2018 Hazard Mitigation Plan Update

Town of Portsmouth, Rhode Island

PREPARED FOR

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November, 2018

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RESOLUTION NO. 2019-01-14

A RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF PORTSMOUTH AUTHORIZING THE ADOPTION OF THE 2018 PORTSMOUTH HAZARD MITIGATION PLAN UPDATE

WHEREAS, the Town of Portsmouth recognizes exposure to natural hazards that increase the risk to life, property, environment, within our community; and

WHEREAS; pro-active mitigation of known hazards before a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre and post disaster hazard mitigation programs; and

WHEREAS; the 2018 Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Portsmouth from impacts of future hazards and disasters; and

WHEREAS, adoption by the Town Council demonstrates their commitment to hazard mitigation and achieving goals outlined in the 2018 Portsmouth Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED that the Town of Portsmouth

1) Adopts in its entirety, the 2018 Portsmouth Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.

2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
4) Will continue its support of the Hazard Mitigation Committee as described within the Plan.
5) Will help to promote and support the mitigation successes of all participants in this Plan.
6) Will incorporate mitigation planning as an integral component of government and partner operations.
7) Will provide an update of the Plan every five years.

PASSED AND ADOPTED on January 14, 2019

_____

Kevin Aguiar, Town Council President, Town of Portsmouth

ATTEST: _____
Jennifer M. West, Town Clerk, Town of Portsmouth

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Executive Summary

This Hazard Mitigation Plan (HMP) is a product of the Portsmouth Hazard Mitigation Committee (HMC). It has been approved by the Portsmouth Town Council, the Rhode Island Emergency Management Agency, and the Federal Emergency Management Agency in accordance with the Disaster Mitigation Act of 2000.

The HMC's overview of past natural hazard occurrences verifies that the Town is vulnerable to diverse events including hurricanes, Nor'easters, flooding, snow storms, and high winds. The discussion puts the likelihood of these events into historical perspective and recognizes that although the probability of thunderstorm, high wind and lightning events may be higher; the intensity and potential impacts from less likely events such as hurricanes and earthquakes can be far greater.

The risk assessment portion of the plan confirms that the Town has much to lose from these events. The identified vulnerabilities include flood prone drainage systems and infrastructure, bridges, water supply systems, dams, critical municipal hazard response facilities, populations, businesses, schools, and recreation facilities.

To address these risks the 2018 HMP put forth a clear mission, a distinct set of goals and 18 specific mitigation actions. The Town's hazard mitigation mission is to enhance our community's quality of life, protecting the property of its citizens, and preserving its natural resources of Portsmouth.

To implement the plan, important goals must be met. The Town should educate residents and visitors to the risks of natural hazards and the various appropriate mitigation strategies that can be taken. It should also continue to reduce flood losses through compliance with National Flood Insurance Program requirement. In addition, the Town should continue to manage development in natural environments and hazard-prone areas.

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Introduction

Plan Purpose

The purpose of the Portsmouth Hazard Mitigation Plan is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life or property from hazardous events such as hurricanes, nor'easters, ice storms, snow storms, and flooding, and high wind. This plan was constructed using input from a variety of municipal and private stakeholders and the general public involved in the planning process. This plan serves as guidance to help the Town reduce their losses and vulnerabilities relating to natural hazards.

Hazard Mitigation and its Benefits

Hazard mitigation planning consists of a series of actions taken to identify specific areas that are vulnerable to natural and human-caused hazards within a town and seek to permanently reduce or eliminate the long-term risk to human life and property. It coordinates available resources and identifies community policies, actions, and tools for implementation that will reduce risk and the potential for future losses town-wide. The process of natural hazard mitigation planning sets clear goals, identifies appropriate actions, and produces an effective mitigation strategy that can be updated and revised to keep the plan current. In short, 'it's where we were, where we are and where we're going' in terms of hazard mitigation.

States and communities across the country are slowly, but increasingly, realizing that simply responding to natural disasters, without addressing ways to minimize their potential effect, is no longer an adequate role for government. Striving to prevent unnecessary damage from natural disasters through proactive planning that characterizes the hazard, assesses the community's vulnerability, and designs appropriate land-use policies and building code requirements is a more effective and fiscally sound approach to achieving public safety goals related to natural hazards.

A **Natural Hazard** is defined as an extreme natural event. **Natural Disasters** occur when these extreme natural events come into contact with people and property.

Natural hazard mitigation is any sustained action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of natural hazards.

Natural Hazard mitigation planning is a process undertaken by a community to analyze the risk from natural disasters, coordinate available resources, and implement actions to minimize the damage to property, and injury or loss of life of its citizens before disaster occurs.

In the past, Federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) is the latest federal legislation to improve this planning process. It reinforces the importance of natural hazard mitigation planning and establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP) or other annual funding opportunities. Section 322 of the Act specifically addresses mitigation planning at the state and municipal levels of government. It identifies new requirements that allow HMGP funds to be used for planning activities. As a result of this Act, states and communities must now have a FEMA-approved natural hazard mitigation plan in place prior to receiving post-disaster HMGP funds. In the event of a natural disaster; municipalities that do not have an approved natural hazard mitigation plan will not be eligible to receive post-disaster HMGP funding.

The purpose of this Plan is to recommend actions and policies for the Town of Portsmouth to minimize the social and economic loss of hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to critical infrastructure and critical facilities, loss/interruption of jobs, loss/damage to businesses, and loss/damage to significant historical structures. Hazardous events that affect Portsmouth include tropical storms and Nor'easters, flooding, snow storms, and high winds. To protect present and future structures, infrastructure and assets and to minimize the social and economic hardships, the Town of Portsmouth implements the following general actions and policies:

- Revisions to the Town's Comprehensive Plan
- Incorporation of hazard mitigation into the site plan review process
- State and local building code review
- Public education/outreach
- Post-disaster recovery opportunities/strategies

The Town of Portsmouth also recognizes the important benefits associated with hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach, which accommodates these interdependencies. The Town's Comprehensive Community plan (2002) addresses natural and cultural resources, land use, housing, services and facilities, traffic circulation, open space, economic development, and future development trends. While the entire hazard mitigation plan will not be formally incorporated into the Comprehensive Plan, certain, applicable mitigation actions will be incorporated during the update process. The Town recognizes coordination between the HMP and the Comprehensive Plan to be of benefit because it will ensure a unified planning approach into the future and ensure that risk reduction remains a critical element of municipal planning. This is also in alignment with current goals of Rhode Island Statewide Planning.

A second benefit of hazard mitigation allows for a careful selection of risk reduction actions through an enhanced collaborative network of stakeholders whose interests might be affected by hazard losses. Working side by side with this broad range of stakeholders can forge partnerships that pool skills, expertise, and experience to achieve a common goal. Proceeding in this manner will help the Town ensure that the most appropriate and equitable mitigation projects are undertaken.

A third benefit of hazard mitigation would be endorsing a proactive planning approach focused on sustainability, whereby the Town of Portsmouth could minimize the social and economic hardships that have resulted from the occurrence of previous natural disasters. These social and economic hardships include: the loss of life/injuries, destruction of property, interruption of jobs, damage to businesses, and the loss of historically significant structures and facilities. This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns. Linking sustainability and loss reduction to other goals can provide a framework within the state and local governments that will bring the comprehensive planning process full circle.

Lastly, the participation in a hazard mitigation planning process will establish funding priorities. The formal adoption and implementation of this plan will allow the Town of Portsmouth and its residents to become more involved in several programs offered by the Federal Emergency Management Agency (FEMA) including: the Community Rating System Program (CRS); the Pre-Disaster Flood Mitigation Assistance Program (PDM); the Flood Mitigation Assistance (FMA) Program; and the Hazard Mitigation Grant Program (HMGP). Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow.

Goals

Mission Statement:

To enhance our community's quality of life, protecting the property of its citizens, and preserving its natural resources.

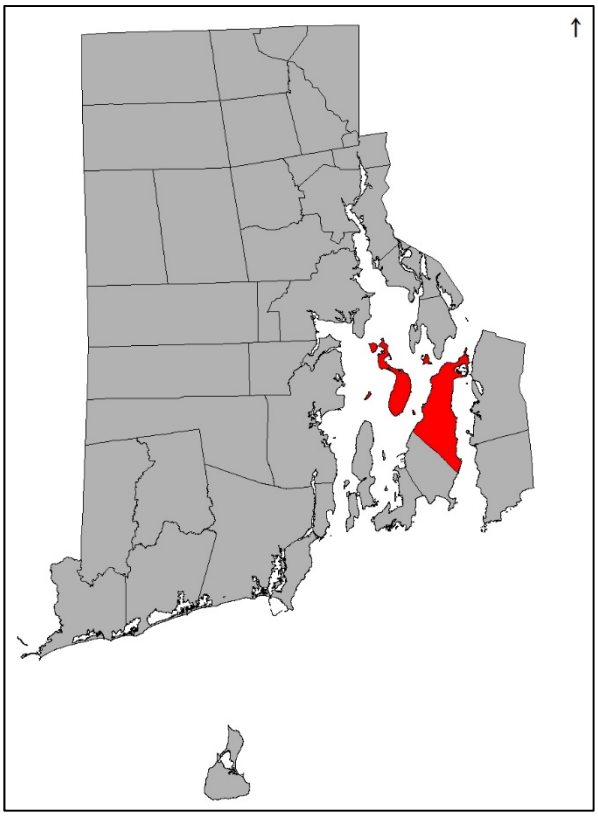
Identify natural hazards, mitigate those hazards to protect, life, property, environment, cultural and historic resources.

The Town of Portsmouth has established the following mitigation plan goals:

1. Implement hazard mitigation actions in order to protect Portsmouth's residents, and cultural, historic, structural and natural environments.
2. Promote educational opportunities to introduce residents and visitors to the risks of natural hazards and the various appropriate mitigation strategies that can be taken.
3. Continue to reduce flood losses through compliance with National Flood Insurance Program requirement
4. Continue to manage the development in natural environments
5. Continue to manage the development in hazard-prone areas

Background

Figure 1: Locus Map



The town of Portsmouth is an island community of approximately 23.3 square miles of land area, wholly within Rhode Island's dominant natural feature, Narragansett Bay (See Figure 1). The town proper occupies approximately 17.1 square miles at the northern end of Aquidneck Island, the largest island in the bay. The remainder of the town is comprised of six separate islands, only one of which (Prudence Island) has year-round residents. The Portsmouth landscape on Aquidneck Island can be characterized by a central upland of residential, commercial, and farming districts that fall off as relatively steep slopes running down to the bay on both sides of the island. Low lying areas, in some cases only a few feet above sea level, characterize the northern sections of town.

Portsmouth soils, like those of much of Southern New England, are derived from glacial deposits (till), and as such are suitable for crop cultivation, which is consistent with the town's coastal farming heritage. While also suitable for residential and commercial development, these soils often limit development because of very slow or very high permeability rates, leading to poor drainage and special on-site septic treatment concerns (Portsmouth has no sewer system). Indeed, wetlands comprise approximately 12% of the total land area of town. Despite these constraints, and like many communities in southern Rhode Island, Portsmouth has seen a significant shift from farming to residential development in recent years.

Winters are cold and summers are warm in Portsmouth. The town however enjoys the moderating effect of the Atlantic Ocean and Narragansett Bay, so temperature extremes are rare. The average daily minimum/maximum temperatures range from 20 degrees in winter to 80 in summer. Precipitation amounts average 45 inches of rainfall and 21 inches of snowfall annually.[1] Humidity averages 55% and the prevailing winds are from the southwest. Portsmouth, as all of southern New England, is exposed to severe weather coming up from the south during the summer months and experiences damaging Nor'easters in the winter months.

History

Settled in 1638, Portsmouth is the second oldest town in Rhode Island, after Providence. The early colonists farmed the area and raised livestock.

According to the 2009 Comprehensive Plan, "Two important Revolutionary War events occurred in Portsmouth: the capture of General Richard Prescott in July 1777 and the Battle of Rhode Island in August 1778, unique in the history of the Revolution as the only engagement in which black Americans participated as a distinct racial group, in the First Rhode Island Regiment. The Battle of Rhode Island site is a National Historic Landmark.

During the nineteenth century, coal was mined in northwest Portsmouth, off Willow Lane. On the same location, copper was smelted between 1866 and 1883. Only an open field, covered with rock and coal, and a handful of modest, shingled workers' houses remain.

While Portsmouth's lack of natural harbor inhibited its links to maritime activity, its location, adjacent to shipping lanes, occasioned the construction of two lighthouses, one at Sandy Point (1823, 1852) and one at Hog Island Shoal (1901).

[1] https://myforecast.com

During the nineteenth century, Newport in particular and Aquidneck Island in general became desirable as places to pass the summer. Summer houses had first appeared here in the late eighteenth century.

Nineteenth-century institutional growth included the construction of several churches, including St. Paul's Episcopal (1833, Russell Warren, architect), St. Mary's Episcopal (1849, Richard Upjohn (New York), architect), and St. Anthony's Roman Catholic (ca. 1901).

The construction of the Mount Hope Bridge in 1929 and the Sakonnet River Bridge in 1957 greatly increased Portsmouth's accessibility. Consequently, the town has seen considerable growth in residential construction, first single-family houses and later apartments, condominiums, and industrial facilities. The growing population has encouraged commercial development, especially along East Main Road."[2]

Demographics

The Town of Portsmouth is a residential coastal community with a population of 17,389 (2010 Census), 95.5% of which live on Aquidneck Island. Median age is 44.8 years, which is moderately higher than both the Rhode Island and national averages. This older, relatively settled population is also reflected in housing tenure and household income. Fully 74% of the 8,457 housing units in Portsmouth are owner-occupied (compared to 60% for the state), and median family income ($86,051) is a significant 39% higher than the value for Rhode Island as a whole. Additional demographic characteristics support the notion that Portsmouth has changed significantly from a rural farming community to a relatively upscale bedroom community in the last few decades.

Population density, which averages 793 people per square mile, ranges widely from well under 100 people per square mile on Prudence Island, to approximately 2,600 people per square mile in the, densely packed, Island Park neighborhood. The Island Park neighborhood, which continues to see a dramatic change from a neighborhood of seasonal summer cottages to year-round high density residential and commercial uses is, unfortunately only a few feet above sea level.

Table 1 Demographic Changes

	2010	2016	% Change
Housing Units	7,985	8,457	+6%
Population	17,316	17,351	+0.2%

[2] Town of Portsmouth Comprehensive Community Plan, Revised July 2002.

Government

Today the Town of Portsmouth is governed by an elected Town Council with seven (7) members, elected every two years. Day to day operation of the town is delegated to an appointed Town Administrator and is head of the administrative branch of government.

Land Use Patterns

"Portsmouth has some contrasts in its development patterns. The Town has developed primarily from north to south over the past 100 years. Housing is dominated by single-family homes; there are few apartment buildings, and these tend to be scattered. The northernmost parts of town are densely developed on small lots, becoming progressively less dense, both in zoning and actual development, as you move south."[3]

Table 2 Land Use Patterns

Land Use Type	2004 (%)	2011 (%)	% Change
Residential	26.5	28	1.5
Commercial/Industrial	2	3	1
Forested	27.7	27	-0.7
Agriculture/Pasture	16	16	0
Surface Water	2	2	0
Other Open Areas	22	15.7	-6.3

Source: RIGIS Land Use Data from 2003/2004 and 2011 (most recent).

Law Enforcement

The Portsmouth Police Department consists of 38 sworn police personnel including a Chief/Colonel, Major, Administration Lieutenant, Detective Lieutenant, 3 Patrol Lieutenants, 4 Sergeants, 3 Detectives, 20 Patrol Officers, 2 School Resource Officers, and 1 Prudence Island Public Safety Officer. The Department operates twenty-four hours a day and responds to all criminal complaints and Town-wide emergencies. The Department is located at 2270 E. Main Road.

The primary mission of the Portsmouth Emergency Management Agency is to protect life and property in the event of a disaster or crises situation, through a program of mitigation, preparedness, response and recovery. The Portsmouth Emergency Management department is currently staffed by 1 paid employee and 6 volunteers.

[3] Town of Portsmouth Comprehensive Community Plan, Revised July 2002.

The permanently established Emergency Operations Center (EOC) is located at the Portsmouth Fire Station.

The primary shelter for Portsmouth is the Portsmouth High School at 120 Education Lane. A secondary back-up shelter is located at the Portsmouth Middle School at 120 Jepson Lane. There is no designated shelter on Prudence Island. During a regional evacuation scenario, the Gaudet Middle School in Middletown is the primary Red Cross Regional shelter for all of Aquidneck Island. Portsmouth Middle School is the overflow Regional shelter- activated when Gaudet nears full capacity.

Fire Protection

Portsmouth businesses and residents are protected from fires and other emergencies by the Portsmouth Fire Department. The Portsmouth Fire Department also responds to all emergencies on Prudence Island to assist the all-volunteer Department located on Prudence Island. The Portsmouth Fire Department also provides automatic aid to Middletown and Tiverton on all major incidents in their communities. The Portsmouth Fire Department also responds to Hog Island to provide fire services when required.

Emergency Medical Services

The Portsmouth Fire Department provides emergency medical services at the Advanced Life Support (ALS) level to the Portsmouth business, residents and visitors. It also provides EMS ALS intercept services to Prudence and Hog Island.

Roads and Bridges

There are approximately 111 miles of Town roads, 37 miles of state roads, and 21 miles of private roads in Portsmouth on Aquidneck Island. The major arteries include Routes 114, 24, and 138 which all run in a north-south direction.

The major bridges leading into Town are Sakonnet River Bridge from Tiverton, the Mount Hope Bridge from Bristol. Hummocks Avenue Escape Bridge to/from Island Park is also a main connector.

Dams

In 2016 the Department of Environmental Management (DEM) identified 8 dams in the Town of Portsmouth. Three of the 8 dams are classified as high hazard dams and 1 dam is identified as a significant hazard dams. The remainder are considered low hazard.

High Hazard Dam- where failure or misoperation will result in probable loss of human life

Significant Hazard Dam- where failure or misoperation will result in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare.

Low Hazard Dam- where failure or misoperation will result in no probable loss of human life and low economic losses

Utilities

Portsmouth does not own the drinking water, it is purchased through the Portsmouth Water and Fire District for use throughout town. Prudence Island is served by 4 public wells- 2 are active, and 2 are for emergencies.

Most of Portsmouth is serviced by on-site septic (ISDS) with a few exceptions. Carnegie Abbey has their own closed sewer system and sewer treatment plant, and sewer lines from Newport service the west side of Portsmouth which includes the Navy Base and the Melville neighborhood.

There are 2 communication towers located in Portsmouth: one is at the police/fire station, and the other is at the State Police Barracks. Cellular towers are located throughout the town.

Forest and Open Space

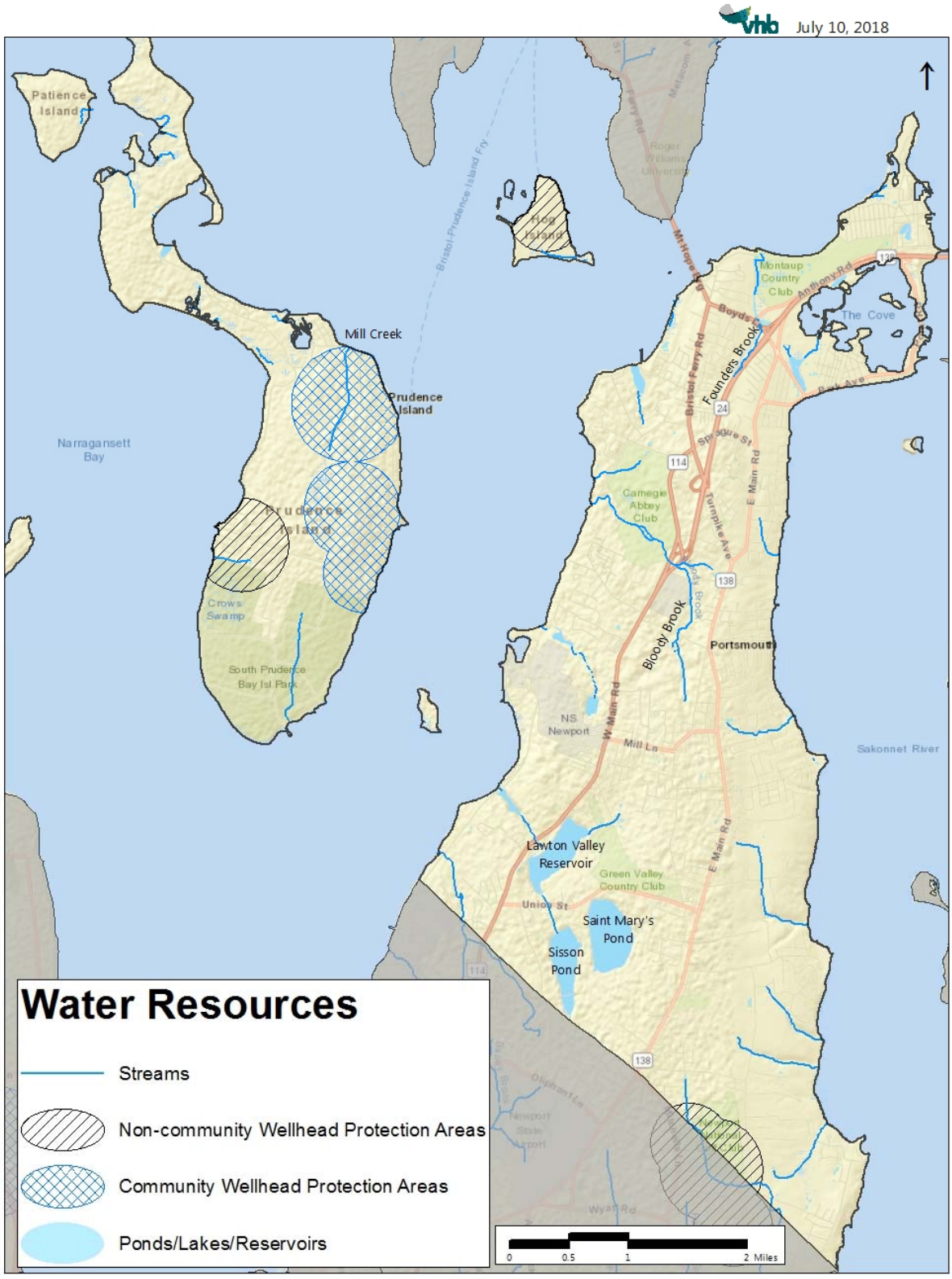
Conservation and open space lands, managed by the Town, land trusts, and private entities contribute to the preservation of Portsmouth's character. Portsmouth's recreation, conservation, and open space areas are used regionally by local residents as well as those in neighboring towns in Rhode Island and Massachusetts. Most of the forested area is located on Prudence Island. Deciduous hardwood forests (i.e. maples and oaks) are located in the southern lobe of the island, with a mix of hardwoods and softwood trees in the neck and northern portion. Smaller areas of hardwood forest exist on either side of Route 114 south of Hedley Street.

