the plan is approved, it enters into the five year “maintenance” phase. **Chapter 7 describes the timeline for plan adoption and includes documentation for plan adoption by the Harwich Board of Selectmen.**

Timeline for Plan Adoption

Timeline for Plan Adoption

The timeline for Plan Adoption is as follows[note this section describes anticipated steps. Will edit as needed.]:

- **August 2017:** After approval by the Board of Selectmen, the Planning Team submitted the Harwich Hazard Mitigation Plan Update to the Massachusetts Emergency Management Agency (MEMA). MEMA reviewed the plan and returned it to the Town of Harwich with required edits. The updated Plan was then submitted to the Federal Emergency Management Agency (FEMA) for final review.
- **NOVEMBER 2017:** FEMA issued an Approved Pending Adoption status and the Harwich Board of Selectmen officially adopted the Harwich Hazard Mitigation Plan during its meeting on December 11, 2017.

E1a

Plan Adoption

The Certificate of Adoption signed by the Harwich Board of Selectmen is shown in *Figure 7.1*.

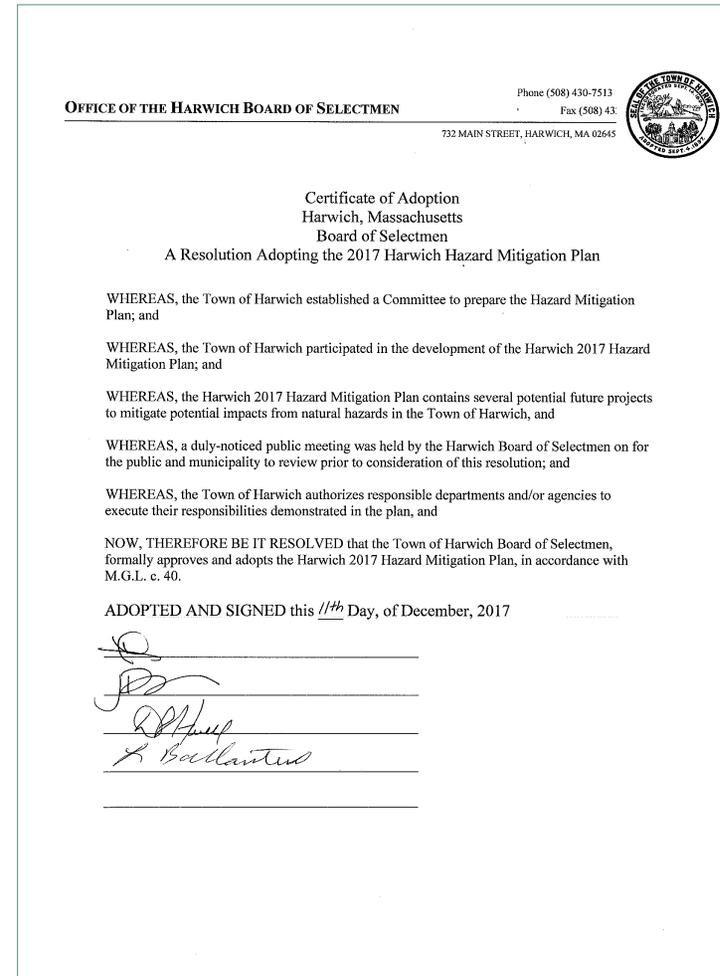


Figure 7.1 | Certificate of Adoption signed by the Harwich Board of Selectmen

Appendix

Introduction: Local Mitigation Plan Review Guide, FEMA



Local Mitigation Plan Review Guide

October 1, 2011



Introduction: Local Mitigation Plan Review Guide, FEMA

4.1 ELEMENT A: PLANNING PROCESS

Requirement §201.6(b)	An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
§201.6(b)(1)	(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
§201.6(b)(2)	(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
§201.6(b)(3)	(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
§201.6(c)(1)	[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.
§201.6(c)(4)(i)	[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.
§201.6(c)(4)(iii)	[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Overall Intent. The planning process is as important as the plan itself. Any successful planning activity, such as developing a comprehensive plan or local land use plan, involves a cross-section of stakeholders and the public to reach consensus on desired outcomes or to resolve a community problem. The result is a common set of community values and widespread support for directing financial, technical, and human resources to an agreed upon course of action, usually identified in a plan. The same is true for mitigation planning. An effective and open planning process helps ensure that citizens understand risks and vulnerability, and they can work with the jurisdiction to support policies, actions, and tools that over the long-term will lead to a reduction in future losses.

Leadership, staffing, and in-house knowledge in local government may fluctuate over time. Therefore, the description of the planning process serves as a permanent record that explains how decisions were reached and who involved. FEMA will accept the planning process as defined by the community, as long as the mitigation plan includes a narrative

description of the process used to develop the mitigation plan—a systematic account about how the mitigation plan evolved from the formation of a planning team, to how the public participated, to how each section of the plan was developed, to what plans or studies were incorporated into the plan, to how it will be implemented. Documentation of a current planning process is required for both new and updated plans.

ELEMENT	REQUIREMENTS
<p>A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? 44 CFR 201.6(c)(1)</p> <p><i>Intent:</i> To inform the public and other readers about the overall approach to the plan’s development and serve as a permanent record of how decisions were made and who was involved. This record also is useful for the next plan update.</p>	<p>a. Documentation of how the plan was prepared must include the schedule or timeframe and activities that made up the plan’s development as well as who was involved. Documentation typically is met with a narrative description, but may also include, for example, other documentation such as copies of meeting minutes, sign-in sheets, or newspaper articles.</p> <p><i>Document</i> means provide the factual evidence for how the jurisdictions developed the plan.</p> <p>b. The plan must list the jurisdiction(s) participating in the plan that seek approval.</p> <p>c. The plan must identify who represented each jurisdiction. The Plan must provide, at a minimum, the jurisdiction represented and the person’s position or title and agency within the jurisdiction.</p> <p>d. For each jurisdiction seeking plan approval, the plan must document how they were involved in the planning process. For example, the plan may document meetings attended, data provided, or stakeholder and public involvement activities offered. Jurisdictions that adopt the plan without documenting how they participated in the planning process will not be approved.</p> <p><i>Involved in the process</i> means engaged as participants and given the chance to provide input to affect the plan’s content. This is more than simply being invited (See “<i>opportunity to be involved in the planning process</i>” in A2 below) or only adopting the plan.</p> <p>e. Plan updates must include documentation of the current planning process undertaken to update the plan.</p>
<p>A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? 44 CFR 201.6(b)(2)</p>	<p>a. The plan must identify all stakeholders involved or given an opportunity to be involved in the planning process. At a minimum, stakeholders must include:</p> <ol style="list-style-type: none"> 1) Local and regional agencies involved in hazard mitigation activities; 2) Agencies that have the authority to regulate development; and 3) Neighboring communities. <p><i>An opportunity to be involved in the planning process</i> means that the stakeholders are engaged or invited as participants and given the chance to provide input to affect the plan’s content.</p>

Introduction: Local Mitigation Plan Review Guide, FEMA

ELEMENT	REQUIREMENTS
<p>Intent: To demonstrate a deliberative planning process that involves stakeholders with the data and expertise needed to develop the plan, with responsibility or authority to implement hazard mitigation activities, and who will be most affected by the plan's outcomes.</p>	<p>b. The Plan must provide the agency or organization represented and the person's position or title within the agency.</p> <p>c. The plan must identify how the stakeholders were invited to participate in the process.</p> <p>Examples of stakeholders include, but are not limited to:</p> <ul style="list-style-type: none"> Local and regional agencies involved in hazard mitigation include public works, zoning, emergency management, local floodplain administrators, special districts, and GIS departments. Agencies that have the authority to regulate development include planning and community development departments, building officials, planning commissions, or other elected officials. Neighboring communities include adjacent counties and municipalities, such as those that are affected by similar hazard events or may be partners in hazard mitigation and response activities. Other interests may be defined by each jurisdiction and will vary with each one. These include, but are not limited to, business, academia, and other private and non-profit interests depending on the unique characteristics of the community.
<p>A3. Does the Plan document how the public was involved in the planning process during the drafting stage? 44 CFR 201.6(b)(1) and 201.6(c)(1)</p> <p>Intent: To ensure citizens understand what the community is doing on their behalf, and to provide a chance for input on community vulnerabilities and mitigation activities that will inform the plan's content. Public involvement is also an opportunity to educate the public about hazards and risks in the community, types of activities to mitigate those risks, and how these impact them.</p>	<p>a. The plan must document how the public was given the opportunity to be involved in the planning process and how their feedback was incorporated into the plan. Examples include, but are not limited to, sign-in sheets from open meetings, interactive websites with drafts for public review and comment, questionnaires or surveys, or booths at popular community events.</p> <p>b. The opportunity for participation must occur during the plan development, which is prior to the comment period on the final plan and prior to the plan approval / adoption.</p>

The Mitigation Planning regulation includes several “optional” requirements for the vulnerability assessment. These are easily recognizable with the use of the term “should” in the requirement (See §201.6(c)(2)(ii)(A-C)). Although not required, these are strongly recommended to be included in the plan. However, their absence will not cause FEMA to disapprove the plan. These “optional” requirements were originally intended to meet the overall vulnerability assessment, and this analysis can assist with identifying mitigation actions.

ELEMENT	REQUIREMENTS
<p>B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction? 44 CFR 201.6(c)(2)(i) and 44 CFR 201.6(c)(2)(iii)</p> <p>Intent: To understand the potential and chronic hazards affecting the planning area in order to identify which hazard risks are most significant and which jurisdictions or locations are most adversely affected.</p>	<p>a. The plan must include a description of the natural hazards that can affect the jurisdiction(s) in the planning area.</p> <p><i>A natural hazard is a source of harm or difficulty created by a meteorological, environmental, or geological event³. The plan must address natural hazards. Manmade or human-caused hazards may be included in the document, but these are not required and will not be reviewed to meet the requirements for natural hazards. In addition, FEMA will not require the removal of this extra information prior to plan approval.</i></p> <p>b. The plan must provide the rationale for the omission of any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area.</p> <p>c. The description, or profile, must include information on location, extent, previous occurrences, and future probability for each hazard. Previous occurrences and future probability are addressed in sub-element B2.</p> <p>The information does not necessarily need to be described or presented separately for location, extent, previous occurrences, and future probability. For example, for some hazards, one map with explanatory text could provide information on location, extent, and future probability.</p> <p>Location means the geographic areas in the planning area that are affected by the hazard. For many hazards, maps are the best way to illustrate location. However, location may be described in other formats. For example, if a geographically-specific location cannot be identified for a hazard, such as tornados, the plan may state that the entire planning area is equally at risk to that hazard.</p> <p>Extent means the strength or magnitude of the hazard. For example, extent could be described in terms of the specific measurement of an occurrence on a scientific scale (for example, Enhanced Fujita Scale, Saffir-Simpson Hurricane Scale, Richter Scale, flood depth grids) and/or other hazard factors, such as duration and speed of onset. Extent is not the same as impacts, which are described in sub-element B3.</p>

³ DHS Risk Lexicon, 2010 Edition. <http://www.dhs.gov/xlibrary/assets/dhs-risk-lexicon-2010.pdf>

Introduction: Local Mitigation Plan Review Guide, FEMA

ELEMENT	REQUIREMENTS
	<p>d. For participating jurisdictions in a multi-jurisdictional plan, the plan must describe any hazards that are unique and/or varied from those affecting the overall planning area.</p>
<p>B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? 44 CFR 201.6(c)(2)(i)</p> <p><i>Intent:</i> To understand potential impacts to the community based on information on the hazard events that have occurred in the past and the likelihood they will occur in the future.</p>	<p>a. The plan must include the history of previous hazard events for each of the identified hazards.</p> <p>b. The plan must include the probability of future events for each identified hazard.</p> <p><i>Probability means the likelihood of the hazard occurring and may be defined in terms of general descriptors (for example, unlikely, likely, highly likely), historical frequencies, statistical probabilities (for example: 1% chance of occurrence in any given year), and/or hazard probability maps. If general descriptors are used, then they must be defined in the plan. For example, "highly likely" could be defined as equals near 100% chance of occurrence next year or happens every year.</i></p> <p>c. Plan updates must include hazard events that have occurred since the last plan was developed.</p>
<p>B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? 44 CFR 201.6(c)(2)(ii)</p> <p><i>Intent:</i> For each jurisdiction to consider their community as a whole and analyze the potential impacts of future hazard events and the vulnerabilities that could be reduced through hazard mitigation actions.</p>	<p>a. For each participating jurisdiction, the plan must describe the potential impacts of each of the identified hazards on the community.</p> <p><i>Impact means the consequence or effect of the hazard on the community and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community. For example, impacts could be described by referencing historical disaster impacts and/or an estimate of potential future losses (such as percent damage of total exposure).</i></p> <p>b. The plan must provide an overall summary of each jurisdiction's vulnerability to the identified hazards. The overall summary of vulnerability identifies structures, systems, populations or other community assets as defined by the community that are susceptible to damage and loss from hazard events. A plan will meet this sub-element by addressing the requirements described in §201.6(c)(2)(ii)(A-C).</p> <p>Vulnerable assets and potential losses is more than a list of the total exposure of population, structures, and critical facilities in the planning area. An example of an overall summary is a list of key issues or problem statements that clearly describes the community's greatest vulnerabilities and that will be addressed in the mitigation strategy.</p>

ELEMENT	REQUIREMENTS
<p>B4. Does the Plan address NFIP insured structures within each jurisdiction that have been repetitively damaged by floods? 44 CFR 201.6(c)(2)(ii)</p> <p><i>Intent:</i> To inform hazard mitigation actions for properties that have suffered repetitive damage due to flooding, particularly problem areas that may not be apparent on floodplain maps. Information on repetitive loss properties helps inform FEMA hazard mitigation assistance programs under the National Flood Insurance Act.</p>	<p>a. The plan must describe the types (residential, commercial, institutional, etc.) and estimate the numbers of repetitive loss properties located in identified flood hazard areas.</p> <p><i>Repetitive loss properties are those for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978.</i></p> <p><i>Severe repetitive loss properties are residential properties that have at least four NFIP payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building.</i></p> <p>Use of flood insurance claim and disaster assistance information is subject to The Privacy Act of 1974, as amended, which prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. However, maps showing general areas where claims have been paid can be made public. If a plan includes the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance, the plan cannot be approved until this Privacy Act covered information is removed from the plan.</p>

Introduction: Local Mitigation Plan Review Guide, FEMA

4.3 ELEMENT C. MITIGATION STRATEGY

Requirement §201.6(c)(3)	[The plan shall include the following:] A <i>mitigation strategy</i> that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.
§201.6(c)(3)(i)	[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
§201.6(c)(3)(ii)	[The hazard mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction’s participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.
§201.6(c)(3)(iii)	[The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
§201.6(c)(3)(iv)	For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.
§201.6(c)(4)(ii)	[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements, when appropriate.

Overall Intent. The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Stafford Act directs Local Mitigation Plans to describe hazard mitigation actions and establish a strategy to implement those actions.⁴ Therefore, all other requirements for a Local Mitigation Plan lead to and support the mitigation strategy.

⁴ Section 322(b), Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, 42 U.S.C. 5165.

The mitigation strategy includes the development of goals and prioritized hazard mitigation actions. Goals are long-term policy statements and global visions that support the mitigation strategy. A critical step in the development of specific hazard mitigation actions and projects is assessing the community’s existing authorities, policies, programs, and resources and its capability to use or modify local tools to reduce losses and vulnerability from profiled hazards.

In the plan update, goals and actions are either reaffirmed or updated based on current conditions, including the completion of hazard mitigation initiatives, an updated or new risk assessment, or changes in State or local priorities.

ELEMENT	REQUIREMENTS
<p>C1. Does the plan document each jurisdiction’s existing authorities, policies, programs and resources, and its ability to expand on and improve these existing policies and programs? 44 CFR 201.6(c)(3)</p> <p><i>Intent:</i> To ensure that each jurisdiction evaluates its capabilities to accomplish hazard mitigation actions, through existing mechanisms. This is especially useful for multi-jurisdictional plans where local capability varies widely.</p>	<p>a. The plan must describe each jurisdiction’s existing authorities, policies, programs and resources available to accomplish hazard mitigation.</p> <p>Examples include, but are not limited to: staff involved in local planning activities, public works, and emergency management; funding through taxing authority, and annual budgets; or regulatory authorities for comprehensive planning, building codes, and ordinances.</p>
<p>C2. Does the Plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? 44 CFR 201.6(c)(3)(ii)</p> <p><i>Intent:</i> To demonstrate flood hazard mitigation efforts by the community through NFIP activities. Where FEMA is the official administering Federal agency of the NFIP, participation in the program is a basic community capability and resource for flood hazard mitigation activities.</p>	<p>a. The plan must describe each jurisdiction’s participation in the NFIP and describe their floodplain management program for continued compliance. Simply stating “The community will continue to comply with NFIP,” will <u>not</u> meet this requirement. The description could include, but is not limited to:</p> <ul style="list-style-type: none"> Adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs); Floodplain identification and mapping, including any local requests for map updates; or Description of community assistance and monitoring activities. <p>Jurisdictions that are currently not participating in the NFIP and where an FHBM or FIRM has been issued may meet this requirement by describing the reasons why the community does not participate.</p>

Introduction: Local Mitigation Plan Review Guide, FEMA

ELEMENT	REQUIREMENTS
<p>C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? 44 CFR 201.6(c)(3)(i)</p> <p><i>Intent:</i> To guide the development and implementation of hazard mitigation actions for the community(ies). Goals are statements of the community's visions for the future.</p>	<p>a. The plan must include general hazard mitigation goals that represent what the jurisdiction(s) seeks to accomplish through mitigation plan implementation.</p> <p><i>Goals</i> are broad policy statements that explain what is to be achieved.</p> <p>b. The goals must be consistent with the hazards identified in the plan.</p>
<p>C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? 44 CFR 201.6(c)(3)(ii) and 44 CFR 201.6(c)(3)(iv)</p> <p><i>Intent:</i> To ensure the hazard mitigation actions are based on the identified hazard vulnerabilities, are within the capability of each jurisdiction, and reduce or avoid future losses. This is the heart of the mitigation plan, and is essential to leading communities to reduce their risk. Communities, not FEMA, "own" the hazard mitigation actions in the strategy.</p>	<p>a. The plan must include a mitigation strategy that 1) analyzes actions and/or projects that the jurisdiction considered to reduce the impacts of hazards identified in the risk assessment, and 2) identifies the actions and/or projects that the jurisdiction intends to implement.</p> <p><i>Mitigation actions and projects</i> means a hazard mitigation action, activity or process (for example, adopting a building code) or it can be a physical project (for example, elevating structures or retrofitting critical infrastructure) designed to reduce or eliminate the long term risks from hazards. This sub-element can be met with either actions or projects, or a combination of actions and projects.</p> <p>The mitigation plan may include non-mitigation actions, such as actions that are emergency response or operational preparedness in nature. These will not be accepted as hazard mitigation actions, but neither will FEMA require these to be removed from the plan prior to approval.</p> <p>A comprehensive range consists of different hazard mitigation alternatives that address the vulnerabilities to the hazards that the jurisdiction(s) determine are most important.</p> <p>b. Each jurisdiction participating in the plan must have mitigation actions specific to that jurisdiction that are based on the community's risk and vulnerabilities, as well as community priorities.</p> <p>c. The action plan must reduce risk to existing buildings and infrastructure as well as limit any risk to new development and redevelopment. With emphasis on new and existing building and infrastructure means that the action plan includes a consideration of actions that address the built environment.</p>

ELEMENT	REQUIREMENTS
<p>C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? 44 CFR 201.6(c)(3)(iii) and 44 CFR (c)(3)(iv)</p> <p><i>Intent:</i> To identify how the plan will directly lead to implementation of the hazard mitigation actions. As opportunities arise for actions or projects to be implemented, the responsible entity will be able to take action towards completion of the activities.</p>	<p>a. The plan must describe the criteria used for prioritizing implementation of the actions.</p> <p>b. The plan must demonstrate when prioritizing hazard mitigation actions that the local jurisdictions considered the benefits that would result from the hazard mitigation actions versus the cost of those actions. The requirement is met as long as the economic considerations are summarized in the plan as part of the community's analysis. A complete benefit-cost analysis is not required. Qualitative benefits (for example, quality of life, natural and beneficial values, or other "benefits") can also be included in how actions will be prioritized.</p> <p>c. The plan must identify the position, office, department, or agency responsible for implementing and administering the action (for each jurisdiction), and identify potential funding sources and expected timeframes for completion.</p>
<p>C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? 44 CFR 201.6(c)(4)(ii)</p> <p><i>Intent:</i> To assist communities in capitalizing on all available mechanisms that they have at their disposal to accomplish hazard mitigation and reduce risk.</p>	<p>a. The plan must describe the community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms.</p> <p>b. The plan must identify the local planning mechanisms where hazard mitigation information and/or actions may be incorporated.</p> <p><i>Planning mechanisms</i> means governance structures that are used to manage local land use development and community decision-making, such as comprehensive plans, capital improvement plans, or other long-range plans.</p> <p>c. A multi-jurisdictional plan must describe each participating jurisdiction's individual process for integrating hazard mitigation actions applicable to their community into other planning mechanisms.</p> <p>d. The updated plan must explain how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts.</p> <p>e. The updated plan must continue to describe how the mitigation strategy, including the goals and hazard mitigation actions will be incorporated into other planning mechanisms.</p>

Introduction: Local Mitigation Plan Review Guide, FEMA

Requirement §201.6(d)(3) A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit if for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

Overall Intent. In order to continue to be an effective representation of the jurisdiction’s overall strategy for reducing its risks from natural hazards, the mitigation plan must reflect current conditions. This will require an assessment of the current development patterns and development pressures as well as an evaluation of any new hazard or risk information. The plan update is an opportunity for the jurisdiction to assess its previous goals and action plan, evaluate progress in implementing hazard mitigation actions, and adjust its actions to address the current realities.

Where conditions of growth and revisions in priorities may have changed very little in a community, much of the text in the updated plan may be unchanged. This is acceptable as long as it still fits the priorities of their community, and it reflects current conditions. The key for plan readers to recognize a good plan update is documentation of the community’s progress or changes in their hazard mitigation program, along with the community’s continued engagement in the mitigation planning process.

ELEMENT	REQUIREMENTS
<p>D1. Was the plan revised to reflect changes in development? 44 CFR 201.6(d)(3)</p> <p><i>Intent: To ensure that the mitigation strategy continues to address the risk and vulnerabilities to existing and potential development, and takes into consideration possible future conditions that can impact the vulnerability of the community.</i></p>	<p>a. The plan must describe changes in development that have occurred in hazard prone areas and increased or decreased the vulnerability of each jurisdiction since the last plan was approved. If no changes in development impacted the jurisdiction’s overall vulnerability, plan updates may validate the information in the previously approved plan.</p> <p>Changes in development means recent development (<i>for example</i>, construction completed since the last plan was approved), potential development (<i>for example</i>, development planned or under consideration by the jurisdiction), or conditions that may affect the risks and vulnerabilities of the jurisdictions (<i>for example</i>, climate variability, declining populations or projected increases in population, or foreclosures). Not all development will affect a jurisdiction’s vulnerability.</p>

ELEMENT	REQUIREMENTS
<p>D2. Was the plan revised to reflect progress in local mitigation efforts? 44 CFR 201.6(d)(3)</p> <p><i>Intent: To evaluate and demonstrate progress made in the past five years in achieving goals and implementing actions outlined in their mitigation strategy.</i></p>	<p>a. The plan must describe the status of hazard mitigation actions in the previous plan by identifying those that have been completed or not completed. For actions that have not been completed, the plan must either describe whether the action is no longer relevant or be included as part of the updated action plan.</p>
<p>D3. Was the plan revised to reflect changes in priorities? 44 CFR 201.6(d)(3)</p> <p><i>Intent: To ensure the plan reflects current conditions, including financial, legal, and political realities as well as post-disaster conditions.</i></p>	<p>a. The plan must describe if and how any priorities changed since the plan was previously approved.</p> <p>If no changes in priorities are necessary, plan updates may validate the information in the previously approved plan.</p>

4.5 ELEMENT E. PLAN ADOPTION

Requirement §201.6(c)(5)	[The plan shall include...] Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.
---------------------------------	---

Overall Intent. Adoption by the local governing body demonstrates the jurisdiction’s commitment to fulfilling the hazard mitigation goals and actions outlined in the plan. Adoption legitimizes the plan and authorizes responsible agencies to execute their responsibilities. Updated plans also are adopted anew to demonstrate community recognition of the current planning process, changes that have occurred within the previous five years, and validate community priorities for hazard mitigation actions.

