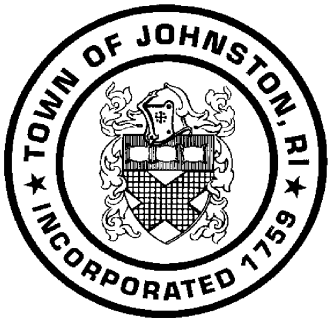


Hazard Mitigation Plan
Johnston, Rhode Island

A Multi-Hazard Mitigation Strategy
2020

Table of Contents

EXECUTIVE SUMMARY

Purpose

The purpose of this report is to recommend programs, policies, and actions for the Town of Johnston to minimize the social and economic loss or hardships resulting from natural hazards and disasters events. The Town of Johnston realizes successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updated revisions to this report. It is intended that this strategy and the ongoing efforts of the Town of Johnston will preserve and enhance the quality of life, property, and resources for the community.

The Rhode Island Emergency Management Agency defines hazard as an event or physical condition that has the potential to cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. Hazards can also be exacerbated by societal behavior and practice, such as building in a floodplain, along a sea cliff or an earthquake fault.

Disasters are the result of hazards affecting vulnerable areas and/or populations. Disasters are inevitable, but with proper knowledge and preparedness the impacts can be mitigated or, in some instances, prevented entirely. This is an update to the Hazard Mitigation Plan, Johnston, Rhode Island which was completed in 2010 and approved by the Federal Emergency Management Agency (FEMA). On May 11, 2011. This update has been completed in conformance with the FEMA Local Mitigation Planning Handbook, March 2013 and the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by Section 322 of the Disaster Mitigation Act of 2000, and 44 Code of Federal Regulations (CFR) Part 201 - Mitigation Planning, inclusive of all amendments.

The 2020 Hazard Mitigation Plan for the Town of Johnston has been prepared by BETA Group, Inc., under the direction of Thom Deller, Town Planner. The plan reflects the input of the Hazard Mitigation Team comprised of the following:

Thomas E Deller, AICP	Town Planner, Town of Johnston
Chief Joseph Razza	Emergency Management Director/Johnston Police Department
Battalion Chief Thomas Marcello	Johnston Fire Department
Robert Parker	Director of Public Works, Town of Johnston
George Lazzareschi	

Section 1.0 Background

"Hazard Mitigation" is an action taken to permanently reduce or eliminate long-term risk to people and their property from the effects of natural hazards or a hazardous event such as wind, fire, flood, "nor'easter", hurricane, snow and ice, earthquake, and the like. Natural Hazard Mitigation generally focuses on climate, or weather, related events, and geologic events. While the Town of Johnston was in the process of updating this Mitigation Plan, the nation was in the midst of the COVID-19 pandemic. In order to slow the rate of infection Governor Raimondo issued a Declaration of Disaster Emergency on March 9, 2020 for the State of Rhode Island in response to the COVID-19 pandemic. Within the next three weeks, the Governor issued a stay-at-home order. The objective of both orders was to help slow the spread of the disease which was feared would tax the health care system due to the number of infected people requiring and treatment. This situation has had two effects on this Hazard Mitigation Plan update. The first is restrictions on public gatherings and the need for social distancing (i.e. maintaining a distance of 6 feet from other people), which has limited the methods of public engagement for the process. The second is the need to take into consideration public preparedness to respond to combined effects the community might face if a natural disaster were to occur during the height of a pandemic.

1.1 Introduction to Hazard Mitigation

By planning ahead, the Town of Johnston can minimize the economic and social disruption floods, blizzards, hurricanes, and other significant natural disaster events can cause. Direct losses resulting from natural disasters include destruction of property, loss or interruption of jobs, loss of businesses, damage to environmental habitats, and destruction of cultural resources and historic structures. Historical resources, including the context for the role these structures played, may be permanently lost. These economic losses also affect the ability of people to return to "normal" and function as a healthy part of society. These indirect losses often pose more serious long-term financial impacts to a community.

This local natural Multi-Hazard Mitigation Plan (Plan) identifies a number of planning processes, programs, and policy initiatives that can be used to prevent and mitigate effects including death and injury from natural disasters. These hazard mitigation measures include:

- Strengthening existing emergency plans;
- Continuing to incorporate hazard mitigation into the site plan review and subdivision processes;
- Continuing public education and outreach programs;
- Basing land use decisions on the potential cumulative impacts that could result in damages from floods, wind and other natural disasters; and
- Identifying structural and non-structural projects required to mitigate disaster.