The Montaup Country Club, Carnegie Abbey Club, Green Valley Country Club, Newport National Golf Club (partially in Portsmouth), Glen Park, and the Gardner Seveney Sports Complex contribute the largest contiguous open space areas on the Aquidneck Island area of the town.

Water Resources

The Town of Portsmouth is bordered by water on 3 of the 4 sides, sharing a border with Middletown to the south. Waterbodies include about a dozen small brooks and streams, several man-made ponds including Lawton Valley Reservoir. In the northeast area of town there is a large irregular tidal inlet (The Cove) with a breachway to the Sakonnet River. There are no major rivers in Portsmouth.

Figure 2 Water Resources in Portsmouth



Cultural and Historic Resources

Historic resources in Portsmouth include early farms and farmhouses; important summer houses designed by nationally recognized architects, late 19th and 20th century recreational farms, houses of worship, two key lighthouses, and several historic districts.

According to the State of Rhode Island Historic Preservation & Heritage Commission, Portsmouth has 4 historic properties and 6 historic districts, and numerous historic candidate sites[4].

Historic Sites

- Oak Glen/Julia Ward Howe
- Union Church and Southernmost Schoolhouse
- Pine Hill Archeological Site
- Hog Island Shoal Lighthouse

Historic Districts

- Battle of Rhode Island Historic District
- Fort Butts
- Prudence Island Lighthouse
- Portsmouth Friends Meeting house/Parsonage & Cemetery
- Lawton-Almy-Hall Farm
- Greenvale Farm

Historic Candidate Sites

- Gifford House
- Elm Farm/Scott Anthony-Mann
- Webb House
- Cory Farm
- Dennis House
- Portsmouth-Newton historic district
- Green Animals/Brayton Estate
- Hedley House

4 State of Rhode Island Historic Preservation & Heritage Commission website, http://www.preservation.ri.gov Accessed 2/22/17

- Sherman House
- Glen Road historic district
- S.E. Portsmouth rural estates historic district
- Equestrian barn of the Vanderbilt estate
- St. Mary's Episcopal Church and Cemetery

Development Trends Since the 2009 Plan

Reflecting slow population growth and declines in both school enrollment and drinking water usage, development trends in Portsmouth over the last decade can best be characterized as modest.

Portsmouth added an average of 28 new dwelling units per year during the period with a steady yearly average of 500-600 building permits for remodeling and home improvements. As a point of reference, the total number of dwelling units in town is approximately 8,000. Single-family dwelling unit construction has seen one or two modest subdivisions being built per year with some infill on existing lots making up the rest. Portsmouth did experience a growth spurt in condominium/townhouse construction associated with resort style development along the west side shoreline in the 2013-2016 time period. However, the pace of so-called "recreational-residential" (i.e. high tax revenue positive) development has slowed considerably and the future is uncertain for this type of development. Plans rolled out in 2006 for an 800+ slip marina with mixed use residential/commercial components have failed to materialize and the sales of high-end units in two gated communities along the west side have been slow. The number of short-term rental (aka "AirBnB") units has increased dramatically, particularly in the summer, which has necessitated the development of a Town ordinance to govern their use and minimize the associated neighborhood impacts.

Retail development has been equally modest with an average of less than two new retail structure building permits per year being issued over the last decade. With a February 2008 moratorium and eventual zoning ordinance restricting big-box type retail development, expansion of the retail sector in Portsmouth has been infill at scattered commercially-zoned locations and of small to moderate scale. Industrial development over the period has been non-existent. The major employer Raytheon has scaled back by selling off a portion of their property and there has been little interest in the two remaining vacant parcels in the Portsmouth industrial park. It is acknowledged by most that lack of sewers in Portsmouth has and will continue to restrict any meaningful expansion in the industrial/manufacturing sector. The one shining spot in recent development trends has been the expansion of the marine trades sector at Melville. Access and infrastructure problems in the area, exacerbated by the associated environmental issues of Navy land in the area being excessed, may

however constrain future expansion unless solutions to these problems can be found.

Future development trends are likely to be guided by the following trends.

- A slow but steady growth in population;
- More households, but smaller household size;
- An aging population with stable or rising income levels;
- Lack of affordable housing;
- Lack of local employment opportunities;
- The continued conversion of more seasonal homes to year-round residences and short-term rentals bringing about changes in community character.

From a natural hazard mitigation standpoint, this last trend is the most consequential. Portsmouth has seen, with increasing frequency, the purchase of older, smaller shore-front cottages that are torn down and replaced with new multi-story high end homes. Any new construction must be built according to Portsmouth's flood-prone construction standards, but this high-density development still poses the serious problem of a population that must be evacuated from the flood plain, as well as increased post-disaster cleanup costs.

2

Planning Process

Overview

The Town of Portsmouth initiated the hazard mitigation planning effort in February 2018 at the recommendation of the Portsmouth Planning Director. This Hazard Mitigation Plan Update is the result of a dedicated group of individuals working for six months identifying natural hazards and proposing ways to improve Portsmouth's resiliency.

Portsmouth Hazard Mitigation Committee

This Hazard Mitigation Plan (HMP) is a product of the Portsmouth Hazard Mitigation Committee (HMC). Committee members include:

- Gary Crosby, Town Planner*
- Mike Asciola, Assistant Town Planner
- Richard Rainer, Town Administrator*
- Thomas Lee, Police Chief*
- Mike Cranson, Fire Chief* (retired in 2018)
- Brian Woodhead, Public Works*
- Gareth Eames, Building Official

- John King, Emergency Management*

* denotes Portsmouth resident.

The Planning Process

This 2018 HMP is the result of a 7-step process that was initiated in February 2018 with the establishment of the HMC by invitation from the Portsmouth Planning Director. The Town hired a consultant to assist with this planning effort.

Step two started the plan development process and included the first meeting of the HMC on February 22, 2018. The HMC met twice a month at the Portsmouth Town Hall.

The Town's previous plan was dated 2009, so the first meeting focused on re-ranking hazards and discussing the process for updating the plan. At this initial meeting, the group reviewed a set of questions to be included in an online public survey. The purpose of the survey was to capture the local residents' perception of natural hazards.

The link to the survey was widely distributed on social media and on the Town's website. Only 24 people responded to the survey. See Appendix A for survey results.

Step three began with the HMC meeting on March 27, 2018. After reviewing the hazards of concerns and survey results, the HMC identified critical infrastructure and community assets within the town. Fourteen areas of vulnerability were identified: flood prone drainage systems, streets or infrastructure; bridges; wastewater; water supply; services/utility facilities; communication towers; dams; marinas/docks; critical municipal hazard response facilities; populations; businesses; schools; recreational facilities; and historic resources.

During this early phase, the Town's consultant reviewed the existing Comprehensive Plan, local ordinances, the StormReady plan, and gathered information on current infrastructure projects going on within the Town.

Current town capabilities were discussed at the meeting on April 10, 2018. Many different departments, committees, and programs already engage in activities that help the town become more resilient to a variety of hazards. It is important to highlight these capabilities and show how they support the Town's hazard mitigation efforts.

Step four was creating an updated list of mitigation actions to reduce the impact to the identified vulnerable areas. Also at the April 10th meeting, the HMC reviewed the mitigation items that were proposed in the 2009 plan. Status updates were given for all the previous actions. The incomplete actions that were still important were rolled into the list of actions for this 2018 plan update.

Step five was completed at the April 24, 2018 meeting where the group brainstormed additional mitigation actions they wanted to include. Included in this

step was proposing new actions, establishing action timelines, costs, and identifying responsible parties.

Step six focused on the prioritization of the mitigation actions. On May 25, 2018, the HMC met as a group to prioritize their proposed actions and confirm additional action details. After this meeting the consultant finished the draft of the plan for committee review.

Step seven furthered the public input and review process with the Portsmouth Planning Board, Town Council, and the general public for review and comment. The plan was posted on the Town's website. Facebook, and made available at Town Hall and Library for public review. The Hazard Mitigation Plan was also emailed to Emergency Management Directors in the neighboring towns of Middletown, Tiverton, and Bristol for their review and comments. No comments were received. Prior to the Town Council meeting on August 27, 2018, there were a few suggested edits to the plan which were incorporated. See the end of Appendix A.

Table 3 below provides a summary of the Committee's meeting dates and the activities that they conducted:

Table 3 Committee Meetings

Date	Meeting Summary
02/22/2018	Kick off meeting with new contractor, VHB. HMC discussed the plan purpose and hazards of concern. Reviewed survey questions.
03/05/2018	Hazards survey posted online.
03/27/2018	The HHMC reviewed the hazards of concern and listed critical infrastructure and community assets.
04/10/2018	Review of community assets and discussion of current capabilities. Review status of 2009 actions.
04/24/2018	Discussed the status/need for actions from the 2009 plan. Brainstormed new mitigation actions.
05/22/2018	Finalized mitigation actions and discussed prioritization.
07/16/2018	Draft plan sent to HMC for review.
07/26/2018	Draft of 2018 HMP posted for public comment and promoted through social media and on the Town's website.
07/26/2018	2018 HMP was emailed to neighboring Emergency Management Directors for review.
08/27/2018	2018 HMP was presented to Town Council and public.
08/28/2018	Town's consultant made document changes as per public comments and final edits.
08/29/2018	Sent to RIEMA for review.
11/20/2018	Comments received from RIEMA. Edits made to draft plan by Town's consultant under the guidance of the Portsmouth Planning Director.
	Sent to FEMA for review.
	Plan approved and adopted by Town Council.

Public Input

This hazard mitigation plan benefits from various distinct types of public input strategies that were utilized by the HMC during the drafting process and prior to its adoption by the Town Council. Public input for the Portsmouth hazard mitigation plan was primarily collected through a public survey, public meetings and an invitation to comment.

Early in the planning process, the HMC promoted and distributed a "Hazard Perceptions" survey online. The purpose of the anonymous survey was to hear from residents the hazards and neighborhoods they are most concerns about. Only 24 individuals participated in the survey. Not surprisingly, most were concerned about snow/blizzards, high winds, and hurricanes/tropical storms. The survey also provided the HMC with a list of problematic areas that are susceptible to flooding. The HMC used the input from the survey to focus their mitigation planning efforts.

The 2018 HMC included town residents and business owners. The HMC's roles focused on reviewing the content of the risk assessment matrix to ensure proper classification of problems and estimates of potential impacts; formulation of mitigation actions and sequencing of primary tasks; and identification of feasible implementation methods and schedules. Their comments were incorporated into the final 2018 hazard mitigation plan.

Another public input strategy involved consulting with other staff and residents who are interested in natural hazard mitigation. A representative from the Town Council participated in the early stages of planning.

Prior to public release of the 2018 HMP, the HMC drafted the plan through a series of committee meetings. While these meetings did not rise to the level of public hearings and were not advertised, they were open to the public. Local interest groups and businesses did occasionally attend when invited.

Another public input strategy was geared toward the general public as opposed to specific stakeholders. During the draft review portion of the plan development, an electronic copy of the draft 2018 HMP was posted to the Town's website. The public was informed of both the webpage posting and the public hearing. See Appendix B. They were encouraged to review the document, comment on the HMP and attend the meeting. Notice of the public hearing was also posted as an agenda item on the Town's website in accordance with state law. During the public review period, a few comments were received suggesting ways to make the Town and residents better prepared to withstand storms. See the end of Appendix A. On August 27, 2018, the Town Council held a discussion on the HMP as part of their regular public meeting. At the Town Council meeting, suggested edits and further clarification requested by Council Members. These were subsequently incorporated into the plan. One general comment from the public was that it's the downed trees that cause power-outages, not the storms themselves.

Review and comments from the Federal Emergency Management Agency and the Rhode Island Emergency Management Agency were also incorporated prior to adoption by the Town Council.

Before the HMC began meeting regularly, the Town was working on updating their Comprehensive Plan which includes discussions on floodplains, resource protection districts, and development trends. Members of the HMC will be involved in the Comprehensive Plan update and will be incorporating elements of this document into the other plan.

3

Natural Hazards

Hazards of Concern

The Rhode Island 2016 Hazard Identification and Risk Assessment and 2009 Portsmouth Hazard Mitigation Plan were used as a starting point for identifying hazards that pose the largest threat to the Town. The following table summarizes the hazards identified by the Portsmouth Hazard Mitigation Committee.

Table 4 Hazards Identified by the Portsmouth Hazard Mitigation Plan Committee

Natural Hazards Identified by the State	Identified by the HMP Committee	Notes
Severe Winter Weather		
Ice Storm	✓	
Snow	✓	
Flood		
Riverine	-	Not likely, there are no major rivers
Coastal	✓	
Flash	-	Conditions not present
Urban/Street	✓	
High Wind	✓	

Natural Hazards Identified by the State	Identified by the HMP Committee	Notes
Extreme Heat	✓	
Hurricane and Tropical Storms		
Nor'easter	✓	
Storm Surge	✓	Included with coastal flooding
Extreme Cold	✓	
Thunderstorm		
Hail	✓	
Lightning	✓	
Dam Failure	✓	
Fire		
Urban	-	Focus on natural hazards
Wildfire	✓	
Sea Level Rise	✓	
Epidemic	-	Not a concern
Drought	✓	
Earthquake	✓	
Tornado	✓	
Tsunami (not in State plan)	✓	
Human-Caused Hazards		**Notes**
Cyber Security	-	Not covered by this natural hazard plan
Chemical Incident	-	Not covered by this natural hazard plan
Terrorism	-	Not covered by this natural hazard plan
Biological Incident	-	Not covered by this natural hazard plan
Radiological Incident	-	Not covered by this natural hazard plan
Civil Unrest	-	Not covered by this natural hazard plan
Technological Hazards		**Notes**
Infrastructure Failure	-	Not covered by this natural hazard plan

During the beginning phases of the planning process, the Hazard Mitigation Committee participated in an exercise that captured the frequency of various hazards, their potential damage extent, and their impacts (i.e. to populations, infrastructure, natural environment, etc.). The following scales were used during the analysis:

Probability of Future Occurrence
Highly likely: near 100% probability within the next year;
Likely: between 10% and 100% probability within the next year or at least one chance in next 10 years;
Possible: between 1% and 10% probability within the next year or at least one chance in next 100 years;
Unlikely: less than 1% probability in next 100 years

Damage Extent
Low: some local property damage not town wide, minor injuries/ loss of life
Medium: 50% of property could be damaged and possible injuries/ loss of life
High: major town wide property damage, injuries and loss of life

Level of Concern/Risk Rank
Developed by the HMC to rank the various hazards based on frequency and damage potential.
Low - Not expected to occur with any frequency, damages will be limited.
Medium - Will occur within the next 10 years but the Town has resources to reduce risks.
High - Expected to occur within the next 5 years and is a major concern for the Town. Town-wide impacts

Based on a combination of probability of future occurrence, damage extent and impacts, the team assigned each hazard a Level of Concern. The table below summarizes the hazards of concern for the Town of Portsmouth, ranked from a high concern to low concern

Table 5 Hazards Ranked

Hazard	Level of Concern/Risk Rank
Hurricane	**High**
Nor'easter	**High**
Flooding (Coastal)	**High**
Snow Storm	**High**
High Winds	**Medium**
Ice Storm	**Medium**
Flooding (Street)	**Medium**
Extreme Heat and Cold	**Medium**
Drought	**Medium**
Brushfire	**Low**
Dam Failure	**Low**
Earthquake	**Low**

Hazard	Level of Concern/Risk Rank
Hail	**Low**
Lightning	**Low**
Tornado	**Low**
Sea Level Rise	**Low**
Tsunami	**Low**

In this hazard mitigation plan, climate change is treated as an ongoing amplifier to the identified natural hazards. According to the State of Rhode Island Hazard Identification and Risk Assessment, "climate change is both a present threat and an ongoing hazard that is expected to have a significant impact on municipalities, including those in Rhode Island. It acts as an amplifier for existing natural hazards.[5] Extreme weather events have become more frequent during the past half-century, and this trend is projected to continue.[6] For instance, more frequent intense precipitation events may translate into more frequent flash flooding episodes. The National Climate Assessment and Development Committee has documented that the average temperature across the United States has increased 1.5°F since 1895, with the majority of the increase since 1980. Weather events have and will continue to become more intense and frequent and will result in health and livelihood related impacts; such as water supply, agriculture, transportation, and energy. The impact of dynamic storm events includes, but is not limited to, more frequent and intense heat waves, increases in ocean and freshwater temperatures, frost-free-days, heavy downpours, floods, sea level rising, droughts, and wildfires.[7]" [8]

Climate change impacts will be mentioned for each hazard.

The following sub-sections are organized by the level of risk as identified in the table above.

5 The Copenhagen Diagnosis, 2009: Updating the World on the Latest Climate Science. I. Allison, N.L. Bindoff, R.A. Bindschadler, P.M. Cox, N. de Noblet, M.H. England, J.E. Francis, N. Gruber, A.M. Haywood, D.J. Karoly, G. Kaser, C. Le Quéré, T.M. Lenton, M.E. Mann, B.I. McNeil, A.J. Pitman, S. Rahmstorf, E. Rignot, H.J. Schellnhuber, S.H. Schneider, S.C. Sherwood, R.C.J. Somerville, K. Steffen, E.J. Steig, M. Visbeck, A.J. Weaver. The University of New South Wales Climate Change Research Centre (CCRC), Sydney, Australia, 60pp.http://www.copenhagendiagnosis.com/

6 IPCC, 2012 - Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (Eds.) Available from Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 8RU ENGLAND, 582 pp.

7 10 National Climate Assessment and Development Advisory Committee (NCADAC) January 2013 Draft Climate Assessment Report. http://ncadac.globalchange.gov/

8 RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

Hurricanes (Tropical Cyclones)

Description

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage (Rhode Island State Hazard Mitigation Plan 2014).

There are three categories of tropical cyclones:

1. Tropical Depression: maximum sustained surface wind speed is less than 39 mph
2. Tropical Storm: maximum sustained surface wind speed from 39-73 mph
3. Hurricane: maximum sustained surface wind speed exceeds 73 mph

Once a tropical cyclone no longer has tropical characteristics it is classified as an extratropical system (Rhode Island State Hazard Mitigation Plan 2014).

Most Atlantic tropical cyclones begin as atmospheric "easterly waves" that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This situation produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult (Rhode Island State Hazard Mitigation Plan 2014).

Hurricanes are categorized according to the Saffir/Simpson scale (Table 6) with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or sooner (Rhode Island State Hazard Mitigation Plan 2014).

The Saffir-Simpson scale below is based primarily on wind speeds and includes estimates of barometric pressure and storm surge associated with each of the five categories. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall."

Table 6 Saffir/Simpson Hurricane Wind Scale[9]

Wind Speed	Typical Effects
Category 1 – Weak 74-95 MPH (64-82kt)	Minimal Damage: Damage is primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage occurs in building structures. Some damage is done to poorly constructed signs.
Category 2 – Moderate 96-110 MPH (83-95kt)	Moderate Damage: Considerable damage is done to shrubbery and tree foliage; some trees are blown down. Major structural damage occurs to exposed mobile homes. Extensive damage occurs to poorly constructed signs. Some damage is done to roofing materials, windows, and doors; no major damage occurs to the building integrity of structures.
Category 3– Strong 111-130 MPH (96-113kt)	Extensive damage: Foliage torn from trees and shrubbery; large trees blown down. Practically all poorly constructed signs are blown down. Some damage to roofing materials of buildings occurs, with some window and door damage. Some structural damage occurs to small buildings, residences and utility buildings. Mobile homes are destroyed. There is a minor amount of failure of curtain walls (in framed buildings).
Category 4 – Very Strong 131-155 MPH (114-135kt)	Extreme Damage: Shrubs and trees are blown down; all signs are down. Extensive roofing material and window and door damage occurs. Complete failure of roofs on many small residences occurs, and there is complete destruction of mobile homes. Some curtain walls experience failure.
Category 5 – Devastating Greater than 155 MPH (135kt)	Catastrophic Damage: Shrubs and trees are blown down; all signs are down. Considerable damage to roofs of buildings. Very severe and extensive window and door damage occurs. Complete failure of roof structures occurs on many residences and industrial buildings, and extensive shattering of glass in windows and doors occurs. Some complete buildings fail. Small buildings are overturned or blown away. Complete destruction of mobile homes occurs.