ELEMENT	REQUIREMENTS
<p>E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? 44 CFR 201.6(c)(5)</p> <p><i>Intent:</i> To demonstrate the jurisdiction’s commitment to fulfilling the hazard mitigation goals outlined in the plan, and to authorize responsible agencies to execute their responsibilities.</p>	<p>a. Each jurisdiction that is included in the plan must have its governing body adopt the plan prior to FEMA approval, even when a regional agency has the authority to prepare such plans.</p> <p>As with single jurisdictional plans, in order for FEMA to give approval to a multi-jurisdictional plan, at least one participating jurisdiction must formally adopt the plan within one calendar year of FEMA’s designation of the plan as “Approvable Pending Adoption.” See Section 5, <i>Plan Review Procedure</i> for more information on “Approvable Pending Adoption.”</p>

ELEMENT	REQUIREMENTS
<p>E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? 44 CFR 201.6(c)(5)</p> <p><i>Intent:</i> To demonstrate the jurisdiction’s commitment to fulfilling the hazard mitigation goals outlined in the plan, and to authorize responsible agencies to execute their responsibilities.</p>	<p>a. The plan must include documentation of plan adoption, usually a resolution by the governing body or other authority.</p> <p>If the local jurisdiction has not passed a formal resolution, or used some other documentation of adoption, the clerk or city attorney must provide written confirmation that the action meets their community’s legal requirements for official adoption and/or the highest elected official or their designee must submit written proof of the adoption. The signature of one of these officials is required with the explanation or other proof of adoption.</p> <p>Minutes of a council or other meeting during which the plan is adopted will be sufficient if local law allows meeting records to be submitted as documentation of adoption. The clerk of the governing body, or city attorney, must provide a copy of the law and a brief, written explanation such as, “in accordance with section ___ of the city code/ordinance, this constitutes formal adoption of the measure,” with an official signature.</p> <p>If adopted after FEMA review, adoption must take place within one calendar year of receipt of FEMA’s “Approval Pending Adoption.” See Section 5, <i>Plan Review Procedure</i> for more information on “Approvable Pending Adoption.”</p>

Chapter 1: Public Survey Website Posting

The screenshot shows the Town of Harwich website with a public survey announcement. At the top left is the town seal. The main header reads "Town of HARWICH Massachusetts". A navigation bar includes "About Harwich", "Departments", "Boards & Committees", and "FAQs". A "FIND IT FAST" button is on the right. The main content area has a breadcrumb trail: "Home > Home > News and Announcements > Harwich Hazard Plan Public Survey". The title is "HARWICH HAZARD PLAN PUBLIC SURVEY". Below the title are social media icons and a "SHARE" button. The post date is "Posted on: March 2, 2016 - 1:57pm". The text states: "The Town of Harwich, along with the Cape Cod Commission and other partners, are working to update the Harwich Hazard Plan. The Plan will identify and assess our community's natural hazard risks and determine how to best minimize and manage those risks. You can participate in the survey by clicking [HERE](#)". To the right is another town seal. The footer contains contact information: "Harwich Town Hall, 732 Main Street, Harwich Center, MA 02645 (508) 430-7514", hours of operation, and links for "Website Disclaimer", "Virtual Towns & Schools Website", and "Login". A language selection dropdown is also present.

Chapter 1: Public Survey Posting, Harwich Police Department Facebook Page



Harwich Police
@harwichpolice

- Home
- About
- Photos
- Terms of Use
- Videos
- Events
- Posts
- Notes
- Community

Create a Page

Like
Share
...



Harwich Police shared Harwich Emergency Management's photo.
March 3, 2016 · 🌐

Please take a few minutes and complete this survey. The survey will help the Town of Harwich as they seek to update their plan when it comes to natural disasters such as flooding during hurricanes.

The Town of Harwich, along with the Cape Cod Commission and other partners, are working to update the Harwich Hazard Plan. The Plan will identify and assess our community's natural hazard risks and determine how to best minimize and manage those risks.

Please take this survey – it is an opportunity for you to share your opinions and participate in the hazard planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that could lessen the impacts of future hazard events. The survey is only **11 questions** and it will take just a few minutes to complete. Thank you so much for participating! **Please complete this survey by March 21, 2016.**

If you have any questions regarding this survey or would like to learn more ways you can participate in the development of the Harwich Hazard Plan, please contact David Spitz at David.Spitz@harwichma.gov or call Harwich Emergency Management at 508-888-3333.

Harwich Emergency Management
March 1, 2016 · 🌐

Harwich residents, please follow the link below and take the survey
<https://www.surveymonkey.com/r/HarwichHazardPlan>

Like
Comment

Dennis Kendrick, Roxanne Locantore Burnie, Dianne Roderick and 3 others like this.

Call Now

Message

People >

4,685 likes

172 visits

People Also Like

- 

Yarmouth Police Dept.
Government Organization
- 

Orleans Police Department
Law Enforcement Agency
- 

Dennis Police Department
Police Station

Government Organizations in Harwich, Massachusetts

Pages liked by this Page >

- 

Corner Store Chatham
- 

Plainville MA Police Department
- 

Boston Police Department (O...)

Places > Harwich, Massachusetts > Police Station > Harwich Police

English (US) · Español · Português (Brasil) · Français (France) · Deutsch +

Privacy · Terms · Advertising · Ad Choices > · Cookies · More >

Facebook © 2017

www.harwich-ma.gov

Chapter 1: Cape Cod Chronicle Article, March 10, 2016

CAPE COD CHRONICLE – 03/10/16

HARWICH

Selectmen Set Special Town Meeting Deadline

Selectmen voted Monday night to call a **special town meeting** within the **annual town meeting** for Tuesday, May 3. Selectmen have to act upon the special town meeting warrant by March 23 so the board voted to open it on Tuesday, March 15 at 8:30 a.m. and close it on Friday, March 18 at noon. Petition articles for special town meetings require 100 signatures.

The town is looking for public input on what residents see as natural hazard risks. **Town Planner David Spitz** is asking residents to take an 11-question survey to help update the town's hazard plan. "The information you will provide will help us better understand you hazard concerns and can lead to mitigation activities that could lessen the impacts of future hazard events," Spitz stated. He said the plan will identify and assess the community's natural hazard risks and determine how best to minimize and manage those risks. The survey is being conducted by the town in conjunction with the Cape Cod Commission. The survey should be taken by March 21. Anyone with questions about the survey can contact Spitz at dsnitz@town.harwich.ma.us or **Cally Harper** at the Cape Cod Commission at cally.harper@capecodcommission.org.

The survey can be found at the town's website, www.harwich-ma.gov.

Selectmen Monday night approved a major Chapter 90 road improvement project at the request of **Lincoln Hooper, Director of the Division of Highways and Maintenance**. Hooper requested the use of \$525,926 out of the fund, which he said contains \$1,297,386. The money will be used to install new drainage systems along Queen Anne Road in advance of the **National Grid** gas main replacement along 4.5 miles of the roadway. Hooper said National Grid has agreed to provide curb-to-curb overlay on all roads, included this project. Most of the drainage systems on Queen Anne Road are antiquated block-built and/or direct leach style systems that do not meet current stormwater standards. "We feel it is prudent to take this opportunity and replace them before the road is repaved," Hooper stated. "It has been our standard practice to upgrade all drainage systems ahead of resurfacing projects to avoid having to cut the road later." The town needs to take advantage of the drainage contract they have with **Robert B. Our Company**,

Continued on **Page 19**

Chapter 1: February 4, 2014 Sign-in Sheet

2-4-2014

Please Sign In

Name	Email	Department
✓ David Spitz	dspitz@town.harwich.ma.us	Planning
✓ Amy Usowski	ausowski@town.harwich.ma.us	Conservation
✓ PAUL CHAMPAGNE	pchampagne@town.harwich.ma.us	HEALTH
✓ Christopher Clark	cclark@town.harwich.ma.us	Town Admin.
✓ GREGORY J. LARSEN	glarsen@town.harwich.ma.us	BUILDING DEPT
✓ HEINZ PROFT	hproft@town.harwich.ma.us	NATURAL RESOURCES
✓ Lincoln Hooper	highway@cape.com	DPW
✓ CHRIS NICKERSON	cnickhighway@comcast.net	Highway DEPT
✓ PAUL SWEETSER	psweetser@town.harwich.ma.us	ENGINEERING
✓ BOB CAFARELLI	rcatarelli@town.harwich.ma.us	ENGINEERING
✓ Craig Wiegand	cwiegrand@harwichunt.com	Water
✓ Norm Clarke	n.clarke@harwich.com	Fire
✓ John Rendon	jrendon@town.harwich.ma.us	HARWICHMASTER
✓ LEE CULVER	lculver@harwichpolice.com	EMO

Chapter 1: December 2, 2014 Attendance Sheet**Updating the Harwich Hazard Mitigation Plan****December 2, 2014****Harwich Town Hall**

NAME	TITLE/DEPARTMENT
Paul Sweetser	Town Surveyor
Heinz Proft	Natural Resources Director
Bob Cafferty	
John Rendon	Harbormaster
Norm Clark	Fire
Lee Culver	Emergency Management
David Spitz	Planning
Chris Nickerson	DPW
Chris Clarke	Administration

Chapter 1: February 2016 Sign-in Sheet

2016 Feb. HM Meeting HARWICH

DAVID LEDWALL	FIRE
Thomas Gagan	Police
Dan Pelletier	WATER
David Spitz	Planning
Meggan Tierney	Health
CHRIS NICKERSON	Highway
John Rendon	HERMANSISTAR
Lee Cullen	EMD
BOB CAFARELLI	ENGINEERING
PAUL SWEETSER	ENGINEERING
Amy Usowski	Conservation
Charleen Greenhalgh	Administration

Updating the Harwich Hazard Plan

March 3, 2016 at 2:00 pm

Harwich Town Hall

NAME	TITLE/DEPARTMENT
Lee CULVER	EMD
David Spitz	Planning
Thomas Gagnon	Harwich P.O.
DAVID LEBLANC	HARWICH FIRE
Charleen Greenhalgh	Administration
DAN PELLETIER	WATER
HEINZ PROFT	NATURAL RESOURCES
Amy Usowski	Conservation

Chapter 1: March 23, 2016 Sign-in Sheet

Harwich Hazard Mitigation Plan
Team MeetingSign In 3/23David Spitz meeting
planning

DAN PELLETIER water

DAVID LEBLANC fire

Henry Proff Nat Res

Lee Culver

Amy Usowski cons comm

PAULA CHAMPAGNE HCH
Harbormaster JOHN REEDER

Chapter 1: May 31, 2016 Sign-in Sheet

Updating the Harwich Hazard Mitigation Plan

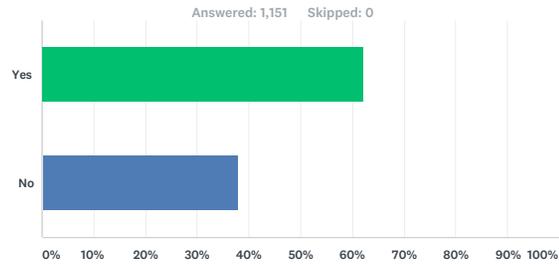
May 31, 2017 at 9:30 AM

Harwich Town Hall

NAME	TITLE/DEPARTMENT
Martha Heveros	Cape Cod Commission HARWICH WATER
Don Pellerica	
HEINZ PROFT	NATURAL RESOURCES DIR.
Lee Cullen	EMD
Bill Neiser	Deputy HarborMaster
Linda Hooper	DPW
John Sullivan	Police Dept.
RAY CHESLEY	BUILDING DEPT
Aly Sabatino	Planning Department
Amy Usowski	Conservation Administrator
Meggan Tierney	Health Dept
Charleen Greenhalgh	Administration
DAVE LEBLANC	FIRE DEPARTMENT

Public Survey for the Harwich Hazard Plan

Q1 Have you experienced a weather-related event or disaster while living, working or visiting Harwich?



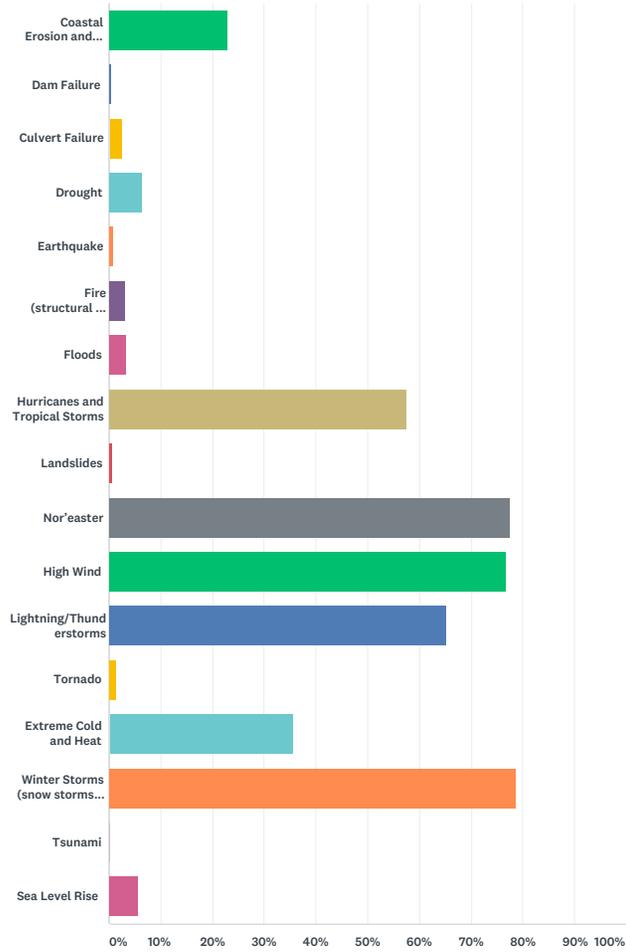
Answer Choices	Responses
Yes	62.21% 716
No	37.79% 435
Total	1,151

Public Survey for the Harwich Hazard Plan

Q2 Which of the following events have you experienced while in Harwich? You can select more than 1 answer. The disasters listed below were taken directly from the State Hazard Plan for the Commonwealth of Massachusetts drafted in 2013.

Answered: 1,151 Skipped: 0

Public Survey for the Harwich Hazard Plan



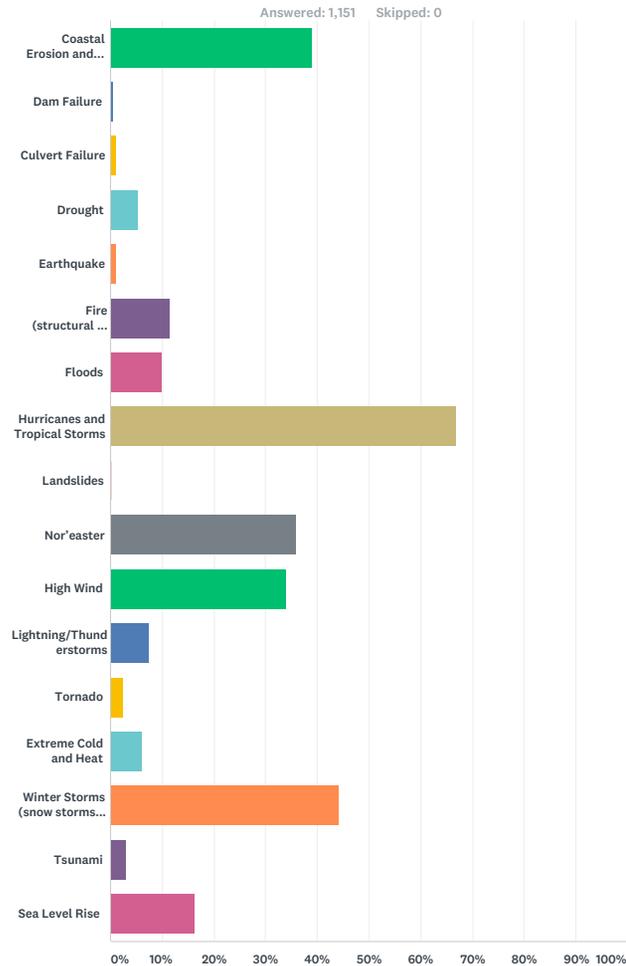
Answer Choices	Responses
Coastal Erosion and Shoreline Change	23.02% 265
Dam Failure	0.35% 4
Culvert Failure	2.52% 29

Public Survey for the Harwich Hazard Plan

Drought	6.52%	75
Earthquake	0.78%	9
Fire (structural or wildfires)	3.21%	37
Floods	3.30%	38
Hurricanes and Tropical Storms	57.43%	661
Landslides	0.70%	8
Nor'easter	77.58%	893
High Wind	76.80%	884
Lightning/Thunderstorms	65.25%	751
Tornado	1.39%	16
Extreme Cold and Heat	35.62%	410
Winter Storms (snow storms, blizzards, ice storms)	78.63%	905
Tsunami	0.26%	3
Sea Level Rise	5.65%	65
Total Respondents: 1,151		

Public Survey for the Harwich Hazard Plan

Q3 In your opinion, which of the following events are you most concerned about? Choose up to 3 answers.



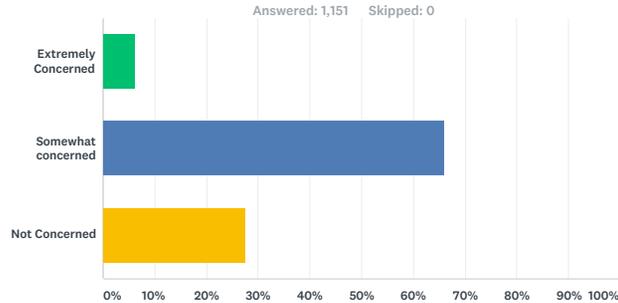
Public Survey for the Harwich Hazard Plan

Coastal Erosion and Shoreline Change	39.01%	449
Dam Failure	0.35%	4
Culvert Failure	1.13%	13
Drought	5.13%	59
Earthquake	1.13%	13
Fire (structural or wildfires)	11.56%	133
Floods	9.82%	113
Hurricanes and Tropical Storms	66.72%	768
Landslides	0.26%	3
Nor'easter	35.79%	412
High Wind	33.80%	389
Lightning/Thunderstorms	7.38%	85
Tornado	2.61%	30
Extreme Cold and Heat	6.08%	70
Winter Storms (snow storms, blizzards, ice storms)	44.22%	509
Tsunami	2.87%	33
Sea Level Rise	16.33%	188
Total Respondents: 1,151		

Answer Choices	Responses
----------------	-----------

Public Survey for the Harwich Hazard Plan

Q4 How concerned are you about the possibility of a natural disaster impacting Harwich?



Answer Choices	Responses	Count
Extremely Concerned	6.26%	72
Somewhat concerned	66.20%	762
Not Concerned	27.54%	317
Total		1,151

Public Survey for the Harwich Hazard Plan

Q5 The Hazard Planning Team would like to learn about your personal stories during the worst storm events that impacted Harwich, such as Hurricane Bob, Winter Storm Juno or other hazard events. In the space below, please describe the impacts that you experienced during a major storm event while living in Harwich. The Hazard Planning Team is especially interested in the location of power outages during storm events, flooding in your neighborhood, down trees in your neighborhood and coastal erosion.

Answered: 727 Skipped: 424

#	Responses	Date
1	none	2/27/2017 4:40 PM
2	We've only lived in Harwich 3 yrs. Weather impacts on us have been principally downed trees from high winds, a couple short power outages, and the heavy snows a couple winters ago.	10/3/2016 1:18 PM
3	2013 power outage, lasted two and a half days.	8/25/2016 10:25 PM
4	Dr lost a number of trees	6/15/2016 9:08 PM
5	Blzzards 2015	6/6/2016 8:11 AM
6	We had significant coastal erosion, power outage, and high wind damage (lost a storm door).	5/8/2016 1:16 PM
7	Major winds, trees down	5/4/2016 9:06 AM
8	Worst impacts I have seen are related to high winds and storm surge. The high winds really batter the house with sea salt and sand, The ocean surge batters the sea wall and access points to and from the beach	5/3/2016 9:21 AM
9	Loss of power Hurricane Bob/Downed trees	5/2/2016 5:42 PM
10	snowed in with ill husband trying to get plowed out. Town was great!	4/28/2016 12:04 PM
11	Snow plow drivers that are too lazy to angle the plows when passing driveways and plowing us back in repeatedly after we dig ourselves out again and again. I have driven plows. It's not that hard.	4/22/2016 9:07 AM
12	I have not been there during any such event	4/21/2016 7:41 AM
13	Although I was concerned about these events, the impact to my life was minimal (short time loss of electricity, need to stay indoors).	4/19/2016 2:06 PM
14	The loss of electrical power	4/19/2016 9:12 AM
15	trees coming down	4/18/2016 2:26 PM
16	Prolonged power outage in the dead of winter.	4/18/2016 11:26 AM
17	We lost electricity and therefore heat for 3 days in February 2015. Water and food became an issue because we were unplowed for days. During other storms 2 neighbor's houses have been hit by trees. We have removed several trees from our property as a precaution.	4/18/2016 10:32 AM
18	minimal power outages	4/17/2016 5:14 PM
19	Hurricane Bob we lost power for about a week, branches and power lines were in the yard. One December we lost power and heat and had to go to a motel elsewhere on the Cape since I had an elderly person in the house.	4/16/2016 6:04 PM
20	Stuck with no plowing on our road	4/15/2016 4:13 PM

Public Survey for the Harwich Hazard Plan

21	Third street power outage for 3 days. Frozen pipes flooded our home 4 feet of water in basement. The interior of the house was totaled had to do a complete remodel down to the studs.	4/13/2016 4:43 PM
22	I have experienced many dramatic storms including a microburst which I indicated as a tornado. Downed trees, power outages, and downed electrical lines have been the main impact to us over the years. Our deepest concern is the fact that for decades our road was plowed by the town and was not considered to be private. Several years ago the town arbitrarily changed it to a private road and now we are responsible for keeping up the road so it can be plowed in the winter. It has caused us a lot of work and money and sometimes we don't get plowed. We worry about the impact to us in an emergency situation. On occasion we have had flooding in the basements. Coastal erosion a concern. Although not specifically dangerous for us, it is concerning to see the impact of it.	4/13/2016 10:33 AM
23	in 1991 August storm, electricity was knocked out for a number of days and the roads were blocked for a bit as I recall	4/11/2016 5:07 PM
24	inability to access home; total disregard by town plowing agents to blocking home	4/11/2016 1:16 PM
25	No real significant impact experienced other than one power outage of 2 1/2 days and a delay in travel plans due to snow storm in Jan 2014.	4/11/2016 8:17 AM
26	The worst I have had to deal with is power outage for over 3 days in extreme cold temperatures without a generator.	4/10/2016 10:01 PM
27	down trees in neighbors yard, tree on roof	4/10/2016 10:47 AM
28	multiple power outages, tree damage, street flooding erosion of private beach	4/9/2016 4:16 PM
29	My home is near route 6 and our power lines are underground, so we have had only mild impacts from storm events--no significant damage since Dec. 2009.	4/9/2016 1:39 PM
30	high winds but no significant damage	4/9/2016 8:07 AM
31	hurricane bob, very close call	4/7/2016 4:55 PM
32	5 days without power	4/7/2016 4:44 PM
33	power outages which cause loss of electricity and especially heat in the winter bitter cold. We have no fireplace or any other source of heat and no generator. We have lost power for only a few hours in storms in our 10 years here	4/7/2016 9:23 AM
34	December 2008? Micro burst - downed trees east harwich/rt 39, blizzards various years	4/7/2016 4:19 AM
35	Electric off, sailboat damage, many trees down	4/6/2016 10:56 PM
36	I believe it was '98 we had back to back snow 18" and 24"	4/6/2016 9:12 PM
37	Power outage for extended period. Streets not plowed for days in major winter storms. Tree and home damage from winds.	4/6/2016 5:15 PM
38	Mostly damage from falling trees and limbs	4/6/2016 3:33 PM
39	Power outages that took what seemed like forever to restore and downed trees	4/6/2016 9:36 AM
40	trees down, flying debris, trees on electrical wires	4/6/2016 9:01 AM
41	We've had a couple of downed trees in the yard, one totalling a car the other causing extensive damage. They were trees on our property. Surprisingly, we rarely lose our power, even during the 2015 winter.	4/5/2016 8:02 PM
42	none	4/5/2016 4:05 PM
43	Most of the issues centered around the loss of beach in the Zylpha road area. On the personal front, it centered around winter months and cold. Power outages resulted in the loss of heat and subsequent freezing pipes.	4/5/2016 3:20 PM
44	We experienced a hurricane in 09 or 10 but it wasn't a problem!	4/5/2016 2:34 PM
45	Downed trees	4/5/2016 11:59 AM
46	power outages, down trees	4/5/2016 11:49 AM
47	Power outages were the major impacts. Have purchased a backup generator. Also had some tree damage and one downed tree due to high winds. Fortunately it missed both house and shed.	4/5/2016 11:12 AM

9 / 61

Public Survey for the Harwich Hazard Plan

48	Dangerous road conditions	4/5/2016 9:28 AM
49	The worst I have experienced personally is high winds and heavy rain...blowing unsecured deck and lawn furniture around and knocking down large tree branches.	4/4/2016 10:24 PM
50	None	4/4/2016 6:54 PM
51	power outage	4/4/2016 4:08 PM
52	Not too bad along Rte 124	4/4/2016 2:01 PM
53	I'm a relatively new resident. I've only experienced minor power outages.	4/4/2016 12:37 PM
54	power outage and downed trees. coastal erosion nearby	4/4/2016 12:16 PM
55	During Hurricane Bob, we lost power for six days. However, there was no erosion of our riverfront bank nor any flooding from the Herring River.	4/4/2016 12:08 PM
56	No heat, no electricity	4/4/2016 11:37 AM
57	Hurricane IRENE & SANDY	4/3/2016 8:40 PM
58	Power outage long enough to lose heat to dangerous low levels.	4/3/2016 7:38 PM
59	We lost power for 2 days during Jun. but wasn't that bad	4/3/2016 6:24 PM
60	Downed trees, long-term power outages	4/3/2016 3:44 PM
61	short-term power outage	4/3/2016 11:18 AM
62	No exciting story	4/3/2016 9:16 AM
63	Haven't experienced big disasters...mostly rain and snow storms that throw debris all over the place and some time shut off the power.	4/3/2016 9:05 AM
64	There are no overhead power lines in our neighborhood but we do lose power during winter storms. With electric heat, this is an issue.	4/3/2016 8:16 AM
65	I have not experienced any hazard event while in Harwich	4/3/2016 8:05 AM
66	Power was out for 1 week because of downed trees	4/3/2016 7:57 AM
67	Power outages	4/3/2016 7:49 AM
68	Hurricane Bob with its high winds we lost power for quite some time. Last year's winter snow storms caused extreme conditions on our street and problems with our home.	4/3/2016 6:32 AM
69	Last winter, no power loss or down trees great job plowing	4/2/2016 7:24 PM
70	From hurricane Bob downed trees, minor damage to house structure power outage	4/2/2016 4:45 PM
71	Lost power for 4 days after Hurricane Bob when living on Division St., West Harwich before moving to Teaberry Ave. in Harwich.	4/2/2016 4:34 PM
72	Power outage Depot Rd area, Winter storm blocked roadway Depot Rd	4/2/2016 2:51 PM
73	Power outages	4/2/2016 2:37 PM
74	Hurricane Bob was on Cape by myself very strong winds and a lot of trees came down and lost power. Winter Storm Juno extremely cold and very high snow drifts and drifts and road closed near Harwich golf course. Lots of wind and lost power. present day problems is the water level at grassy pond very concerned flooded forest street this February	4/2/2016 11:12 AM
75	I experienced power outages during major storms while living at 14 Harold Street in Harwich Port.	4/2/2016 11:01 AM
76	Blizzard (2005?) my street wasn't plowed for 2-3 days	4/2/2016 10:47 AM
77	We have lost a few trees due to wind, and regret the loss of sand at the beach and the erosion.	4/2/2016 9:13 AM
78	Heavy snows, strong winds	4/2/2016 8:27 AM
79	Extreme wind during blizzard downed some trees that damaged electrical lines to my house leaving it without electricity.	4/2/2016 7:47 AM
80	I have not had any negative experience. The worse that has happened is I have lost electricity/cable	4/1/2016 9:34 PM