This Plan considers various actions both private citizens and the local government can take to help prevent disasters resulting from natural hazards. Adoption of this Hazard Mitigation Plan Update will also qualify the Town of Johnston to receive assistance from the FEMA through various programs, such as the ones listed below:

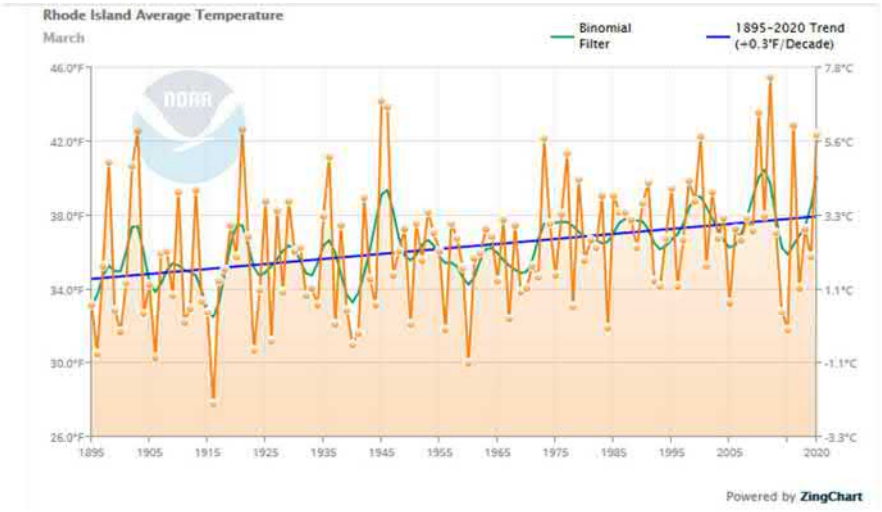
- **Community Rating System (CRS):** allows residents to gain credit points towards discounts on flood insurance premiums through National Flood Insurance Program (NFIP).

- **Building Resilient Infrastructure and Communities (BRIC):** makes grants available to communities to implement flood mitigation planning and activities such as acquisition, relocation, and retrofitting of existing structures.

- **<u>Post-Disaster Hazard Mitigation Grant Program (HMGP):</u>** available after a federally declared disaster has occurred. An approved Mitigation Plan expedites the application process by helping to ensure a funded project is eligible and technically feasible.

Johnston's mission for its Hazard Mitigation Plan is to preserve and enhance quality of life, property, social, environmental, and economic resources. This will be done by identifying areas at risk from anticipated increased occurrences and severity of natural hazards as a result of climate change, and by implementing priority hazard mitigation actions to protect the Town of Johnston's infrastructure and population, as well as, historical, cultural and natural resources.

National Oceanic and Atmospheric Administration's (NOAA) historic temperature and rainfall graphs for Rhode Island indicate trends consistent



NOAA National Centers for Environmental information, Climate at a Glance: Statewide Time Series, published April 2020, retrieved on April 15, 2020 from https://www.ncdc.noaa.gov/cag/

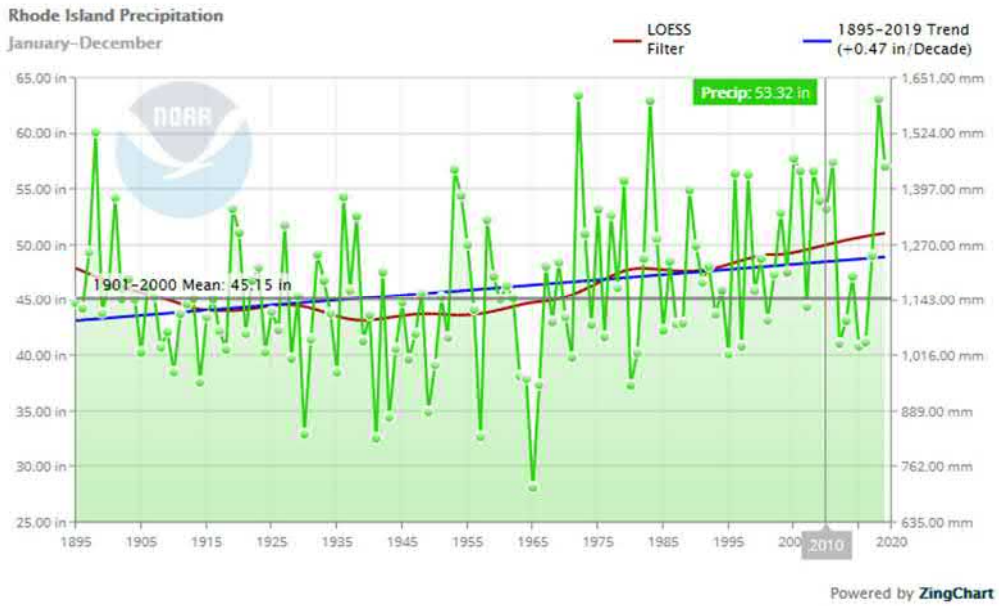


Figure 1: Rhode Island Precipitation and Temperature Trends

1.2 Community Planning Area

The planning area covered in this Plan includes all lands within the geographical boundaries of the Town of Johnston.