Storm surge is the abnormal rise in water level caused by the wind and pressure forces of a hurricane or nor'easter (Rhode Island State Hazard Mitigation Plan 2014). Nationally, storm surge flooding has caused billions of dollars in damage and hundreds of deaths. Given today's ever-increasing population densities in coastal communities, the need for information about the potential for flooding from storm surge has become even more important.

Location

The Town's close proximity to the Atlantic Ocean renders it particularly susceptible to hurricanes and the resulting loss of human life and property.

9 National Weather Service, National Hurricane Center

Probability of Future Occurrence

Likely.

Extent (Event Magnitude)

Hurricanes that likely make it up to Rhode Island are usually weak (Category 1) or downgraded tropical systems. The wind speeds may be less but the storms can still bring a lot of rain.

Impact and Damage Extent

Portsmouth is a coastal community; in addition to coastal storm surge flooding, damage would be from downed power lines, downed trees, and damage to mobile homes or older structures.

Climate Change Impacts

Warming global air and water temperatures may increase the intensity of hurricanes that travel along the Atlantic Coast.

History

The unforeseen Great New England Hurricane of 1938 is the most catastrophic weather event in Rhode Island and history. The event occurred slightly before high tide and brought with it winds upward of 120 mph. A tidal surge inundated the city of Providence with over 10' of water.

Portsmouth suffered loss of power and damage to houses and buildings.

A Category 1 hurricane struck Rhode Island in August 1954 (Carol). There is no first hand record of the extent of the impact to Portsmouth but the hurricane likely resulted in house and tree damage around Portsmouth.

In October 1991, Hurricane Bob hit Rhode Island as a Category 2 storm. There is no personal recollection of the damage from Hurricane Bob from the hazard mitigation committee but the hurricane likely damaged business and homes as well as took down numerous trees and utility lines in Portsmouth.

In 2011, Hurricane Irene hit Portsmouth as a tropical storm. Despite the relatively low wind speeds, sustained winds over a 6 to 12-hour long duration resulted in widespread tree damage and resulted in power outages to roughly half a million customers throughout the state. Numerous trees, poles, and wires were downed throughout Portsmouth. The Portsmouth DPW worked 26 days or 1,307.5 man hours cleaning up storm damage. Collective effects throughout Massachusetts and Rhode Island resulted in 1 fatality, no injuries, and $127.3 million in property damage (NOAA).

In October 2012, Hurricane Sandy severely impacted coastal Rhode Island as it came ashore with Tropical Storm strength winds. Portsmouth was mainly impacted by

waves and high winds. Tree damage was widespread. The Portsmouth DPW worked 26 days or 1,327 man hours cleaning up storm damage.

Nor'easters

Description

A strong low-pressure system along the Mid-Atlantic and New England, can form over land or over coastal waters. The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 miles per hour, traveling up the eastern United States coast. Sustained wind speeds of 10-40 MPH are common during a nor'easter, with short term wind speeds gusting up to 70 MPH. Typically a winter weather event, Nor'easters are known to produce heavy snow, rain and heavy waves along the coast. Unlike hurricanes and tropical storms, nor'easters can sit off shore, wreaking damage for days.

Also called East Coast Winter Storms, Nor'easters are characterized by:

- A closed circulation.
- Located within the quadrilateral bounded at 45N by 65W and 70W, and at 30N by 85W and 75W.
- Show a general movement from the south-southwest to the north-northeast.
- Contain winds greater than 23 mph.
- The above conditions must persist for at least a 12-hour period[10].

The magnitude or severity of a severe winter storm or Nor'easter depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend), and season.

The extent of a severe winter storm (including Nor'easters that produce snow) can be classified by meteorological measurements and by evaluating its combined impacts. For measuring wind effects, the Beaufort Wind Scale is a system that relates wind speed to observed conditions at sea or on land (See Figure 4). The snow impact of a Nor'easter can be measured using NOAA's Regional Snowfall Index (See the section Snow Storm).

Location

The Town's close proximity to the Atlantic Ocean renders it particularly susceptible to Nor'easters and the resulting loss of human life and property.

10 Hersher, et al. An East Coast Winter Storm Climatology. Northeast Regional Climate Center, Cornell University, Ithaca, NY, 2001.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

On average, Portsmouth experiences or is threatened by a Nor'easter every couple of years.

Impact and Damage Extent

Portsmouth is a coastal community; most damage would be to utilities, roads, stormwater infrastructure, personal property, trees, and snow loads on roofs. The Blizzard of 1978 was the largest Nor'easter on record. Many people in Rhode Island were without heat, food, and electricity for over a week.

Climate Change Impacts

Similar to hurricanes, changes in air and water temperatures may lead to stronger Nor'easters along the Atlantic Ocean. Portsmouth should expect stronger and more frequent sever storms.

History

Table 7 Nor'easter History[11]

Date	Comments
02/10/1969	Up to 20 inches of snow in parts of Rhode Island.
02/07/1978	27 inches of snow in Providence. State of emergency declared in RI and in surrounding MA and CT.
02/24/1998	The second powerful nor'easter to affect the region in less than a week brought heavy rainfall and strong northeast winds to much of Rhode Island. An extremely intense low pressure system moving to the northeast and passing just to the southeast of Nantucket had a central barometric pressure just under 29 inches of mercury. Rainfall totals for this storm exceeded 2 inches over the eastern and northern part of the state. Strong northeast winds gusted to 40 to 56 mph across the state. Nearby Tiverton experienced wind gusts of 52 mph.
03/21/1998	A strong very early Spring nor'easter brought a mixture of snow, sleet, and rain to Rhode Island. Peak wind gusts were 35-49 mph.
10/25/2005	A strong coastal storm (i.e. a nor'easter) entrained with energy and moisture from the remnants of Wilma brought rainfall amounts between 2 and 2.5 inches and damaging winds to portions of Rhode Island. The high winds brought

[11] [11] NOAA Storm Event Database for flood events in Washington County. https://www.ncdc.noaa.gov/stormevents/

Date	Comments
	down limbs, trees, and wires, resulting in scattered power outages in nearby Tiverton.
01/12/2011	A developing nor'easter coastal storm dumped nearly two feet of snow across portions of Rhode Island in a 24-hour period. Six to ten inches of snow fell across Newport County.
10/29/2011	A rare and historic October nor'easter brought very heavy snow to portions of southern New England on Saturday October 29. Low pressure tracked northeast from the North Carolina coast Saturday morning, rapidly strengthening as it passed well south of Nantucket Saturday evening. As the storm intensified, colder air from aloft was drawn into New England resulting in heavy snow in the interior. Newport State Airport recorded sustain wind speeds of 36 mph with gusts to 53 mph.
03/02/2018	Nor'easter #1. Wind gusts >70 mph. Two to four inches of rain across the region. Coastal flooding. Widespread power outages and tree damage. This was a rain and wind event.[12]
03/07/2018	Nor'easter #2. Wind gusts >60 mph.
03/13/2018	Nor'easter #3. Wind gusts about 60 mph. Thousands without power in Rhode Island. Downed trees throughout Aquidneck Island. This was a heavy snow and wind event.[13]

Flooding (Coastal and Street/Urban)

Description

According to the Rhode Island 2014 Hazard Mitigation Plan Update, "Flooding is a localized hazard that is generally the result of excessive precipitation. Flooding is the most commonly occurring natural hazard, due to the widespread geographical distribution of river valleys and coastal areas, and the attraction of human settlements to these areas. Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss."

"A flood, which can be slow or fast rising but generally develops over a period of days, is defined by the National Flood Insurance Program (NFIP) as:

› A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow; or

[12] WPRI. March 20, 2018 https://www.wpri.com/news/local-news/march-of-the-noreasters-each-storm-different-from-the-last/1082557076

[13] Newport Daily News. March 14, 2018 http://www.newportri.com/da9d9382-475d-5911-8cd2-1fc8cfbb3c1a.html

› The collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above."

Severe storms with heavy rain can generate flash floods which strike and end quickly. Flash flooding isn't limited to streams and rivers but also streets. Conditions in Portsmouth do not typically yield flash floods.

Flooding due to runoff occurs when water runs over the land's surface impervious surfaces (paved areas, building subdivisions, and highways). Two major environmental modifications are primarily responsible for drastically altering the rain fall-runoff relationship.

1. Making the land surface impervious by covering it with pavement and construction work.
2. Installing storm sewer systems that collect urban runoff rapidly discharging large volumes of water into stream networks and/or freshwater wetland system.

FEMA maintains regulatory flood maps called Flood Insurance Rate Maps (FIRM). Insurance companies refer to these when providing coverage to homeowners. These maps are available for viewing at Town Hall and online at The FEMA Map Service Center https://msc.fema.gov. Please note that there is a process for the public to request a change in the flood zone designation for their property.

Location

During the March 2010 flood events several roads were unpassable on Prudence Island as well as Portsmouth. Low-lying coastal roads, as well as the neighborhoods of Common Fence Point, and Island Park are the most vulnerable.

Probability of Future Occurrence

Riverine flooding is unlikely. Street/urban and coastal flooding is highly likely.

Extent (Event Magnitude)

Localized flooding can be expected to occur on an annual basis. The flood event which occurred in March 2010 was a 250 year +/- event.

Impact and Damage Extent

Heavy rains, quick thaws with precipitation, and hurricanes accompanied by heavy winds and rain make the Town vulnerable to personal, property and environmental damage occasioned by flooding.

Flood prone areas and/or areas of concern include Park Avenue, Common Fence Point Boulevard, Island Park, Glen Road, and Melville.

Vulnerable structures include stormwater infrastructure, dams, residential homes, marinas, water supply lines, and roads.

During the floods of 2010, on Prudence Island, 27 roads sustained damage, and on Portsmouth 10 roads were damaged. The Town hauled over to Prudence over 1,308 tons of gravel, 264 tons of 4" to 6" rip rap, 294 tons of 3" stone and 54 tons of cold patch to repair the roads that were washed out. FEMA approved a post-disaster hazard mitigation action for Prudence Island to install a retaining wall on Narragansett Ave at Sand Point Hill. This section of the hill washed out onto the roadway making this section of roadway impassable.

The Town of Portsmouth also participates in the National Flood Insurance Program (NFIP). There are 343 policies in an A zone, and 70 policies in the V zone.

Climate Change Impacts

Changing climate conditions are likely to bring more rainfall events to Portsmouth and fewer snow storms. More intense storms will stress the natural floodplains and stormwater infrastructure. In coastal areas where storm drains empty into the ocean, rising tides and storm surge may further exacerbate flooding during heavy rain events.

History

Table 8 History of Flooding in Portsmouth Since 2000.[14]

Date	Comments
07/01/2009	A stationary front stretched from Hartford, Connecticut across northern Rhode Island to southeast Massachusetts combined with an upper level disturbance to produce showers and thunderstorms across southern New England. Plenty of moisture was in place across these areas, increasing the chance for heavy rain and flooding. In Portsmouth, a house on East Main Road was flooded with water going into the first floor of the house.
03/29-31/2010	River and areal flooding resulted in millions of dollars of damage across Rhode Island, with numerous homes, businesses, and people affected. Five to eight inches of rain fell across Newport County. Many basements were flooded in Jamestown, and Portsmouth. Several roads were flooded in Jamestown, Tiverton, and Portsmouth, including Route 24 at Boyds Lane in Portsmouth, which was closed.
08/13/2014	An area of low pressure over New York City lifted northeast across Southern New England. This worked together with a warm humid airmass to produce heavy downpours. Water spilled over the seawall in Portsmouth.

[14] NOAA Storm Event Database for flood events in Newport County, specifically The Town of Portsmouth. https://www.ncdc.noaa.gov/stormevents/

Snow Storm

Description

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland areas. However, snow and ice do occur and can be more than an inconvenience and cause extensive damage. The two major threats from these hazards are loss of power due to ice on electrical lines and snow loading on rooftops. Additionally, loss of power could mean loss of heat for many residents.

Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chill. There are three categories of winter storms. A blizzard is the most dangerous of the winter storms. It consists of low temperatures, heavy snowfall, and winds of at least 35 miles per hour. A heavy snow storm is one which drops four or more inches of snow in a twelve-hour period. An ice storm occurs when moisture falls and freezes immediately upon impact. For the purpose of this plan, snow storms include heavy amounts of snow and ice. All of which may occur independently or at the same time.

Location

A severe winter storm could have a serious impact in private, and public structures, as well as the general population throughout Portsmouth. Those most at risk to extreme cold are the elderly and those who work outside.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

On average, Portsmouth receives 21 inches of snow throughout the year. The average winter temperature in Portsmouth is 43.6 Fahrenheit.[15]

Impact and Damage Extent

The combination of wind, ice, and snow can have a crippling effect on the Town. Wind and ice impacts are described in their respective sections of this plan. Heavy and/or excessive snowfall amounts can stress roofs and slow plowing efforts.

15 https://myforecast.com

Climate Change Impacts

Portsmouth may likely see less snowfall over the winter season but may see more intense blizzards when they do occur.

History

Portsmouth has been subjected to annual snowstorms and Nor'easters. The Great Blizzard of 1978 blanketed Portsmouth with 27 inches of snow and closed businesses for several days. In February 2013, Winter Storm Nemo temporarily crippled the town. Power lines were downed, and road crews had a tough time keeping up with keeping the roads passable.

Table 9 History of Blizzard and Winter Storm Events In and Near Portsmouth

Date	Inches	Comments
12/19/2009	17-21	Seventeen to twenty-one inches of snow fell across Newport County.
02/10/2010	5-8	Heaviest snow confined to only southern Rhode Island and southeastern Massachusetts. Strong winds accompanied the storm across this area, resulting in numerous downed trees and power lines, knocking out power to many. Five to eight inches of snow fell across Newport County.
12/26/2010	6-10	Snowfall totals of 6 to 10 inches were observed in Newport County.
01/12/2011	6-10	Six to ten inches of snow fell across Newport County.
01/26/2011	5.7	A strong low-pressure system moved up the coast and southeast of Nantucket producing up to a foot of snow across Rhode Island. Five to seven inches of snow fell across Newport County.
01/21/2012	8-9	Eight to twelve inches of snow fell along the coast with five to eight inches falling on Martha's Vineyard and Nantucket. About 8 inches fell in Portsmouth.
12/29/2012	5-8	A rapidly intensifying low moved out of the mid-Atlantic, passing southeast of Southern New England. This spread heavy snow across much of Southern New England, resulting in six to twelve inches of snow across the area. Snowfall between five and eight inches were reported in Newport County.
02/08/2013	13-16	The Blizzard of 2013 also produced a prolonged period of very strong winds Friday night along the MA and RI coasts. Gusts exceeded hurricane force (74 mph) at a few locations. Gale force gusts (to 50 mph) continued on the MA coast through Saturday afternoon. The strong winds, combined with a wet snow, led to extensive power outages from downed trees and wires in southeast coastal MA and in southern RI. Thirteen to sixteen inches of snow fell across Newport County.
01/02/2014	7-9	A significant, rapidly developing coastal storm moved southeast of Southern New England bringing heavy snow, bitter cold temperatures, and strong winds to all of the region. Seven to nine inches of snow fell across Newport County.
01/21/2014	5-8	Low pressure tracked along an arctic front bringing heavy snow and strong winds to much of southern New England. Five to eight inches of snow fell across Newport County.

Date	Inches	Comments
02/15/2014	6-8	Low pressure moved off the DelMarVa peninsula and moved northeastward passing southeast of southern New England. This brought strong winds and heavy snow to the southern portions of the region. Six to eight inches of snow fell across Newport County.
01/26/2015	16-19	The Blizzard of January 2015 produced very strong winds late Monday into Tuesday near the Massachusetts and Rhode Island coasts where gusts of 50 to 65 mph were common. The Governor of Rhode Island declared a state wide travel ban beginning at midnight on January 27th and continuing through 8 pm. Blizzard conditions occurred at nearby T.F. Green Airport from approximately 6 am to 9 am. Outside this time frame, near blizzard conditions occurred with gusty winds and limited visibilities. Sixteen to nineteen inches of snow fell across Newport County. Rhode Island's tall ship, the Continental Sloop Providence, was toppled by strong wind gusts and sustained extensive damage. The mast was broken and the hull punctured.
02/14/2015	9-10	Nine to ten inches of snow fell across Newport County.
03/05/2015	8-11	Low pressure moved along a cold front stalled south of southern New England, bringing accumulating snow to much of the region. Snow was focused along the south coasts of Massachusetts and Rhode Island, including Cape Cod and the islands. Eight to eleven inches of snow fell across Newport County.
01/23/2016	4-9	Four to nine inches of snow fell across Newport County. Snow was difficult to measure because strong, gusty winds occurred simultaneously, resulting in blowing and drifting of snow.
01/7/2017	8-14	Eight to fourteen inches of snow fell on Newport County during the day and evening.
02/09/2017	9-12	Strong winds and heavy snow. 6-13 inches fell across Washington County.
03/10/2017	5-6	Low pressure moved up along the cold front on March 10 and passed south of the region, but close enough to bring snow especially on the South Coast. Trained spotters measured 5-6 inches of snow accumulation.

High Winds

Description

Wind is the movement of air caused by a difference in pressure from one place to another. Local wind systems are created by the immediate geographic features in a given area such as mountains, valleys, or large bodies of water. National climatic events such as high gale winds, tropical storms, thunderstorms, nor'easters, hurricanes, and low-pressure systems produce wind events in Rhode Island. Wind effects can include blowing debris, interruptions in elevated power and communications utilities, and intensification of the effects of other hazards related to winter weather and severe storms.

The Beaufort Wind Scale is a 17-level scale used to describe wind speed and observed wind conditions at sea and on land. A wind classification of 0 has wind speeds of less than 1 mile per hour are considered calm. On the other end, a classification of 10 with wind speeds reaching 63 miles an hour will blow down trees and cause considerable damage.

Figure 3: Wind Speed

Beaufort Wind Chart – Estimating Winds Speeds

Beaufort Number	MPH Range	MPH Average	Terminology	Description
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	**Severe gale**	**Light structure damage.**
10	55-63	60	**Storm**	**Trees uprooted. Considerable structural damage.**
11	64-73	70	**Violent storm**	**Widespread structural damage.**
12	74-95	90	**Hurricane**	**Considerable and widespread damage to structures.**

Location

Wind events are expected throughout the year in Portsmouth.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

Wind speeds are not monitored in Portsmouth. However, wind speeds in nearby Providence are indicative of Portsmouth. "With an average wind speed of 9.3 MPH,

Providence is a windy city, 1.00 mph higher than the national average. The average wind speed in Providence is about the same as the State average. The windiest season in Providence is spring, with spring wind speeds reaching 10.27 mph on average, 1.17 mph higher than in the rest of the U.S..[16]

Impact and Damage Extent

Strong wind gusts of 40 miles an hour (Beaufort Scale of 8) can blow twigs and small branches from trees. Occasional gusts and sustained winds at this speed (and above) are of concern to the Town. Damages from wind events range from power outages, property damage to vehicles and buildings and fallen trees/limbs. Wind events in Portsmouth have resulted primarily in power outages and downed tree limbs with minimal property damage. It is important that the Town of Portsmouth maintain their public tree trimming program that will reduce the likelihood of fallen trees/limbs from disrupting transportation routes and/or taking down power lines. In early March 2018, high winds lead to dangerous driving conditions on the Sakonnet and Mount Hope bridges. Both bridges were closed briefly to protect driver safety.

Climate Change Impacts

Changes in atmospheric circulation are predicted to occur. See "Hurricanes" and "Nor'easters".

History[17]

Table 10 History of High Winds in Newport County

Date	Magnitude (kts)	Comments
03/14/2010	50	Trees and power lines were downed in Newport, Middletown, and Portsmouth.
02/25/2011	50	-
12/08/2011	59	-
01/13/2012	50	-
10/29/2012	75	Hurricane Sandy which had been downgraded by the time it reached Rhode Island. Numerous trees were downed throughout Newport County.
12/27/2012	53	-
01/31/2013	50	-
02/08/2013	55	-
11/27/2013	51	-
01/09/2015	51	-

16 WeatherDB https://wind-speed.weatherdb.com/l/206/Providence-Rhode-Island accessed 3/3/2017.

17 National Climate Data Center (2017)

Date	Magnitude (kts)	Comments
02/08/2016	53	-
02/16/2016	50	-
04/03/2016	35	-
10/0920/16	35	-
11/21/2016	35	-
10/29/2017	50	The remnants of Tropical Storm Phillipe merged with a mid-latitude system approaching the U.S. East Coast. The combined system generated strong to damaging winds. At 1018 PM EST, a tree and wires were down at Prospect Court in Portsmouth.