10 / 61

Public Survey for the Harwich Hazard Plan

81	power outages	4/1/2016 8:26 PM
82	Just high powered winds in the summer with thunder/lightning	4/1/2016 7:58 PM
83	High snow drifts. Difficult to get to the house. No Plowing.	4/1/2016 7:18 PM
84	Flooding, power outage	4/1/2016 6:53 PM
85	Long term power outage	4/1/2016 2:13 PM
86	just the inconvenience of the conditions the storms brought ;power outages and a longer wait for roads to be traveled on.	4/1/2016 12:18 PM
87	Power out, some trees down. NO BIG DEAL	4/1/2016 12:17 PM
88	During Bob our 27' sailboat in Wychmere Harbor snapped the mooring chain and ended up in the weeds on it's side. Also south side of the house covered with pulverized leaves and pine needles but no damage.	4/1/2016 11:07 AM
89	I have been in Harwich for 3 hurricanes. There has been very little damage around Earle Road. Some power outages, trimming trees has helped.	4/1/2016 10:24 AM
90	All but coastal erosion has occurred in my neighborhood since i have lived here (2001). A couple/few years ago my street was re-paved and it was supposed to help with the flooding that always occurs with excess rain. It is better but problem not solved. We have done much tree pruning ourselves on our property and have hired professionals to come and remove some large limbs of concern. I do see some trees in need of attention in my neighborhood. I knocked on the door of one elderly neighbor to point out a tree in really bad shape but he has not done anything. I was worried it would fall on his house. Another property down the road did have a tree fall down and it took the power from their neighbor (they said that tree was marked to be taken down by the town and never was). Much of this is routine maintenance which may or may not get done; but with the weather seeming to become more severe each year I suppose it is of more concern.	4/1/2016 8:52 AM
91	Significant south coast shoreline erosion	4/1/2016 8:44 AM
92	Hurricane Bob was the only major storm that impacted our home. Fortunately, we had no structural damage but the power outage was challenging. But we survived and will again if it ever comes to another hurricane.	4/1/2016 7:26 AM
93	Power outage for multiple days with winter storm Juno (long pond area)	4/1/2016 6:29 AM
94	My family was in Harwichport at the time of Hurricane Bob and lost electricity for 4-5 days	4/1/2016 12:02 AM
95	I've had several large branches and one very large tree come down in high winds. The tree missed my house and landed across a fence that needed to be replaced. Underground electric cables in my neighborhood results in fewer power outages than in other neighborhoods.	3/31/2016 11:13 PM
96	power outages	3/31/2016 8:51 PM
97	Harwich did ok job on clearing the road on a winter storm	3/31/2016 8:05 PM
98	Heavy snow and wind cause anxiety for house structural damage	3/31/2016 5:39 PM
99	We were without power and several trees came down taking our chimney down with them.	3/31/2016 5:10 PM
100	Hurricane Bob was probably the worst, we were visiting my grandmother when it was still her home and the water came all the way up the stairs and reached out house which is normally 400 ft from the beach. That storm took down our chimney and three trees around our house that somehow managed to not cause any damage.	3/31/2016 5:04 PM
101	no power for 4 days in winter	3/31/2016 4:56 PM
102	We had the typical damage during Hurricane Bob (trees down, etc). We also had roof damage and leaks during spring storms and had to have restoration services indoors for damaged walls and ceilings	3/31/2016 4:41 PM

Public Survey for the Harwich Hazard Plan

103	Last summer there was a tornado traveling down rte. 28. There was a warning but no shelters to go to. I contacted the police and the answer was there is no place specified but I suppose you could go to the senior center. Thankfully, the tornado never reached our area. I own a summer cottage. This past winter there was a lightening strike at the residence. The next door neighbor called the fire dept., the electric co. Cut the wires to the house, yet no one contacted me or my co owner. Would be a good idea if some authority might contact owners when an incident like this happens. I found it when I traveled to the cape for a day and stopped to check on the property.	3/31/2016 3:50 PM
104	hurricane Bob down trees, flooding	3/31/2016 3:25 PM
105	Hurricane Bob. Have boat in Saquatucket	3/31/2016 3:21 PM
106	we have experienced downed trees blocking queen anne road. have also experienced power outages for longer than 1 week. Coastal erosion seems to be more of an issue for Chatham, Orleans and the outer cape but less so for Harwich.	3/31/2016 3:17 PM
107	inaccessibility due to snow and ice, dead branches from salt spray during hurricane	3/31/2016 2:40 PM
108	Power outage	3/31/2016 1:54 PM
109	5 1/2 without electricity (Power) down trees	3/31/2016 1:42 PM
110	During Hurrican Bob, we of course had a power outage, lasted 5 days, not so bad since it was August and we could cook on the grill. Also lost power during the mini hurricane that happened a few years back in early December. That was worse since it was cold out, and we had no heat. We never have flooding on Headwaters Drive, being 70 feet above sea level. No coastal erosion here either.	3/31/2016 1:41 PM
111	shingles off garage roof during Bob	3/31/2016 1:30 PM
112	Occasional power outages during winter storms	3/31/2016 1:14 PM
113	Power outage during some high wind events and hurricanes.	3/31/2016 12:55 PM
114	power outages, difficulty driving	3/31/2016 11:56 AM
115	The impact was minimal. Power outage also was minimal, no flooding and only a few large branches	3/31/2016 11:48 AM
116	high wind caused power outage loss of power caused pipes to freeze and burst causing water damage to home	3/31/2016 11:44 AM
117	Storms that cause high winds and down trees are one of our largest concerns.	3/31/2016 11:33 AM
118	Winter storms like Juno made it very difficult for owners of dogs and farm animals; being able to walk dogs and clear areas around barns.	3/31/2016 11:25 AM
119	Power Outage	3/31/2016 10:44 AM
120	During Hurricane Bob lost power, phone service (due to electric lines down) and loss of 5 trees.	3/31/2016 10:15 AM
121	It was power outage. I now have a natural gas powered stand by generator. Since I have had that installed, power outage is no longer a concern.	3/31/2016 10:02 AM
122	High winds, tree damage and erosion.	3/31/2016 9:01 AM
123	Loss of power from winter storm Juno	3/31/2016 8:43 AM
124	Only very short term power outages.	3/31/2016 6:49 AM
125	During a wind storm, two tall pine trees (about 50 feet high), were uprooted and blown onto my house, causing roof and gutter damage-and a major clean-up	3/31/2016 3:13 AM
126	We lost power for awhile during Hurricane Bob	3/30/2016 10:05 PM
127	Trees broke off and some limbs fell into the road. My husband was able to remove them himself but at the age of 72 he will not always be able to do so in the future. The winter storms last year were the worst. Snow removal was poor and we had to clear much of our road ourselves. So much back up and frozen ice caused storm drain blockage. We are in our early 70's and had to pick and chop and shovel the ice and snow on our street to keep the water from flooding the road and making it impassable.	3/30/2016 8:56 PM
128	short term power outages, tree damage, down trees	3/30/2016 8:21 PM

Public Survey for the Harwich Hazard Plan

129	NO ELECTRICITY	3/30/2016 8:17 PM
130	Bob blew some, shook the house, but the absence of rain kept damage low. Some trees went down but no large scale damage. Coastal erosion is ongoing, and the town needs a comprehensive plan to deal with it. The harbor master is obsessed with harbors, and pays little attention to beaches.	3/30/2016 8:15 PM
131	Have not experienced the events listed, but Hurricane Sandy and its associated winds, plus the extreme snowfall several years ago were significant. Our lot is treed so Nor'Easters are of concern	3/30/2016 7:42 PM
132	No electric for 3 days	3/30/2016 7:08 PM
133	Lost power and tree limbs falling on property/car	3/30/2016 7:00 PM
134	Power outage	3/30/2016 6:48 PM
135	Most of the problems that are bothersome centered around electrical outages from downed power lines. However, that has now been greatly improved with the shoring up done by the power company. We also decided to invest in a generator because we had too many outages. That was a few years ago. The power has only gone out once since then and it was just a half an hour. And the maintenance costs for the generator to assure year round operation are somewhat costly. So unless we get a real serious ice storm which are killers for power lines, the strengthening of the lines has proved to be sufficient so far. We also invested in solar panels but that was to cut our electrical costs; it does nothing to prevent outages.	3/30/2016 6:15 PM
136	Did not experience	3/30/2016 6:04 PM
137	Loss of electricity	3/30/2016 6:00 PM
138	None in our 8 years in Harwich of concern	3/30/2016 5:47 PM
139	Unplowed road with 3feet of snow	3/30/2016 5:46 PM
140	Never experienced anything more than power outage and frozen pipes	3/30/2016 5:45 PM
141	Red River Beach was looking quite shabby and lost alot of the beach until it was replaced a few years ago. It is one of the nicest beaches on the cape. Keep it up!	3/30/2016 5:35 PM
142	I have not experienced power outages, flooding, downed trees or coastal erosion. I have simply experienced the normal consequences of storms.	3/30/2016 5:29 PM
143	Hurricane Bob; loss of power, trees. Could have been much worse. We and the Cape were extremely fortunate during that hurricane.	3/30/2016 5:25 PM
144	wind, trees down, flooding in streets	3/30/2016 5:09 PM
145	Hurricane Bob, lack of power for cooking ect.	3/30/2016 5:07 PM
146	power outage, phone service out, poor snow plowing & damage, down trees & wires	3/30/2016 5:04 PM
147	Loss of power(heat;electricity) for over a week; loss of trees, beach erosion	3/30/2016 4:28 PM
148	Power outages during storms, hurricanes, etc.	3/30/2016 4:22 PM
149	Power outages	3/30/2016 4:12 PM
150	Extreme cold and a window being blown open in our basement caused our water main to freeze fortunately we got there in time to turn of the main before it got warm and flooded the basement.	3/30/2016 3:40 PM
151	We retired to Harwich Port in 2008 and experienced power outages due to a Nor'easter. Since that time the power company has trimmed many of the trees overhanging the power lines and we have not experienced a significant power outage since that time. Have not experienced any flooding, some downed branches but no trees.	3/30/2016 3:40 PM
152	None	3/30/2016 3:32 PM
153	Prolonged power outages from weather related events on Courtney Road	3/30/2016 3:31 PM
154	had many power outages in area. Has gotten better since area equipment by electric co was updated.	3/30/2016 3:16 PM
155	we have been very fortunate and have not really had any bad storms that impacted us. we had one where we lost power for 2 days, but it wasn't really a problem.	3/30/2016 3:15 PM

13 / 61

Public Survey for the Harwich Hazard Plan

156	Hurricane Bob uprooted 13 trees on my property. Fortunately, none resulted in any structural damage but cleanup was time consuming and expensive. I currently have 5 very large and old pine trees surrounding my home with potential to cause severe if not catastrophic damage. However, I have owned this property for 38 years and I am forever hopeful neither hurricane, strong winds nor nor'easter will someday present me with that nightmare.	3/30/2016 2:57 PM
157	Broken tree limbs due to high winds	3/30/2016 2:52 PM
158	power outage during Hurricane Bob	3/30/2016 2:50 PM
159	Lost power during Juno, roads closed, a pipe froze and broke- an expensive mess. Coastal erosion and higher sea levels is threatening Round Cove , a wonderful habitat and mooring place.	3/30/2016 2:48 PM
160	In the past we have lost electricity on school and drive school and in the past we have lost electricity on Schooner Drive.	3/30/2016 2:41 PM
161	Not much impact, just some downed tree limbs and torn screens.	3/30/2016 2:20 PM
162	Simply a blizzard here and there	3/30/2016 2:07 PM
163	The effects were mild. Short power outages, branches and limbs down, no major damage.	3/30/2016 1:57 PM
164	Loss of trees and power	3/30/2016 1:46 PM
165	NA	3/30/2016 1:28 PM
166	Old pipe line from street froze and burst resulting in water damage in cellar.	3/30/2016 1:25 PM
167	Periods of long power outages.	3/30/2016 1:21 PM
168	Downed trees, power outages and hurricanes	3/30/2016 1:07 PM
169	High winds	3/30/2016 1:02 PM
170	I was fine.	3/30/2016 1:00 PM
171	Three trees have been blown down during winter storms in '13, and '14. Luckily they fell away from my home.	3/30/2016 12:37 PM
172	Power Outage experience for a 24 hour period	3/30/2016 12:18 PM
173	Power outage	3/30/2016 12:11 PM
174	Rode out a minor Hurricane many years ago at my family summer cottage. My son and nephew got caught in a winter storm while checking on the family summer cottage and could not leave the cape to return home for days.	3/30/2016 11:09 AM
175	Sorry, we haven't experienced anything but some high winds that didn't really cause any damage.	3/30/2016 10:49 AM
176	Snow storm February, 2013, power lost for three days.	3/30/2016 10:39 AM
177	During Hurricane Bob, we had no power for a week. That was difficult for we lost all food, no water, and no business.	3/30/2016 10:30 AM
178	I've had no significant impacts as of yet from natural disasters or other. I have an emergency generator for power outages. My property does suffer from river shore erosion which is amplified during storms but am working to protect our property further.	3/30/2016 10:29 AM
179	In Hurricane Bob I had wind and tree damage. Two years ago I had tree damage during the winter.	3/30/2016 10:25 AM
180	inconvenient when loose power since that causes lot of other problems like frozen pipes etc.	3/30/2016 10:24 AM
181	Downed trees in my yard, one against the house. Nothing my chain saw couldn't handle	3/30/2016 10:14 AM
182	power outage	3/30/2016 10:11 AM
183	Hurricane Bob electrical wiring problem while visiting my sister in Osterville	3/30/2016 10:05 AM
184	During winter storms our biggest issue is electricity/heat failure. Wind can be a concern but as property owners we can remove potential hazards. The town should concentrate on the same.	3/30/2016 10:01 AM
185	Winter power outage. Location North Westgate Road, North Harwich	3/30/2016 10:00 AM
186	downed trees in Church and Bay Road intersection area	3/30/2016 9:52 AM

14 / 61

Public Survey for the Harwich Hazard Plan

187	high winds causing downed trees in neigh hood	3/30/2016 9:50 AM
188	power outages	3/30/2016 9:49 AM
189	No serious impacts other than our fire hydrant being plowed over with about a 6ft wall of snow. I called to advise of the issue and it was corrected that day.	3/30/2016 9:46 AM
190	Was here for Bob. Also the storm (Bob?) that blew boats out of Allen Harbor. Can't remember if I lost power but lost trees. Generally think Harwich is extremely well governed.	3/30/2016 9:44 AM
191	loss of electricity for less than 24 hours	3/30/2016 9:40 AM
192	I was building my house in 1991, and we had a hurricane and the perfect storm in October. The only impact that I had were downed trees in the back of the house.	3/30/2016 9:33 AM
193	Hurricane Sandy in 2012. Lost power for several days	3/30/2016 9:29 AM
194	only there for the summer	3/30/2016 9:21 AM
195	power outages and downed trees	3/30/2016 9:16 AM
196	During Bob - lost large trees, week long power outage. Winter storms of 1987 and 2014-2015 - actually trapped in my home several days, dangerous icing and deep snow with extreme cold. Had difficulty getting out and health problems. Lost power for days following microburst in Dec., 2005.	3/30/2016 9:15 AM
197	none	3/30/2016 9:11 AM
198	Lost electricity and 14 trees in Hurricane Bob	3/30/2016 9:08 AM
199	seasonal so limited to damage from wind, snow	3/30/2016 9:07 AM
200	Juno was tough, but thought the town was up to the task re: snow removal and power outages!	3/30/2016 9:06 AM
201	During hurricane Bob we lost power for over a week. Since then we have weathered storms very well. We have never had any damage to our home.	3/30/2016 9:05 AM
202	down trees	3/30/2016 9:02 AM
203	Hurricane. No power for 5 days was probably the worst. Often notice the changes in our coastline after a severe winter storm or bad nor easter	3/30/2016 8:55 AM
204	power outages, trees down	3/30/2016 8:48 AM
205	During thunderstorm, we typically lose a number of tree limbs as we have a wooded lot. During last winter's (2015) snow storms, we had excessive snow (over one foot deep) on our roof and had to clean it off with a roof rake for the first time ever.	3/30/2016 8:48 AM
206	So far in the past nine years no real problem.	3/30/2016 8:43 AM
207	Been in HARWICH since 2005. Have experienced none of the above	3/30/2016 8:42 AM
208	We felt like we were trapped in our house as we are quite far off the street, luckily we did not lose power	3/30/2016 8:40 AM
209	loss of power and downed trees blocking roads	3/30/2016 8:34 AM
210	In the 3 years we've owned our home I believe we have only lost power once or twice and not for very long, we have not had any flooding in the neighborhood nor trees down. Just the typical bad winter storms that we're all used to.	3/30/2016 8:30 AM
211	No outages, flooding or downed trees	3/30/2016 8:29 AM
212	13 trees lost in Hurricane Bob and power outage	3/30/2016 8:16 AM
213	A rare power outage.	3/30/2016 8:14 AM
214	Snow blocking furnace vent and snow drifting and closing access to our house	3/30/2016 8:07 AM
215	Electrical outages and down trees	3/30/2016 8:07 AM
216	Empower outages have been minimal for several years. Hurricane Bob, because of wind, was the worst. Still, clean up was the biggest issue.	3/30/2016 8:02 AM
217	n/a	3/30/2016 8:00 AM
218	Minimal impact	3/30/2016 8:00 AM

Public Survey for the Harwich Hazard Plan

219	Broken branches	3/30/2016 7:58 AM
220	Went without power or running water (on a well at the time) , for 5 or 6 days after hurricane Bob.	3/30/2016 7:48 AM
221	Power outage for greater than one day	3/30/2016 7:34 AM
222	Hurricane Bob - no electricity, hot water, etc. for 5 days	3/30/2016 7:26 AM
223	Multi day power outage.	3/30/2016 7:14 AM
224	Power outage, downed limbs	3/30/2016 6:59 AM
225	During Hurricane Bob my property suffered many downed large trees and an extended power outage.	3/30/2016 6:58 AM
226	I don't have major personal story. Coastal erosion like in Chatham is a concern, but I do realize we are stuck out in the ocean. As I see it the Ice Age is still receding. Nature is still doing it's thing. We all need to respect the power of Mother Nature. The EVACUATION ROUTE in a disaster will be the ultimt Back Up we've ever seen. m	3/30/2016 6:46 AM
227	Hurricane Bob - was living on Great Woods Rd; lost power for over a week, no well, etc.	3/30/2016 6:42 AM
228	Mostly tree damage.	3/30/2016 6:40 AM
229	power outage for 6 days due to trees down	3/30/2016 6:35 AM
230	We've lost power several times. Dundee Circle	3/30/2016 6:35 AM
231	none	3/30/2016 6:23 AM
232	trees down. roof, drainage and fence damage	3/30/2016 6:10 AM
233	Power outage, trees down	3/30/2016 5:59 AM
234	Some power outages in extreme cold; knocked down trees during intense storms.	3/30/2016 5:55 AM
235	Since living in Harwich I have experienced several severe storms and a few power outages	3/30/2016 5:49 AM
236	Short power outage only and some downed trees	3/30/2016 5:28 AM
237	Lengthy power outage	3/30/2016 5:11 AM
238	In the blizzard of 2015, my driveway was unplowable and had to be opened up by a front end loader at great expense. The icy burge and had to be opened up by a front end loader at great expense. The icy berm and the road was impossible to shovel and my car was stuck on top, taking three hours of hard labor on my part to release	3/30/2016 3:18 AM
239	Down trees and branches have lead to power outages in most of the winter storms	3/30/2016 1:21 AM
240	Mostly downed trees and power outages during winter storms or hurricanes	3/30/2016 12:09 AM
241	I am a seasonal resident and have rarely been in Harwich during storm events. I always receive telephone notifications from ever source when power failures occur.	3/29/2016 11:55 PM
242	No special problems	3/29/2016 11:40 PM
243	My basement was flooded in the spring of 2002; since I was not in residence at the time, I do not know whether there was a huge storm then.	3/29/2016 11:37 PM
244	Several years ago, in a December or November late afternoon, there was a sudden (un-forecasted) wind squall that took down dozens of big trees that fell across most of the roads I needed to get back home to Hillside Road from Brooks Library. I also worry about frequent power outages in thunder storms or high winds.	3/29/2016 11:19 PM
245	Extreme cold caused a frozen heating pipe. This resulted in a total loss of the interior of the house.	3/29/2016 11:03 PM
246	We have gone through power outages due to high winds and snow laden tree branches falling across overhead primary lines coming along Headwaters drive. We however, put our generator into service, which run two refrigerators, our furnace, microwave, bathroom lights and power outlets, also outlets around the house	3/29/2016 10:55 PM
247	Falling tree on power lines	3/29/2016 10:49 PM
248	Actually happy have not lost power ver often	3/29/2016 10:44 PM
249	wind damage, loss of power	3/29/2016 10:38 PM

Public Survey for the Harwich Hazard Plan

250	power outage in 2014 was a problem for a few days.	3/29/2016 10:35 PM
251	Street flooding due to poor street drainage; intermittent power outages	3/29/2016 10:26 PM
252	On two occasions during winter nor'easters the street that I live on was not plowed for 24 hours after the storm. The snow was nearly 3 feet deep. I also recall a power outage that lasted about 24 hours with temperatures in the teens/20s. Fortunately we were able to spend the time elsewhere off cape.	3/29/2016 10:23 PM
253	Hurricanes many years ago.	3/29/2016 10:21 PM
254	Power outages	3/29/2016 10:15 PM
255	Downed trees in our neighborhood and on our property	3/29/2016 10:14 PM
256	The snowstorms of Jan & Feb 2015 were psychologically very traumatizing and left a lasting impression on me. I'm 69 and live alone, so I was seriously frightened by the blocked roads. Otherwise, I remember a power outage in the mid-2000s which lasted almost a week. I had electric heat and had to leave my condo and move to a motel.	3/29/2016 10:09 PM
257	No power for 6 days due to trees down over power lines down, and winter storm in 2005	3/29/2016 10:05 PM
258	With heavy snowfall the inability/ unwillingness to get some roads cleared	3/29/2016 10:04 PM
259	long term power outages. lack of plowed roads leads to lack of food/heat/utilities.	3/29/2016 9:53 PM
260	down trees, no power during winter of 2015	3/29/2016 9:48 PM
261	Na	3/29/2016 9:43 PM
262	Water came into my basement after a heavy rainstorm. It required my needing to pay for a rearranging drainage in my back yard and installing ceramic tile on my basement floor.	3/29/2016 9:43 PM
263	We were there for Hurricane Bob. We had a lot of branches down, but fortunately no significant damage.	3/29/2016 9:39 PM
264	short term power outages	3/29/2016 9:34 PM
265	No major impact. Loss of power - if it lasted a day we went home.	3/29/2016 9:25 PM
266	Coastal erosion	3/29/2016 9:19 PM
267	*	3/29/2016 9:18 PM
268	Have experienced power outages in the Headwater and azalea Rd. Area the past ten years. Also, downed trees have destroyed our fence during the snow storms during the 2015 and 2016 winter.	3/29/2016 9:16 PM
269	Power outages appear common; downed trees	3/29/2016 9:14 PM
270	I have been lucky with just downed trees but the shore line on our beach took a bigger hit.	3/29/2016 9:07 PM
271	Lost electricity and many limbs from trees.	3/29/2016 9:03 PM
272	Power Outage, Downed Limbs and Trees	3/29/2016 9:03 PM
273	no problems	3/29/2016 9:02 PM
274	Power Outages and downed trees	3/29/2016 8:59 PM
275	None of the above	3/29/2016 8:58 PM
276	We have repeatedly lost power at our home in Harwich every year during the winter months. This has happened every winter since we purchased this home on 2001	3/29/2016 8:57 PM
277	Closed roads, power outage, accessibility coastal flooding	3/29/2016 8:56 PM
278	We have been very fortunate during most of the large storms. We usually retain power in our area.	3/29/2016 8:53 PM
279	none	3/29/2016 8:52 PM
280	Only been here 2yrs; bad snowstorm last year	3/29/2016 8:50 PM
281	power outage	3/29/2016 8:46 PM
282	Long power outage	3/29/2016 8:42 PM
283	I have had four trees uprooted during hurricane hugo	3/29/2016 8:41 PM

17 / 61

Public Survey for the Harwich Hazard Plan

284	No power in North Harwich for a week during Bob. But upgrades to electrical system and tree management ?? really helped reduce downed trees and outages. I was very concerned about wildfires in conservation areas during droughts and would like to know there's a plan for dealing with them in all parts of town.	3/29/2016 8:37 PM
285	Power loss, down trees	3/29/2016 8:36 PM
286	'78 hurricane power outage 5-7 days. Downed trees during storms	3/29/2016 8:35 PM
287	We seem to always lose power. Given the wind on the cape, I would like to see better infrastructure to prevent outages.	3/29/2016 8:33 PM
288	Hurricane Bob, trees down where we could not get out of house or yard. Snowed in for up to 4 days wiyh loss of power for heat or lights. Lightning strikes on poles and transformers.	3/29/2016 8:28 PM
289	power outage lasted 3 days	3/29/2016 8:26 PM
290	Heavy snow storm 2-3 feet several years ago keep us in our home for several days until we were plowed out.	3/29/2016 8:24 PM
291	Extended power outages and downed trees.	3/29/2016 8:24 PM
292	None.	3/29/2016 8:22 PM
293	On a scale of 1-10 10 being the worst a 3	3/29/2016 8:21 PM
294	Loss of power caused property loss during extreme cold after a blizzard or 3	3/29/2016 8:21 PM
295	power outage in the winter.	3/29/2016 8:19 PM
296	no problems	3/29/2016 8:17 PM
297	power loss	3/29/2016 8:14 PM
298	Power outage during Hurricane Irene. Tree damage from winds/salt.	3/29/2016 8:14 PM
299	Near Harwich Center we have experienced power outages, but not nearly as bad as in Connecticut after the October storms in 2012 or 2013.	3/29/2016 8:04 PM
300	Hurricanes have destroyed some of our seawalls over the years. We have had to rebuild our wall with increasing strength over the years	3/29/2016 8:04 PM
301	The tow most notable impacts that were felt were a few multi-day power outages and the mayhem involved with the evacuation of the cape during the hurricane that hit the cape in the late 90's	3/29/2016 8:01 PM
302	We were vacationing here when Hurrucane Bob hit. We spent the day at the emergency shelter (the elementary school). When we were allowed to return to the house we spent a few days without power. Strong memories include how uprooted trees disturbed the nests of yellow jackets so they were more than the usual nuisance.	3/29/2016 8:01 PM
303	Town of Harwich was excellent in their response to snow storms	3/29/2016 7:55 PM
304	I cannot get up my driveway after snow. It cost \$200 per plowing. Not often a problem except for winter of 2014/15. Route 28 near Bay Road has flooded w/ high winds, tides and rain. As our wires are underground, power outages are rare.	3/29/2016 7:55 PM
305	N/A	3/29/2016 7:54 PM
306	We've experience minor soil erosion during high rains. The heavy snow was very challenging to clear in 2015.	3/29/2016 7:54 PM
307	nothing significant	3/29/2016 7:54 PM
308	power outages	3/29/2016 7:44 PM
309	Down trees	3/29/2016 7:44 PM
310	Juno wind; successive blizzards 2014; Grey Neck Beach erosion	3/29/2016 7:43 PM
311	N/A	3/29/2016 7:40 PM
312	Snow 2015 and 2014	3/29/2016 7:39 PM

18 / 61

Public Survey for the Harwich Hazard Plan

313	I have not been impacted by any storms or flooding. We do have coastal erosion in my neighborhood of Wychmere Pines which is likely a result of the breakwater associated with Saquatucket Harbor.	3/29/2016 7:38 PM
314	Only a 5 hours power outage once, but concern over not getting road plowed and being able to get out if there was a medical emergency.	3/29/2016 7:32 PM
315	Have only been a resident of Harwich since June 2015	3/29/2016 7:31 PM
316	Power outage	3/29/2016 7:29 PM
317	High winds took down 30 foot plus trees where large branches damaged roof and sidings. large sums of sniw nake it bear impossible to get around or clear driveway and walks..	3/29/2016 7:27 PM
318	Power outage	3/29/2016 7:25 PM
319	Hurricane Bob was a nightmare. Noreasters and winter storm blizzards aren't fun either in Harwich I've been pretty lucky to have made through these storms with little or no damage. Haven't lost power in a long time and am pretty gratefulteful!	3/29/2016 7:23 PM
320	Not impacted	3/29/2016 7:16 PM
321	have had no impacts in Harwich so far	3/29/2016 7:16 PM
322	Hurricane Bob caused the most damage to my property since we moved to Harwich in 1984.	3/29/2016 7:13 PM
323	Downed trees during winter storms	3/29/2016 7:12 PM
324	Hurricane Bob: My daughter and I were trapped in the house on Catherine Rose Road, a dead end road, with trees downed over the road with no electric for a week. The neighbors pulled together and since I had gas, I would cook soups and stews of combined food for those who had no other means of getting food. Eventually the neighbors cleared out the trees so that we could leave to get ice that was being given away at the Ice House. We toughed it through, but the support of the neighbors and community made the hardship easier. When I rented on Off Great Western Rd on Sand Pond, a major winter storm hit that buried the road with 3 feet of snow. My daughter and I were trapped out there for 3 days. The fireplace afforded us the warmth and cooking ability to survive. On the 3rd day I heard a truck and looked out the window to see a front end loader scooping out the snow and dumping it so that I could drive down the road. A wonderful friend saved us from this disaster. Another winter storm brought down 6 trees on my property on Tupelo Dr. Fortunately, I had enough insurance to cover the trees being cut down and removed. The roof had a little damage to the shingles, and the trees missed the 4 Seasons Sunroom in back. I have seen the houses slipping into the ocean in several parts of the Cape over the years, but never in Harwich. During the winters it has never been unusual to have the electric go out. That is why I got a Ben Franklin Stove fired with gas. I may not have electric or lights or a stove to cook on, but I got warmth.	3/29/2016 7:12 PM
325	I live on Quail Nest Run in East Harwich. I've experienced minor power outage (less than 12 hrs.), downed tree limbs, & ice dams on roof.	3/29/2016 7:09 PM
326	power outage	3/29/2016 7:07 PM
327	I have only been plowed in at the end of my street.	3/29/2016 7:07 PM
328	Loss of power to business, street flooding, downed trees	3/29/2016 7:03 PM
329	The prolonged power outage after Hurricane Bob was an inco nvenience, but not devastating. Power outages during blizzards and extreme cold do concern me.	3/29/2016 7:02 PM
330	Loss of power, flooding	3/29/2016 7:00 PM
331	Long period of loss of electricity due to winter storm taking down overhead lines	3/29/2016 6:55 PM
332	Live on Noreast dr, winter storm...massive snow and ice...about 10-12 years ago	3/29/2016 6:54 PM
333	Loss of power for 1 week during Hurricane Bob	3/29/2016 6:52 PM
334	No comments	3/29/2016 6:50 PM
335	Power outage	3/29/2016 6:48 PM
336	Loss of power for more than 24 hours, trees down and damage to a fence in my yard.	3/29/2016 6:48 PM
337	Always losing power in east Harwich rye. 39	3/29/2016 6:45 PM
338	Downed trees, power lines,wind damage,snow drifts	3/29/2016 6:41 PM

19 / 61

Public Survey for the Harwich Hazard Plan

339	flooding on Bank St. in front of #268	3/29/2016 6:36 PM
340	I am a summer resident. I have lost many trees during storms and had a lightning strike with damage this winter.	3/29/2016 6:34 PM
341	Power outages, downed trees, and damage to property due to high winds	3/29/2016 6:33 PM
342	I live in an area where we have sump pumps in the basement. We feel our area is getting wetter. Partly due to raising homes out of the flood zone without designing areas for water to go. Also the way the trees along the road have been trimmed by nstar makes them an accident ready to happen.	3/29/2016 6:33 PM
343	na	3/29/2016 6:28 PM
344	juno-downed trees, badly plowed road.	3/29/2016 6:26 PM
345	tree damage, power outages, tree on house	3/29/2016 6:24 PM
346	Major tree damage	3/29/2016 6:23 PM
347	Power outage, flooding	3/29/2016 6:21 PM
348	Nothing in particular other than a noticeable rise in tide in the Herring Run River	3/29/2016 6:20 PM
349	Traffic mess getting off Cape per Hurricane Bob warning	3/29/2016 6:15 PM
350	During the hurricane in the mid 90's, I had a power shortage. No big deal.	3/29/2016 6:14 PM
351	Only lived on Cape four years. No issues during that short period.	3/29/2016 6:10 PM
352	Loss of power for several days. Fortunately I had wood for the fireplace, so I had heat. I have flameless candles, so I had light, and a battery radio. I also had plenty of non-perishable food!	3/29/2016 6:09 PM
353	Power outage	3/29/2016 6:07 PM
354	Fortuantly, only power outages here.	3/29/2016 6:07 PM
355	power outages	3/29/2016 6:06 PM
356	Power outages during severe weather or winds	3/29/2016 6:04 PM
357	Power outages in the center of town during Bob, during Juno. I think we were out of power for a week with Bob.	3/29/2016 6:03 PM
358	Serious tree damage in Hurricane Bob, long term power outage.	3/29/2016 6:02 PM
359	Bob: fallen trees; power outage	3/29/2016 6:02 PM
360	3 years ago loss of electricity (heat) for 3+ days during blizzard!	3/29/2016 6:02 PM
361	Nothing extreme. minor wind damage and power outages	3/29/2016 6:01 PM
362	Power Outages	3/29/2016 6:01 PM
363	Coastal erosion in Harwich Port	3/29/2016 5:57 PM
364	Downed tree branches, debris blown around neighborhood	3/29/2016 5:55 PM
365	We have had trees fall down during storms and power outages are most disturbing, food loss, etc	3/29/2016 5:55 PM
366	Power outages encouraged us to have a generator installed	3/29/2016 5:52 PM
367	N/A	3/29/2016 5:50 PM
368	Our house flooded during winter storm Juno. Power remained on Pleasant Bay came across RT 28 and up Bay Road and filled in the pond behind our home . The water height in our basement was 4.5 feet. All the debris that was on the beach and not cleaned up by the town end up in our yard. I contacted the town supervisor to ask for assitance with dump runs but he said that the disposal of the debris was our responsibility. I also lost my front split rail fence because of the debris that was snow plowed into the fence after the water receded. I would love to speak to someone about this and any future natural disasters to see if we can devise a better plan for the future.	3/29/2016 5:45 PM
369	Power outage	3/29/2016 5:44 PM
370	power outage	3/29/2016 5:43 PM

20 / 61

Public Survey for the Harwich Hazard Plan

371	I was there during hurricane bob and was evacuated to Cape Cod Technical high school, upon returning to the house at 7:00, ther was minimal damage although no power we had a working telephone and were able to grill dinner in the breezeway. Areas nearer the water sustained greater damage from the storm	3/29/2016 5:42 PM
372	the first winter we lived in Harwich we had a 36 inch snow fall. We were house bound for 3 days. The town equipment was not able to move the snow since a lot of the plowing is with pickup trucks. Other than that we did not experience any major problems. We lived in Harwich for 9 years. We have since returned to Waterford, CT.	3/29/2016 5:40 PM
373	Heavy snow. One tree down. Someone took it for fire wood.	3/29/2016 5:38 PM
374	We had not arranged for a plow service and the snow was very heavy, icy and difficult to move. While we do not lose power for long, we lose it often, especially in wind.	3/29/2016 5:38 PM
375	The low part of Hillcrest Dr. floods and overflows the road in any heavy rain storm.	3/29/2016 5:37 PM
376	Power outages where I had to use my generator.	3/29/2016 5:36 PM
377	Power outages , trees down	3/29/2016 5:35 PM
378	Trees falling in Harwich Center	3/29/2016 5:31 PM
379	Power outages, down trees	3/29/2016 5:29 PM
380	Hurricane Bob resulted in the downing of 17 trees on my 1/3 acre property at 60 Kelley Rd., West Harwich, followed by the need to remove an additional 8 damaged trees the following year. In the 35 years I have owned my property there were multiple short outages in the early years but essentially none in recent years.	3/29/2016 5:28 PM
381	Last time I lost power was Hurricane Bob, for about 3 hrs.	3/29/2016 5:22 PM
382	power outages, downed trees	3/29/2016 5:21 PM
383	During the winter storm in Jan-Feb 2015 we were buried under lots of snow but had electricity most of the time. Trees come down in our neighborhood during every type of storm, so getting the power lines underground would be the most help.	3/29/2016 5:21 PM
384	Loss of trees during Hurricane Bob	3/29/2016 5:20 PM
385	Three day power outage during blizzard of 2004.	3/29/2016 5:19 PM
386	Power outages from 1 to 3 days due to wet snow and high winds. Significant storm surges in Saquatucket Harbor due to tropical storms/hurricanes. My street is impassable during heavy snow storms, making it impossible to get oil and propane deliveries, mail delivery, and access by emergency services.	3/29/2016 5:18 PM
387	power outage	3/29/2016 5:16 PM
388	The only storm I call with a personal impact around Queen Anne Road was approx. 11 years ago during a winter noreaster and heavy snow and high winds which made roads impassable and power outages that lasted several days - no heat, extreme cold and big beach erosion	3/29/2016 5:16 PM
389	Bob damaged the houses on colonial way. No power for 4 days	3/29/2016 5:14 PM
390	power outages; downed trees	3/29/2016 5:14 PM
391	Down trees on our property is the issue we have had.	3/29/2016 5:09 PM
392	snowbound loss of power	3/29/2016 5:09 PM
393	Hurricane Gloria took down a tree in my backyard; an unknown winter storm took down another tree 3 years ago. There have been power outages at times during any number of storms. It is nature/natural so all of this is to be expected. There is nothing we can do about it except to recover from it.	3/29/2016 5:06 PM
394	was out of town	3/29/2016 5:06 PM
395	Loss of electricity,storm related property damage. Trees down,shingles off roof	3/29/2016 5:04 PM
396	Hurricane Bob blew in windows in our condo at the Belmont (1 Belmont Road, W. Harwich). My condo suffered water damage due to roof leak resulting from wind and rain during the Halloween Storm in 2011	3/29/2016 5:02 PM
397	power outage due to tree damage	3/29/2016 4:59 PM

21 / 61

Public Survey for the Harwich Hazard Plan

398	Just lived through it. No damage.	3/29/2016 4:58 PM
399	Harwichport power outage (not extended period of time so was fine)	3/29/2016 4:58 PM
400	lack of drinking water and no electricity	3/29/2016 4:58 PM
401	5 days without power	3/29/2016 4:58 PM
402	loss of electricity	3/29/2016 4:56 PM
403	very little.	3/29/2016 4:54 PM
404	None	3/29/2016 4:51 PM
405	No major impacts, Lost power briefly in a couple of storms.	3/29/2016 4:50 PM
406	no experience	3/29/2016 4:49 PM
407	power outages	3/29/2016 4:48 PM
408	power outage, tree down	3/29/2016 4:48 PM
409	We lost power on 2 occasions, within memory for 4 days + one a winter storm, the other a nor'easter	3/29/2016 4:46 PM
410	roof damage, downed trees and limbs	3/29/2016 4:43 PM
411	Pooling of water in street whenever it rains. Concerned if days of heavy rain will make road impassable and flood property. Old County Road	3/29/2016 4:43 PM
412	My eperience in Harwich has been minor compared to hurricanes in homes in CT, Quincy, MA and in the Bahamas	3/29/2016 4:43 PM
413	Have lived in Harwich for 19 years and have had some power outages relaed to coastal storms, wind, severe cold. live in East Harwich abutting to National Golf Course so jave experienced very strong winds from Pleasant Bay.	3/29/2016 4:41 PM
414	each time there is a significant amount of rain, a street-wide puddle forms at the base of my driveway bc the sewer elevation is higher than my driveway point thus not allowing the water to drain. When it then freezes, I have an ice-skating rink at the base of my driveway. this is a major concern of mine.	3/29/2016 4:37 PM
415	As we live more in land. Power outage due to town cutbacks on tree trimming and also electric company	3/29/2016 4:36 PM
416	1.5 days power loss plus 5 trees in microburst last decade	3/29/2016 4:35 PM
417	Hurricane Bob, several trees and limbs lost. The trees are no much bigger. On three occasions lightning has struck the house or within a few feet of it, it made the fire or alarm go off twice.	3/29/2016 4:35 PM
418	tree damage	3/29/2016 4:34 PM
419	Nothing major	3/29/2016 4:33 PM
420	Hurricane Bob, power outage for 5 days	3/29/2016 4:32 PM
421	No Major Impact	3/29/2016 4:32 PM
422	Power outage	3/29/2016 4:30 PM
423	Nothing personal, just normal property owner concerns	3/29/2016 4:30 PM
424	I've lived in Harwich year-round since 1973. I've experienced trees down and home damage from that, long term power outages, evacuation(I worked shelters for BOB), basement flooding due to frozen ground and heavy rain, and more...	3/29/2016 4:30 PM
425	Loss of power for a few day, some downed trees	3/29/2016 4:29 PM
426	Power outage, Trees down	3/29/2016 4:29 PM
427	No significant power outages, flooding, etc. My biggest impact has been accumulation of snow, which is sometimes made worse by city plowing blocking my driveway.	3/29/2016 4:29 PM
428	High wind resulting in. Tree fall	3/29/2016 4:28 PM
429	Trees down as a result of blizzard ans wind damage.	3/29/2016 4:28 PM

22 / 61

Public Survey for the Harwich Hazard Plan

430	No Major story	3/29/2016 4:27 PM
431	We had an dam issues during last year's snowy winter that resulted in significant leakage into our townhouse. Our subsequent insurance claim paid for a majority of the damage taht exceeded \$10,000.	3/29/2016 4:27 PM
432	Power outage and down trees	3/29/2016 4:22 PM
433	Large limbs breaking off trees in wind	3/29/2016 4:22 PM
434	I've weathered these events with very low impact of power outages, but some branch impact. Otherwise, uneventful even during the Blizzard last year.	3/29/2016 4:20 PM
435	Coastal erosion	3/29/2016 4:20 PM
436	Hurricane Irene 2011 - all wind, no water - lost power but recovered quickly; biggest problem in my neighborhood is flooding on Lower County, power outages and trees down on Brooks Road	3/29/2016 4:16 PM
437	Hurricane Bob- power outage lasting over 3 days. Nor'easters causing power outages, trees down.	3/29/2016 4:11 PM
438	I have been impressed that we have not lost power while living in Harwich. While the roads were bad for serval days after last year's snowstorm, they were passable. It was acceptable because the storm was unusual.	3/29/2016 4:10 PM
439	Power outage and downed power pole on Freeman Street during hurricane Bob. Flooding at Wychmere harbor during several hurricanes, beginning with Hurricane Carol in 1954; and boat damaged when some moorings were broken or dragged in the harbor.	3/29/2016 4:09 PM
440	Losing power is a frightening experience, especially if it is cold!	3/29/2016 4:05 PM
441	hurricane bob we lost power and had downed trees but overall not an event that was real bad.	3/29/2016 4:04 PM
442	Fallen trees, power outages	3/29/2016 4:03 PM
443	I'm seasonal so can't remember any major storm event	3/29/2016 4:03 PM
444	hurricane Bob, no electricity for over a week	3/29/2016 4:03 PM
445	LITTLE OR NO IMPACT IF THERE IS PLENTY OF NOTICE ALLOWING PREPARATION.	3/29/2016 4:02 PM
446	I experienced no impact from ay storm events.	3/29/2016 4:02 PM
447	power outage no elec. for 3days	3/29/2016 4:00 PM
448	One tree blew over my first year here, two smaller ones got all bent. The guys whoso town plowing scraped up several inches of my topsoil(corner house) and this year a section of my fence blew over (post broke).	3/29/2016 4:00 PM
449	Downed Trees have been a concern. Power outages have improved greatly through the decades.	3/29/2016 4:00 PM
450	The inability to leave the house for two days during winter storm Juno	3/29/2016 3:57 PM
451	Juno power outage in W. Harwich	3/29/2016 3:56 PM
452	2014 was awful with the snow and getting rid of it was a real problem.	3/29/2016 3:56 PM
453	hurricane bob---- no power --- high wind	3/29/2016 3:55 PM
454	Never had any problems during any storms	3/29/2016 3:54 PM
455	Loss of electricity during extreme weather	3/29/2016 3:53 PM
456	Extended power outage of over a week that impacted East Harwich.	3/29/2016 3:53 PM
457	harwich center, downed trees, impassable roads, great western road is not sufficiently plowed	3/29/2016 3:53 PM
458	Our home was hit by lightning a few years ago.	3/29/2016 3:50 PM
459	Lost power during Bob for 5 days, a house in neighborhood burned down after power restored. No water was the struggle with two small children.	3/29/2016 3:49 PM
460	Down trees	3/29/2016 3:48 PM
461	Downed trees	3/29/2016 3:48 PM
462	Lost power for about a week,I have purchased. A generator	3/29/2016 3:48 PM

Public Survey for the Harwich Hazard Plan

463	Power outages, fallen trees	3/29/2016 3:47 PM
464	Minimal power outages some trees down.	3/29/2016 3:47 PM
465	During hurricane Bob we were without power for 6 days. Also had many downed trees in the neighborhood.	3/29/2016 3:46 PM
466	I must be in a good are because we rarely lose power. i think in the 15 years I've lived here we've only lost power for more than a day once. I am concerned about evacuation if anything really major ever happened.	3/29/2016 3:46 PM
467	Lost power for several days during a nor'easter. Have since installed a gas fireplace for backup heat.	3/29/2016 3:43 PM
468	Occasional tree damage from limbs not trimmed near power lines	3/29/2016 3:42 PM
469	4 to 5 day power outage on Archibald Circle	3/29/2016 3:42 PM
470	I have been fortunate. Never had a really bad experience. Harwich Center.	3/29/2016 3:41 PM
471	Water damage from rain driven up the bluff and into eave vents. Beach erosion.	3/29/2016 3:39 PM
472	Power outages	3/29/2016 3:38 PM
473	We moved to Harwich in fall of 1998 and frequently experience power outages(including down lines), phone and internet disruption. Since we live off rt.39 and on the Cape in general we expect to "rough it " now and then. w	3/29/2016 3:38 PM
474	Due to high winds the winter storms of last winter created enormous snow drifts. Back hoes were required to dig us out.	3/29/2016 3:37 PM
475	There are tree branches over power lines on Robbins Road. Water collects at the corner of Wheaton Way and Laurie Lane.	3/29/2016 3:36 PM
476	On Wequasset Rd we had to evacuate.Lost power had wind damage storm peeked at low tide otherwise we would have had sea water in the house	3/29/2016 3:35 PM
477	Big tree came across driveway during a wind storm	3/29/2016 3:34 PM
478	Power Outage in Hurricane of Sept.2011 in Harwich	3/29/2016 3:32 PM
479	Hurricane Bob, downed trees, power outage	3/29/2016 3:32 PM
480	While staying at our second home in Harwich we experienced a winter storm but it had no impact like the ones you listed.	3/29/2016 3:31 PM
481	We had power outage durng a New Year's Eve storm a few years ago. Power was restored in an hour or two. Otherwise there was a fairly big storm the day of the last Cranberry Festival, but despite a lot of wind and rain, we were not impacted.	3/29/2016 3:29 PM
482	We had power outages in winter storms.X 3,days several years ago. I have had snow entering the attic due to 60-70 mph winds. That snow melted and water on ceiling below. We had trees down in summer due to unnamed storms.	3/29/2016 3:28 PM
483	No major problems in 20 plus years	3/29/2016 3:28 PM
484	no story to tell	3/29/2016 3:27 PM
485	Lot of snow last winter and couldn't get commercial snow plow companies to plow my driveway.	3/29/2016 3:27 PM
486	5 days without electricity in Hurricane Bob. Lots of trees down in the area.	3/29/2016 3:27 PM
487	roof damage & power outage during winter storms	3/29/2016 3:26 PM
488	trees down, home damage from wind. windy area this part of harwich	3/29/2016 3:25 PM
489	Hurricane Floyd - lost power for 4 days, swimming pool overflowed, 6 foot stockade fence around pool fell like dominos. Lost flowering trees outside house. Put in insurance claim for the fence. They paid to fix it and then dropped us!	3/29/2016 3:25 PM
490	downed trees power outage	3/29/2016 3:23 PM
491	downed tree loss of power	3/29/2016 3:22 PM