Ice Storm

Description

Ice Storm. Source: NOAA.

An ice storm occurs when moisture falls and freezes immediately upon impact. The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Freezing rain most commonly occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations. If extreme cold conditions are combined with low or no snow cover, the cold can better penetrate downward through the ground and potentially create problems for underground infrastructure, as well. When utilities are affected and heating systems are compromised or do not work, water and sewer pipes can freeze and even rupture.

Location

All of Portsmouth is susceptible to ice storms.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

Ice storms can be the most devastating winter weather phenomena and are often the cause of automobile accidents, power and communication system outages, personal injury, and death. Moreover, they can hinder the delivery of emergency

services needed in response to these catastrophes and endanger the responders. Ice storms accompanied by wind gusts cause the most damage.

The Sperry–Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems. The SPIA Index uses forecast information to rate an upcoming ice storm's impact from 0 (little impact) to 5 (catastrophic damage to exposed utility systems).

Portsmouth expects at least a level 1- isolated or localized utility interruptions every year due to ice.

Figure 4 SPIA Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Impact and Damage Extent

The Portsmouth Hazard Mitigation Committee is most concerned about ice taking down trees throughout the heavily forested town. Falling trees have taken out power lines, damaged buildings, and essentially shut down the town. Icy roads can also cause dangerous driving conditions.

Climate Change Impacts

Warming temperatures may mean less snowfall but if there is enough moisture in the atmosphere, it may fall as freezing rain, coating everything in ice. Portsmouth should expect more ice events.

History

Due to the unique weather in New England, ice storms are usually part of larger snow events. The winter storm event that crippled the state in February 1978 did include a FEMA disaster declaration for snow and ice. Subsequent storms have included ice warnings when there are rapidly warming and cooling temperatures. Rhode Island was spared the brunt of the 2008 ice storm which affected more than a million people across New Hampshire, Vermont, Massachusetts, Maine, Connecticut, and New York.

Extreme Temperatures

Description

Extreme cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. The definition of an excessively cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." In Rhode Island, extreme cold usually involves temperatures below zero degrees Fahrenheit (Rhode Island State Hazard Mitigation Plan 2014).

The wind chill index attempts to quantify the cooling effect of wind with the actual outside air temperature to determine a wind chill temperature that represents how cold people and animals feel, based on the rate of heat loss from exposed skin. A wind chill index of -5 indicates that the effects of wind and temperature on exposed flesh are the same as if the air temperature alone were five (5) degrees below zero (0), even though the actual temperature could be much higher. The NWS issues a wind chill advisory when wind chill temperatures are potentially hazardous and a wind chill warning when the situation can be life-threatening (Rhode Island State Hazard Mitigation Plan 2014).

The National Weather Service issues **extreme (or excessive) heat** warnings when the maximum expected heat index is expected to be 105^{o} F or higher for at least 2 consecutive days and night time air temperatures are not expected to fall below 75^{o}. In the northeast, this criteria are generally modified to a heat index of 92^{o} For higher for 2 consecutive days.

Location

An extreme heat or cold event would be a regional issue affecting Portsmouth and significant portions of Southern New England. Extreme temperatures could have a serious impact on private and public structures, as well as the general population throughout Portsmouth. Those most at risk to extreme temperatures are the elderly and those who work outside.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

In 2011, T.F. Green Airport reported heat indexes of 105 to 106 over an eight-hour period.

Wind chills of 32 below zero were reported at T.F. Green Airport in 2016.

Impact and Damage Extent

Personal exposure to dangerous heat conditions may lead to heat cramps, heat exhaustion, and heat stroke. These are especially important to monitor in children, elderly, and vulnerable populations that are not able to move to cooler conditions.

Extreme cold conditions may occur during, after, or without any connection to a winter storm. Exposure to extreme cold can lead to hypothermia and frostbite.

Climate Change Impacts

Over the coming century, extremely hot days (over 90 degrees F) is projected to increase in New England.[18]

"Extreme cold in Rhode Island is projected to continue as extreme weather events experience an upswing due to climate change. The specific likelihood of extreme cold is unpredictable, as days of frigid, arctic air and below freezing temperatures may be followed by days of mild temperatures in the 40s or 50s."[19]

History[20]

NOAA's Storm Events Database does not have any records specifically for Portsmouth, nor does the Town keep records. The following were reported at the Newport State Airport located a few miles south of Portsmouth.

Table 11: Extreme Temperatures (Excessive Heat, and Extreme Cold/Wind Chill) in Newport County[21]

Date	Temperature	Comments
07/22/2011	106-110	The Automated Surface Observing System at Newport State Airport (KUUU) recorded heat indexes of 106 to 110 over a five-hour period.
02/16/2011	-26	The Automated Surface Observation Station at Newport State Airport (KUUU) recorded wind chills as low as 26 below zero.
02/14/2016	-34	Wind chills as low as 34 below zero were reported at Newport Airport.

18 Confronting Climate Change in the Northeast, by the Northeast Climate Impacts Assessment Group, July 2007

19 RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

20 Intellicast http://www.intellicast.com/Local/History.aspx?month=2

21 National Climate Data Center (2018)

The following were temperature records provided by Intellicast which is owned by the same company as the Weather Channel.

- August 2, 1975: record high of 98 degrees
- January 18, 1982: record low of -9 degrees

Drought

Description

Drought in nearby Connecticut.
Source: Bob Luckey Jr./ Hearst Connecticut Media

Drought is characterized as a continuous period of time in which rainfall is significantly below the norm for a particular area over a multi-year period. The American Meteorology Society defines drought as a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance. Drought differs from other natural hazards in that they occur suddenly. Rather, a drought evolves over months or even years and, while causing very little structural damage, can have profound economic, environmental, and social impacts.

There are four different ways that a drought can be defined:

1. Meteorological – A measure of departure of precipitation from normal. Due to climatic differences, what is considered a drought in one location may not be a drought in another location.
2. Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
3. Hydrological- occurs when surface and subsurface water supplies are below normal.
4. Socioeconomic- refers to the situation that occurs when physical water shortage begins to effect people.

Characteristics and impacts of drought differ in many ways, so it is difficult to quantify drought. An existing index called the Palmer Drought Severity Index (PDSI) that used temperature and precipitation levels to determine dryness, measuring a departure from the normal rainfall in a given area. The advantage of the PDSI is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. A monthly PDSI value below -2.0 indicates moderate drought, and a value below -3.0 indicates severe drought.

The U.S. Drought Monitor tracks drought conditions in Rhode Island and in the rest of the nation. They create maps based on climate data, hydrologic and soil conditions, as well as reported impacts and observations from over 350 contributors nationwide.

Table 12 Drought Severity [22]

Severity	PDSI Index Value	Drought Level	Possible Impacts
Exceptional Drought	-5 or less	Emergency	Widespread crop/pasture losses, shortages of water creating water emergencies.
Extreme Drought	-4 to -4.9	Warning	Major crop/pasture losses, widespread water shortages or restrictions.
Severe Drought	-3 to -3.9	Watch	Crop or pasture losses likely, water shortages common, water restrictions imposed.
Moderate Drought	-2 to -2.9	Advisory	Some damage to crops/pastures, developing water shortages, voluntary water-use restrictions requested.
Mild Drought/Abnormally Dry	-1 to -1.9	Normal	Short term dryness slowing planting or crop growth.
Incipient Dry Spell	-0.9 or less	-	-

Rhode Island, as with most states within the United States, uses both the Palmer Drought Severity Index (PDSI) and the Crop Moisture Index (CMI) as indices for a drought occurrence. The CMI (a derivative of the PDSI) provides information on the short-term or current status of purely agricultural drought or moisture surplus. The PDSI is most effective for determining long-term drought conditions, while the CMI is effective at helping determine short-term drought.

The RI Drought Steering Committee assigns drought levels for the seven designated drought regions in the state, based on hydrological indices such as precipitation, groundwater, stream flow, and the PDSI, as well as on local supply indices such as static groundwater levels and reservoir levels. The Normal, Advisory, and Watch levels are issued statewide. The Warning and Emergency levels are issued on a regional basis and consider local conditions, source of water supply, and water storage capacity issues.

22 http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx

Location

According to the Rhode Island Water Resource Board the potential for a drought exists every eleven years in Rhode Island. Although temporary drought conditions may occasionally exist in Rhode Island, affecting Portsmouth devastating, long term drought conditions are not indicative of this temperate region.

Probability of Future Occurrence

Likely.

Extent (Event Magnitude)

According to The National Weather Service Rhode Island receives on average 39" to 54" of rain annually. Notwithstanding the same, the State experiences extended periods of dry weather. Some type of drought in Rhode Island occurs approximately once every 11 years.

Impact and Damage Extent

The main impacts of meteorological drought are periods of very high fire danger and low drinking water supplies. Portsmouth's drinking water is supplied by local surface water resources. Changes in surface water levels can impact not only the quantity of available water but also the quality.

Prudence Island has a finite supply of freshwater for residents. Extended drought conditions will require water use restrictions and possibly a backup water source to the island.

Drought conditions have been known to trigger the rapid increase of the gypsy moth populations in the region. The extended period of dry weather (specifically in May and June) slows the fungus that usually keeps the gypsy moth caterpillars at bay. Denuded trees can have cascading effects on the local ecosystem.

Drought conditions can also cause farmers to lose livestock or crops, or invest more money in alternate water sources. In Portsmouth, farmers pay less for water than residents but when there are water restrictions, they are the first to be cut off.

Climate Change Impacts

Even though rain events may intensify due to climate change, the periods between them may be longer. Rhode Island expects longer periods of drought. According to the 2016 Rhode Island Hazard Identification and Risk Assessment, "Recent climate change studies[23] have indicated that although precipitation is projected to increase throughout this century, it will be in the form of short duration, intense, and less

[23] Information derived from two recent studies: Confronting Climate Change in the Northeast, by the Northeast Climate Impacts Assessment Group, July 2007, and Climate Risk Information, by the New York City Panel on Climate Change, 2/17/09.

frequent events. In addition, it is projected by the Northeast Climate Impacts Assessment Group (NECIA) and the New York City Panel on Climate Change (NPCC) that most of this increased precipitation may occur during colder times of the year, such as winter, in the form of snow or ice. Furthermore, it is projected that the frequency and intensity of both long-term and short-term droughts throughout the Northeast will increase throughout the century with the impacts beginning to occur with a greater degree of frequency beginning in the mid-century (2050s)."

History

Extended droughts are rare in Rhode Island with a record of six major droughts (those lasting for more than one year) since 1929 (Table 13; USGS: Rhode Island Floods and Droughts). The longest and most severe drought occurred in 1963-67 and affected most of the northeast (USGS: Rhode Island Floods and Droughts). Water shortages affected most communities in Rhode Island and several municipal-supply wells were drilled to augment declining public supplies (USGS: Rhode Island Floods and Droughts).

Table 13 History of Droughts

Date	Area Affected	Remarks
1930-31	Statewide	Stream flow of 70% normal.
1941-45	Statewide	Stream flow of 70% normal in Blackstone and Pawtuxet Rivers.
1949-50	Statewide	Stream flow of 70% normal.
1963-67	Statewide	Water restrictions/well replacements common.
1980-81	Statewide	Groundwater deficient in eastern part of state. Considerable crop damage.
1987-88	Southern part of the State	$25 million crop damage.
1998-99	Statewide	Spring through summer the State experienced 75% of normal flow.
2012	Statewide	January –April 2012. Meteorological drought due to precipitation levels one half of normal.
2016	Statewide	Drought Advisory.

Brushfire

Description

Brushfires are fueled by natural cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. While available fuel, topography, and weather provide the conditions that allow wildfires to spread, most wildfires are caused by people through criminal or accidental misuse of fire.

Brushfires pose serious threats to human safety and property in rural and suburban areas. They can destroy crops, timber resources, recreation areas, and habitat for wildlife. Wildfires are commonly perceived as hazards in the western part of the country; however, smaller brushfires are a growing problem in the wildland/urban interface of the eastern United States, including Rhode Island.

Brushfires are dependent upon the quantity and quality of available fuels. Fuel quantity is the mass per unit area. Fuel quality is determined by a number of factors, including fuel density, chemistry, and arrangement. Arrangement influences the availability of oxygen. Another important aspect of fuel quality is the total surface exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark and twigs, are easily ignited when dry.

Climatic and meteorological conditions that influence wildfires include solar insulation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. In Rhode Island, common factors leading to large fires include short-term drought, humidity below 20%, and fuel type.

Various natural and human agents can be responsible for igniting brushfires. Natural agents include lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Human-caused brushfires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set deliberately at times when factors such as wind, temperature, and dryness contribute to the fires' spread.

The humid coastal climate in Portsmouth is not set up to endure long periods of drought that lead to widespread vegetation loss. Destructive lightning fires in remote locations are rare but there is always a risk of fires from arson or careless fire use.

Location

Being largely undeveloped, Prudence Island is most at risk for brushfires. The open fields, forested areas, and grassy areas on the mainland are also at risk.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

Average of twice per year with a burn area of generally less than an acre. The extent has decreased over the years due to better response equipment, faster response time, and the widespread use of cell phones used to report fires.

Impact and Damage Extent

Individual buildings may be more or less vulnerable to damage from brushfires based on factors such as the clear distance around the structure and the structure's

construction materials. Brushfires primarily impacts timber and forest ecosystems, although the threat to nearby buildings is always present.

The likelihood of brushfires occurring and having widespread impacts has decreased over the years as fields and wooded areas are taken over by development. The Town has also noted an increase in fire public education- most people are intelligent about the causes of brushfires and how quickly they can get out of control.

Climate Change Impacts

Longer dry periods and droughts may increase the probability of brushfires but their extent has diminished over the years due to advances in detecting and firefighting technologies.

History

There have been no significant brushfires in the past 25 years on Portsmouth, Prudence, or Hog Island. Regular controlled burn on Prudence Island for training.

Dam Failure

Description

Dams are classified as high hazard, significant hazard or low hazard. The classification is not based on whether a dam is deemed safe or unsafe. As of the 2016 RIDEM dam inventory, there are 96 high hazard dams, 81 significant hazard dams and 491 low hazard dams in the state. Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted.

A *High Hazard* dam is one whose failure or misoperation will result in a probable loss of human life.

A *Significant Hazard* dam is one whose failure or misoperation results in no probable loss of human life but may cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare.

A *Low Hazard* dam is one whose failure or misoperation results in no probable loss of human life and low economic losses.

As part of each Rhode Island Department of Emergency Management (RIDEM) inspection, the major components of the dam are subjectively rated as good, fair or poor. The major components are the embankment, the spillway and the low-level outlet. Good means the dam meets the minimum Army Corps of Engineers (ACOE) guidelines. Fair means the dam has one or more components that require maintenance. Poor means a component of a dam has deteriorated beyond maintenance and is in need of repair.

Flood events call into question the structural integrity of dams that would affect Portsmouth. In 2016 RIDEM identified 8 dams in the Town of Portsmouth. Three of

the 8 dams are classified as high hazard dams and 1 dam is identified as a significant hazard dam, and 4 are low hazard dams.

The following summaries set forth the conditions of the twelve dams that are classified as significant or high hazard dams.

Location

See Appendix C for the locations of various dams in Portsmouth.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

All three dam hazard classifications are represented in Portsmouth. The extent of a failure would vary. The Portsmouth Hazard Mitigation Committee has identified failure as a break in the dam, sending water downstream, or faulty gates which if not opened will cause flooding behind the dam.

Impact and Damage Extent

The Portsmouth Hazard Mitigation Committee recognizes that a dam failure is not a natural hazard in itself but several of the hazards listed in the hazard list could bring dam failure upon the Town of Portsmouth. Severe winter storms, flooding, and a hurricane could all bring enough rain and or snowfall to cause a dam failure. The age of these dams also poses a risk to the structural integrity of these dams. A failure of the antiquated gates could cause loss of lives, property, the natural environment, and economy.

Climate Change Impacts

Related to flooding, more intense rain events may stress the structural integrity of dams which would lead to failure.

History

There is no history of dam failure in Portsmouth.

Earthquake

Description

An earthquake (also known as a quake, tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. The size or magnitude is recorded on a device known as a seismograph.

Earthquakes with a magnitude 3 or lower are mostly imperceptible (too low to recognize) and magnitude 7 earthquakes cause serious damage over large areas.

Although earthquakes are not considered to be a major problem in the Northeast United States, they are more prevalent than one might expect. Table 14 presents historical seismic activity for Rhode Island. It highlights the earthquake epicenter, the Richter magnitude at the epicenter, and the Mercalli Intensity Level. Richter magnitudes are technical quantitatively based calculations that measure the amplitude of the largest seismic wave recorded. Richter magnitudes are based on a logarithmic scale and are commonly scaled from 1 to 8. See the graphic below. The higher the magnitude on the Richter Scale, the more severe the earthquake. Mercalli intensity levels are based on qualitative criteria that use the observations of the people who have experienced the earthquake to estimate the intensity level. The Mercalli scale ranges from I to XII. The higher the intensity level on the scale, the closer the person is to the epicenter.

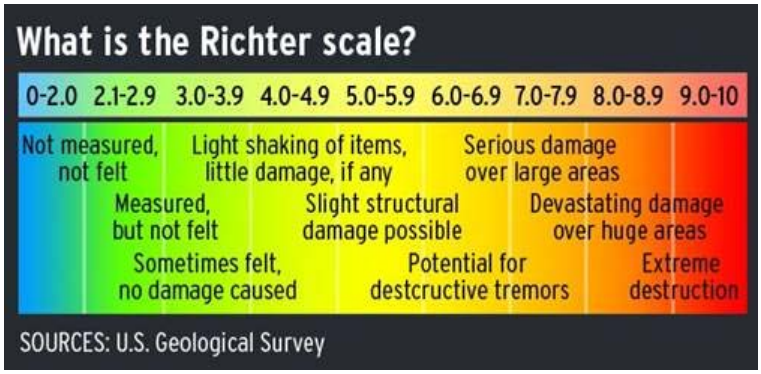


Table 14 Mercalli Scale

Modified Mercalli Intensity	Description of Intensity Level
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 by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. 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 broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars.

Modified Mercalli Intensity	Description of Intensity Level
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level distorted. Objects thrown into the air.

Despite the low probability of a high impact earthquake, physical characteristics in Rhode Island may increase earthquake vulnerability:

- Hard Rock: Due to the geological makeup of New England's base rock, seismic energy is conducted on a greater scale (four (4)-10 times that of an equivalent Richter magnitude earthquake in California).
- Soft Soil: Many coastal regions of New England are made up of soft soils. These soils can magnify an earthquake as much as two times.
- Structures: The New England region, being one (1) of the first settled areas of the United States, has an abundance of older, unreinforced masonry structures that are inherently brittle and very vulnerable to seismic forces.
- Low Public Awareness of Vulnerability: Little public recognition of earthquake threat, and no established system of educating or informing the public of the threat or how to prepare for or respond during an earthquake. Therefore, higher losses will occur here than in other regions of the country.

Location

Rhode Island is located in the North Atlantic tectonic plate and is in a region of historically low seismicity. Only three (3) or four (4) earthquakes of Modified Mercalli Intensity Scale (MMI) V or greater have been centered in Rhode Island, including the 1951 South Kingstown earthquake of magnitude 4.6 on the Richter scale. The Town of Portsmouth is about 16 miles northeast of South Kingstown.

Probability of Future Occurrence

Possible

Extent (Event Magnitude)

Damaging earthquakes do not normally occur in this region. Rhode Island is located in an area of "moderate" seismicity and "high" risk. Seismic risk applies to the seismic hazard, location demographics, and regional economics to the vulnerabilities of the

structure or lifeline on the site. Seismologists have estimated that there is about a 50% probability of a very damaging magnitude 5.0 earthquake occurring anywhere in New England, in a 50-year period.[24] However, based on past occurrences, current geologic makeup and future climate changes, the Town of Portsmouth is not anticipating any disturbances higher than a Class IV intensity.

Impact and Damage Extent

The committee recognizes that the potential for an earthquake to strike the Town of Portsmouth is low but the hazard could afflict town wide damage, causing power outages, building collapses, water main breaks, dam failures, gas leaks, fires and injuries or deaths. Buildings that are most at risk from earthquakes are the historic structures and the two residential high-rise buildings.

Climate Change Impacts

It is uncertain how climate change will affect earthquake magnitude in and around Portsmouth.

History

No major earthquakes have happened in Portsmouth.

Table 15 Historic Seismic Activity in/near Rhode Island[25]

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
10/16/1963	Coastal MA	4.5	Caused some cracked plaster (MMI V) at Chepachet, Rhode Island.
6/14/1973	Western Maine	unknown	The intensities in Rhode Island were IV at Charlestown and I-III at Bristol, East Providence, Harmony, and Providence.
03/11/1976	Near Newport, RI	3.5	Intensity level VI shock effects felt throughout Southern New England. This earthquake has the distinction of being the largest earthquake to originate in Rhode Island.
04/20/2002	Plattsburgh, NY	5.2	Intensity level II to III shock effects felt throughout Rhode Island.
03/11/2008	Central Connecticut	2.9	No data reported for Rhode Island.
06/23/2010	Ontario-Quebec	5.0	Felt throughout Rhode Island.
2011	Rhode Island	0.9	Felt locally. (No specific dates given in source data of RI HIRA.)
2012	Rhode Island	1	Felt locally. (No specific dates given in source data of RI HIRA.)