Public Survey for the Harwich Hazard Plan

492	At the time, we rented a house. Hurricane Bob was approaching. I was in Boston, but my family was in Harwich. I came down picked them up and went off Cape, back to Boston. Prior to picking the family up, our close friends offered to stay at their place. It was just 2 houses down from where we were staying. As it turned out their house received a direct hit from a fallen tree. Right through the roof.	3/29/2016 3:22 PM
493	I live at 5 Bay Lane which is a private road. Each time there is a substantial snow storm, we seem to have bot ends of driveway blocked with snow from a snow plow. Not sure if this is a municipal low or careless neighbor plowing out her 6 car parking lot.	3/29/2016 3:20 PM
494	I live in North Harwich and have been fortunate not to have lost power during any of the storms in the past 5 years or so.	3/29/2016 3:20 PM
495	I lost power for 2 days during Hurricane Bob. No foloods or anything like that despite being put in a flood zone by the federal government idiots.	3/29/2016 3:19 PM
496	Lost power tree hit power line	3/29/2016 3:18 PM
497	1 week power outage during Hurricane Bob	3/29/2016 3:17 PM
498	We lost our power in the winter snow storm for a day	3/29/2016 3:14 PM
499	Hurricane Bob -- 5 days without power; boat destroyed. High wind -- large tree pushed to lean over house -- we had it taken down.	3/29/2016 3:13 PM
500	Power outage, downed trees and limbs	3/29/2016 3:12 PM
501	electricity was off for more than a week in Hurricane Bob. We often experience brown-out now and always have...there is poor...worse than poor, cell reception...if there is no electricity...the cells need to work... ATT reception in west Harwich is beyond poor. ..	3/29/2016 3:12 PM
502	Power outage, down trees	3/29/2016 3:11 PM
503	Power outages mostly. Have to say I'm impressed as to the calls my Mom received when living in Harwich to check on her by the town, that was awesome	3/29/2016 3:11 PM
504	None	3/29/2016 3:10 PM
505	I haven't been living in Harwich long enough to answer.	3/29/2016 3:10 PM
506	Lots of trees in my neighborhood, so power outages during high winds and hurricanes.	3/29/2016 3:09 PM
507	Lack of snow removal due to strict Harwich conditions placed on home owners on private roads	3/29/2016 3:09 PM
508	Loss of power for 3 days	3/29/2016 3:09 PM
509	Hurricane Bob wrought significant damage for the property primarily by downed trees that completely blocked access to roadway into the property. It also cause utilities outages. Since then all utilities have been relocated underground and except for trunk lines going down we have good connections. Winter storms and high wind have continued to bring down branches and individual trees. While I am not directly located on the shore as a resident I have witnessed and had my use of the coastal areas altered due to erosion and sea level rise in Harwich (as well as neighboring towns).	3/29/2016 3:09 PM
510	Fallen trees, debris	3/29/2016 3:07 PM
511	Extreme high winds and downed trees; electricity outage	3/29/2016 3:07 PM
512	power outages are impacted by the fire departmentpower companies should control power outages	3/29/2016 3:07 PM
513	There were no major problems. Getting plowed out after snow is the biggest issue	3/29/2016 3:06 PM
514	downed trees, loss of power Hurricane Bob; winter storms with no plowing on our private way	3/29/2016 3:06 PM
515	severe wind and rain from hurricanes	3/29/2016 3:05 PM
516	Hurricane that caused 3 days with power in 2011	3/29/2016 3:01 PM
517	Down trees and limbs, road blockages, power hits	3/29/2016 3:00 PM
518	I was not here for those events	3/29/2016 2:59 PM
519	Trees	3/29/2016 2:59 PM
520	Extended Power Outage Hurricane Irene, Hurricane Bob little problem	3/29/2016 2:59 PM

25 / 61

Public Survey for the Harwich Hazard Plan

521	Nor'easter wind and down trees. During snowstorms, roads are plow properly.	3/29/2016 2:59 PM
522	Power outages, downed branches,	3/29/2016 2:59 PM
523	Power outage; downed trees; high winds	3/29/2016 2:59 PM
524	We have been in Harwich for three years. Other than some large snow flows we have had very little problems. Only 1 relatively short power outage	3/29/2016 2:58 PM
525	Water in roadway So. Chatham Rd and Uncle Venie's Rd.	3/29/2016 2:58 PM
526	Snowstorm power outage, but it was restored in a reasonable amount of time	3/29/2016 2:58 PM
527	branches down in yard	3/29/2016 2:57 PM
528	none	3/29/2016 2:57 PM
529	lost power for a week with Hurricane Bob	3/29/2016 2:56 PM
530	Severe Erosion on grey neck road beach	3/29/2016 2:54 PM
531	Nothing earth shattering. Sea Wall Erosion is my major concern.	3/29/2016 2:53 PM
532	Hurricane Carol, August 1954. Watched several small summer cottages floating up Uncle Venies Road. Small pine and oak trees sheltered many of those homes on South Chatham Road. Water came up to our driveway	3/29/2016 2:52 PM
533	Power outage	3/29/2016 2:51 PM
534	Loss of power, downed trees.	3/29/2016 2:51 PM
535	power outages	3/29/2016 2:51 PM
536	Hurricane Bob took down trees and power on Old Mill Lane	3/29/2016 2:50 PM
537	Hurricane Bob	3/29/2016 2:49 PM
538	Frozen pipes; wind damage on siding and roof; no electricity	3/29/2016 2:49 PM
539	I was without electricity during Hurricane Bob	3/29/2016 2:48 PM
540	December 2005, extensive Power Outages	3/29/2016 2:48 PM
541	nothing terrible, electric outages	3/29/2016 2:47 PM
542	Hurricanes & high winds have impacted my landscape creating dangerous situation to my property & family	3/29/2016 2:46 PM
543	Lose of power in South Harwich,trees down	3/29/2016 2:45 PM
544	Before we connected to town water loss of electricity was a major problem for us.	3/29/2016 2:44 PM
545	downed tree branches, power outage	3/29/2016 2:44 PM
546	blackouts . damaging fallen trees	3/29/2016 2:44 PM
547	We just lost power, each year beach at grey neck road erodes away	3/29/2016 2:43 PM
548	Coastal erosion	3/29/2016 2:41 PM
549	Power outtage, flooding, down trees	3/29/2016 2:40 PM
550	The worst was the wind sheer storm that hit some years back knocking down many poles.	3/29/2016 2:40 PM
551	power outage ; downed tree(s)	3/29/2016 2:40 PM
552	Power outages and coastal erosion	3/29/2016 2:39 PM
553	I really have not experienced a weather disaster in Harwich.	3/29/2016 2:39 PM
554	Power outages	3/29/2016 2:37 PM
555	During Hurricane Bob we lost power for less than 2 days, we are lucky , we live near Harwich center and the Water Dept.. We also lost 16 trees on our property, but luckily none hit our house.	3/29/2016 2:37 PM
556	We had down trees take out the power at my home	3/29/2016 2:36 PM
557	Power was out for several days during summer storm.	3/29/2016 2:35 PM

26 / 61

Public Survey for the Harwich Hazard Plan

558	Loss of electricity is main problem on Depot Rd, South Harwich	3/29/2016 2:35 PM
559	Hurricane Bob. Power outages, downed trees.	3/29/2016 2:35 PM
560	Have had periodic power failures. Lucky that they didn't last too long. During blizzards, lost major limbs off trees. Have been very please with snow removal during blizzards. Was good yo know i could leave the house in the event of a long duration power failure	3/29/2016 2:35 PM
561	When storms arrive, we vacate to CT.	3/29/2016 2:33 PM
562	Trees were down, electric out but restored quickly. No damages to my property.	3/29/2016 2:31 PM
563	None in the two years I've lived in Harwich	3/29/2016 2:31 PM
564	Mostly downed trees	3/29/2016 2:30 PM
565	NA	3/29/2016 2:30 PM
566	Power outages (Argyle and Depot Rd) is the item we see the most of.	3/29/2016 2:30 PM
567	hurricane Bob, 1991; snowstorms and cold temps 2015	3/29/2016 2:29 PM
568	Usually not there during such storms.	3/29/2016 2:29 PM
569	nothing major ... power outage and downed tree limbs	3/29/2016 2:28 PM
570	We have experienced extended power outages, downed trees, many downed braches during hurricanes on two occasions.	3/29/2016 2:27 PM
571	Downed trees & electrical outages	3/29/2016 2:27 PM
572	Hurricanes and power outages	3/29/2016 2:26 PM
573	We were renting in Dennis for Hurricane Bob, No power for the week. We've been in our Harwich home, part time and experienced winter storms, power outages; We are close to Bucks pond; we've had trees come down as well. For the most part, electricity was up and running within 24+ hours. Hurricane Bob was more like a week. that was terrible.	3/29/2016 2:25 PM
574	Going far back to Hurricand Carol in 1954 I remember the National Guard was intown cleaning up. During that hurricane and over the years we have often had to evacuate due to the number of trees on our property.	3/29/2016 2:25 PM
575	Power outages, downed trees	3/29/2016 2:24 PM
576	We have weather related experienced power outages and downed trees.(Shangri La Drive)	3/29/2016 2:24 PM
577	We do lose power a lot, but while we have lived here we have not lost it for very long at most 3 maybe at most 4 days.	3/29/2016 2:21 PM
578	Power Outage, Tree Limbs done, Wind Damage	3/29/2016 2:20 PM
579	Tree down going across road, power outage, flood in front of my home.	3/29/2016 2:20 PM
580	No power for multiple days	3/29/2016 2:20 PM
581	Downed tree in yard. Blocked furnace vent set off CO alarm.	3/29/2016 2:20 PM
582	Hurricane Bob took down about 12 trees in my yard several of which wiped out stockade fencing and one went thru neighbors roof. Lost power for a week. I had another home off cape so I was able to escape the worst of it but tree removal and cleanup took weeks	3/29/2016 2:18 PM
583	Did not experience any hazards	3/29/2016 2:17 PM
584	Electric outage & roof damage	3/29/2016 2:17 PM
585	Bombogenesis -loss of power for a couple of days	3/29/2016 2:15 PM
586	power outages	3/29/2016 2:14 PM
587	We have only recently relocated full time to Harwich and have not had any major incidents occur.	3/29/2016 2:14 PM
588	We lost several mature trees. We did not lose power.	3/29/2016 2:13 PM
589	We have experienced short power outages caused by winter weather.	3/29/2016 2:12 PM

Public Survey for the Harwich Hazard Plan

590	We lost power for 3 days. Plus every time it rains our street floods and whe it freezes it a danger.	3/29/2016 2:12 PM
591	down trees and flooding in our neighborhood coastal erosion	3/29/2016 2:12 PM
592	I don't remember which storms were involved, but several years ago there were back-to-back heavy snow storms who's snow drifts & volume of snow caused extensive water damming with our roof resulting in a lot of interior ceiling water damage. We don't live there year round so our personal experience is limited to what happens when we are there or the aftermath of events.	3/29/2016 2:12 PM
593	we were living in harwich during hurricane bob and the halloween storm of that same year during bob power was down for almost a week. thank god we had a barbecu	3/29/2016 2:11 PM
594	During Hurricane Bob several BIG trees came down in my neighborhood. We had just had our trees checked and pruned so luckily no damage other than lots of limbs down. The neighbor across the street had a large tree come down onto his deck just missing his roof.	3/29/2016 2:11 PM
595	Power outages during wind and snow storms, though not so many in recent years.	3/29/2016 2:11 PM
596	We were not living here at the time of those events.	3/29/2016 2:11 PM
597	In August of 2011, we experienced Hurricane Irene; while we didn't lose power, we did lose a 50-year-old 50-foot maple tree, part of which came down on our roof. During the eye of the storm, the Tree Company was able to come and remove the part from the roof, and after the storm had passed, took down the rest of the tree. Overall, if it had to happen, this was the way to have it happen. Photos are available if you'd like to see them.	3/29/2016 2:10 PM
598	n/a	3/29/2016 2:07 PM
599	Home Owners insurance increase	3/29/2016 2:06 PM
600	Constant Power outages; down trees; poor town response to treating ice and snow removal regardless of the amount.	3/29/2016 2:06 PM
601	Winter storm related power outages, roads impassable for short periods	3/29/2016 2:04 PM
602	Hurricane Bob - all of the above except flooding	3/29/2016 2:03 PM
603	Our neighborhood (Idle Way) does pretty well during and after big snow storms (esp. 2015) although when the power does go out, it seems to stay out for a significant period; same with tropical storms. [We were living on Walther Rd during the last hurricanes (Gloria in 1985, Bob in 1991) and the power was out for many days as I recall.] Plowing is also pretty good: we realize we aren't a major road. Drainage is good, even when the ground is frozen.	3/29/2016 2:01 PM
604	extended loss of power	3/29/2016 2:00 PM
605	I am prepared for all types of events	3/29/2016 1:57 PM
606	power outages in the E harwich area. would like to know why we are on Brewster's grid. has times during hurricane season that nobody knew we were out and didn't get back on for 4/5 days	3/29/2016 1:56 PM
607	Downed trees leading to multi-day power outtages and road detours (Queen Anne Rd. area); concern about traffic plan for leaving the Cape in an emergency.	3/29/2016 1:55 PM
608	Trees downed by winds	3/29/2016 1:54 PM
609	We have only been here two years, and the winter of 2015 was a little bad for us. There was snow, but nothing that drastic. We had no power outages- knock, knock.	3/29/2016 1:54 PM
610	trapped in house during major storm events; also possibility of nuclear disaster in plymouth	3/29/2016 1:53 PM
611	Power outages	3/29/2016 1:53 PM
612	No major problems	3/29/2016 1:51 PM
613	power outage Tyler Lane, West Harwich	3/29/2016 1:51 PM
614	Power outages (luckily short lived - 3 hrs or less!); downed limbs	3/29/2016 1:51 PM
615	Nothing drastic has happened since the hurricane of 1992	3/29/2016 1:50 PM
616	LOSS OF ELECTRICITY	3/29/2016 1:49 PM
617	Down trees and power outage.	3/29/2016 1:49 PM

Public Survey for the Harwich Hazard Plan

618	None	3/29/2016 1:46 PM
619	Loss of electric and significant tree / wind damage	3/29/2016 1:46 PM
620	"Trapped" in house, back roof ice dams, leaks	3/29/2016 1:43 PM
621	Nothing special. Winter is winter.	3/29/2016 1:42 PM
622	No impact. Only in Harwich during the summer months.	3/29/2016 1:42 PM
623	Loss of power	3/29/2016 1:41 PM
624	there is no system for water run off from rt 28. it travels to the lowest level and ends up in my yard.	3/29/2016 1:40 PM
625	Power Outage, Trees falling and damage, Poor drainage.	3/29/2016 1:39 PM
626	Only here 4 years. Have only experienced minimal difficulties (i.e. Power outage of short duration)	3/29/2016 1:39 PM
627	There were many downed trees in town. Could not get anywhere	3/29/2016 1:38 PM
628	During hurricane Bob we lost power for 4 days, we had 14 trees go down in our yard....disturbing!	3/29/2016 1:35 PM
629	None of them was any big deal.	3/29/2016 1:34 PM
630	Can't recall exactly which storm it was, possibly no-name storm, but we lost power for about a week. Have not had much actual damage in our immediate neighborhood over the years, but have been affected by events occurring nearby.	3/29/2016 1:34 PM
631	Power outage	3/29/2016 1:30 PM
632	Nor Easter that caused loss of power, ultimately causing water pipes to freeze, sending 800,000 gallons of water through our home destroying it. Bigger issue is that Harwich Water Dept tried to screw us on the cost of water lost when they should have meters that know when seasonal homes are using crazy amounts of water. TOTALLY unacceptable in this day and age. Also, not one bit of sympathy, concern, or care to the fact that the water cost was nearly \$2000.	3/29/2016 1:30 PM
633	We have experienced trees down and power outages. Nothing major.	3/29/2016 1:29 PM
634	Lack of power	3/29/2016 1:22 PM
635	Downed trees, beach erosion	3/29/2016 1:19 PM
636	I only work for the Town of Harwich but have experienced several hurricanes/tropical storms during the busy seasons which required emergency action from staff	3/29/2016 1:17 PM
637	Power outages way too many times to count	3/29/2016 1:16 PM
638	I have experienced power outages during some bad storms, I live in East Harwich	3/29/2016 1:14 PM
639	No extreme impacts	3/29/2016 1:14 PM
640	Hurricane Bob and the no-name storm caused lots of downed trees in our neighborhood. Occasional power outages in storms.	3/29/2016 1:14 PM
641	power outage, poor plowing of roads	3/29/2016 1:13 PM
642	Power	3/29/2016 1:12 PM
643	seldom lose power on my street; no loss of trees	3/29/2016 1:06 PM
644	Downed Trees Power Loss	3/29/2016 1:02 PM
645	Electrical Power outages due to high wind are my greatest concern	3/29/2016 12:57 PM
646	Power failures	3/29/2016 12:56 PM
647	Loss of power and heat for 1 week winter of 2013	3/29/2016 12:51 PM
648	Tree down across road.	3/29/2016 12:50 PM
649	i encountered no particular problems, not even power outage	3/29/2016 12:47 PM

29 / 61

Public Survey for the Harwich Hazard Plan

650	The effects of Hurricane Bob in Harwich are pretty well known. We were on Snow Inn Road and were evacuated to the Cape Cod Tech. The power was out for days. We lost tress then and lose branches fairly often given the high winds near the shore. Honestly I'm worried as much these days about pollution in Wychmere Harbor and the hazards of high speed traffic, poor lighting, and horrible to nonexistent sidewalks between the Port and Saquatucket. It seems as if the daily hazards of life around Wychmere Harbor are not of much interest to the town except when it comes to making money from tourists and then all is forgotten.	3/27/2016 5:17 PM
651	lack of back up power at commercial entities during storms--BOB,, Irene, Blizzard of '05	3/24/2016 4:33 PM
652	Not much impact. Lost some stockade fence panels during Hurricane Bob along with a couple trees. Power outages have been minimal the last 20 years lasting for only a couple of hours at most. No flooding. Rt124 area.	3/23/2016 3:07 PM
653	power outages	3/20/2016 6:44 PM
654	I have only lived here for 8 months, so I have not experienced any disaters except for the occasional power outage.	3/14/2016 7:04 PM
655	We were without power for some time in parts of East Harwich. Since it was not winter we did not seek shelter. We did lose everything in our refrigerator and freezer.	3/14/2016 3:38 PM
656	I have only been through one major power outage while living here in Harwich over the past 17 years as the result of a nor'easter. The East Harwich power outage lasted 5 days as did the rest of town from my memory. It was not heating season for this longer outage but we lost our freezer full of food; had to cook out on the grill. Lots of downed trees around. No flooding close by: Route 137 at Exit 11 on Route 6.	3/14/2016 2:52 PM
657	Blizzard 2013 - downed large tree in our yard. Power failure was brief. We have tracked winds up to 73 miles per hour.	3/13/2016 8:58 AM
658	downed tree	3/11/2016 10:21 AM
659	loss of power in harwich center and hazardous road conditions while having to drive in snow	3/10/2016 12:09 PM
660	We have been living here for 4 yr. and have been visiting here for 10. Although we have been here during major weather events, they were more of an inconvenience than any real issue.	3/9/2016 3:47 PM
661	"Thundersnow" event in Dec. 2005 - no notice or warning from any officials. Multiple trees came down in Harwich Center parking lot and damaged cars. Several blizzards where there were several days without power in Harwich Center.	3/9/2016 3:30 PM
662	Cold and snow affect senior citizens and children the most. Driving around and seeing young students standing on snow banks or in the road is a concern when the roads are still icy and covered in snow - especially after the storm. Our crews do a good job of plowing and sanding but there needs to be space carved out for bus stops. Also the schools need to be more sensitive to closing schools earlier when the snow starts - not at 11:45 after the roads get icy.	3/9/2016 1:33 PM
663	no power	3/8/2016 12:53 PM
664	Extreme icing including coastal ice, tree damage from trees too close to buildings	3/8/2016 8:07 AM
665	Downed trees continue to be a big concern-so many dead trees due ti disease and infestations	3/6/2016 10:46 AM
666	Downed trees and power loss in December 2005 5 minute storm	3/4/2016 4:52 PM
667	Long power outage	3/4/2016 2:03 PM
668	none	3/4/2016 9:31 AM
669	downed trees from Winter Storm Juno	3/4/2016 8:36 AM
670	Without power for a wk. because of hurricane Bob	3/3/2016 9:45 PM
671	Tree damage. Lost roof shingles	3/3/2016 9:25 PM
672	Power outages especially during the winter	3/3/2016 8:18 PM
673	Hurricane Bob wasn't a big factor. 2015 snow impacted daily life for long past the actual storm. Interruption of cable, electric, not able to be plowed out for 3 days. Snow so high affected traveling for a month. Neighbors did help each other during wins storms etc in riding trees down and shoveling each other out of snow.	3/3/2016 7:58 PM
674	Power outages, tree damage, leaks	3/3/2016 6:26 PM

30 / 61

Public Survey for the Harwich Hazard Plan

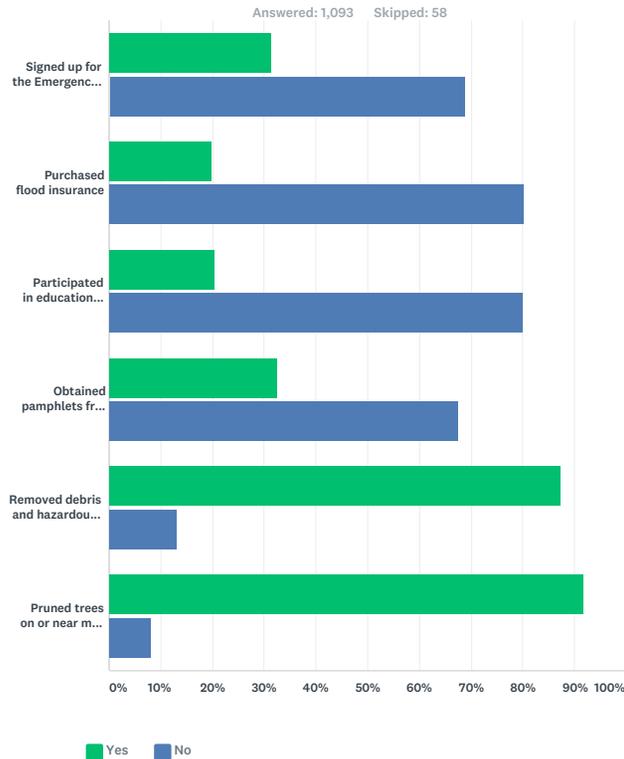
675	None - moved to town in 2015.	3/3/2016 6:00 PM
676	Hurricane Bob, loss of power for 6 days	3/3/2016 5:59 PM
677	Winter storm of 2014/15	3/3/2016 5:25 PM
678	Five days outage in hurricane Bob. Three days marooned in blizzard of 2015	3/3/2016 5:20 PM
679	loss of power, fallen trees	3/3/2016 5:06 PM
680	without power for 3 days from winter storm	3/3/2016 4:25 PM
681	Trees falling on house	3/3/2016 4:17 PM
682	Power outages for more than 3 days, road closure for more than 3 days due to snow depth.	3/3/2016 4:09 PM
683	Shoveling snow	3/3/2016 3:16 PM
684	We did not loose power on Noreast Dr, nor many downed trees	3/3/2016 3:05 PM
685	power outage	3/3/2016 2:58 PM
686	Power Loss	3/3/2016 2:52 PM
687	power outage after wind storm	3/3/2016 2:49 PM
688	Several years ago experience multiday power outage.	3/3/2016 2:31 PM
689	downed trees , moderate flooding, power outages, inadequate snow removal secondary roads, gilbert lane harwich	3/3/2016 2:31 PM
690	Power outages for 3 days during Nemo. Downed branches on our street. One landing on a neighbors vehicle. We are a dead end street and often don't get plowed til the end. I've been stuck in my driveway for days during that storm. Mark In.	3/3/2016 2:11 PM
691	Losing power for 3 or 4 days a year to 2 ago in a December "hurricane". Otherwise,we really haven't been impacted in the almost 20 years we have lived here.	3/3/2016 2:03 PM
692	Hurricane Carol and Bob. Family had home on the water in camp grounds	3/3/2016 1:43 PM
693	multiple downed trees	3/3/2016 1:20 PM
694	Power outage	3/3/2016 12:26 PM
695	Loss of power - Harwich Port	3/3/2016 12:10 PM
696	There was power outage in my neighborhood during the March blizzard in 2014. It was out for about 4 hours.	3/3/2016 11:52 AM
697	power lost	3/3/2016 11:40 AM
698	power outage that lasted for 5 days, power outages in general	3/3/2016 11:28 AM
699	During Winter Storm Juno I was at work as I manage an assisted living community and need to be on sight. I was there for 4 days - waiting to return once my street and driveway had been plowed. I have to say that I thought that Harwich did an phenomenal job with snow removal during that storm - much better than surrounding towns. Thank you.	3/3/2016 11:12 AM
700	hurricane bob we had no power for almost two weeks, with ability to get gas for car or take care of one self	3/3/2016 10:32 AM
701	We have had downed trees - but have not lost power	3/3/2016 10:25 AM
702	Approximately 3-4 years ago (the storm called Nemo in the winter) caused power outage) at our Harwich house. Your wonderful fire dept went to our home and, with our permission, broke one little window , to open the cellar door, to turn off the main water, as we are 3 hours away. They saved our house! Our house is on 7 Grist Mill Road. Had I not monitored the house temp, I would never have known and had your wonderful firemen not offered to help me, we would have had a disaster on our hands. So, thank you from the bottom of our hearts. We will return the favor someday.	3/3/2016 9:59 AM
703	After Hurricane Bob and the no name storm shortly after, we lost power for perhaps a day or two. It was not long in comparison to some parts of the Cape. There were a few trees (locusts) down in the neighborhood.	3/3/2016 9:46 AM
704	We let power for 4 days about 15 years ago. Parallel st.	3/3/2016 7:25 AM