24 RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

25 United States Geologic Survey http//neic.usgs.gov/neis/states/rhode_island/rhode_island_history.html and Earthquake Hazards Program "*Did You Feel It*" Archives, and RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
2013	Kingston, RI	Unknown	Felt locally. (No specific dates given in source data of RI HIRA.)
04/04/2013	Hope Valley, RI	1.8	Felt locally.

Hail

Description

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 mph. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Hail larger than 0.75 inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter. Hail causes about $1 billion in damages annually in the U.S. (Rhode Island State Hazard Mitigation Plan 2014).

Table 16 Hail Size

Hail Diameter	Size Description
1/4"	Pea Size
1/2"	Mothball Size
3/4"	Penny Size
7/8"	Nickel Size
1" (Severe Criteria)	Quarter Size
1 1/4"	Half Dollar Size
1 1/2"	Walnut or Ping Pong Ball Size
1 3/4"	Golf Ball Size
2"	Hen Egg Size
2 1/2"	Tennis Ball Size
2 3/4"	Baseball Size
3"	Teacup Size
4"	Grapefruit Size
4 1/2"	Softball Size

Location

All of Portsmouth is susceptible to hail.

Probability of Future Occurrence

Possible.

Extent (Event Magnitude)

The hail in Portsmouth is usually 1 inch or smaller.

Impact and Damage Extent

Structure vulnerability to hail is determined mainly by construction and exposure. Metal siding and roofing is better able to stand up to the damages of a hailstorm than many other materials, although it may also be damaged by denting. Exposed windows and vehicles are also susceptible to damage. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Early warnings of severe storms are also vital for aircraft flying through the area.

Climate Change Impacts

There is uncertainty about the effects of climate change on hail storms in Portsmouth. It is likely that the changes in weather patterns may bring more severe hail events.

History

Table 17 History of Hail in Portsmouth[26]

Date	Type	Comments
05/24/2000	7/8" Hail	Large hail the size of nickels fell in Portsmouth.
08/02/2006	¾" Hail	Penny sized hail reported in nearby Tiverton.
07/01/2009	¾" Hail	Plenty of moisture was in place across these areas, increasing the chance for heavy rain and flooding.

Lightning/Thunderstorms

Description

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year, but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. The National Weather Service (NWS) classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 MPH or greater, or a tornado. About 10 percent of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe. Thunderstorms affect a smaller area

26 National Climate Data Center, 2018

compared with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce localized flooding.

All thunderstorms contain lightning. Thunderstorms can occur singly, in clusters, or in lines. Therefore, it is possible for several thunderstorms to affect one location over the course of a few hours. Thunderstorms usually bring heavy rains (which can cause localized floods), strong winds, hail, lightning, and tornadoes. Lightning is caused by the attraction between positive and negative charges in the atmosphere, resulting in the buildup and discharge of electrical energy. Lightning is one of the most underrated severe weather hazards, yet ranks as the second-leading weather killer in the United States. "Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression and muscle spasms. Lightning has the potential to start both house fires and wildfires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over $1 billion in insured losses annually nationwide." Lightning often strikes as far as 10 miles away from any rainfall.

Location

All of Portsmouth is susceptible to lightning/thunderstorms.

Probability of Future Occurrence

Highly Likely.

Extent (Event Magnitude)

There is no universally accepted standard for measuring the strength or magnitude of a lightning storm. Similar to modern tornado characterizations, lightning events are often measured by the damage they produce. Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a lightning strike. A rough estimate of a structure's likelihood of being struck by lightning can be calculated using the structure's ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to.

Impact and Damage Extent

Lightning can strike buildings and accessory structures, often causing structure fires. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communication outages for businesses, residencies, and critical facilities.

Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communication outages for businesses, residencies, and critical facilities.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Swimming, boating, and fishing are particularly dangerous during periods of frequent lightning strikes, which can also cause power outages, topple trees, and spark fires. Individuals who immediately seek shelter in a sturdy building or metal-roofed vehicle are much safer than those who remain outdoors. Like hail, early warnings of severe storms are also vital for aircraft flying through the area.

Climate Change Impacts

Changing weather patterns may lead to more severe thunder and lightning storms.

History

There has been no reported loss of human life in Portsmouth in the past 50 years due to lightning. On June 5, 2010, several trees and wires were downed by lightning strikes. Portsmouth's fire communications were temporarily knocked out by a lightning strike. On July 28, 2015, lightning struck a house in nearby Tiverton and knocked down a tree.

Tornadoes

Description

A tornado is a violent windstorm with a twisting, funnel-shaped cloud. They are often spawned by thunderstorms or hurricanes. Tornadoes are produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. Over 80 percent of all tornadoes strike between noon and midnight. During an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one-mile-wide and 50 miles long.

Tornadoes are categorized according to the damage they produce using the Fujita Scale (F-scale). Below is the Enhanced Fujita (EF) Scale and the Old Fujita (F) Scale. An F0 tornado causes the least amount of damage, while an F5 tornado causes the

most amount of damage. Relatively speaking, the size of a tornado is not necessarily an indication of its intensity. On August 7th, 1986, a rare outbreak of seven tornadoes occurred in New England. One such tornado, rated F2 on the Fujita Scale, carved its way through Cranston, RI, and Providence, RI, causing twenty injuries and $2,500,000 in damages. Table 19 highlights more tornado events that have affected, Rhode Island.

Table 18 Fujita Scale

Fujita Scale			Enhanced Fujita Scale		Damage Scale
F Number	Fastest ¼ mile (MPH)	3 Second Gust (MPH)	EF Number	3 Second Gust (MPH)	
0	40-72	45-78	0	65-85	**Light damage.** Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
1	73-112	79-117	1	86-110	**Moderate damage.** Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
2	113-157	118-161	2	111-135	**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.
3	158-207	162-209	3	136-165	**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.
4	208-260	210-261	4	166-200	**Devastating damage.** Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
5	261-318	262-317	5	Over 200	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

Probability of Future Occurrence

Possible.

Location

The hazard mitigation committee recognizes that the risk of tornadoes is low for the State of Rhode Island and Town of Portsmouth but with the recent changing weather patterns and touchdowns of tornadoes, it would be unwise not to consider them a possible hazard.

Extent (Event Magnitude)

Historically, Portsmouth isn't known to be a hotbed of tornado activity. It is expected that future tornadoes will be 0 or 1 on the F-Scale of magnitude.

Impact and Damage Extent

Tornadoes could cause significant damage to structures, trees and utility lines. Flying debris could cause injuries to residents. Mobile homes are generally more vulnerable to damage than steel framed structures. The town has four year-round mobile or manufactured homes within its borders; two have approximately 110 units each and 2 have less than 10 units each. Due to their construction, these properties would be more vulnerable to tornado damage than a traditionally constructed house.

Climate Change Impacts

It is uncertain how climate change will affect tornado outbreaks in Portsmouth.

History

Table 19 Recent Tornado Events in Rhode Island[27]

Date	F-Scale	Injuries	Damage	Location
8/16/2000	-	0	$0	Providence County
8/7/2004	-	0	$0	Kent County
7/23/2008	1	0	$47,987	Bristol County
8/10/2012	-	0	$50,000	Washington County
10/24/2018	0/1			North Providence and Lincoln

Tsunami

Although tsunamis were not discussed in the Rhode Island State Hazard Mitigation Plan, they are profiled in the Massachusetts and Connecticut Plans. The Portsmouth Hazard Mitigation Committee perceives a probable likelihood of tsunamis in the future and is thus including them as an identified hazard in this plan.

Tsunamis (seismic waves), are a series of giant ocean waves created by underwater geologic activity such as an earthquake, landslide, volcanic eruption, or impact from a meteorite. This series of waves can travel hundreds of miles per hour across the open ocean and develop waves of 100 feet or more.

27 Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2014 Hazard Mitigation Plan Update. There have been no reported tornadoes in Portsmouth.

The configuration of the ocean bottom and magnitude of the tsunami will influence the size of the wave(s) when it hits land. The Pacific coastlines of California, Oregon, Washington, Alaska, and Hawaii are the most popular places for tsunamis to occur.

Because earth movements associated with large earthquakes are thousands of square kilometers in area, any vertical movement of the seafloor immediately changes the sea-surface. Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major tsunamis are produced by large (greater than 7 on the Richer scale), shallow focus (< 30km depth in the earth) earthquakes associated with the movement of oceanic and continental plates. Underwater landslides associated with smaller earthquakes are also capable of generating destructive tsunamis.[28]

Although the U.S. east coast is much less likely to be affected by a tsunami than the west coast, tsunami threats do exist. The closest tectonic boundary to the U.S. east coast is the spreading Mid-Atlantic Ridge, which contains numerous faults and earthquakes that take place. However, according to the Maine Geological Survey, tsunamis are more likely to occur at convergent margins. In the Caribbean Sea, there is a convergent plate boundary and a region with a higher probability of generating earthquakes that could produce tsunamis. Tsunamis could potentially travel to New England from the Caribbean, the Mid-Atlantic Ridge, or from the Canary Islands.[29]

Traditionally the magnitude of tsunamis was measured by the wave height, speed, and associated earthquake magnitude. A Tsunami Intensity Scale, although not used that much has been proposed to quantify a large number of criteria. http://neamtic.ioc-unesco.org/images/Neamtic/PDF/intensity-scale.pdf

Probability of Future Occurrence

Possible. Major subduction zones in the Atlantic are along the Caribbean Sea, there have been a relatively low frequency of tsunamis compared to the Pacific Ocean.

Location

All of Portsmouth is susceptible to tsunami damage but low areas of the Island Park neighborhood and Common Fence Point are most vulnerable to tsunami waves that come onshore.

Extent (Event Magnitude)

Due to the low magnitude of seismic activity in the Atlantic Ocean, tsunamis that are formed off the coast of New England would be relatively small.

[28] NOAA Tsunami webpage https://www.tsunami.noaa.gov/

[29] Commonwealth of Massachusetts State Hazard Mitigation Plan, September 2013

Impact and Damage Extent

The amount of energy carried by a tsunami can cause widespread devastation and loss of life for miles. In addition to the sheer weight and force of the wave, all the debris it creates can further damage the area. Trees and natural habitats are destroyed, and coastal zones are polluted by the dangerous chemicals carried out by receding waves. Flooding and contaminated drinking water can quickly spread diseases.

Climate Change Impacts

It is uncertain how warming temperatures and more extreme rainfall will impact the triggers that cause tsunamis. However, as sea levels rise, previously inland areas will be more susceptible to coastal wave action.

History

"Only a total of six tsunamis have been recorded anywhere in the Gulf and East Coast States. Three of these tsunamis were generated in the Caribbean, two were related to magnitude 7+ earthquakes along the Atlantic coastline, and one reported tsunami in the mid-Atlantic States may be related to an underwater explosion or landslide."[30]

The latest recorded tsunami anywhere close to Rhode Island was in November 1929 when an earthquake and submarine slump offshore caused a significant tsunami to come ashore in Newfoundland. Enormous waves hit the coast at 25 miles/hour. In addition to major damage along the coast, twenty-eight people died in Newfoundland.[31]

Climate Change

Changing climate patterns globally and in Rhode Island will worsen the effects of natural hazards and affect future planning and mitigation efforts. Changes are already being observed and documented. Long-term climate change is likely to cause the following impacts in Portsmouth:

- Heavier, more frequent precipitation events, which may cause more riverine flooding and flash flooding events.
- Longer periods of drought which may affect water availability and increase the threat for wildfires.
- Increasing air and water temperatures.

[30] Dunbar, Paula (2008), "U.S. States and Territories National Tsunami Hazard Assessment: Historical Record and Sources of Waves". National Tsunami Hazard Mitigation Program. https://nws.weather.gov/nthmp/documents/Tsunami_Assessment_Final.pdf

[31] Higgins, Jenny (2007), "The Tsunami of 1929". The Heritage Newfoundland & Labrador website http://www.heritage.nf.ca/articles/politics/tsunami-1929.php

- More frequent high heat days and heat waves.
- More flooding from higher tides and storm surge

How rapidly these changes will be felt is debatable but there is certainty within the state that municipalities need to be prepared. The Town aims to become more adaptable/resilient to the changing conditions.

Through the exercise of creating this plan, the Town of Portsmouth is exploring ways to reduce their long and short-term risks to a variety of hazards. Any storm that comes up the eastern seaboard will likely impact this coastal town. As climate conditions intensify, the HMC is prepared to update this plan accordingly.

4

Risk Assessment

Facilities Inventory

The first step in the assessment process was to create the inventory of facilities of special concern to the Town. The HMC identified the following as community assets:

- Flood prone drainage systems, streets, and infrastructure
- Bridges
- Wastewater facilities
- Water supply systems
- Services/Utilities
- Communication towers
- Dams
- Marinas/docks
- Critical municipal hazard response facilities
- Populations
- Businesses (including agricultural businesses)
- Schools
- Recreational facilities
- Historic resources

During the review of these assets, the HMC came to the conclusion that not all of these are so vulnerable they require a new mitigation action within the next 5 years.

For some, assets, the Town will continue with ongoing actions. As infrastructure ages, and climate conditions change, the HMC will update this plan accordingly.

These most vulnerable assets are identified in the Community Assets Matrix located at the end of this section.

Hazard Mitigation Mapping

The Town's GIS database, including parcel data, latest NOAA sea level rise predictions, orthophotography and FEMA flood zone information, were utilized to complete the assessment. The use of this system allowed the HMC to estimate potential fiscal and population impacts for individual parcels (see Sections 4.3 and 4.4 for results).

The final output of this exercise is the Town of Portsmouth Resources map in Appendix C. The focus of the maps is not to duplicate all of the spatial information generated through the inventorying process but rather to present the location of the identified risks as they relate to the Town's response facilities.

Fiscal Impact Analysis

The Town of Portsmouth's parcel data and FEMA's 1% annual chance floodplain data were utilized to generate estimates of potential fiscal impacts from natural hazard events such as flooding. The information utilized from the tax assessor's database and GIS included the improvement values, land usage, and unit counts. The analysis showed that Portsmouth is comprised of 14,912 acres of land, with 2,074 acres (14%) in the regulatory floodplain. These 2,074 acres are mainly located along the shorelines, the Island Park and Common Fence Point areas, and Prudence Island.

HAZUS-MH was used to further understand the potential risk from a large hurricane. HAZUS-MH is a software tool that contains models for estimating potential losses from earthquakes, floods, and hurricanes. For the purpose of this plan, a scenario was run that capture the town's risk from hurricane damage. The table below summarizes some of the potential damages. The hurricane scenario model uses the same path as Hurricane Carol which tracked west of Portsmouth.

In 1954 Hurricane Carol (Category 1, peak gusts at 94 mph) tore through Southern New England, causing extensive damage throughout Rhode Island. If this same storm were to strike again today, it would cause nearly $26 million dollars in total economic losses (property damage and business interruption loss).[32] About 103 buildings are expected to be at least moderately damaged, 4 of which would be totally destroyed.

[32] 2010 dollars

HAZUS Qualitative Damage Description
No Damage or Very Minor Damage
Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.
Minor Damage
Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.
Moderate Damage
Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water
Severe Damage
Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.
Destruction
Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.

Table 20 HAZUS-MH Scenarios for Portsmouth, RI

1954 Hurricane Carol Scenario- If It Happened Today	
Estimated Damage	**Amount**
Debris generated	10,431 tons (52% tree debris)
Buildings destroyed	4
Buildings at least moderately damaged	103
Displaced households	27
Essential Facility Damage (fire, police, schools)	<1 day loss
Residential Property (capital stock)	$1.8 million
Business interruptions	$420,000

Figure 5 Hurricane Carol Path

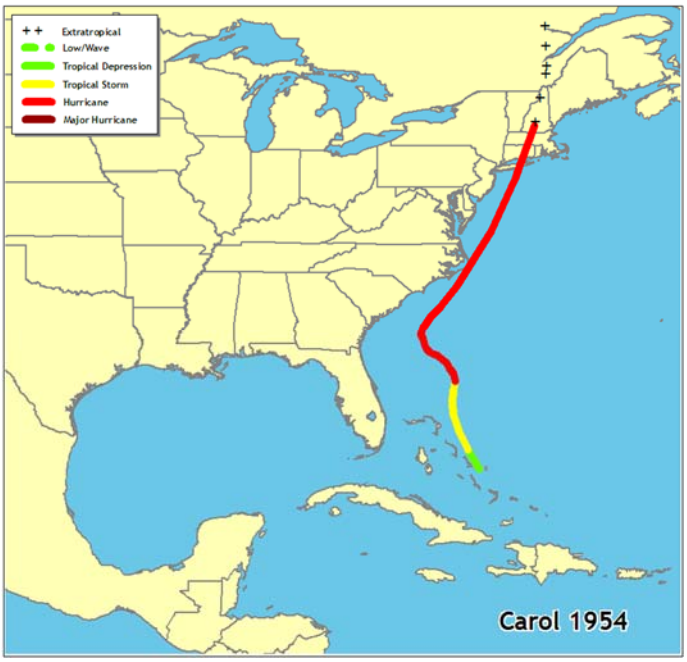


Table 20 displays potential damage estimates of property values of buildings within the Town's Special Flood Hazard Area (SFHA), or regulatory floodplain. The parcel information, using the best available data, provides the number of parcels in the SFHA, and values of the buildings on each property. Land value was not considered for this exercise. The values provided are an estimate considering some properties are located in more than one sub-watershed. This percentage was calculated in order to assist with identifying which areas are at greater risk. According to Table 20, the town-wide total potential building damages for these floodplain areas are over $168,000,000.

The most expensive building in the SFHA belongs to the United States Navy on Prudence Island. The commercial area with the highest building value is on the west side of town near Little Harbor Landing.

Approximately 84% of Portsmouth's revenue is generated from property taxes.[33] Should any of the properties forming the tax base be destroyed by a hazardous event, a causal effect would be those property owners whose parcels remain intact would carry an increased financial burden with regards to property taxes. It is an important course of action for the Town to protect both lives and property from natural disasters. However, as Portsmouth's population grows, the burden of protecting lives and property grows.

Using data from the RI Geographic Information System (RIGIS) and information from the Portsmouth Tax Assessor, the following table summarizes the value of the

[33] Town of Portsmouth, Rhode Island, Town Council's Adopted Budget Fiscal Year July 1, 2017 -June 30, 2018.

insurable buildings that are located within the Special Flood Hazard Areas. Accessory buildings such as sheds located in the SFHA were not included in the summaries.

Table 21 Building Values in Special Flood Hazard Areas[34]

Watershed	# Insurable buildings in SFHA	Residential	Commercial/ Industrial	Public	Utility	TOTAL
Upper East Passage						
East Side of Prudence Island						
West Side of Aquidneck Island	79 (30 VE Zone)	$ 15,160,700	$ 61,641,100	$ 732,300	$ -	**$ 77,534,100**
Upper West Passage						
West Side of Prudence Island	5	$ 708,400	$ -	$ -	$ -	**$ 708,400**
Sakonnet River						
East Side of Aquidneck Island						
Island Park Area	716 (158 VE Zone)	$ 87,340,700	$ 3,080,100	$ 8,200	$ -	**$ 90,429,000**
Mount Hope Bay						
Common Point Fence Area	193 (107 VE Zone)	$ 33,348,300	$ 1,603,900	$ 191,900	$ -	**$ 35,144,100**
TOTAL	**993**	**$ 103,209,800**	**$ 64,721,200**	**$ 740,500**	**$ -**	**$ 168,671,500**

Most of the buildings located in the SFHA are residential, scattered throughout the perimeter and northern area of town.

Built Environment

According to HAZUS-MH, Portsmouth has over an estimated 8,000 buildings with a total replacement value (excluding contents) of $2,364 million (2010 dollars). Approximately 93% of the buildings and 82% of the value are associated with residential housing.

The HMC has identified critical infrastructure listed in the Community Asset Matrix (Table 21). The list includes: flood prone drainage systems, streets or infrastructure; bridges; wastewater; water supply; services/utility facilities; communication towers; dams; marinas/docks; critical municipal hazard response facilities; populations; businesses; schools; recreational facilities; and historic resources. All of these important community resources have the potential to be affected by natural disasters. The magnitude of the losses would be dependent upon the type, location, and extent of each unique hazard.

The town's zoning laws help dictate future development while maintaining Portsmouth's rural character. Continued enforcement of Rhode Island State building codes and new regulations as required will lessen potential damage caused by a natural hazard event. The codes adopted by the Town of Portsmouth range from building codes and design standards, to zoning regulations.