Public Survey for the Harwich Hazard Plan

705	Power outage Hurricane Bob, downed trees likewise, particularly troublesome as had private well for water at that time.	3/3/2016 12:23 AM
706	Downed trees, power outages, food spoilage, inability to receive emergency information, downed power lines.	3/2/2016 10:50 PM
707	We are fortunate in our location near Elementary School, Police, Fire - even when power goes out (which is rare), it is back on within a couple hours max.	3/2/2016 9:36 PM
708	Lots of Snow, loss of power one year, but not an extreme concern	3/2/2016 6:43 PM
709	we lost power for a day and bought a generator afterwards	3/2/2016 3:19 PM
710	Loss of power for days at a time, when i lived on Lothrop Ave and Pleasant Street. Flooding on Bank Street beach is bad during any storm of significant rain fall. Downed trees and limbs are very common.	3/2/2016 11:22 AM
711	Only small power outage during one winter storm and one small power outage during a tropical storm in 7 years of living here.	3/2/2016 11:11 AM
712	Prolonged power outage after Hurricane Bob was inconvenient because of mild weather. This would be a true disaster in winter.	3/2/2016 10:27 AM
713	Power outage during hurricane's were the biggest impact on us.	3/2/2016 10:16 AM
714	Power outagesand large puddle of standing water in front of my home so deep that cars could not get through.	3/2/2016 10:02 AM
715	Water damage very significant due to pipe freeze tho house was at 60	3/2/2016 9:45 AM
716	The storm of 2005 one drop of 2feet of snow followed by another power outhouse was 44 degrees and I came home from major surgery with staples in my abdomen and couldn't get warm. Called EM Mgmt Dir who arranged for me to go to tech school for shelter this involved hwy dept to dig out doors out first as we were completely trapped with 6 foot drifts of snow at all exits of our house	3/2/2016 8:56 AM
717	Hurricane Bob caused down trees that damaged my property. Power outages of long duration during multiple storms.	3/2/2016 7:23 AM
718	Hurricane Bob used the Elementary and Middle schools for shelter, which worked well. But, people wanted to watch out the window. As they did things blew off the roof and smashed the widow to the hallway to the courtyard and some people, including an infant, were cut by the glass. Scary. I've also experienced trees coming down on houses with family inside. I remember boats in the parking lot and power outages a week long.	3/2/2016 7:10 AM
719	Power outages & downed trees in South Harwich.	3/2/2016 7:02 AM
720	Bob caused power outage for four days. one gas station in west Yarmouth had a generator and could pump gas. No other way to get gas.	3/2/2016 6:43 AM
721	power losssequattom rd. 6 days BOB storm	3/2/2016 6:00 AM
722	Hurricane Bob 3-4 days w/o power trees down in yard. Other major storms branches and trees down. Concerned with possible fire in Town Forest and Hawksnest. Permanent since 1991, first came in 1946.	3/2/2016 12:10 AM
723	Power outages was the main thing. Road clearance after a snowstorm would be next.	3/1/2016 10:54 PM
724	Hurricane Bob, major tree damage	3/1/2016 10:44 PM
725	power outages during tropical storm and blizzard, wind damage to chimney	3/1/2016 10:09 PM
726	Wind storms and hurricanes knocking out power for days at a time. Snow locking us in the house for days at a time. Wind knocks down trees, poles and power lines..and should be monitored better.	3/1/2016 9:42 PM
727	We are real esate for two Nantucket Sound houses. One has experienced severe erosion. Ou own houses at 91 and 95 Parallel St have experienced liss of electricity. One case was related to tree branches not beingtrimmed from power lines at Rec Building	3/1/2016 9:25 PM

Public Survey for the Harwich Hazard Plan

Q6 Which of the following actions have you taken to be more hazard resistant? Answer yes or no to the following activities:



	Yes	No	Total Respondents
Signed up for the Emergency Alert System hosted by the Harwich Water Department	31.30% 313	68.90% 689	1,000
Purchased flood insurance	19.79% 191	80.31% 775	965
Participated in educational activities and trainings about hazard and emergency preparedness	20.59% 196	80.15% 763	952
Obtained pamphlets from town buildings	32.54% 316	67.66% 657	971
Removed debris and hazardous materials from my property	87.38% 907	13.10% 136	1,038

Public Survey for the Harwich Hazard Plan

Pruned trees on or near my property	91.83% 978	8.26% 88	1,065
-------------------------------------	---------------	-------------	-------

#	Other (please specify)	Date
1	supply of working flashlights and candles and water	8/25/2016 10:26 PM
2	Purchased new stronger windows and storm doors.	5/8/2016 1:18 PM
3	Prepared myself and family for the event of a grid failure. It is my belief, based upon conversation with fire, police, other local officials that most people in this town are prepared for nothing. Given the demographics, possibility for failure (parts of Hartford were without power for 9 days with Sandy), the limited number of first responders, this place would be mess and people would be in for a serious amount of hurt. Too many have normalcy bias, think nothing bad is going to happen. You see these type of people every night on the News being rescued or removed (no longer living) from their homes or cars.	5/4/2016 9:09 AM
4	Installed backup generator	5/2/2016 5:43 PM
5	don't know..I do get alerts and have generator	4/28/2016 12:06 PM
6	Removed trees. Purchased snow blower.	4/18/2016 10:33 AM
7	Installed back up generator	4/5/2016 11:17 AM
8	cut trees that kept falling over the property line, breaking the fence and damaging the roof and porch windows	4/4/2016 8:28 PM
9	to assure health of the water we do not use lawn treatments or weed killers we are mindful of the need to keep the nitrate level down to protect our water source and to protect our shoreline	4/4/2016 12:23 PM
10	Installed whole house backup generator	4/2/2016 2:52 PM
11	Not certain about the Emergency Alert System from HWD.	4/1/2016 12:21 PM
12	taken down large pine trees that posed an impact if strong winds prevailed.	4/1/2016 12:20 PM
13	We are on a hill and not near a body of water, the flooding that occurs is because the corner behind my house is a low lying area. I don't think our house would ever flood. We do however evaluate our property every year and try to keep up with the necessary maintenance.	4/1/2016 9:00 AM
14	Installed hurricane Windows and had an energy audit performed on my house which resulted in increased insulation and ventilation.	4/1/2016 8:45 AM
15	Keep potassium iodine with general emergency kit (flashlights, candles, water etc)	4/1/2016 6:30 AM
16	Read materials on the topic	3/31/2016 8:53 PM
17	wE LIVE IN cONDO.	3/31/2016 8:07 PM
18	Bought a generator	3/31/2016 5:11 PM
19	Use of hurricane clips on roof.	3/31/2016 4:42 PM
20	Purchased a generator and chain saw	3/31/2016 1:43 PM
21	Installed generator.	3/31/2016 12:58 PM
22	Can't prune trees even if needed because of conservation.	3/31/2016 9:02 AM
23	Always aware of weather forecast	3/31/2016 3:15 AM
24	i use a RO system and save the waste water to flush toilets and water house plants wit while drinking the clean ppm free water 2-3 gal a day due to no more large intestine from crohn's and colitis.	3/30/2016 8:46 PM
25	As mentioned previously, we purchase a generator.	3/30/2016 6:21 PM
26	N/A	3/30/2016 5:50 PM
27	The town should plow all roads. Emergency action at a stand still with deep unplowed snow	3/30/2016 5:49 PM
28	Requested pruning effecting power and phone lines	3/30/2016 5:16 PM
29	Back-up generator.	3/30/2016 4:24 PM

Public Survey for the Harwich Hazard Plan

30	Listened to weather alerts and acted to adequately be prepared	3/30/2016 2:52 PM
31	Looking at adding a generator - wish I could get my heating system on natural gas rather than oil. I dislike propane.	3/30/2016 2:49 PM
32	O	3/30/2016 2:43 PM
33	Checked to make sure I'm not in a coastal flood zone.	3/30/2016 2:22 PM
34	Put in new water line	3/30/2016 1:28 PM
35	purchased a generator	3/30/2016 12:19 PM
36	Maintain an emergency generator. Added erosion protection to my shoreline. Added security system alerts for fire, security and utility outage/water protection. Get weather alerts from others on the cape.	3/30/2016 10:33 AM
37	Have flood compliant basement.	3/30/2016 9:45 AM
38	I'd like to sign up for the Emergency Alert System. I have no house phone, so will provide my cellphone.	3/30/2016 9:35 AM
39	Purchased a generator after Hurricane Bob. Keep a cache of foodstuffs and medical supplies when expecting big storms. I have dead trees and branches removed at least every 2 years.	3/30/2016 9:20 AM
40	We try to reduce our carbon foot print to help slow down climate change. This will help with sea level rise and coastal erosion.	3/30/2016 9:06 AM
41	As noted in #5 we had to remove excessive snow from the roof for the first time in 2015.	3/30/2016 8:50 AM
42	Hired house watchers	3/30/2016 8:10 AM
43	Generator	3/30/2016 7:00 AM
44	Installed whole-house natural gas generator.	3/30/2016 5:14 AM
45	Stock piled food/ water, generator, 4x4 vehicles, security cameras and alarm system, ect.	3/30/2016 1:27 AM
46	Changed the drainpipes to draw the water away from the house.	3/29/2016 11:39 PM
47	Not prepared	3/29/2016 10:45 PM
48	Bought a generator and installed a wood stove	3/29/2016 10:07 PM
49	prepped around the outside of my home for water damage.	3/29/2016 9:54 PM
50	natural gas generator	3/29/2016 9:50 PM
51	Re-designed drainage system and installed ceramic tile.	3/29/2016 9:46 PM
52	Hand crank flashlights; fill bathtubs with water; gas tank for grill stored in cinder block container away from house.use grill after storm for outdoor cooking when no electricity; remove deck furnishings during storm and during winter; considered purchasing 1/2" plywood to make covers for windows.	3/29/2016 9:34 PM
53	Bring iodine tablets to the cape.	3/29/2016 9:27 PM
54	We have taken down sick trees, from both beetles and winter moths on our property.	3/29/2016 9:02 PM
55	Emergency materials in home	3/29/2016 8:57 PM
56	I have boards to put on the picture windows facing the ocean for possible hurican/wind damage	3/29/2016 8:42 PM
57	Made sure we were out of a flood zone when we recently moved from North to West Harwich and on to a lot with few overgrown trees.	3/29/2016 8:40 PM
58	Snowed in with loss of power heat or street not plowed out for 4 days. Could not get out of house 3 means of egress. lightning strikes on poles and transformers. Need I say more.	3/29/2016 8:35 PM
59	Always have plenty of batteries, candles, flashlights, water non perishable food, fuel the cars, secure outdoor furniture and garden art.	3/29/2016 8:27 PM
60	Replaced all my cold/storm damaged Windows	3/29/2016 8:23 PM
61	Increased the size and strength of our seawall.	3/29/2016 8:06 PM
62	We were unaware that the Town of Harwich had a water emergency alert system. What is that?	3/29/2016 7:44 PM

Public Survey for the Harwich Hazard Plan

63	Due to the lack of interest from the Town of Harwich, the erosion from cars and people continue to do great harm to the Herring River and the Wixon dock. Harbor Way has an enormous problem with cars and people causing great harm to the land and the erosion is becoming a bigger problem every year.	3/29/2016 7:38 PM
64	Removed nearly 10 trees.	3/29/2016 7:28 PM
65	As I already stated, I bought a gas stove to heat the house, so that when the electric is out, the warmth will allow me to continue to live in my home.	3/29/2016 7:12 PM
66	backup generator	3/29/2016 7:10 PM
67	Had catch basin put in	3/29/2016 7:01 PM
68	cut down trees close to thr house	3/29/2016 6:26 PM
69	Current CPR and defibrillator. Past advanced first aid, first responder, life guard	3/29/2016 6:04 PM
70	installed generator	3/29/2016 5:55 PM
71	got a generator	3/29/2016 5:54 PM
72	Renovated my basement using close cell foam insulation to make the siding more impervious to water/flooding. We also used PVC beadboard and moved all electrical wiring above the high water mark in the basement.	3/29/2016 5:48 PM
73	alternate heating and lighting source, bottled water	3/29/2016 5:44 PM
74	I read about emergency preparedness and am forward thinking about that subject. I have ways to store water, and have other supplies.	3/29/2016 5:37 PM
75	We took down pine trees near the house.	3/29/2016 5:22 PM
76	Not sure if signed up with Water Dept. for Emerg. Alert	3/29/2016 5:20 PM
77	When a storm threatens, you board up windows, and bring all the lawn stuff indoors. Have food, water, candles, wood for woodstove, all common sense, survival tactics.	3/29/2016 5:08 PM
78	Gas battery and water preparations as elk as flashlights and weather radio	3/29/2016 5:00 PM
79	Purchased generator and directly hooked it to house.	3/29/2016 4:59 PM
80	Have stocked emergency supplies. such as oil lamps, battery powered lamps & spotlights, non-perishable foods for humans and pets,cell phones with battery chargers, potable water, etc	3/29/2016 4:56 PM
81	none	3/29/2016 4:55 PM
82	Made plywood storm covers for my windows	3/29/2016 4:51 PM
83	installed generator	3/29/2016 4:51 PM
84	changed the topography so water runs off property more easily.	3/29/2016 4:11 PM
85	bought a generator	3/29/2016 4:10 PM
86	installed an automatic generator	3/29/2016 4:05 PM
87	I'm not here mostly winters but this could change I miss Harwich for now, I have someone watch the house. Peter died in 2009.	3/29/2016 4:04 PM
88	I am more worried about the nuclear reactor than any of the weather events. I picked up the potassium iodide pills. The directions to live in the basement are extreme. Do we have boats to evac people from Chatham, plume allowing?	3/29/2016 3:56 PM
89	Call Nstar to trim trees, they did not	3/29/2016 3:50 PM
90	Took down dead or dying trees on property	3/29/2016 3:48 PM
91	Tree removal near house	3/29/2016 3:46 PM
92	Backup gas generator	3/29/2016 3:45 PM
93	Installed backup gas fireplace.	3/29/2016 3:44 PM
94	We have an emergency generator and sump pumps in the basement. We store any objects that could become windborne in a storm.	3/29/2016 3:39 PM

Public Survey for the Harwich Hazard Plan

95	have kit at home and in cars.	3/29/2016 3:39 PM
96	Only federal flood insurance is available since the revamped 100 year flood maps Leaving us basically self insured	3/29/2016 3:38 PM
97	Solar Power	3/29/2016 3:33 PM
98	Periodically clean out two coach basins in front of my property. They clog frequently and water can back up.	3/29/2016 3:29 PM
99	Bought generator ...but it doesn't work	3/29/2016 3:29 PM
100	wind resistant roof shingles up to approx. 110mph..took some trees down near house area in case of heavy snow snapping them or high wind in a hurricane/nor'easter. staked trees in yard. battery for flashlight.	3/29/2016 3:28 PM
101	Installed a 10,000 watt generator. Took down many trees.	3/29/2016 3:27 PM
102	KI pills from town in case of Pilgrim disaster	3/29/2016 3:25 PM
103	Keep a propane camp stove and fuel; also flashlights and lanterns. Installed a wood-burning fireplace insert.	3/29/2016 3:16 PM
104	left town for the worst 6 months... NB emergency alleys cannot work with out electricity...nor can it be effective without 100% cell coverage	3/29/2016 3:15 PM
105	During winter storms I've called the highway department to report that my road (bonnie Lane, a private dirt road) is blocked by a snow bank created by town plows plowing town roads (Julien). This is exasperated by the fact that the town no longer plows Glenna Lane due to property owners not meeting tree branch height limits etc. Something I have no control over.	3/29/2016 3:14 PM
106	Have wired home for a generator.	3/29/2016 3:13 PM
107	I had 3 large/looming trees removed. They are to close to the house.	3/29/2016 3:09 PM
108	I have concerns about our water supply and keeping it from chemical contamination as out in West. WE stopped a neighbor once from adding chemical to pond to kill weeds.	3/29/2016 3:04 PM
109	standby generator	3/29/2016 3:02 PM
110	Installed a generator	3/29/2016 3:01 PM
111	Alarm system, water dept ins for pipe to house	3/29/2016 2:51 PM
112	recently had several dead trees taken down	3/29/2016 2:48 PM
113	Connected to town water.	3/29/2016 2:44 PM
114	cut plywood for over the windows	3/29/2016 2:41 PM
115	I am not certain if I have signed up for the Emergency Alert System hosted by the Harwich Water Department. How do I do that?	3/29/2016 2:27 PM
116	Have battery backup on phone	3/29/2016 2:25 PM
117	Put Emergency Power generator	3/29/2016 2:19 PM
118	Whe the flood water freezes we have called the town	3/29/2016 2:13 PM
119	Created a family emergency plan, packed "bug-out" emergency bags.	3/29/2016 2:11 PM
120	purchased and maintain whole house generator (natural gas)	3/29/2016 1:56 PM
121	replaced roof; added solar collectors and generator to become more energy-independent; cut down trees around house.	3/29/2016 1:54 PM
122	Installed permanent generator.	3/29/2016 1:52 PM
123	Keep homes maintained and stocked for storms.	3/29/2016 1:48 PM
124	Kept the town notified about plugged storm drain	3/29/2016 1:46 PM
125	Purchased a generator	3/29/2016 1:42 PM
126	Have a 'storm kit' with flashlights and battery operated radio.	3/29/2016 1:40 PM

37 / 61

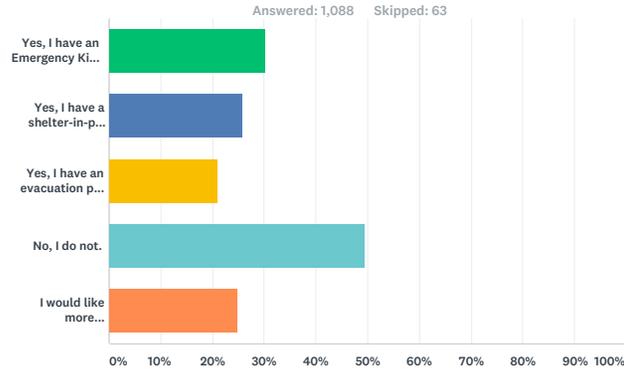
Public Survey for the Harwich Hazard Plan

127	Reviewed the current plan and contacted the emergency planner with no response. Plan style is useless and unusable. Other writing methods would make the plan a useable document, not a plan that just checks boxes for FEMA funding. Thanks, Terry Bauer	3/29/2016 1:36 PM
128	nothing, the Water Dept and the town need to change, not the inhabitants	3/29/2016 1:31 PM
129	Signed up with Gas and Electric company alerts	3/29/2016 1:31 PM
130	Put in generators at home and office that turn on after 15 seconds of lost power.	3/29/2016 1:28 PM
131	safety committee at CBI	3/29/2016 1:14 PM
132	Installed an automatic natural gas powered generator.	3/29/2016 12:52 PM
133	i have a gas heating stove that does not depend on electricity to run.	3/29/2016 12:48 PM
134	We'll be renovating with durability and environmental sustainability in mind.	3/27/2016 5:18 PM
135	I have installed a generator. I have gotten KI pills from the town hall. I need to have some trees pruned.	3/14/2016 7:06 PM
136	Purchased a natural gas generator	3/14/2016 6:39 PM
137	My husband has training from a career in Emergency Management from the State of CT.	3/14/2016 2:55 PM
138	We are not on Harwich water system. We have a well. We stockpile water before major storms.	3/13/2016 9:03 AM
139	Installed emergency Generator	3/3/2016 6:01 PM
140	Installed standby generator	3/3/2016 5:09 PM
141	got a generator and had the house wired so the 5 most important circuits are powered.	3/3/2016 4:10 PM
142	Installed a generator!	3/3/2016 2:46 PM
143	had gutters cleaned and repaired, pruned all trees near house	3/3/2016 11:29 AM
144	Graded to prevent erosion. Took down large trees near the house.	3/2/2016 10:58 PM
145	emergency supplies in the home	3/2/2016 6:44 PM
146	got a generator	3/2/2016 3:19 PM
147	purchased generator	3/2/2016 10:28 AM
148	Picked up a small generator	3/2/2016 10:17 AM
149	Had a pipe rerouted to be more protected.	3/2/2016 9:49 AM
150	Got on the call me emergency list to go to a local nursing facility of shelters are open and power is out	3/2/2016 8:57 AM
151	bought a generator	3/2/2016 6:02 AM
152	I have had my power lines placed underground at a cost of \$8,000.	3/1/2016 9:27 PM

38 / 61

Public Survey for the Harwich Hazard Plan

Q7 Do you have an emergency plan for yourself and/or household? Check all that apply.



Answer Choices	Responses
Yes, I have an Emergency Kit that I keep in my car or home.	30.33% 330
Yes, I have a shelter-in-place plan for myself and/or family	25.92% 282
Yes, I have an evacuation plan for myself and/or family	21.05% 229
No, I do not.	49.54% 539
I would like more information about these emergency plans.	24.91% 271
Total Respondents: 1,088	

#	Other (please specify)	Date
1	I would like to see more interest in checking properties with old cars, and junk. These items cause soil problems & fire hazards.	4/26/2016 12:11 PM
2	We have tons of supplies and equipment that we can use in an emergency. We simply didn't buy them for that reason initially.	4/22/2016 9:10 AM
3	The one snowstorm where I was alone and we were without power, I was very concerned about my ability to get to a shelter, because no one could travel including the shuttles that were to be available to transport residents without heat and power. There was no way to get to a motel. The heat and electricity did come back on during the night.	4/7/2016 9:27 AM
4	Evacuating the Cape by car would be almost impossible due to the extremely limited routes available for a very large population	4/4/2016 12:23 PM
5	We are summer residents	4/1/2016 7:59 PM
6	I am on question #7, and I already sense a bias in this survey for more government action. People are resilient and have lived on the Cape for 400 years and have adapted and survived on their own with limited governmental assistance.	4/1/2016 12:21 PM
7	I just sold this property	3/31/2016 5:05 PM
8	Evacuation planning is nearly impossible on Cape Cod...unless you leave a week in advance.....need another bridge or exit point to the mainland...	3/31/2016 3:19 PM

Public Survey for the Harwich Hazard Plan

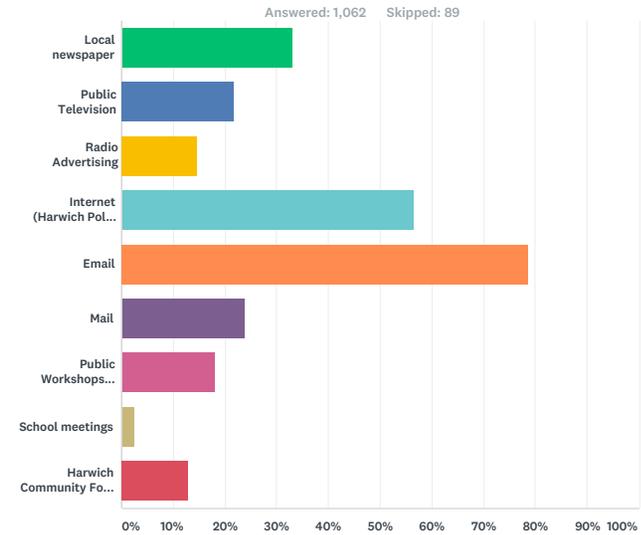
9	I have wood for heat , water to drink , food canned goods, dry stores , first aid	3/31/2016 7:58 AM
10	We do have a basement for major hurricane and tornado problems but it is not heated. We have major battery storm lights, some food items and drinking water all stored in the basement. We do not have blankets and other items which would be useful in case of a major power outage.	3/30/2016 6:21 PM
11	Need plan for our family if the Pilgrim Nuclear plant has a problem with the spent fuel rods over the next few years leading up to the shut down and years after relative to removal of these rods!!	3/30/2016 5:50 PM
12	Generator that runs on natural gas tied in to the gas intake from outside the house. This comes on automatically when the electricity comes on. Our house has never experience flooding and I am not concerned about this for now.	3/30/2016 10:41 AM
13	I have a wood stove to stay self sufficient during power outages in the winter	3/30/2016 10:16 AM
14	I would like more information about pet-friendly shelters.	3/30/2016 9:20 AM
15	If possible, plan to leave Cape if enough warning of possible problems.	3/30/2016 8:49 AM
16	I worry about my dogs during an emergency evacuation/shelter times	3/30/2016 7:36 AM
17	I have an alternate, off Cape, location to which I can drive, assuming driving is possible.	3/30/2016 5:56 AM
18	have the nuclear power station as part of an evacuation plan, plank over the tracks on the RR bridge as another means of egress., get the army corps of engineers involved to accelerate the process.	3/29/2016 11:07 PM
19	nothing will help residents if the nuclear power plant in plymouth blows up.	3/29/2016 10:37 PM
20	New home owner under 2 years. Please share this info.	3/29/2016 9:39 PM
21	Evacuation plan would depend on intensity of the event. There would be a lot of chaos at the bridges. Would there be tow trucks available to remove broken down cars on routes 28, 6 and 6A? Would there be helicopters monitoring the evacuation routes to keep traffic flowing? Would there be increased police presence in evacuated neighborhoods?	3/29/2016 9:34 PM
22	Shut down Pilgrim Nuclear power plant	3/29/2016 9:04 PM
23	We always have flash lights, fire wood, water and non-perishable food on hand in case of power outages.	3/29/2016 9:02 PM
24	Purchased a generator	3/29/2016 8:44 PM
25	Need a new plan for the new (old) house.	3/29/2016 8:40 PM
26	Yes these plans if there are any that I'm not knowledge about. Plans about getting off cape in an emergency. If the power plant explodes etc. we are sitting ducks.	3/29/2016 8:35 PM
27	??what about Pilgrim Nuclear Power Plant??	3/29/2016 8:18 PM
28	Common sense will hopefully prevail. We will heed warnings and evacuate when advised.	3/29/2016 8:06 PM
29	(Harwich is where we go to escape 12 day power outages in Connecticut!!)	3/29/2016 8:05 PM
30	As ours is a vacation home, we leave before things get too bad.	3/29/2016 7:57 PM
31	Evacation plan	3/29/2016 7:48 PM
32	My house is not in a flood zone, so I have a finished basement in case the roof or windows upstairs has damage and the upstairs is unusable. I have cabinets in the basement stocked with water and canned goods, linens and blankets.	3/29/2016 7:12 PM
33	or move to shelter at the Tech School.	3/29/2016 7:10 PM
34	I have a generator	3/29/2016 6:56 PM
35	Depends on the emergency, wether to shelter in place or attempt to get over the bridge.	3/29/2016 6:37 PM
36	Investigated the town emergency shelter plans and am glad dogs can be brought to the tech school.	3/29/2016 6:37 PM
37	we are stuck here, bridges won't be passable	3/29/2016 6:26 PM
38	State-of-the-arts fire, smoke and carbon monoxide detectors.	3/29/2016 6:12 PM
39	My current house is a second home.	3/29/2016 5:15 PM

Public Survey for the Harwich Hazard Plan

40	I tried to sign up for the "Emergency Alert System" on the Harwich Water Dept but could find nothing by that name. Please advise.	3/29/2016 5:08 PM
41	I have most of the above for my home in the Bahamas which has greater exposure and risk than the Cape	3/29/2016 4:48 PM
42	Chances are that I would not be on the Cape during a hurricane or significant winter storm	3/29/2016 4:29 PM
43	Myain concern is for my wonderful Newfoundland Dog.	3/29/2016 4:04 PM
44	Very concerned that if there were a disaster of any type they is no safe way to get off the Cape. Grid locked highways won't work.	3/29/2016 3:59 PM
45	Have gas grill if power goes out. Have extra water in gallon jugs. First aid kits, cordless radios	3/29/2016 3:46 PM
46	Kids have moved out. Only 2 of us so the evacuation plan is to just get the heck out if we have to.	3/29/2016 3:27 PM
47	leaving my home and trying to get off of the Cape with the number of people and lack of traffic lanes would be crazy. there is no way evacuation by car is possible or even safe here	3/29/2016 3:25 PM
48	I am single, I worry about my pets being safe.	3/29/2016 3:21 PM
49	where do you evacuate to! How about some realistic thoughts...I have been her thru hurricane Carol...Bob was nothing...we have no realistic plan for evacuation and you know it!	3/29/2016 3:15 PM
50	I have a contractor on call if the town leaves a snow bank at the end of Bonnie Lane or at the end of Glenna.	3/29/2016 3:14 PM
51	Are emergency prep kits and info available at the Harwich Chamber of Commerce?	3/29/2016 3:09 PM
52	we are only summer residents, so winter storms don't directly threaten us, only our home.	3/29/2016 3:05 PM
53	In addition to "natural disasters", I have a concern about the Pilgrim Nuclear Power Plant and whether there will ever be any reasonable, sensible, realistic "evacuation" plan .	3/29/2016 1:00 PM
54	I also have bugout bags for my dog and cat thanks to info from Cape Cod DART. More info should be provided for going to shelters with pets. Many don't know they need rabies certificates.	3/23/2016 3:12 PM
55	I have discussed this with my wife, but we need to formalize it.	3/14/2016 7:06 PM
56	Thought about it but done nithing. Would like more information how to build things safer if adding or building. Would like more info on what to do if Pilgrim has a problem. Would like lots of safety info..maybe channel 18 over and over.	3/2/2016 9:49 AM
57	generator gas	3/2/2016 6:02 AM
58	Plans and emergency equipment need overhaul and upgrade.	3/2/2016 12:13 AM
59	No, we do not know how we are 'supposed' to leave the Cape...but we have our own plans.	3/1/2016 9:44 PM

Public Survey for the Harwich Hazard Plan

Q8 What is the most effective way to engage you in hazard planning and emergency preparedness activities? You can select more than 1 answer.



Answer Choices	Responses
Local newspaper	33.05% 351
Public Television	21.85% 232
Radio Advertising	14.69% 156
Internet (Harwich Police and Fire Department Facebook page and Town website)	56.50% 600
Email	78.63% 835
Mail	23.82% 253
Public Workshops and/or meetings	17.98% 191
School meetings	2.45% 26
Harwich Community Forum meetings	12.90% 137
Total Respondents: 1,062	

#	Other (please specify)	Date
1	text alerts from police and fire departments.	5/8/2016 1:19 PM
2	Senior Center Newsletter	4/28/2016 12:10 PM

Public Survey for the Harwich Hazard Plan

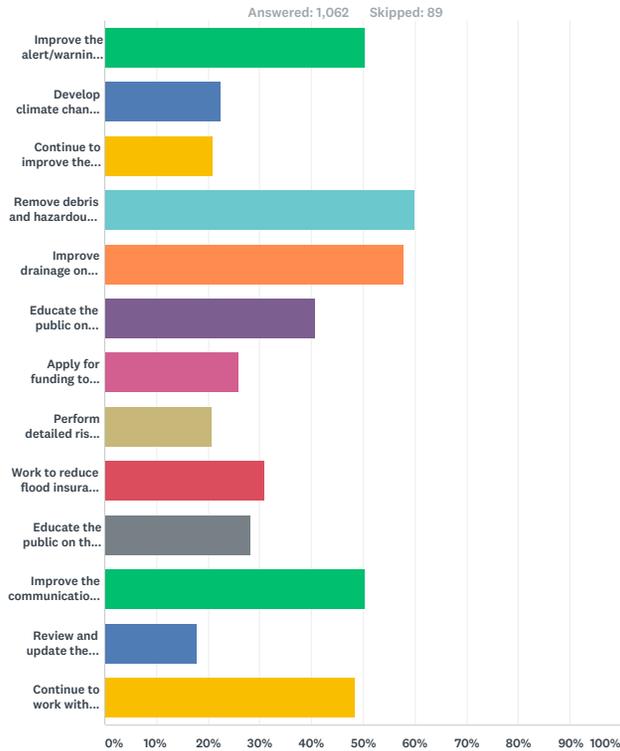
3	Ham Radio	4/21/2016 2:14 PM
4	Reverse 911 calls	4/6/2016 3:35 PM
5	cell phone message	4/5/2016 8:46 PM
6	Text messaging	4/4/2016 12:11 PM
7	We live most of the time off-Cape so email or mail is best to reach us...we don't monitor local press and PR from Harwich much.	4/3/2016 9:08 AM
8	Phone alerts	4/2/2016 10:27 AM
9	Summer residents	4/1/2016 8:01 PM
10	Simple way to reach out, effective, and frankly, the cheapest.	4/1/2016 12:22 PM
11	reverse 911 call	4/1/2016 1:47 AM
12	Twitter	3/31/2016 8:31 AM
13	Seems to me the Fire Dept. should have ongoing chats on emergency planning. I do not know if they have indoor facilities for lectures but that could be done presumably at the Community Center.	3/30/2016 6:24 PM
14	N/A	3/30/2016 5:54 PM
15	Texting	3/30/2016 5:51 PM
16	I have greatly appreciated warning robo-calls from the Town of Harwich	3/30/2016 2:56 PM
17	text messaging	3/30/2016 12:20 PM
18	I live in New York and my sister who now owns the house lives in New Jersey. Otherwise I would have said that public workshops and meetings are the best way to be informed.	3/30/2016 10:44 AM
19	Text messaging	3/30/2016 10:08 AM
20	Town of Harwich website	3/30/2016 9:08 AM
21	At COA events, pass out pertinent info when it becomes available.	3/29/2016 11:14 PM
22	Phone calls are always effective.	3/29/2016 10:13 PM
23	Provide low cost emergency kits. Provide low cost tree evaluation and pruning (Somone would make a decent profit on volume trimming. Provide low cost plywood (to be stored in basement or garage and cut to cover windows, doors, etc; and a method for one person to install that wood using a ladder.	3/29/2016 9:51 PM
24	Frankly I'm more concerned with the historic commission waiting when there isn't neighborhood attendance to make our area a historic zone against the will of the owners. That's the biggest natural hazard I see.	3/29/2016 9:31 PM
25	Emergency alerts	3/29/2016 8:59 PM
26	Phone alert messages	3/29/2016 8:44 PM
27	Text	3/29/2016 8:26 PM
28	Text	3/29/2016 7:29 PM
29	Cell texts help alot	3/29/2016 7:24 PM
30	COA programs that keep me informed	3/29/2016 6:52 PM
31	Through local fire departments	3/29/2016 6:42 PM
32	weather on the internet as long as it lasts. I anticipate no assistance from anyone, we are mostly on our own	3/29/2016 6:29 PM
33	Again, you folks are keeping people aware through all of the elements defined above. A+	3/29/2016 6:22 PM
34	Text messages	3/29/2016 6:10 PM
35	text messaging	3/29/2016 5:56 PM
36	Definitely need to get everyones attention. thank you.	3/29/2016 5:39 PM

Public Survey for the Harwich Hazard Plan

37	How can I sign up for the alert/warning/notification system?	3/29/2016 5:29 PM
38	Just need to know when the emergency is approaching/imminent. All the stuff is there and ready.	3/29/2016 5:12 PM
39	Live on the Cape each year from mid May to Mid Oct	3/29/2016 4:59 PM
40	Certified Cape emergency	3/29/2016 4:41 PM
41	Harwich Conservation Trust Winter Lecture Series? Or Brooks Library Presentation?	3/29/2016 4:39 PM
42	Red Cross	3/29/2016 3:51 PM
43	any and all of the above	3/29/2016 3:42 PM
44	internet weather services not facebook mentioned above	3/29/2016 3:27 PM
45	ALL REQUIRE ELECTRICITY AND/OR CELL TOWERS THAT LET YOU STAY HOME TO MAKE A CALL...I AM TIRED OF WALKING UP THE STREET TO A "SPOT" WHERE YOU HAVE SPORADIC COVERAGE... EDUCATION AND PREPAREDNESS ARE YOUR ONLY WORKABLE IDEA...LOOK AT YOUR LIST...ALL ELEC. DEPENDANT	3/29/2016 3:20 PM
46	texting alerts via cellphone	3/29/2016 3:17 PM
47	You could link the Harwich PD & FD internet pages to the email.	3/29/2016 3:11 PM
48	Text	3/29/2016 3:02 PM
49	We Live Off Cape	3/29/2016 2:49 PM
50	Text too. I'm not on Facebook, so don't think I have that option. I can't return to previous page so will add this in here: Our home is 9/10 mile inland off Pleasant Bay. While the surrounding terrain is elevated from sea level, our home is down in a "bowl" so that's where my landslide concerns come from. With sandy soil & copious amounts of rain/water, it could potentially be a bad thing. Hopefully it won't be an issue..... :-/	3/29/2016 2:26 PM
51	Video with what to do. Maybe a checklist at the end of the video and who to contact in case of an emergency and where to go. How someone in Harwich would know if weather conditions got dangerous and what to do next.	3/29/2016 2:15 PM
52	We are going to engage in the Facebook page for the Police and Fire department. I have heard from friends that those departments work well with issuing alerts when something happens. Case in point is the recent power outage in South Yarmouth due to the traffic accident.	3/29/2016 2:09 PM
53	Text messaging	3/29/2016 1:48 PM
54	Education, education, education.....	3/29/2016 1:37 PM
55	should be able to text people!!!	3/29/2016 1:33 PM
56	text message	3/29/2016 1:18 PM
57	text to my phone	3/29/2016 12:49 PM
58	The most effective way to engage would depend on the action needed and the level of priority. Each person has their own 'best' way to hear the importance of doing something.	3/14/2016 3:09 PM
59	My husband has FEMA certifications.	3/13/2016 9:10 AM
60	info and displays at Brooks Library and better info - easier to find- on town website - not everyone uses facebook	3/10/2016 12:13 PM
61	Library has section with emergency preparedness brochures.	3/9/2016 3:35 PM
62	Find some way to reach out to senior citizens who do not get the paper or email - they need help when it is cold or shoveling the snow properly.	3/9/2016 1:36 PM
63	Channel 18 I watch once in awhile if it was replayed a lot I would try to see it.	3/2/2016 9:53 AM
64	text message	3/1/2016 10:45 PM

Public Survey for the Harwich Hazard Plan

Q9 What steps can your local government take to reduce risk from natural hazards and protect the buildings and people of Harwich? Please select more than 1 answer.



Answer Choices	Responses
Improve the alert/warning/notification system	50.28% 534
Develop climate change adaptation plans and implement them	22.41% 238
Continue to improve the regional shelter	21.00% 223
Remove debris and hazardous materials as well as prune trees on town property	59.79% 635
Improve drainage on area roads	57.82% 614
Educate the public on evacuation methods	40.58% 431

Public Survey for the Harwich Hazard Plan

Apply for funding to reduce Harwich's risk to natural hazards	25.89%	275
Perform detailed risk assessments	20.81%	221
Work to reduce flood insurance for residents through the Community Rating System	30.98%	329
Educate the public on the science of natural hazards and emergency preparedness	28.15%	299
Improve the communication system during hazard events (i.e. radio towers, cellular services)	50.28%	534
Review and update the Harwich Zoning Bylaws as they relate to flooding	17.70%	188
Continue to work with Regional partners to prepare for and recover from natural disasters	48.31%	513
Total Respondents: 1,062		

#	Other (please specify)	Date
1	You need to educate and thoroughly convince people they are at risk.	5/4/2016 9:10 AM
2	Be honest..How would you ever evacuate the Cape in an emergency..you can't handle 4th of July	4/28/2016 12:10 PM
3	Seems it is not on your radar, but one hazard that concerns me is a possible meltdown/terrorist attack at the Pilgrim Nuclear Facility in Plymouth.	4/21/2016 7:48 AM
4	Because I have a Dennis number, I get calls from the Dennis police regarding emergencies.	4/19/2016 2:09 PM
5	I have seen a new type of beach erosion barrier that is used on some NY and NJ beaches ... large Compacted bails of decomposed leaves. They have had impressive results. Also, we live off of Long Pond and residents need to be made more aware of the environmental impact of lawn chemicals, herbicides and insecticides on the health and water quality of the lake! There has been a tremendous growth of the algae bloom in the summer over the years.	4/13/2016 4:48 PM
6	They all seem quite relevant.	4/9/2016 1:42 PM
7	don't just apply for funding or enter into programs because they are available. Determine as cost efficiently as possible if it is really needed for the town.	4/6/2016 9:38 AM
8	they are all good	4/4/2016 12:24 PM
9	Find a solution for the fact that evacuation from the Cape is limited by two bridges. Given the traffic jams during non-emergency travel during the summer, an emergency evacuation does not stand a chance!	4/3/2016 3:49 PM
10	:) I was right as of two questions ago.	4/1/2016 12:22 PM
11	Continue to alert / warn / notify and communicate during hazard events. I do not feel like this needs improvement but rather a continuation	3/31/2016 4:44 PM
12	Develop a beach erosion control plan like Brewster and other towns. Stop making private beach owners pay for sand replenishment that is necessary due to jette caused erosion. SEE Sandwich and the admission by the Army Corps that jetties cause beach erosion.	3/30/2016 8:22 PM
13	Continue scheduled maintenance	3/30/2016 6:03 PM
14	N/A	3/30/2016 5:54 PM
15	Plow snow	3/30/2016 5:51 PM
16	All the above are important and valuable. I chose a few that I consider the most important for our house.	3/30/2016 10:44 AM
17	Work to reduce regular home insurance.	3/30/2016 9:10 AM
18	Continue converting to underground utilities whenever possible.	3/30/2016 8:07 AM
19	Please continue all of the above.	3/30/2016 12:02 AM
20	Compile a list of those residents most at risk during a major weather event or other widespread emergency. Such a list would include the elderly, the infirm, those living alone and/or in remote locations. During an emergency/disaster have some way of checking on those residents.	3/29/2016 10:13 PM

Public Survey for the Harwich Hazard Plan

21	Need to address before and after the event the specific needs of residents to the best of your ability. Buses to bring residents to shelters who will or can not evacuate; do a survey to get approximate numbers Will shelters have generators, food, water, bedding and sanitary facilities? Emergency crews committed and ready to go to repair electric wires and remove downed trees. Gouging of residents by repair contractors will not be tolerated.	3/29/2016 9:51 PM
22	Devise a plan for evacuation from the Cape for all residents. Currently there is nothing. By water may be the only real option. Certainly, not by road!	3/29/2016 9:50 PM
23	I don't see how Harwich could really evacuate in any safe manner. My family plans to shelter in place unless there is some huge threat, in which case we would go to family further inland, off Cape.	3/29/2016 9:04 PM
24	Sorry for selecting all but they all sound like good ideas.	3/29/2016 8:45 PM
25	Flood insurance is too high and that is why I do not have it. And, there are very limited carriers for the cape/harwichport flood zone.	3/29/2016 8:44 PM
26	The elderly are really stuck there in the event of a large/major disaster. I/we have left the cape because of those things and others.	3/29/2016 8:39 PM
27	Shut down Pilgrim Nuclear Power Plant Invest in Wind Power! - - Get Cape Wind back on line.	3/29/2016 8:19 PM
28	improve power system	3/29/2016 8:15 PM
29	Planning and zoning are critical. Consider partnering with Massachusetts Dept of Insurance on disaster preparedness, flood prevention and home building methodologies to mitigate risk.	3/29/2016 8:10 PM
30	There is absolutely nothing government can do to eliminate the risk of naturally 'hazards'.	3/29/2016 7:28 PM
31	When it rains really hard the end of Pasture Lane floods right up onto my front lawn and up my driveway.	3/29/2016 7:12 PM
32	Bury all overhead utilities	3/29/2016 6:57 PM
33	1. Make a schedule to regularly clean out storm drains. 2. Look at natural hazard prevention before planning any road reconstruction. Involve all the neighbors, not just abutters. 3. Do not allow clearcutting anywhere. 4. Protect the wetlands around the harbors.	3/29/2016 6:44 PM
34	Biggest threat is Pilgrim Power Plant	3/29/2016 6:42 PM
35	PILGRIM PLANT DISASTER EVACUATION PLAN	3/29/2016 6:40 PM
36	cut trees away from power lines more.	3/29/2016 6:29 PM
37	Keep doing what you folks do to keep people aware. The way I see it, you are currently addressing all of the elements above. Keep Chugging!	3/29/2016 6:22 PM
38	If you have off the grid power and back up power generation equipment almost everything else will run. Back up water filtration capability and access to large Earth moving equipment. Surplus food bank. Access to boats if the tide rises above 25 feet over normal.	3/29/2016 6:14 PM
39	utilize twitter, Facebook and internet to monitor disasters as they are happening. Send photos to show where problems are so people can avoid such areas. Maybe create a local interactive website or social media page as an online go to location for information during a storm.	3/29/2016 5:52 PM
40	Wake people up to the reality of an event occurring. And how we can work with fire and police.	3/29/2016 5:39 PM
41	There is only one way to evacuate by land, so that is what it is. Bury more electrical cables to limit outages. Flooded roads can be very dangerous.	3/29/2016 5:25 PM
42	devise and implement a better evacuation route to better help an obvious stampede with any disaster (especially since Plymouth is still up and running).	3/29/2016 5:25 PM
43	Improve snow removal on unpaved roads during major snow storms	3/29/2016 5:22 PM
44	Once again, these are natural disasters, and we can only go so far to be prepared. After that, it is the recovery process that is more important.	3/29/2016 5:12 PM
45	Evacuation and/or shelter plans in the event of a Plymouth Nuclear Plant failure. Insure the decommissioning plan for Plymouth is timely, comprehensive and failsafe.	3/29/2016 4:46 PM
46	Open Harwich shelters instead of only regional shelters. Many residence can't get to Barnstable or Nauset	3/29/2016 4:41 PM

Public Survey for the Harwich Hazard Plan

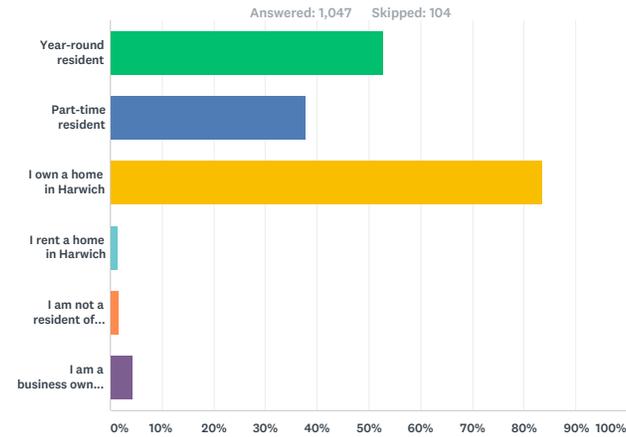
47	Set up system to notify snowbirds of power outages accompanied with sub zero temperatures so we can Protect our property from freezing pipes.	3/29/2016 4:25 PM
48	Be considerate of my property when plowing	3/29/2016 4:06 PM
49	Firstnet Federal funding for better radio communication for Fire and Police is under evaluation now. Contacts the Mass SPOC to be sure you have applied for the funds. New radio spectrum will protect emergency responder access to wireless spectrum and funds will help pay for new radios and related first responder tools. http://www.firstnet.gov/ and Curtis Wood, Massachusetts Single Point of Contact (SPOC) and docs http://www.firstnet.gov/resources Harwich qualifies under many categories.	3/29/2016 4:03 PM
50	ALL OF THE ABOVE	3/29/2016 3:52 PM
51	Require boaters to remove their boats from harbors before disasters strike if possible	3/29/2016 3:49 PM
52	Advocate for burial of utility wires and work with utility companies to expedite that goal, thus reducing the potential for power outages.	3/29/2016 3:44 PM
53	I built my house in 1980 and have never had a drop of water in my cellar during the last 36 years. Well, the Fed's say it's a 100 year flood plan, so, I guess, 64 years to go!	3/29/2016 3:23 PM
54	Drainage on Snow Inn Road south of intersection with Bay Lane is terrible.	3/29/2016 3:23 PM
55	Proactively notify home owners that their roads will not be plowed due to deterioration of the conditions they need to meet. Lighten up on the conditions that home owners have to meet to get their street plowed.	3/29/2016 3:17 PM
56	Emergency testing will provide instant emergency updates.	3/29/2016 3:11 PM
57	all very useful	3/29/2016 2:49 PM
58	Safely closing the Plymouth nuclear plant will improve my feeling towards natural disasters.	3/29/2016 2:46 PM
59	Consider managed retreat policies along the shoreline in anticipation of sea level rise and storms of greater intensity resulting from climate change. Prohibit new development in these areas and prepare a managed retreat plan.	3/29/2016 2:46 PM
60	Any & all of the above. I say that because we all have differing immediate potential problems. Those on the water, those inland, those high up, those down low, etc.	3/29/2016 2:26 PM
61	Learn from others mistakes. Look at similar places across the US that had disasters and conduct a "Lessons Learned." What would they have done different and prioritize those findings. People listen when you have concrete examples.	3/29/2016 2:15 PM
62	Having been here for just two years, and not living anywhere near the coast or a flood zone, our needs might be quite different from a lot of the population. On a Cape wide disaster, evacuation is straightforward and limited to the mid-Cape Highway, so it behooves all the towns and state to ensure that traffic moves along, with no slowdowns with exiting and/or entering traffic, and most importantly, that the traffic going over the bridges is not backed up by bottlenecks on the other side. Obviously, both bridges should be one-way traffic (both lanes) exiting the Cape, and once off the Cape, all the exiting traffic lights are green.	3/29/2016 2:09 PM
63	Been here 15 years and haven't had a reason to criticize Town's response to emergencies.	3/29/2016 1:56 PM
64	think about my dog too please	3/29/2016 1:55 PM
65	We are relatively protected here, because of the offshore islands on the south and the bay on the north. So, I wouldn't want the town to spend a lot of money and raise taxes. You really can't provide protection from a storm that might be the magnitude of Sandy. And regular storms don't have much of an impact. Burying the electric lines would prevent more power outages in snow and ice storms and that might be worth doing.	3/29/2016 1:55 PM
66	put water meters in that are actually smart and adopt better policies on costs associated with residential disasters.	3/29/2016 1:33 PM
67	Work with the state to improve and upgrade high-power electrical lines and get them underground. Underground high voltage cable installation have improved durability and capacity compared to above ground lines. Our outdated infrastructure is deeply concerning. What is happening with Open Cape? Why isn't the network available to individuals? Durable and fast communications are a necessity. PS: Harwich needs wind power.	3/27/2016 5:37 PM

Public Survey for the Harwich Hazard Plan

68	Create additional shelter sites for potential large scale disasters. Purchase additional generators for use at these sites.	3/14/2016 3:47 PM
69	It is always important to do a little of something every year with planning for being prepared: i.e., buy more supplies for a shelter or budget half the drainage sewers to be cleaned. Ask any Mom who has had a family to watch over: if you don't have a game plan in mind, you will eventually have to "pay the price". We need to take care of each other in emergency situations so planning is essential. Keep doing some and it will add up for when you need it.	3/14/2016 3:09 PM
70	all town buildings/departments should have emergency plans. All should have storm shutters like community center better posting of emergency closings etc on town website for ALL departments i.e. flood at community center - lack of power at library etc.	3/10/2016 12:13 PM
71	Since there is a large population of senior citizens, some who may be computer literate and others who are not, and rely on newspapers, there should be multiple venues to distribute information about planning including where to go to get the information. Churches may also provide a way of letting people young and old know where to go to get information and the importance of planning ahead of time. I have not notice a hazerous plan anywhere on the town web site. However I have not specifically looked, but I don't think it's on the front page of the town web site. Might be worth looking into.	3/9/2016 4:01 PM
72	Town does not communicate well during disasters or weather events. Little information on website, Channel 18 or social media.	3/9/2016 3:35 PM
73	work with COA to get a list of seniors needing to be checked on or helped in the vent of a disaster - seniors can sign up also.	3/9/2016 1:36 PM
74	Does anyone seriously think there is any way to evacuate the Cape in a realistic way?	3/3/2016 2:09 PM
75	Use internet and social media to distribute information during storms.	3/3/2016 8:12 AM
76	Work with utilities to help minimize power loss during weather events.	3/2/2016 12:24 PM
77	Don't have someone put in above ground septic in a way it floods the neighbors basement. This is the case for people in town.i know who them had to take steps with their own money and effort to protect themsrives.	3/2/2016 9:53 AM
78	Harwich does a good job communicating about storms.	3/2/2016 6:46 AM
79	Require gas stations and grocery stores to have generators or be required to have generator quick connects for emergencies. Generators can be brought to disaster areas. FOOD FUEL CELL TOWERS.. THE REST IS SPORT	3/2/2016 6:08 AM

Public Survey for the Harwich Hazard Plan

Q10 Please tell us about yourself. Select all that apply to you.