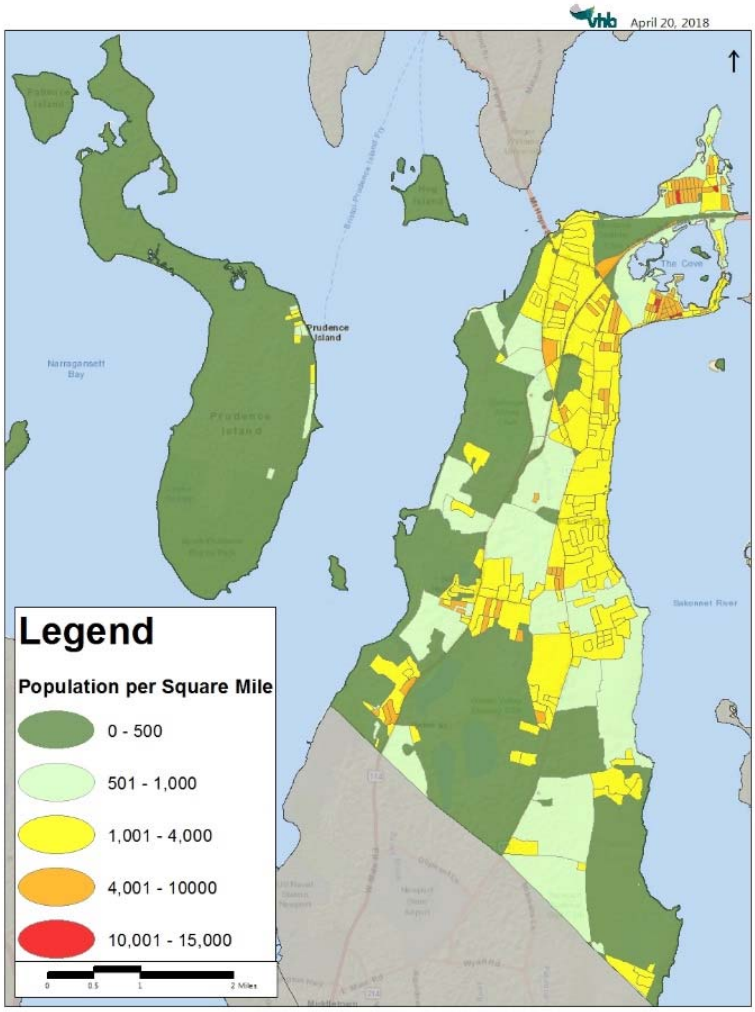
[34] Based on RIFIS e911 Sites, FEMA 2013 Flood Insurance Rate Maps, and 2017 parcel information from the Town. This data is to be used for planning purposes only to prove estimate values.

Some of the developed parts of Portsmouth are particularly susceptible to flooding. The base flood is an event that has a 1% chance of occurring annually and is the storm event used to identify the flood zones which impact zoning and building requirements throughout the Town. In Portsmouth, the HMC is most concerned about the Melville, Island Park, and Common Fence Point areas where many homes and businesses are located in or near the regulatory flood zone.

Population Impact Analysis

Of primary concern during a hazard event is protecting the health and safety of Portsmouth residents. In addition to knowing the total population, it's also important to estimate how many people would be impacted by loss of service or need to evacuate. According to the 2015 US Census, there are 8,457 housing units in Portsmouth supporting a population estimate of 17,389. The population is not spread evenly throughout the town. The more densely populated areas are in the north and northeastern side of town.

Figure 6 Population Density of Portsmouth



Using the 2017 Tax Assessor's Database, the Rhode Island GIS e911 structure file, and the Town's GIS, it was determined that there are total of 993 non-accessory structures within Town's base flood zones (47 are commercial, 1 is a gated property, 1 is a quarry entrance, 8 are public buildings, and 936 are residential buildings).

Due to their non-residential nature, at-risk population estimates could not be developed for historic resources, critical municipal hazard response facilities, and recreational facilities.

Natural Environment

The Portsmouth 2002 Comprehensive Plan identifies the following critical natural resources:

- Surface water body systems and watersheds
- Groundwater resources
- Freshwater and shoreline ecosystems and habitats
- Wetlands
- Soils
- Floodplains
- Air
- Waterfront
- Coastal waters

"The Portsmouth landscape on Aquidneck Island can be characterized by a central upland of residential, commercial, and farming districts that fall off as relatively steep slopes running down to the bay on both sides of the island. Low lying areas, in some cases only a few feet above sea level, characterize the northern sections of town. A large majority of the land in Portsmouth is undeveloped forest or wooded areas.

Portsmouth soils, like those of much of Southern New England, are derived from glacial deposits (till), and as such are suitable for crop cultivation, which is consistent with the town's coastal farming heritage. While also suitable for residential and commercial development, these soils often limit development because of very slow or very high permeability rates, leading to poor drainage and special on-site septic treatment concerns.

Wetlands comprise approximately 12% of the total land area of town. Despite these constraints, and like many communities in southern Rhode Island, Portsmouth has seen a significant shift from farming to residential development in recent years."[35]

35 Town of Portsmouth 2009 Hazard Mitigation Plan

The biggest threats to the natural environment are non-point source pollution, point source pollution, leaking underground storage tanks, erosion, and development pressures.

Vulnerability of Future Structures

There is considerable potential for additional development however growth should only occur when there is an available capacity for municipal services to absorb the growth, and there is a fiscal ability and community desire to par for the expanded infrastructure required for growth. The Town has several concerns regarding increasing development within the coastal areas due to the increasing threat of erosion and flooding.

Portsmouth's vulnerability to natural hazards is not expected to change dramatically over the next five years due to increased development. Enforcement of current building codes will ensure that development will be stronger and more resilient than some of the older structures in Portsmouth.

Community Assets Matrix

The matrix (Table 21): Critical Infrastructure/Community Assets represents the culmination of the risk assessment process and is the final product. Its purpose is to gather all the pertinent results in one place for ease of presentation and to serve as a starting point for discussion of specific mitigation actions. It not only lists the specific areas of concern, but provides detailed location information, summarizes the applicable hazard, problem, and mitigation benefits.

Table 22 Portsmouth Critical Infrastructure/Community Assets

At Risk	Location	Hazard/Problem	Mitigation Actions
Flood Prone Drainage Systems/Streets, and Infrastructure	Park Avenue Seawall- protects evacuation route Park Ave./Boyd's Lane Old Colony Railroad underpass West end of Cedar Avenue Riverside Street- at hollow at end of Morgan Frank Coello at Glen Road McCory at Windstone Glen Road at Glen Farm Road Common Fence Blvd Mill Creek Narragansett Road Nagg's Pond on Prudence Island Neck Farm Road Old Mill Lane Melville neighborhood	Flooding due to ground saturation, and coastal flooding.	• **1a** Create an internal list of flood-prone parcels for the town to consider for open space acquisition • **1b** Explore interest in voluntary acquisition program • **1c** Acquire vacant or underdeveloped properties • **2** Amend zoning ordinance to incorporate multiple hazards • **3a** Distribute NFIP information to all households in the floodplain area • **3b** Public outreach to residents and business owners in the most vulnerable areas • **3c** Signage for high water line from past storm surge events
	Boyds Lane Narragansett Ave. Neck Farm Road Park Avenue State Highway 24N (and on-ramp) State Highway 24S Exit 2 Railroad Ave. Anthony Road	Storm surge and SLR	• **4a** Structural evaluation of Park Avenue seawall • **4b** Beach nourishment adjacent to seawall • **4c** Culvert replacement at seawall • **5a** Figure out who owns the Stone Bridge abutments • **5b** Ask RIDOT to do a structural evaluation on Stone Bridge abutments • **6** Ask RIDOT to do a structural evaluation on the Common Fence Point railroad underpass • **7** Install an inground stormwater injection system along Riverside Street • **8** Install riprap on the north side of Common Fence Point Boulevard

At Risk	Location	Hazard/Problem	Mitigation Actions
			• **9** Repair cement roadway on Prudence Island that leads to the dock • Inventory of areas subject to flooding (ongoing) • Design and engineering solutions (ongoing)
Bridges	Sakonnet River Bridge (operated by RITBA) Hummocks Escape Bridge to/from Island Park Mount Hope Bridge (operated by RITBA) Boyds Lane NB and SB The Cove/ Escape Bridge Bradford Ave. RR	High wind Emergency Water Supply Line Evacuation Routes Evacuation Routes Storm surge and SLR	• **10** Communicate with RI Turnpike and Bridge Authority about storm-time operations of Sakonnet River Bridge and Mount Hope Bridge
Wastewater	On-site septic (ISDS) Sewer lines from Newport that service the west side (Melville and Navy housing) go to the sewage treatment plant in Newport. Carnegie Abbey has own sewage treatment plant. Navy wants to self-sustain. Sewer line on Jefferson Lane from Lawton Valley water treatment plant to Middletown, RI	Loss of power from severe storms	• Distribute information regarding proper management of ISDS systems (ongoing)
Water Supply Systems	Main water source from Newport Emergency main line over Sakonnet River Bridge Portsmouth Water and Fire Lawton Valley Water Treatment Plant in Portsmouth, jurisdiction of Newport. Water lines for Navy in same area as sewer.	Drought, Hazardous material contamination, Loss of power from other hazards, Extreme Temperatures	• **11** Purchase a second generator for Prudence Island pump stations • **12** Improve communications with Newport Water

At Risk	Location	Hazard/Problem	Mitigation Actions
	Prudence Island Water District- 4 public wells, 2 are functioning, 2 are emergency Hog Island private wells and septic systems		
Services/Utilities	Transfer Station- 305 Hedly Street Transfer station on Prudence Street lights (not town owned yet) Turbine safety- next to water department, owned by Green Energy, feeds into the Town, on Town land Tank farms on Navy property Gas mains Electric power lines Portsmouth Water- 4 water tanks (1 is in Newport)	High winds, hurricane	• **13a** Conduct Power Assessments for Prudence Island and Hedley Street transfer stations • **13b** Purchase and install generators for Prudence Island and Hedley Street transfer stations
Communication Towers	Police/Fire Station- Town Access Crown Castle State Police Barracks (800Mhz) Cell Towers- town wide	Wind Lightning	• Maintain equipment and redundancy by department (ongoing)
Dams	Lawton Valley (High)- owned by City of Newport Sisson (High)- owned by City of Newport St. Mary's (High)- owned by City of Newport Melville #1 (Significant)- owned by Town of Portsmouth Four low hazard dams	Severe storms- flooding upstream and downstream	**14** Have all dam emergency action plans on file.
Marinas/Docks	Ferry Docks (2 for Prudence) Brewer Sakonnet Marina New England Boatworks Pirate Cove Marina Hinckley Yacht Services Public Safety vessels at Carnegie Abbey	Storm surge, coastal flooding and erosion	• Keep response plans up to date (ongoing) • Stage vessels pre-storm if necessary (ongoing)

At Risk	Location	Hazard/Problem	Mitigation Actions
Critical Municipal Hazard Response Facilities	Police Station • 2270 East Main Road • 838 East Main Road (State Police) Fire Station • 2300 East Main Road • 0292 Narragansett Avenue, Prudence Island (volunteer) Town Hall- 2200 E. Main Road Public Works- 143 Hedley Street Prudence Island 01351 Narragansett Ave. Portsmouth Canvassing Authority 2200 E. Main Road	All hazards.	• **15** Codify orders of succession during an emergency. • **16** Adopt Continuity of Operations Plan (COOP) for each Town agency. • Annual inspection of all town-owned, non-school buildings (ongoing)
Populations	All residents Elderly and infants Island Park Common Fence Point <u>Assisted Living</u> Atria Aquidneck Place- 125 Quaker Hill Lane Anthony House <u>Public Housing</u> Quaker Estates Anthony House (or Assisted Living)- highest fire calls locations <u>Mobile Homes</u> Melville Trailer Park Melville Campground Sunny Acres Davey Lane <u>Education</u>	All hazards	• **3a** Distribute NFIP information to all households in the floodplain area • **3b** Public outreach to residents and business owners in the most vulnerable areas • **3c** Signage for high water line from past storm surge events • **17** Participate in the Community Rating System (CRS) program • **18a** Explore funding opportunities to build a public safety complex on Prudence Island • **18b** Consider including sheltering capacity as part of the plans to build a new public safety complex on Prudence Island • **19** Inspect all senior housing facilities for compliance with building code. • **20** Verify all senior housing facilities have up-to-date emergency response plans • **21** Create an inventory of known elderly living alone that may need assistance during an emergency.

At Risk	Location	Hazard/Problem	Mitigation Actions
	Roger Williams dormitories Portsmouth Abbey resident students <u>Shelters</u> Portsmouth High School (primary local, secondary regional)- 120 Education Lane Portsmouth Middle School (secondary local)- 120 Jepson Lane No designated Prudence Island Shelter Gaudet Middle School (primary Red Cross Regional Shelter)- 113 Aquidneck Avenue, Middletown, RI <u>Special Needs Registry</u> 100 people on the registry		• **22** Provide information online for improved tie-down methods for mobile homes • Up to date information on hazards and preparedness activities on Town website (ongoing) • Provide public information regarding post-disaster rebuilding regulations (ongoing). • Fire department does wellness checks before and after a destructive event (ongoing).
Businesses	Raytheon- Defense Marina District Melville Clements Market CVS Pharmacy Town gas stations State highway garage- fuel facility for this section of the state. Private farms	Severe Storms Blizzards Wind	• **23** Back-up power for pharmacy, grocery, and north and south gas stations. Conduct a power needs assessment (generator needs study) for each site.
Schools	Portsmouth High School (primary shelter)- 120 Education Lane Portsmouth Middle School (secondary shelter)- 120 Jepson Lane Hathaway Elementary Melville Elementary Penn Field	Severe Storms Blizzards Wind Extreme Heat	• All town-owned school buildings inspected for compliance with building code (ongoing). • Verify all public and private schools have up to date emergency response plans (ongoing).

At Risk	Location	Hazard/Problem	Mitigation Actions
	St. Philomena's Portsmouth Abby Bradley School Roger Williams University classrooms School Administration Building		
Recreation Facilities	Island Park beach (Teddy's Beach, State Beach) Town Beach at Sandy Point Sand Point beach on Prudence Island McCorrie Point Glen Farm Stables Glen Park Melville Ponds Campground Portsmouth Senior Center- 110 Bristol Ferry Road Founders Brook Dog park on Smith Road Common Fence Point Community Center Elmhurst Park Bristol Ferry Town Commons Gardner Seventy Sports Complex Brown House Library Newport National Golf Greenvalley Montaup Sandy Point Stables Carnegie Abby Golf Club	Erosion Severe storms	• **24-** Dredge Founders' Brook near Old Boyd's Lane to reduce flooding at Founders' Brook Park and Boyd's Lane. • Install sand fencing annually at Town Beach (ongoing).
Historic Resources	Battle of Rhode Island Historic District Fort Butts Prudence Island Lighthouse Portsmouth Friends Meeting house Lawton-Almy-Hall Farm Greenvale Farm Hog Island Lighthouse	Wind, Severe Storms	• Continue to support historical society (ongoing).

At Risk	Location	Hazard/Problem	Mitigation Actions
	Pine Hill Archeological Site Christian Union Church (Portsmouth Historic Society) Southernmost Schoolhouse Julia Ward Howe's Oak Glen Glen Manor House Green Animals Red Cross House (Phelps house) Library Sandy Point Stables		

5

Programmatic Capabilities

Purpose

This capability assessment examines the existing studies, plans, programs, and policies that have incorporated hazard mitigation and other pro-active tools into the Town system. The purpose of the capability assessment is to highlight successes, identify shortcomings, and to lay the groundwork for possible improvement. Portsmouth recognizes that the inclusion of mitigation initiatives not only benefits the community by reducing human suffering, damages and the costs of recovery, but also helps build and maintain the sustainability and economic health of the Town. This section details the Town's existing relevant plans, programs, and policies that were reviewed during the drafting of this plan.

Primary Plans, Regulations, and Departments

Portsmouth Comprehensive Plan

The Portsmouth 2002 Comprehensive Plan was written in September 1992, revised in and most recently adopted in July 2002. The Land Use and Economic Development chapter was updated in October 2004 to include support for a Town Center Zoning District. The Portsmouth Comprehensive Plan discusses current community conditions, expected future trends, and new initiatives, challenges, and opportunities. It provides a vision for future community development by identifying updated goals, policies, and implementation actions. It is expected that new

revisions will include elements of hazard mitigation and climate change, using this document as a reference.

Zoning Ordinance

Among other things, the Zoning Ordinance of the Town of Portsmouth (February 13, 2012) aims to provide guidance to promote public health, safety, and general welfare; provide a range of uses and intensities of use appropriate to the character of the town; provide orderly growth and development; provide for the control, protection, and/or abatement of air, water, groundwater, and noise pollution, and soil erosion and sedimentation; provide for and protect the public investment in public infrastructure and facilities; promote safety from fire, flood, and other natural or man-made disasters; and coordination of land uses with other municipalities as appropriate; among others.[36] The Zoning ordinance promotes safety from fire, flood, and other natural or man-made disasters. Chapter 405, Article III, Section F of the Code of Ordinances describes zoning standards for the Special Flood Hazard Area.

Land Development and Subdivision Regulations

These regulations, last revised January 12, 2012, protect existing natural and built environments and mitigate the significant negative impacts of proposed development on those environments, among other things. The regulations promote design of land developments and subdivisions which are well-integrated with the surrounding neighborhoods with regard to natural and manmade features, and which concentrate development in areas which can best support intensive use by reason of natural characteristics and existing infrastructure.

Further, the regulations encourage the location of development to preserve the natural features of the site and to avoid areas of environmental sensitivity, and to minimize negative impacts and alteration of natural features, historic and cultural resources, and areas of scenic value which contribute to the character of the Town. do not allow for development in wetlands or floodplains without appropriate permitting procedures. Lands in the floodplain (as defined) shall be preserved as undeveloped open space or lot area to the extent consistent with reasonable utilization of land.

Stormwater Management Plan

The Portsmouth Stormwater Management Plan aims to preserve, protect, and improve the nearby water resources from polluted stormwater runoff. Small municipal separate storm sewer systems (MS4s) located in designated urbanized areas such as Portsmouth are required to apply for coverage for their storm water discharges under the Rhode Island Pollutant Discharge Elimination System (RIPDES)

[36] Portsmouth Zoning Ordinance, February 13, 2012

general permit. As part of the permit application, municipalities are required to develop, submit for RIDEM approval, and ultimately implement a Storm Water Management Program Plan (SWMPP) that addresses six minimum control measures with selected best management practices (BMPs) and measurable goals for each respective control measure.

The six minimum control measures required in the SWMPP and addressed in Section 3.0 are:

- Public Education and Outreach on Storm Water Impacts
- Public Participation / Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention / Good Housekeeping for Municipal Operations

In addition, the general permit specifies that if a Total Maximum Daily Load (TMDL) has been approved (which it was in March 2005) for any waterbody into which storm water discharges from the municipality contribute directly or indirectly the pollutant(s) of concern, the Town of Portsmouth must address the provisions and recommendations of the TMDL in its SWMPP. This amended plan does so in Section 4.0.

Beyond the required elements listed above, Section 5.0 of the stormwater management plan addresses specific storm water abatement and source reduction opportunities unique to Portsmouth, as identified by the Portsmouth SWMPP Project Steering Committee.

Finally, the SWMPP provides goals, costs, financing, and a schedule for implementing this plan, guidelines for the evaluation and assessment of the effectiveness of the plan over the five-year permit period, the process for annual reporting to RIDEM, and a list of Portsmouth officials designated to implement the plan.

Onsite Wastewater Management Plan

The Onsite Wastewater Management Plan provides a set of strategies and implementation items to ensure the proper management, inspection, use and maintenance of on-site wastewater treatment systems. The Town recognizes that poorly managed on-site systems are prone to failure with age, out-moded design, overuse, poor soil conditions, or improper installation, repair or maintenance and that failing on-site systems jeopardize the health, safety and welfare of the community. The Town also recognizes that a properly developed and implemented OWMP can mitigate these circumstances and provide an efficient, environmentally safe and cost-effective alternative to municipal sewers.

The Purpose of the OWMP is to:

- Address recommendations in the 2005 Sakonnet River – Portsmouth Park and The Cove – Island Park TMDL, which was written to address pathogen impairments to the Sakonnet River and the Cove, to establish "a comprehensive Town-wide wastewater management strategy."
- Act in accordance with the Portsmouth Comprehensive Community Plan which states "It is the goal of the Town of Portsmouth to minimize pollution by ensuring existing septic systems are properly maintained and to ensure that new septic systems are properly set back from environmentally sensitive resources and properly maintained."
- Establish a program which ensures that all on-site wastewater treatment systems in the Town of Portsmouth are properly operated, regularly inspected, routinely maintained and promptly repaired or replaced when necessary.
- Facilitate the timely upgrading of aging on-site treatment systems to modern pathogen removal technologies.
- Abide by the provisions of a signed agreement dated November 2014 between the Rhode Island Department of Environmental Management (RIDEM) and the Town of Portsmouth regarding the resolution of an appeal of a Notice of Violation issued by RIDEM.
- Qualify the Town for the State's Community Septic System Loan Program (CSSLP) in order for its citizens to take advantage of low-cost loans to assist in the repair and replacement of failed on-site systems.

Harbor Management Plan

The Portsmouth Harbor Management Plan has recently been updated and is being reviewed by the Town Council and Rhode Island Coastal Resource Management Council (CRMC). The purpose of the Harbor Management Plan is twofold; (1) to establish a set of goals, objectives, and policies for the management of Portsmouth's harbors and coastal waters, and (2) to provide a basis for revision and updating of the Portsmouth Harbormaster Ordinance, the legal enforcement mechanism of our harbor management strategies. Created consistent with CRMC guidelines, the Harbor Management Plan follows a well-established planning process by:

- identifying the coastal and harbor resources of the Town;
- identifying the existing and potential issues associated with those resources;
- establishing goals, objectives and policies for the public and private use of those resources;
- setting forth an implementation approach for achieving those goals, objectives, and policies.