Answer Choices	Responses	Count
Year-round resident	52.82%	553
Part-time resident	37.92%	397
I own a home in Harwich	83.48%	874
I rent a home in Harwich	1.43%	15
I am not a resident of Harwich, but I am employed in Harwich	1.72%	18
I am a business owner in Harwich	4.49%	47
Total Respondents: 1,047		

#	Other (please specify)	Date
1	since 1970	4/28/2016 12:10 PM
2	Usually gone for 2 months in winter (Feb & Mar)	4/11/2016 8:21 AM
3	We winter in Florida	4/6/2016 9:17 PM
4	I am a part time self employed artist , educator, and appraiser and my husband is retired	4/4/2016 12:26 PM
5	We are there maybe six weeks per year.	4/3/2016 9:09 AM
6	I plan to be a full time resident of Harwich	4/3/2016 8:09 AM
7	I have two homes. Rental property on Duke Ballem Rd. Too many power outages and limited town snow removal	4/3/2016 7:53 AM
8	I rent the house in the summer	3/31/2016 5:47 PM
9	I sold my home in January but now I rent it from the new owner.	3/31/2016 5:06 PM
10	Summer resident	3/31/2016 3:52 PM

Public Survey for the Harwich Hazard Plan

11	Former Assistant Secretary of Labor for Occupational Safety and Health, CEO and President of the National Safety Council, Chairman of the Fallen Firefighter's Memorial Fnd. .	3/31/2016 11:58 AM
12	I manage an oceanfront complex.	3/31/2016 8:32 AM
13	water dept electrician , keeping trees away from power lines , maintaining generators for water pump power	3/31/2016 8:08 AM
14	disabled	3/30/2016 8:48 PM
15	We are getting on in years and eventually will require help if our home should be severely damaged. I would suggest that a free non-profit electronic service perhaps funded through the normal property tax, should be instituted between the fire/police depts. on Route 124 to each and every home in the Harwich township so that we citizens can contac them immediately if we are in serious difficulties. Phones don't always work in disasters.	3/30/2016 6:29 PM
16	We have been residents for 21 years (same home) and have been both part time and full time residents over the years.	3/30/2016 8:53 AM
17	retired couple	3/30/2016 8:53 AM
18	I am a business owner in Orleans	3/30/2016 1:32 AM
19	I have left the cape recently for those reasons and others	3/29/2016 8:41 PM
20	I own investment property in Harwich Port in addition to having a business.	3/29/2016 7:45 PM
21	I have rented on Catherine Rose Rd, Off Great Western Rd on Sand Pond, and now own on West Tupelo Rd. Each place has had a challenge with seasonal storms. If not for neighbors and the wonderful people of Harwich, I would have had a tougher time with the weather issues.	3/29/2016 7:13 PM
22	We own the house and cottage across from Pleasant Bay. We rent both, primarily in the summer, to pay the mortgage.	3/29/2016 5:53 PM
23	lived in Harwich for 9 years no longer a resident but do visit family often	3/29/2016 5:44 PM
24	Moved from single home to condo last year (still in Harwich)	3/29/2016 5:36 PM
25	My home is a condo on the 4th floor of our building which is a 7 minute walk to the beach.	3/29/2016 5:09 PM
26	I am a Harwich " resident." Im not here less than 5 months a year . I vote in Harwich.	3/29/2016 4:09 PM
27	Consultant working out of my home office. Let me know if you need help fund raising.	3/29/2016 4:04 PM
28	We are currently snowbirds.	3/29/2016 3:53 PM
29	I am also employed in Harwich	3/29/2016 3:24 PM
30	REGISTERED VOTER BUT I LEAVE FOR HALF THE YEAR	3/29/2016 3:20 PM
31	I've owned a home in Harwich since 2010.	3/29/2016 3:18 PM
32	I am here most of the time.	3/29/2016 3:01 PM
33	I am an Independt Insurance Agent and Risk Manager. I have conducted many risk management and disaster planning sessions for clients including municipalities in New York State.	3/29/2016 2:57 PM
34	Also grew up there. Vacation home now. Most weekends	3/29/2016 2:53 PM
35	Cape Cod Theatre Company Home of Harwich Junior Theatre	3/29/2016 2:52 PM
36	Owner but the condo.	3/29/2016 2:51 PM
37	Chatham Firefighter/Paramedic	3/29/2016 2:35 PM
38	My husband and I are in Harwich at least 3 to 4 days out of the week, most weeks.	3/29/2016 2:17 PM
39	Only been here two years after re-locating from the Caribbean side of Mexico (lived there 15 years) where we experienced Cat 5 hurricanes at our beach front property. Those were serious hazards from which we evacuated.	3/29/2016 2:12 PM
40	a given, save out beaches. You're way too lax on something that impacts our way of lifel..... think you're missing the biggest issue, the quality of our beach water is horrible, leakage from cesspools is ruining our major resource.The seaweed makes the shoreline unusable at times, all a result of land seepage. Why is this not an issue?Storms are and the town's greatest asset	3/29/2016 2:00 PM
41	Am a homeowner but we are moving this summer	3/29/2016 1:53 PM

Public Survey for the Harwich Hazard Plan

42	Note: please don't waste any money planning evacuation routes. Impossible to achieve.	3/29/2016 1:18 PM
43	I retired to East Harwich after managing an office at Central CT State University. I am currently volunteering and on the Board of Harwich's Historical Society.	3/14/2016 3:11 PM
44	not a natural disaster but failure of Pilgrim power plant needs to be included in these plans more worried about that over anything else really - results of that could be much worse than hurricane etc.	3/10/2016 12:15 PM
45	Just a historical observation, if you notice most old sea captain homes are built along rte 28' they knew better then to build near the ocean way back then. Common sense .	3/2/2016 6:04 AM
46	I grew up in Harwich, live elsewhere,but plan to return to the town for my residence.	3/1/2016 10:58 PM
47	Born and raised. Many generations!	3/1/2016 9:49 PM

Public Survey for the Harwich Hazard Plan

Q11 If you would like to be involved in the hazard planning process, please provide your name, email and/or alternative contact information

Answered: 148 Skipped: 1,003

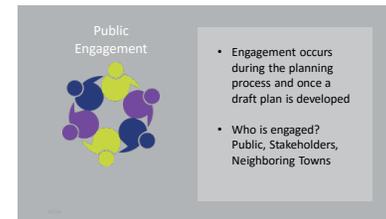
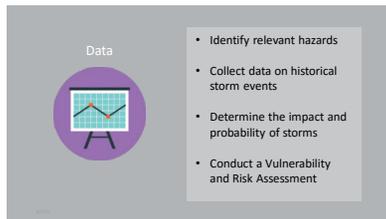
Answer Choices	Responses	
Name:	95.95%	142
Email:	99.32%	147
Alternate Contact:	41.22%	61

#	Name:	Date
1		6/6/2016 8:14 AM
2		5/4/2016 9:11 AM
3		4/26/2016 12:16 PM
4		4/9/2016 1:43 PM
5		4/6/2016 11:26 AM
6		4/6/2016 9:39 AM
7		4/5/2016 4:08 PM
8		4/5/2016 11:19 AM
9		4/3/2016 8:42 PM
10		4/3/2016 6:27 PM
11		4/3/2016 8:09 AM
12		4/2/2016 2:54 PM
13		4/2/2016 7:50 AM
14		4/1/2016 8:47 AM
15		3/31/2016 5:47 PM
16		3/31/2016 4:44 PM
17		3/31/2016 1:20 PM
18		3/31/2016 11:58 AM
19		3/31/2016 8:08 AM
20		3/30/2016 8:48 PM
21		3/30/2016 6:29 PM
22		3/30/2016 5:37 PM
23		3/30/2016 5:16 PM
24		3/30/2016 5:07 PM
25		3/30/2016 3:34 PM
26		3/30/2016 2:15 PM
27		3/30/2016 10:45 AM
28		3/30/2016 10:39 AM
29		3/30/2016 9:33 AM
30		3/30/2016 9:24 AM

**NAMES &
CONTACT INFO
OMITTED**
Pages 53-61

Chapter 1: Public Survey Results

March 2, 2016



Chapter 1: Public Survey Results

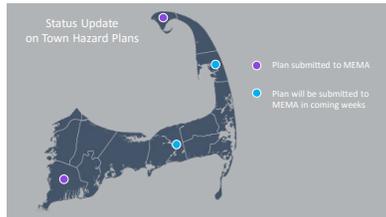
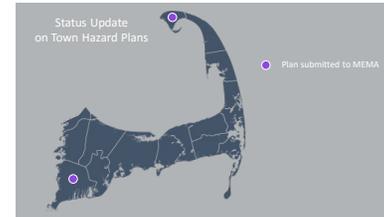
March 2, 2016

Why is hazard planning important?

1. Protects people and property
2. Eligibility for Hazard Mitigation Assistance
3. Community Rating System



Hazard Mitigation Assistance Guidance
 Hazard Mitigation Assistance Guidance
 Hazard Mitigation Assistance Guidance
 Hazard Mitigation Assistance Guidance
 Hazard Mitigation Assistance Guidance



Chapter 1: Public Survey Results

March 2, 2016

FEMA Requirement 201.6(b)(2):
Give neighboring communities the opportunity to be involved in hazard mitigation activities



- A lot of towns are working on their plans!
- BCREPC meeting is a great opportunity to fulfill this requirement!
- Specifically, the towns would like to engage the BCREPC in the development of their hazard profiles

How is a Hazard Profile developed?

This process is performed by Hazard Planning Team with assistance from the Cape Cod Commission

```

    graph LR
    A[Review the natural hazards in the MA State Hazard Plan] --> B[Determine which natural hazards are relevant to the Town]
    B --> C[Engage public, stakeholders and neighbors]
    
```

Town reviews the natural hazards in the MA State Hazard Plan



- Erosion + Shoreline Change
- Dam/Culvert Failure
- Earthquake
- Fire: Wildland and Urban
- Flood
- Hurricanes + Tropical Storms
- Landslide
- Nor'easters
- High Winds
- Thunderstorms
- Extreme Temperatures
- Tornadoes
- Drought
- Severe Winter Weather
- Tsunami
- Sea Level Rise

Town reviews the natural hazards in the MA State Hazard Plan

Town looks at the data and determines which hazards are relevant to their town



Example from the 2016 Provincetown Hazard Mitigation Plan

Town engages the public and stakeholders to comment on relevant natural hazards



Seek the public input on:

- History and impact of storms in town
- Level of concern that a storm will occur again



Town engages the public and stakeholders to comment on relevant natural hazards



Public input is used to determine which hazards undergo a Vulnerability and Risk Assessment

An example from the Provincetown Hazard Mitigation Plan

Chapter 1: Public Survey Results

March 2, 2016

Seeking input from the BCREPC for Town Hazard Mitigation Plans

Nearly all towns will benefit from your input!



Activity #1: Discuss which hazards are relevant to Cape Cod

Activity #2: Fill out a survey on Survey Monkey

Activity #1: Discuss hazard relevance using local knowledge

- Erosion + Shoreline Change
- Dam/Culvert Failure
- Earthquake
- Fire: Wildland and Urban
- Flood
- Hurricane + Tropical Storms
- Landslide
- Nor'easters
- High Winds
- Thunderstorms
- Extreme Temperatures
- Tornadoes
- Drought
- Severe Winter Weather
- Tsunami
- Sea Level Rise

Are all of these hazards relevant to Cape Cod?

Are any missing?

Which ones affect only a few towns?

Activity #2: Survey on Impact + Probability of Natural Hazards



www.surveymonkey.com/r/BCREPC

You can fill it out now or it will be emailed to you this week.

P.S. Its only 3 questions!



Cally Harper, PhD
 Community Design Department
 Cape Cod Commission
 (508) 744-1211
cally.harper@capcocommission.org

Chapter 1: BCREPC Meeting Notes



**BARNSTABLE COUNTY
REGIONAL EMERGENCY PLANNING
COMMITTEE**

SUPERIOR COURT HOUSE
POST OFFICE BOX 427
BARNSTABLE, MA 02630

Phone: (508) 375-6618
FAX: (508) 362-2603
Email: bcrepc@barnstablecounty.org

MEETING NOTES

The Barnstable County Regional Emergency Planning Committee
Held a meeting on Wednesday, March 2, 2016 at 2:00 p.m. in the
Innovation Room in the OpenCape Building at the Barnstable County Complex
3195 Main Street, Barnstable, MA 02630

I. Welcome/Introductions

The meeting was called to order at 1405 by co-chair Chief Ron Fisette.
Introductions were made around the room:

Tim Lynch, Massachusetts Maritime Academy, Cally Harper, Cape Cod Commission, Lance Lambros, Office of Senator Vinny deMacedo, Hilary Greene, American Red Cross, Kent Farrenkopf, Eastham Fire Department, Jerry McDermott, Eversource, Philip Simonian, Yarmouth Fire Department, Kevin Morley, PIO BCREPC, Sean O'Brien, BCREPC, Debra Rogers, Falmouth Community Television, Dan Howard, ARES, Jeff Tavares, Falmouth Fire Department, Michael Walker, Incident Management Team, Diana Gaumont, Cape Cod Medical Reserve Corps, Roy Jones, Cape Cod Regional Transit Authority, Chrystal LaPine Health and Medical Coordinating Coalition, Bill Ciocca, National Grid, Dee Yeater, Visiting Nurse Association, Amy Henderson, AmeriCorps Cape Cod, Chloe Schaefer, Cape Cod Commission, Deirdre Arvidson, Barnstable County Department of Health and Environment, Amy Alati, Barnstable County Department of Health and Environment, Brian Dale, Cape Cod Regional Transit Authority, Ed Kulhawik, Eastham Police Department, Jeff Rossi, AmeriCorps Cape Cod, Paul Hoy, American Red Cross, Jake Garringer, AmeriCorps Cape Cod, Michael Clark, Barnstable Police Department, Brian Gallant, Sandwich Office of Emergency Management, Ron Fisette, Wellfleet Police Department, Chad Absten, Falmouth Fire Department, Laura Marin, Provincetown Health Department, Rachel Potts, Massachusetts Emergency Management Agency, Joseph Gordon, Barnstable County Sheriff's Office, Phil Burt, BCREPC, Eric Trudeau, National Park Service, Charles Noyes, Bourne Emergency Management Director.

II. Minutes: February 3, 2016

A motion was made by Brian Gallant to accept the minutes; the motion was seconded by Roy Jones and approved unanimously.

1

III. Status Reports from REPC Subcommittees and Programs:

• **Executive Committee**

Sean O'Brien said there would be a meeting on March 14 to discuss expansion of the executive committee from 5 to 9 members

• **HAZMAT/Tier 2 Update**

Amy Alati reported it was the best year ever but most complicated. She praised the filers using the Tier 2 Manager software. 418 facilities reported in Barnstable County this year. BCREPC covers Nantucket County as well – 27 facilities reported on the island.

There were 67 office visits from public and private facility representatives in the month of February. Compliance protects the facilities by ensuring fire departments on Cape Cod and Nantucket receive the HAZMAT database and the facility emergency response plans.

Oyster Harbor Marine and Cape Cod Oil were exemplary said Amy. They were assiduous in their willingness to do the right thing.

• **Health Agents Coalition**

No report but Amy mentioned a program around opioid abuse. She has copies of the presentation

• **Incident Management Team**

Mike Walker reported on the MACC standup and the call-out for a search operation in Harwich. The team continues to seek more training opportunities.

• **Sheltering Task Group**

Phil Burt said there were no shelter operations this winter. The committee is looking for grant funding for equipment and supplies and scheduling walk-throughs during the summer months.

• **American Red Cross**

Paul Hoy introduced himself as the Disaster Program Manager on an interim basis. He reported the ARC is looking for a full-time replacement

2

Chapter 1: BCREPC Meeting Notes

for Ellen Rossano who left the ARC due to health reasons. In terms of volunteers the ARC is trying to increase shelter manager capacity by 25%. The ARC is also adding supplies, in addition to shelter equipment and is also working on a mobile capacity, each of which would shelter 100 people. ARC is also increasing by 100 % the capacity of the Nantucket shelter with material for 100 people. Hilary Greene updated to committee on the Heroes Breakfast.

- **MEMA**

Rachel Potts reported there were no updates

- **OpenCape Liaison Task Group**

Sean O'Brien said the Task Group would be looking at dash/body cams and 700 MHz He would have a report at the next meeting.

- **Citizens Corps Council**

Amy Alati reported that the final edits were being made to the senior emergency reference magnetic card, which is to be printed by the Barnstable County Sheriff's Office. It will educate the senior population about planning for emergencies. Public seminars and education events will be held as well.

- **ARES**

Dan Howard reported that issues with antennas are being addressed at the Old Jail.

- **Barnstable County Sheriff's Office**

Joe Gordon reported that the S39 vehicle responded to Harwich for a search and rescue operation. He said that agencies shouldn't hesitate to ask for that vehicle as a command post. He reported that a new CERT class was starting at the Massachusetts Maritime Academy.

- **Public Information Officer**

Kevin Morley reported the shelter video project is making good progress. He reported that he is engaging Cape Cod Community Access TV stations in the production of Regional Shelter System videos

IV. **Introduction: Verizon Government Affairs**
Ellen Cummings, Regional Director

Sean introduced Ellen. She has been working with Cape for six years wireline and wireless. She is very happy to make connection with public safety, She will stay around after meeting to meet with public municipal officials to hand out information sheet on reporting on problems.

Sean praised Ellen and Verizon for their responsiveness.

V. **Presentation: Engaging Neighboring Communities in Hazard Planning**
Cally Harper, PhD, Planner II
Cape Cod Commission

Cally Harper reported her primary role is helping towns update hazard mitigation plans. She reviewed elements of hazard mitigation plan. She presented a status update on hazard mitigation plans for Cape towns. She reported that the majority of towns do not have an active plan. She reviewed the process of developing a hazard profile. She also sought input from the BCREPC for Town Hazard Mitigation Plans. She sought discussion of the relevant hazards on Cape Cod. She asked the meeting members to fill out a survey on Survey Monkey.
www.surveymonkey.com/r/bcrepc

VI. **News - Open Announcements - Information**

Hillary Greene announced a fundraiser for Frank O'Laughlin on March 11.

VII. **Public Comments**

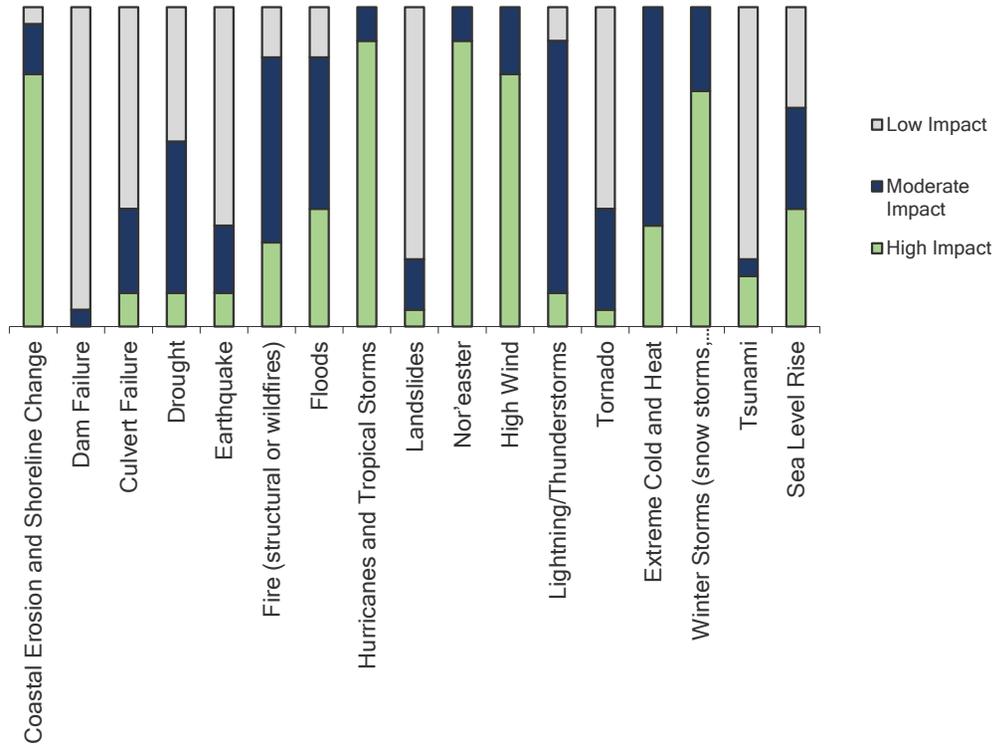
None

VIII. **Adjourn**

A motion for adjournment was made by Joe Gordon; seconded by Brian Gallant. The meeting was adjourned at 1445

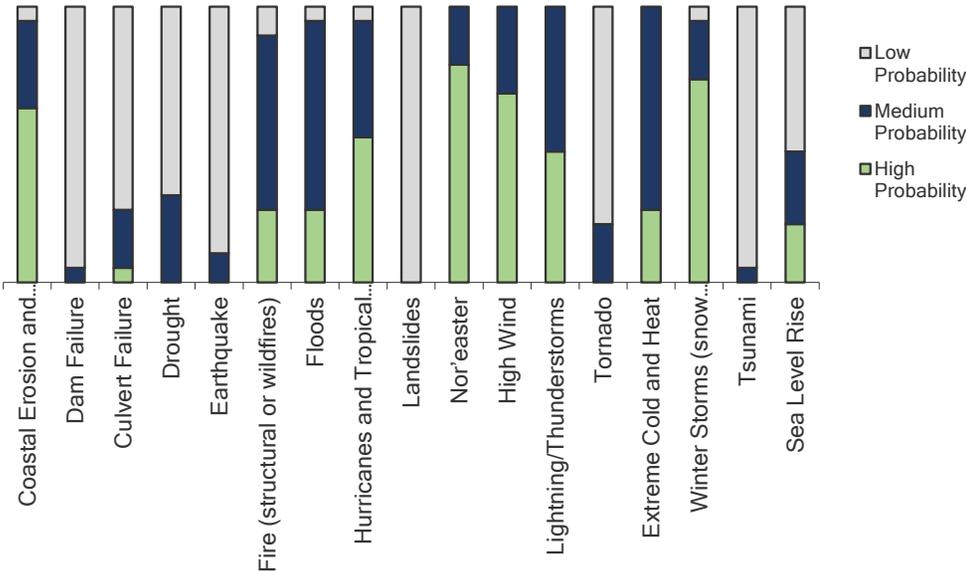
Chapter 1: BCREPC Survey Results

Question 1: For each hazard listed below, please identify if it will have a "low," "moderate" or "high" impact on Cape Cod. The towns would like you to use your local knowledge of Cape Cod. According to FEMA, impact is defined as the damage or consequence



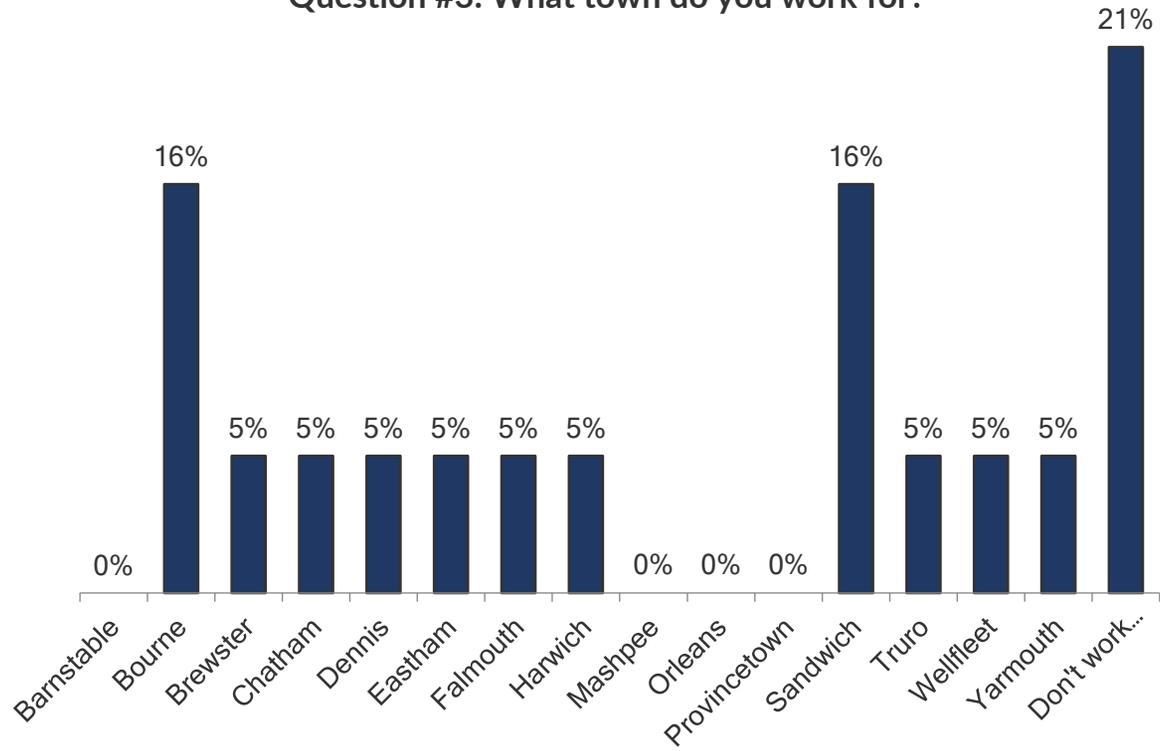
Chapter 1: BCREPC Survey Results

Question #2: For each hazard listed below, please assign a probability score of "low," "medium" or "high". According to FEMA, probability measures how often an event is likely to occur. Low probability means the event will occur at least once in the next



Chapter 1: BCREPC Survey Results

Question #3: What town do you work for?



Chapter 1: BCREPC Survey Results



Harwich Hazard Mitigation Plan, 2017



CAPE COD
COMMISSION

Prepared by the Cape Cod Commission

US Mail: P.O. Box 226 (3225 Main Street), Barnstable, Massachusetts 02630

Phone: (508) 362-3828 • Fax: (508) 362-3136 • Email: frontdesk@capecodcommission.org

Web Sites: www.capecodcommission.org