The goals of the Harbor Hazard Mitigation Element of the Harbor Management Plan are to prevent the loss of life and property by:

- Properly preparing the community for storm events;
- Having a completed and tested preparedness, response and recovery plan;
- Working in cooperation with harbor and shorelines users to ensure that a coordinated approach is applied to hazard mitigation;
- Integrating harbor hazard mitigation activities with other, ongoing, local hazard mitigation programs;
- Identifying and completing long term actions to redirect, interact with or avoid natural hazards.

The plan seeks to provide the greatest degree of protections from storm events that can practically be achieved, while allowing traditional waterfront uses to continue.

Soil and Sediment Control Ordinance

The Portsmouth Soil Erosion and Sediment Control (SESC) ordinance is maintained by the Town to prevent soil erosion and sedimentation from occurring as a result of nonagricultural development. The Town requires proper provisions for water disposal, construction waste management, and the protection of soil surfaces during and after construction. The aim of these regulations is to promote safety, public health, and general welfare by keeping sediment from clogging storm sewers (flood prevention), and contaminating surface and groundwater resources.

National Flood Insurance Program (NFIP)

The Town of Portsmouth is an active and compliant member of the National Flood Insurance Program since 1982. As such, Portsmouth residents are able to purchase flood insurance to protect their property against flood losses. The Town of Portsmouth has adopted the most recent (September 4, 2013) Flood Insurance Rate Maps (FIRM) and Flood Insurance Study (FIS). The Town has designated the Building Official as the NFIP Coordinator to manage the program.

Flood Insurance Coverage[37]

Total Number of Policies	616
Total Premiums	$1,146,287
Insurance in Force	$147,827.50
Total Number of Closed Paid Losses	128
$ of Closed Paid Losses	$747,672.27
Repetitive Loss Properties	7 (all residential)
Severe Repetitive Loss Properties	0

[37] As of July 31, 2018, according to the State Floodplain Manager.

Number of Policies in Each Zone	
Zone	**Policies**
A-Zone	339
V-Zone	67
X-Zone (Standard)	79
X-Zone (Preferred)*	131

* A Preferred Risk Policy (PRP) offers low-cost coverage to residents whose buildings were in the X-Zone on the effective date of the policy but then newer maps were issued designating their home as in a Special Flood Hazard Area (A or VE Zones). Buildings within an SFHA due to a map revision are eligible for a PRP for 2 policy years from the map revision date.

Emergency Operations Plan (EOP)

Last updated in 2013, the local EOP focuses on coordination and planning for a disaster. It outlines how the Town departments coordinate resources, personnel, and equipment. The purpose of the plan is to protect lives and property and to restore services after a major disaster.

MEDS-POD (Medical Emergency Distribution System- Point of Dispensing)

The MEDS-POD Plan outlines the processes to enact a mass antibiotic or vaccine dispensing campaign within the jurisdiction. The general objective of the plan is to provide necessary framework to administer medical countermeasures to the entire targeted Portsmouth populations within 48 of notification from the RI Department of Health or the RI Emergency Management Agency.

Departments

Planning Department

The Department serves many functions related to the physical development of the community. The department, staffed by 2 people, is responsible for carrying out the Council's vision of the future through land use regulations, managed growth, and environmental protection.

The Planning Director led the recent hazard mitigation plan update process. It is likely that they will retain that role in the future.

Emergency Management

The primary mission of the Portsmouth Emergency Management Agency is to protect life and property in the event of a disaster or crises situation, through a program of mitigation, preparedness, response and recovery. The Portsmouth

Emergency Management department is currently staffed by 1 paid employee and 6 volunteers.

The permanently established Emergency Operations Center (EOC) is located at the Portsmouth Fire Station. The EOC has 2 diesel generators for the whole building, and emergency battery backup for all systems.

Portsmouth uses the CodeRED emergency telephone notification system to provide important emergency information to citizens.

Public Works

The mission of the Department of Public Works is to provide a responsive and high quality public service to all Portsmouth residents in the maintenance and improvement of town-owned property and infrastructure through positive interaction, interdepartmental relationships, and cost-effective management.

The Public Works facilities are located at 143 Hedly Street and 01351 Narragansett Ave on Prudence Island. The Hedly Street property houses all the Town's public works maintenance equipment, vehicle repair facilities, sand and salt storage, and fueling facilities. Public Works staff include 1 Director, 1 Deputy Director, 2 Foremen, 12 Operators, and 2 Mechanics, and a part-time clerk on Prudence Island.

Public Works maintains the following ongoing mitigation strategies: snow plowing, ice management, storm drain and culvert maintenance, Town vehicle repair, road repairs, street sweeping, and tree trimming (in partnership with the utility companies).

The Public Works department helps the Town improve resiliency and reduce damages and cost from hazards by reviewing every site that is proposed for new development and/or redevelopment to ensure the sewer, water and stormwater regulations are followed during the design, the construction and the final acceptance of the site.

Building Inspection

The Building Official and Assistant Building Inspector make up the Portsmouth Building Inspection department. The Building Inspection department enforces the Minimum Housing Code and Zoning Ordinance. The Building Official regularly inspects all town-owned school buildings for compliance with the building code.

Engineering

The Town does not currently have an Engineering department. The bulk of these duties are handled by the Public Works department.

Police Department

The Portsmouth Police Department's mission is to prevent crime, protect life and property and improve the quality of life in Portsmouth. The Portsmouth Police Department consists of 38 sworn police personnel including a Chief/Colonel, Major, Administration Lieutenant, Detective Lieutenant, 3 Patrol Lieutenants, 4 Sergeants, 3 Detectives, 20 Patrol Officers, 2 School Resource Officers, and 1 Prudence Island Public Safety Officer. The Department operates twenty-four hours a day and responds to all criminal complaints and Town-wide emergencies. The Department is located at 2270 E. Main Road.

Fire Departments

Portsmouth businesses and residents are protected from fires and other emergencies by 39 staff. The Department is led by the Fire Chief, and 1 Deputy Fire Chief, Fire Marshall, 4 Captains, 8 Lieutenants, 20 firefighters, 4 Dispatchers. A second station is staffed by volunteers on Prudence Island.

The fire stations are equipped with 3 engines, 1 ladders, 3 rescues, a brush truck, utility truck, and 3 staff cars. All 3 ambulances are equipped for Advanced Life Saving.

All personnel (including fire alarm division, fire marshal and education personnel) are trained to respond to all emergencies. These volunteer departments provide quality protection to residents and businesses.

The Fire Department has 35 EMTs and 3 rescues throughout the departments.

Fire department staff check on Special Needs Registry enrollees before and after destructive storms.

StormReady Community

Portsmouth (the first StormReady Community in RI) is a StormReady Community having demonstrated necessary communication and safety procedures needed to save lives and property before and during a storm event. There is an existing notification network, and weather radios and lightning detection devices are distributed throughout town. The Town has adopted Standard Operating Procedures to provide guidance in preparing for and dealing with the effects of hazardous weather conditions. If the Portsmouth EMA Director is unable to be reached, responders are encouraged to monitor weather activity through WebEOC, National Weather Service Alerts, and Code Red. The Rhode Island State Police provide National Weather Service Alerts over the Openfox Messenger Service.

National Flood Insurance Program (NFIP)

The Town of Portsmouth is an active and compliant member of the National Flood Insurance Program since 1982. As such, Portsmouth residents are able to purchase flood insurance to protect their property against flood losses. The Town of Portsmouth has adopted the most recent (September 4, 2013) Flood Insurance Rate

Maps (FIRM) and Flood Insurance Study (FIS). The Town has designated the Building Official as the NFIP Coordinator to manage the program. Article III, Section F of the Code of Ordinances is dedicated to floodplain management.

Town Council & Town Administrator

The Town Council is made up of seven elected members committed to providing an effective and efficient government for residents and businesses. In addition to other duties, the Town Council approves local hazard mitigation plans and zoning ordinances.

The Town Administrator is the administrative officer of the Town that reports to the Town Council. The Town Council President is the Chief Executive Officer.

Zoning Board of Review

The Zoning Board plays a significant role in Portsmouth's development. It has the authority to grant relief from the Town's Zoning Ordinance. With few commercial and industrial uses allowed by right, as codified in the Zoning Ordinance, this Board is the permitting authority for almost all development of this nature through the Special Use Permit review process. The Zoning Board also reviews dimensional and use variances in addition to administrative appeals of the Zoning Enforcement Officer's decisions. The Portsmouth Zoning Board of Review is made of up 5 board members and 2 alternates.

State Programs

Rhode Island State Building Code

All municipalities within the State of Rhode Island share a single building code (RIGL 23-27.3-100 et. al.). The Code itself (which incorporates the International Building Code) was last amended in 2012 and provides comprehensive construction requirements designed to mitigate the impacts from natural hazards, such as high wind events. The Code is enforced by the Portsmouth Building Department and provides an additional layer of regulatory control to those discussed above.

Rhode Island State Fire Code Regulations

Portsmouth has adopted the R.I. Fire Safety Codes to safeguard life and property from the hazards of fire and explosives in accordance with safe practice. The Code is enforced by the Portsmouth Fire Departments and provides reasonable minimum requirements for fire prevention and protection.

Rhode Island State Dam Safety Program

The Town of Portsmouth participates in the State Dam Safety Program because of the high hazard and significant hazard dams in the town. The State Dam Safety

Program was created to facilitate the enforcement of the primary dam inspection law (RIGL 46-19, Inspection of Dams and Reservoirs). RIGL 46-19 states that dam owners are responsible for the safe operation, maintenance, repair, and rehabilitation of a dam, which are the essential elements in preventing dam failure; furthermore, dam owners are liable for the consequences of accidents or failures of their dams. According to the State of Rhode Island 2017 Dam Safety Program Report, the following have been identified as program limitations: unclear ownership of numerous high hazard dams, construction of buildings within inundation areas below dams, lack of funding to repair of remove privately owned dams, inadequate spillway capacities and engineering analyses, lack of Emergency Action Plans across the state, inadequate staffing, increase in rainstorm intensities. Of the 4 high and significant hazard dams in Portsmouth, all have draft Emergency Action Plans which are being updated.

Rhode Island DEM Wetland Regulations

The Rhode Island Department of Environmental Management is responsible for regulating alterations of the freshwater wetlands throughout the State. Since many floodplains are also wetlands, appropriately managing these resources help maintain proper floodplain function. These regulations ensure that actions in this plan which will alter the physical landscape will not do so at the expense of wetlands.

Rhode Island Emergency Management Agency

The Rhode Island Emergency Management Agency (RIEMA) is the State agency assigned to reduce the loss of life and property for the whole community while ensuring that as a state we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all natural, human-caused, and technological hazards. RIEMA is also the pass-through agency for FEMA mitigation funding.

Rhode Island Department of Health

The Rhode Island Department of Health (HEALTH), not only strives to prevent disease and increase health and safety, but they also promote the Special Needs Emergency Registry. By voluntarily enrolling in this list, local police, fire, and other local first responders can better prepare for and respond to an individual's needs during a disaster.

Rhode Island Coastal Resource Management Council

Coastal Resource Management Council (CRMC) is a management agency with regulatory functions to preserve, protect, develop, and where possible, restore the coastal areas of the state. They have authority of activities that occur up to three miles offshore and 200 feet landward of a coastal feature. All development within this area requires special permitting from CRMC.

Rhode Island Bridge and Turnpike Authority

The Rhode Island Bridge and Turnpike Authority (RIBTA) operates and maintains the Mount Hope Bridge and the Sakonnet River Bridge which have terminuses in Portsmouth. Maintaining these bridges and communicating with the Town can help secure public safety.

6

Mitigation Actions

Mission Statement

To enhance our community's quality of life, protecting the property of its citizens, and preserving its natural resources.

Identifying natural hazards, mitigate those hazards to protect, life, property, environment, cultural and historic resources.

Mitigation Goals

The goals of the Portsmouth Hazard Committee are as follows:

1. Implement hazard mitigation actions in order to protect Portsmouth's cultural, historic, structural and natural environments;
2. Promoting educational opportunities to introduce residents and visitors to the risks of natural hazards and the various appropriate mitigation strategies that can be taken;
3. Continue to reduce flood losses through compliance with National Flood Insurance Program requirement;
4. Continue to manage the development in natural environments; and
5. Continue to manage the development in hazard-prone areas.

Status of Proposed 2009 Actions

Table 23 Status of Proposed 2012 Actions

Action	Status	Reason why it is not complete (shift in focus, funding, etc.)	Other comments
Town-wide inventory of areas subject to flooding	Ongoing		The installation of the major storm water infrastructure on the Clements Market property has significantly relieved flooding in the general area, but there is still a specific problem at the rear of Clements Market having to do with the unreported/unregulated installation of some storm water structures that are causing flooding of the property immediately adjacent to the rear of Clements. The issue is in court to determine who is ultimately responsible for remedying the situation.
Design & engineering solutions from Action 1	Ongoing		Rhode Island Blvd. and Cove Street have been improved.
Inventory vacant parcels in flood-prone areas for possible Open Space acquisition	Not completed		Add "underdeveloped parcels". Move to 2018 plan.
Amend flood zone regulations to incorporate multi-hazards	Not completed		Change to amend "zoning ordinance". Move to 2018 plan.
Develop information program of neighborhood preservation	Not completed	Other priorities	
Certification as "Storm-Ready" community	✓		
Adopt policy to keep public away from Park Ave. during storm events	✓		
Structural evaluation of Park Ave. seawall	Not completed		Owned by RIDOT. No funds. Move to 2018 plan.
Beach nourishment adjacent to Park Ave. seawall	Not completed		

Action	Status	Reason why it is not complete (shift in focus, funding, etc.)	Other comments
Redesign / replace culvert under Park Ave.	Not completed		
Structural evaluation of Escape Bridge	✓		Decking and legs were replaced.
Structural evaluation of Stone Bridge abutment	Not completed		Evaluation only of the Tiverton side which was in worse shape. Owned by RIDOT.
Evaluation of Common Fence Pt railroad underpass	Not completed		Owned by RIDOT. Move to 2018 plan.
Historic high-water mark signage	Not completed	No definitive reference marks.	Move to 2018 plan.
Develop a plan for regular tree trimming along town roads	✓		
Develop plans for debris removal / sand overwash	✓		Only on local roads
Enhance dune system at Town Beach	Ongoing		Installed sand fencing
Upgrade PIVFD building to American Red Cross certification	Not complete	Lack of funding	Have talked w NRCS about a public safety building.
Repair to Sand Pt. Dock & breakwater on Prudence Island	Not complete ✓		The roadway leading to the dock (Landing lane) at the east end has a cement roadway that need to be addressed/rebuilt. The breakwater is in good shape.
Water buffaloes for Prudence Island	Not completed	May not be the best method.	Private Water agency. Improvements have been made. PI Water District. More vehicles on island. Getting more cisterns with CDBG funds in 2018..
New AED plus PI Rescue Wagon upgrade	✓		
Complete establishment of Emergency Operations Center	✓		
Update & codify Emergency Operations Plan	✓		
Evacuation route and direction to shelter signage	✓		No shelter signage because they are assigned as needed.

Action	Status	Reason why it is not complete (shift in focus, funding, etc.)	Other comments
Identify and upgrade additional shelter capacity	✓		
Inspect and upgrade all town-owned, non-school buildings	Ongoing		
Provide improved tie-downs for all mobile homes	Not completed		Info available upon request.
Provide evacuation information at all town locations frequented by tourists	Ongoing		
Verify all public & private schools have up-to-date emergency response plans	Ongoing		
Inspect all town-owned school building for compliance with building code	Not completed	Other priorities	Move to 2018 plan.
Verify all senior housing facilities have up-to-date emergency response plans	Not completed	Other priorities	Move to 2018 plan.
Inspect all senior housing facilities for compliance with building code	Not completed	Other priorities	Move to 2018 plan.
Provide public information regarding post-disaster rebuilding regulations	Ongoing		
Distribute National Flood Insurance information to all households in the floodplain area	Not completed	Do not have that list	Move to 2018 plan.
Distribute information regarding proper management of ISDS systems	Ongoing		

Mitigation Actions

The Portsmouth Hazard Mitigation Plan Committee decided to propose actions that addressed certain vulnerabilities that were identified earlier in the planning process. See Chapter 4.

The text following the table below summarizes the specific problem and proposed possible solution, details the primary tasks to be undertaken, identifies an appropriate lead and anticipates financing options. Each action was given a priority ranking of low, medium, or high as determined by the Committee. This helps to generally prioritize needs when funding becomes available or budgeted. Funding and staff time will be the determining factors on when various actions are completed. The Committee understands that implementation of many of these proposed actions require the Town to secure external funding.

There are necessary planning elements that need to be completed before additional mitigation actions can be considered. The Committee has identified a range of actions below, some of which are planning activities. However, there is a mitigation action identified for each vulnerable area where applicable.

Priority Level

High: Reduces the greatest risks, is important to accomplish first

Medium: May need other actions to be completed first

Low: Less of an impact on safety and property

Time Frame (from date of plan adoption)

Short Term: within 1-3 years

Medium Term: within 3-5 years

Long Term: greater than 5 years

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
1 Open Space Acquisition **1a** Create and prioritize an INTERNAL list of vacant or under developed parcels in flood-prone areas for the town to consider purchasing as open space. **1b** Explore interest in voluntary acquisition program.* **1c** Acquire vacant or underdeveloped properties.*	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☒4 ☐2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
One of the best ways to prevent flood damage is to keep flood-prone areas undeveloped.

BENEFITS	OBSTACLES
Enhanced natural floodplain may lessen flooding of the built infrastructure	Open Space Committee was dissolved in April 2015. Already overburdened Planning staff.#
LEAD/CHAMPION	**SUPPORT**
Portsmouth Planning Department	Town Planning Board, Town Council, Aquidneck Land Trust, RIEMA and FEMA

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
<u>Creating the list</u> Planning Department Operating Budget <u>Acquisitions</u> FEMA PDM and FMA grants State and municipal land acquisition bonds RIDEM grants.	Minimal staff time to create the list.	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
Special consideration should be given to parcels that experience repeated flooding and those that provide public access to the shoreline. * The Town may not be close to acquiring properties but items **1b** and **1c** were included to show the intended process.

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
2 Amend zoning ordinance to incorporate multiple hazards.	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☒4 ☐2 ☒5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
Keeping existing rules and regulations up to date with the most appropriate best management practices for natural hazard-prone areas enhances public health and safety as well as improves local government responsiveness to community needs.

BENEFITS	OBSTACLES
Up-to-date zoning regulations which are better aligned to the Town's long-term vision.	

LEAD/CHAMPION	SUPPORT
Town Planning Department	Zoning Board of Review, Planning Board, Town Council, Conservation Commission

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Planning Operating Budget	Staff Time and advertising for hearings	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
3 Develop flood information program for neighborhood preservation. **3a** Distribute National Flood Insurance Program information to all households in the floodplain area. **3b** Public outreach to residents and business owners in the most vulnerable areas: • Island Park • Common Fence Point • Melville business district	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☒1 ☐4 ☒2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
As a coastal community, Portsmouth has some neighborhoods that are more vulnerable to coastal flooding. Educating residents and developers can help them make better informed decision about their own preparedness measures.

BENEFITS	OBSTACLES
Programs such as this reduce post disaster damage repair costs as well as provide for the enhancement of the health, safety, and welfare of the community. 3a will help the community with their CRS rating (See Action #17).	Keep messaging to general areas and not making addresses public.

LEAD/CHAMPION	SUPPORT
Town Planner	Town Building Official, URI, RI CRMC, Fire Chief, local EMA Director.

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Staff Budget FEMA Pre-Disaster Mitigation and Flood Mitigation Assistance grants FEMA EMPG grant	$5,000	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

3a Use the following for reference:
http://www.riema.ri.gov/resources/citizens/prepare/threats/flooding/Flood%20Safety.pdf
Emergency Preparedness https://www.fema.gov/media-library/collections/357

Flood Insurance for Businesses https://www.fema.gov/media-library/assets/documents/126017

3b Provide information to builders and homeowners on the risks of:

- building in hazard-prone areas
- the benefits of renovating structures to current standards
- techniques for homeowner self-inspection, and
- methods for landscaping to mitigate erosion and flood damage.

The Town is currently in discussion with URI/Sea grant to improve public awareness of risks due to sea level rise.

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
3c Develop signage showing the high- water line from past storm surge events along Park Avenue. This signage should include information about past storm damage in the area, as it has been some time since significant damage has been recorded.	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐4 ☒2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
Public awareness of past storm damage is important in guiding future mitigation activities

BENEFITS	OBSTACLES
More informed decision making by residents and visitors.	Accurately calculating the high-water mark.

LEAD/CHAMPION	SUPPORT
Town Planner	Portsmouth DPW

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Operating Budget	$1,500	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
The Town may consider adding storm surge elevations if available.

#

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
4 Discuss with RIDOT, the effectiveness of the Park Avenue seawall. **4a** structural evaluation **4b** beach nourishment to stabilize the beach adjacent to the seawall. **4c** culvert replacement at seawall	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☐4 ☐2 ☒5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?

4a: The over 60-year old Park Avenue Seawall may have exceeded its anticipated useful life and should undergo a thorough structural evaluation. **4b:** At normal high tides, portions of the beach are submerged and seawater reaches the base of the seawall, severely compromising its integrity. **4c**: the culvert which is supposed to convey stormwater from the salt marsh to Narragansett Bay has become silted in and buried.

BENEFITS	OBSTACLES
4a: The seawall protects a critical evacuation route for the Park Avenue neighborhood and as such is a paramount safety concern. **4b**: Widening the beach would provide pressure relief for the seawall, which in turn protects a critical evacuation route. **4c**: Allowing free flow between the salt marsh and the bay would provide pressure relief for the seawall, as well as some measure of flood protection for the key intersection of Park Avenue and Boyd's Lane.	Priorities of RIDOT

LEAD/CHAMPION	SUPPORT
Portsmouth DPW Portsmouth Planning Department	RIDOT, RI CRMC, RIDEM, State Legislatures

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town DPW and Planning Operating budget (for discussions)	Discussions with RIDOT to encourage them to consider improvements to the seawall would require minimal dollars. The costs of the specific projects should be borne by the State.	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

The Park Avenue Seawall and Park Avenue are owned by the State.

Documentation should be such that, should funds be made available in the future, rehabilitation/reconstruction of the seawall could begin immediately.

Consider future sea level rise and storm surge scenarios that may occur during the expected lifespan of the project.

#

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
5 Discuss with RIDOT maintaining Stone Bridge abutments. **5a** Ask RIDOT who owns the infrastructure. **5b** Ask DOT to do a structural evaluation on the Stone Bridge abutments.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☐4 ☐2 ☒5 ☐3	☐High ☐Medium ☒Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
Stone Bridge was destroyed in 1954 by Hurricane Carol. The remaining stone abutments are important for flood control on both sides of the bridge. The Tiverton side of Stone Bridge has already undergone evaluation and improvements. Serves as a breakwater for the marina and State boat ramp.

BENEFITS	OBSTACLES
Critical flood control functionality would be maintained by insuring the integrity of these stone bridge abutments. Could open up recreational opportunities.	Different priorities of RIDOT.

LEAD/CHAMPION	SUPPORT
Town DPW and Planning Operating Budgets	RIDOT, RI CRMC, RIDEM, State legislators

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town DPW and Planning budget (for discussions)	Discussions with RIDOT to encourage them to consider a structural evaluation would require minimal dollars. The costs of the specific evaluation should be borne by the State.	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
Stone Bridge and the associated structures are owned by the State. Establishing the legal ownership may prove to be a complication.

#

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
6 Ask RIDOT, to do a structural evaluation on the Common Fence Point railroad underpass.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☐1 ☐4 ☐2 ☒5 ☐3	☐High ☐Medium ☒Low
			ACTION STATUS
			Active

RATIONALE- WHY IS THIS IMPORTANT?
This area is a significant bottleneck.

BENEFITS	OBSTACLES
This action helps maintain a critical evacuation route as well as control flooding on one of our community's more important roads	

LEAD/CHAMPION	SUPPORT
Portsmouth DPW and Planning	RIDOT, RI CRMC, RIDEM

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town DPW and Planning budget (for discussions)	Discussions with RIDOT to encourage them to consider a structural evaluation would require minimal dollars. The costs of the specific evaluation should be borne by the State.	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
The Common Fence Point railroad underpass is owned by the State.

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
7 Install an inground stormwater injection system along Riverside Street.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
This is a low-lying flood area with frequent standing water

BENEFITS	OBSTACLES
Improve the number of days Riverside Street is usable.	

LEAD/CHAMPION	SUPPORT
Portsmouth DPW	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
DPW Operating Budget	$80,000	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
As funding becomes available.

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
8 Install riprap on the North side of Common Fence Point Boulevard.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☒High ☐Medium ☐Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?
Exposed to Mount Hope Bay, the northern side of Common Fence Point Boulevard could benefit from additional armoring to reduce erosion of the residential area.

BENEFITS	OBSTACLES
Better protect the built environment south of Common Fence Point Boulevard from flooding and storm surge.	Identifying the property ownership.

LEAD/CHAMPION	SUPPORT
Portsmouth DPW	Town Council, RI CRMC, CFPIA

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
FEMA Pre-Disaster Mitigation grant	$1.2 Million	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

This may be a phased approach as funding allows.

VULNERABLE AREA: Flood Prone Drainage Systems, Streets, or Infrastructure

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
9 Repair cement roadway on Prudence Island that leads to the dock.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☒High ☐Medium ☐Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?
The cement at the end of the roadway leads right into the dock. There is no other way to the Sand Point Dock.

BENEFITS	OBSTACLES
Improved safety of the approach to the dock.	

LEAD/CHAMPION	SUPPORT
Portsmouth DPW	RIDEM, RI CRMC, Prudence Island Planning Commission

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
DPW Operating Budget FEMA Pre-Disaster Mitigation grant	$80,000	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
Repairs to the dock are underway.

#

VULNERABLE AREA: Bridges

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
10 Communicate with RI Turnpike and Bridge Authority about storm-time operations of Sakonnet River Bridge and Mount Hope Bridge	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐4 ☒2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
These are two main access areas into and out of Portsmouth.

BENEFITS	OBSTACLES
Coordinating efforts with RITBA will improve messaging distribution and timing of evacuations if necessary.	

LEAD/CHAMPION	SUPPORT
Portsmouth Police and Fire	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Police and Fire Operating Budget	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
# # # # #

VULNERABLE AREA: Water Supply Systems

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
11 Purchase a second generator for Prudence Island pump stations.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Loss of power to water pump stations could limit availability of fresh water and firefighting efforts.

BENEFITS	OBSTACLES
Health and safety precautions.	

LEAD/CHAMPION	SUPPORT
Prudence Island Water Department	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Post-disaster CDBG grant	$70,000	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
# # #

VULNERABLE AREA: Water Supply Systems

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
12 Improve communications with Newport Water	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☐High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

Portsmouth relies on drinking water from Newport. The Lawton Valley Water Treatment Plan, although located in Portsmouth is owned by Newport. [get action details from Brian]

BENEFITS	OBSTACLES
Health and safety precautions.	

LEAD/CHAMPION	SUPPORT

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
		☐Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

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VULNERABLE AREA: Services/Utilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
13 Obtain generators for Prudence Island and Hedley Street Transfer Stations **13a** Conduct Power Assessments **13b** Purchase and install generators	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
During a long-term power outage, back-up power will be necessary at the two transfer stations to maintain Town operations.

BENEFITS	OBSTACLES
Business Continuity	

LEAD/CHAMPION	SUPPORT
Portsmouth DPW	Town Council

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
13a DPW Operating Budget **13b.** Town's Capital Budget	**13a** $2,500 **13b** $70,000 each	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
Voltage regulator being considered for Prudence Island in 2018.

VULNERABLE AREA: Dams

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
14 Have all dam emergency action plans on file.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☒3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
The Town does not have completed dam EAPs as required by the State's Dam Safety Program

BENEFITS	OBSTACLES
Public safety	Getting plans done for privately owned dams
LEAD/CHAMPION	**SUPPORT**
Planning Department	EM

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
# # #

VULNERABLE AREA: Critical Municipal Hazard Response Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
15 Codify orders of succession during an emergency.	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☒High ☐Medium ☐Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?

Under the current Town Charter, certain powers and duties are conferred upon a single person. There are no provisions to legally transfer authority to execute these powers and duties in the event that the designated person is unavailable, incapacitated, or otherwise unable to execute these powers and duties.

BENEFITS	OBSTACLES
Continuity of government during extraordinary circumstances.	

LEAD/CHAMPION	SUPPORT
Emergency Management Director	Town Administrator Town Council

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Operating Budget	Staff Time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

The Town Charter is reviewed by the Charter Review Commission every 10 years. In the meantime, an ordinance of ordinances could be adopted to affect the desired results.

VULNERABLE AREA: Critical Municipal Hazard Response Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
16 Adopt Continuity of Operations Plan (COOP) for each Town agency.	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☐High ☒Medium ☐Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?
To ensure that critical services and facilities continue to operate during an emergency.

BENEFITS	OBSTACLES
Better organization during an emergency and continuation of essential services.	

LEAD/CHAMPION	SUPPORT
Emergency Management Director to coordinate	All Portsmouth Town Departments

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Operating Budget	Staff Time	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
Include: essential functions; orders of succession; delegations of authority; continuity facilities; continuity communications; vital records management; human capital; tests, training, and exercises; devolution of control and direction; and reconstitution.

#

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
17 Participate in the Community Rating System (CRS) program	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☒4 ☒2 ☒5 ☒3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

Going above and beyond the standard flood insurance program requirements may improve the Town's resilience to recover from a disaster.

BENEFITS	OBSTACLES
Lower flood insurance premiums for residents, reduced disaster costs, and improved post-disaster recovery.	Already overburdened Planning staff.

LEAD/CHAMPION	SUPPORT
Town Planning Department	Portsmouth Floodplain Manager, FEMA, RIEMA

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Planning Department Operating Budget	Staff time	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Planning Department is currently exploring program feasibility and will be reporting progress and recommendations to Town Administrator.

# #

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
18 Provide adequate shelter on Prudence Island **18a** Explore funding opportunities to build a public safety complex. **18b** Consider including sheltering capacity as part of the plans to build a new public safety complex	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☒2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?

The current fire station on Prudence Island is not equipped to act as a shelter and has limited space to store vehicles year-round. Underserved population on the island.

BENEFITS	OBSTACLES
A safe place for those that have not left the island ahead of a storm and can act as a Point of Distribution post-storm.	

LEAD/CHAMPION	SUPPORT
Prudence Island Fire District	Portsmouth Emergency Management, Portsmouth Fire Department

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Town Operating Budget	Staff time	☐Short Term (0-3 years) ☐Medium Term (3-5 years) ☒Long Term (more than 5 years)

OTHER NOTES

Discussion with USDA/NRCS to meet the rural needs of the area occurred in 2015. Facility location and ownership was not identified. Aging infrastructure on the existing parcel that houses current fire department and DPW operations would not be able to sustain a new building. The volunteer fire department, serving a low-income population is more likely to receive grant funding than the Town. Would need to pursue grant funding for the shelter.

#

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
19 Inspect all senior housing facilities for compliance with building code.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☒5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
All buildings must meet certain standards to maintain safety.

BENEFITS	OBSTACLES
Improved safety for the older population	Staff time

LEAD/CHAMPION	SUPPORT
Building Official and Fire Department	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Building Department and Fire Department Operating budget	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

Portsmouth Housing Authority runs Quaker Manor.

Atria Aquidneck Place is privately run.

# #

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
20 Verify all senior housing facilities have up-to-date emergency response plans	☒Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☒5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
All facilities should have a plan of action during an emergency.

BENEFITS	OBSTACLES
Improved safety for the older population.	

LEAD/CHAMPION	SUPPORT
Emergency Management and Fire Department	Planning Department

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Emergency Management and Fire Department Operating Budgets	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
#

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
21 Create an inventory of known elderly living alone that may need assistance during an emergency.	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐4 ☒2 ☐5 ☐3	☒High ☐Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Having a better understanding of where vulnerable populations are located can help with pre-emergency and response efforts.

BENEFITS	OBSTACLES
Improved safety for the older population.	

LEAD/CHAMPION	SUPPORT
	Planning Department, Portsmouth Senior Center

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Fire Department and Emergency Management Operating budgets	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
This inventory will be enhanced by the Special Needs Database that people can opt-in to.

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
22 Provide information online for improved tie-down methods for mobile homes.	☐Local Plans and Regulations ☐Structure and Infrastructure ☐Natural Systems Protection ☒Education and Awareness	☐1 ☐4 ☒2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** Active

RATIONALE- WHY IS THIS IMPORTANT?
Better informed residents can make better decisions and reduce wind-related damages,

BENEFITS	OBSTACLES
Improved safety for people living in mobile homes during high winds.	

LEAD/CHAMPION	SUPPORT
Building Official	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Building Department budget	Staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Businesses

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
23 Back-up power for pharmacy, grocery, and north and south gas stations. Conduct a power needs assessment (generator needs study) for each site.	☐Local Plans and Regulations ☒Structure and Infrastructure ☐Natural Systems Protection ☐Education and Awareness	☒1 ☐4 ☐2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Business continuity for essential services that residents depend upon.

BENEFITS	OBSTACLES
Access to food, medication, and gas during a long-term power outage.	

LEAD/CHAMPION	SUPPORT
Emergency Management	Electrical Inspector, businesses

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Emergency Management Operating Budget	$1,500 and staff time	☒Short Term (0-3 years) ☐Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Recreational Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
24 Dredge Founders' Brook near Old Boyd's Lane to reduce flooding at Founders' Brook Park and Boyd's Lane.	☐Local Plans and Regulations ☐Structure and Infrastructure ☒Natural Systems Protection ☐Education and Awareness	☒1 ☒4 ☐2 ☐5 ☐3	☐High ☒Medium ☐Low **ACTION STATUS** New

RATIONALE- WHY IS THIS IMPORTANT?
Founders' Brook Park has historical memorials what honor the founders and early settlers.

BENEFITS	OBSTACLES
Improve waterflow and lessen flooding.	

LEAD/CHAMPION	SUPPORT
DPW	

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
DPW Operating budget	$30,000	☐Short Term (0-3 years) ☒Medium Term (3-5 years) ☐Long Term (more than 5 years)

OTHER NOTES
An initial section has already been completed.

7

Implementation and Adoption

Prioritization of Mitigation Actions

Implementing the Plan

The Town of Portsmouth and the Portsmouth Hazard Mitigation Committee realize that successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updates to this plan. The Town also understands the importance of integrating appropriate sections of the plan into the Town's Comprehensive Plan, Emergency Operations Plan, and site plan review process. It is intended that this plan and the ongoing efforts of the HMC will preserve and enhance the quality of life, property, and resources for the Town of Portsmouth.

Adoption of this mitigation plan increases Portsmouth's eligibility for federal hazard mitigation grants. These grants originate from FEMA's Pre-Disaster Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM) and post-disaster Hazard Mitigation Grant (HMGP) Programs. (Refer to Appendix D for further information.)

Monitoring

The HMC, under the leadership of the Town's Planning Director, will meet annually (or more frequently if necessary), to monitor and evaluate the actions contained in the plan. At each meeting, the committee members will discuss the actions assigned to them to ensure continual progress with mitigation efforts. The status of each

mitigation action will be documented, and minutes recorded for the record. The HMC will also continue to re-evaluate membership on the committee to ensure effective engagement of the appropriate parties. New members may be invited to serve on the HMC as priorities shift.

Evaluation

At the annual meetings, the HMC will evaluate both the actions and the planning process. The HMC will base its evaluation on whether or not the actions have met the following criteria: increased public awareness/education, reduction in hazard damage, actions being implemented in the designated time frames, and actions staying within the cost estimate. The committee will document and report its findings to the Planning Board and Town Council. The HMC will involve the public in the action evaluation process by holding an annual advertised public meeting in order to review the evaluation and solicit input.

During the annual evaluation process, the plan will be promoted online, in the local library, at Town Hall, and the Community Center for public review. Comments and suggests can be sent directly to the Emergency Management Director or brought up at the advertised public meeting.

Revisions

Recognizing that this is a living document, the HMC will make changes to it after each annual revision or a disaster, as conditions warrant. These revisions will also reflect changes to priorities and funding strategies that may have been implemented.

A full revision of the plan will commence a year in advance of the current plan expiration date in order to ensure the Town always has an approved plan. The update will be completed every five years and will incorporate a formalized process for prioritizing actions and weighing the cost/benefit of such actions. All updates or revisions to the plan will be submitted to the RIEMA. The Town Council will involve the public in the plan revision process by holding an annual advertised public meeting to present recommended revisions and solicit input. Revised plans will also be sent to the neighboring communities for comment.

All future meetings will again be open to the public and it is the hope of the HMC Committee that once the public education and outreach actions begin, public involvement in the Plan will increase and will be reflected in future revisions. The HMC will involve the public in the annual meeting by posting it on the website, in the local library, and in the local newspaper to encourage involvement.

Adoption

After each evaluation cycle (every 5 years), the Portsmouth hazard mitigation plan will be presented to and adopted by the Town Council. The associated ordinance documentation will be kept as part of this plan.

Appendices

A Survey Results

B Public Notices

C Resources Map

D Additional Resources

Appendix A: Survey Results

Appendix B: Public Notices

Appendix C: Resources Map

Appendix D: Additional Resources

Technical and Financial Assistance for Mitigation
State Resources

Coastal Resources Center
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882
(401) 874-6224

Coastal Resources Management Council
Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879
(401) 222-2476

Department of Administration/Division of Planning
One Capitol Hill
Providence, RI 02908
(401) 222-6478

Department of Environmental Management
235 Promenade Street
Providence, RI 02908
(401) 222-6800

Rhode Island Banking Commission/Associate Director
233 Richmond Street
Providence, RI 02903
(401) 222-2405

Rhode Island Builders Association
Terry Lane
Gloucester, RI 02814
(401) 568-8006

Rhode Island Department of Business Regulations
233 Richmond Street
Providence, RI 02903
(401) 222-2246

Rhode Island Emergency Management Agency
645 New London Avenue
Cranston, RI 02920
(401) 946-9996

Public Utilities Commission
100 Orange Street
Providence, RI 02903
(401) 222-3500 Ext. 153

State Fire Marshal's Office
272 West Exchange Street
Providence, RI 02903
(401) 222-2335

State of Rhode Island Building Committee Office
Building Commissioner's Office
560 Jefferson Boulevard, 2nd Floor
Suite 204
Warwick, RI 02886
(401) 889-5550

Technical and Financial Assistance for Mitigation

Federal Resources

Economic Development Administration
Philadelphia Regional Office
The Curtis Center
601 Walnut Street, Suite 140 South
Philadelphia, PA 19106-3323
(215) 597-8822

Federal Emergency Management Agency
Mitigation Division
Mitigation Division
Region I Office
99 High Street
Boston, MA
(617) 223-9561

Small Business Administration
10 Causeway Street
Room 265
Boston, MA 02222
(617) 565-5590

U.S. Department of Agriculture
Natural Resources Conservation Service
451 West Street
Amherst, MA 01002
(413) 253-4362

U.S. Department of Commerce
National Weather Service Forecast Office
445 Myles Standish Boulevard
Taunton, MA 02780 (508) 823-2262

U.S. Department of Housing and Urban Development
Community Development Block Grants
Region I – O'Neill Federal Building
10 Causeway Street
Boston, MA 02222
(617) 565-5354

U.S. Department of the Interior
National Park Service
Rivers and Trails Conservation Program
Regional Office
15 State Street
Boston, MA 02109
(617) 223-5203

U.S. Environmental Protection Agency
Region I Offices
5 Post Office Square - Suite 100
Boston, MA 02109-3912
(617) 565 3400

U.S. Fish and Wildlife Service
Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9587
(413) 253-8200

Other Resources

National/Regional Resources

The Association of State Floodplain Managers (ASFPM)
http://www.floods.org

A professional association with a membership of almost 1,000 state employees that, assists communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

The Rhode Island Flood Mitigation Association (RIFMA):
http://www.riflood.org

The goal of the organization is to form a network of associates who could bring their ideas and experiences to a forum for people to share and learn from. The result of the Association is a network of floodplain managers who can improve the effectiveness and efficiency of all aspects of floodplain management in the State of Rhode Island. RIFMA regularly provides training opportunities and an annual floodplain conference.

Natural Hazards Center at the University of Colorado, Boulder
Tel: (303) 494-6818
http://www.colorado.edu/hazards

The Natural Hazards Center is an international/national information center that provides information on natural hazards and human adjustments to hazards and disasters, by providing information dissemination, free library and referral services, research, and an annual workshop.

Flood Relief Funds
After a disaster, local businesses, residents, and out-of-town groups often donate money to local relief funds. They may be managed by the local government, or by one or more churches. No government disaster declaration is needed. Local officials should recommend that the finds be held until an applicant exhaust all sources of public disaster assistance. Doing so allows the funds to be used for mitigation and other projects that cannot be funded elsewhere.

Volunteer Organizations
Organizations, such as the American Red Cross, the Salvation Army, Habitat for Humanity, Interfaith, and the Mennonite Disaster Service, are often available to help after disasters. Service organizations, such as the Lions, Elks, and VFW are also available. These organizations have helped others with food shelter, clothing, money, etc. Habitat for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings incorporating mitigation or flood proofing concepts. The offices of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

New England States Emergency Consortium (NESEC)
Lakeside Office Park
http://www.serve.com/NESEC

NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Brochures and videotapes are available on such topics as earthquake preparedness, mitigation, and hurricane safety tips.

Institute for Business and Home Safety (IBHS)
http://www.ibhs.org

An insurance industry-sponsored, nonprofit organization dedicated to reducing losses-deaths, injuries, and property damage-resulting from natural hazards. IBHS efforts are directed at five specific hazards: floods, windstorms, hail, earthquakes, and wildfires. Through its public education efforts and information center, IBHS communicates the results of its research and statistical gathering, as well as mitigation information, to a broad audience.