1.2.1. Location Information & Geography

Johnston is located in Providence County in the northeasterly portion of Rode Island and is bordered by the towns of Smithfield, North Providence, Providence, Cranston, and Scituate. The intersection of the Route I-295 north-south corridor and the Route 6 east-west corridor is located almost squarely in the central portion of the town. The Town of Johnston has a total area of 24.4 square miles, 97.7% of which is land and 2.3% of which is water. Roughly half of the Town of Johnston is comprised of urban development.

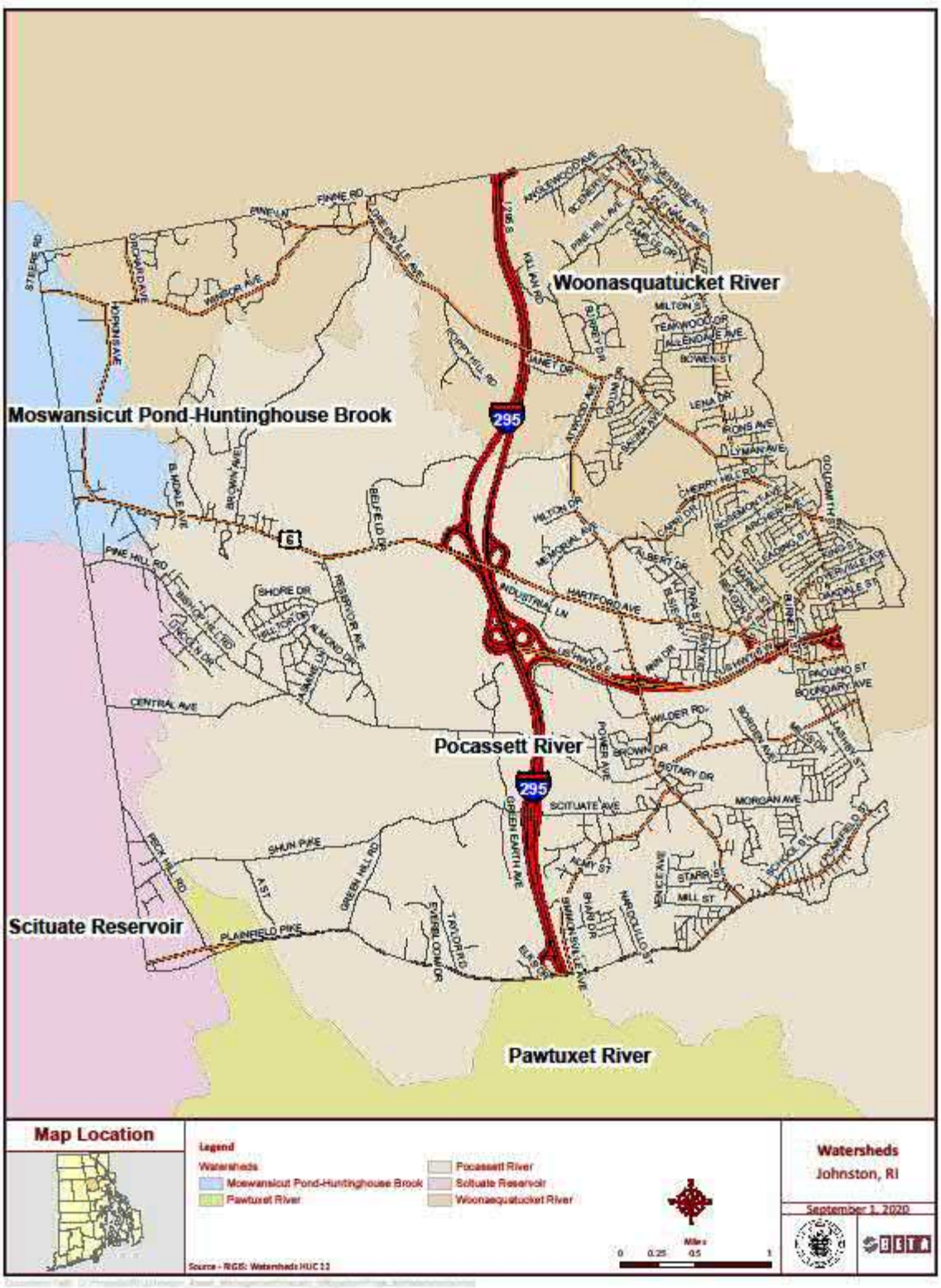
Map 1 displays the Woonasquatucket and Pocasset River watersheds, which define the major drainage areas in the Town of Johnston. Waterbodies and special flood hazard areas are illustrated in Map 2 on page 6, titled Special Flood Hazard Areas. The following information is provided from the *Johnston Comprehensive Community Plan*:[1]

Woonasquatucket River System
The Woonasquatucket River flows along the eastern boundary of the Town and defines the municipal line between the Town of Johnston and the Town of North Providence and the City of Providence. The watershed of the river covers approximately 4,990 acres from its tributaries in Smithfield and North Smithfield to its confluence with the Providence River. The Slack Reservoir, located on the Johnston/Smithfield border, is a tributary to the Woonasquatucket River. The river boundary along the Town of Johnston is approximately 4.2 miles long.

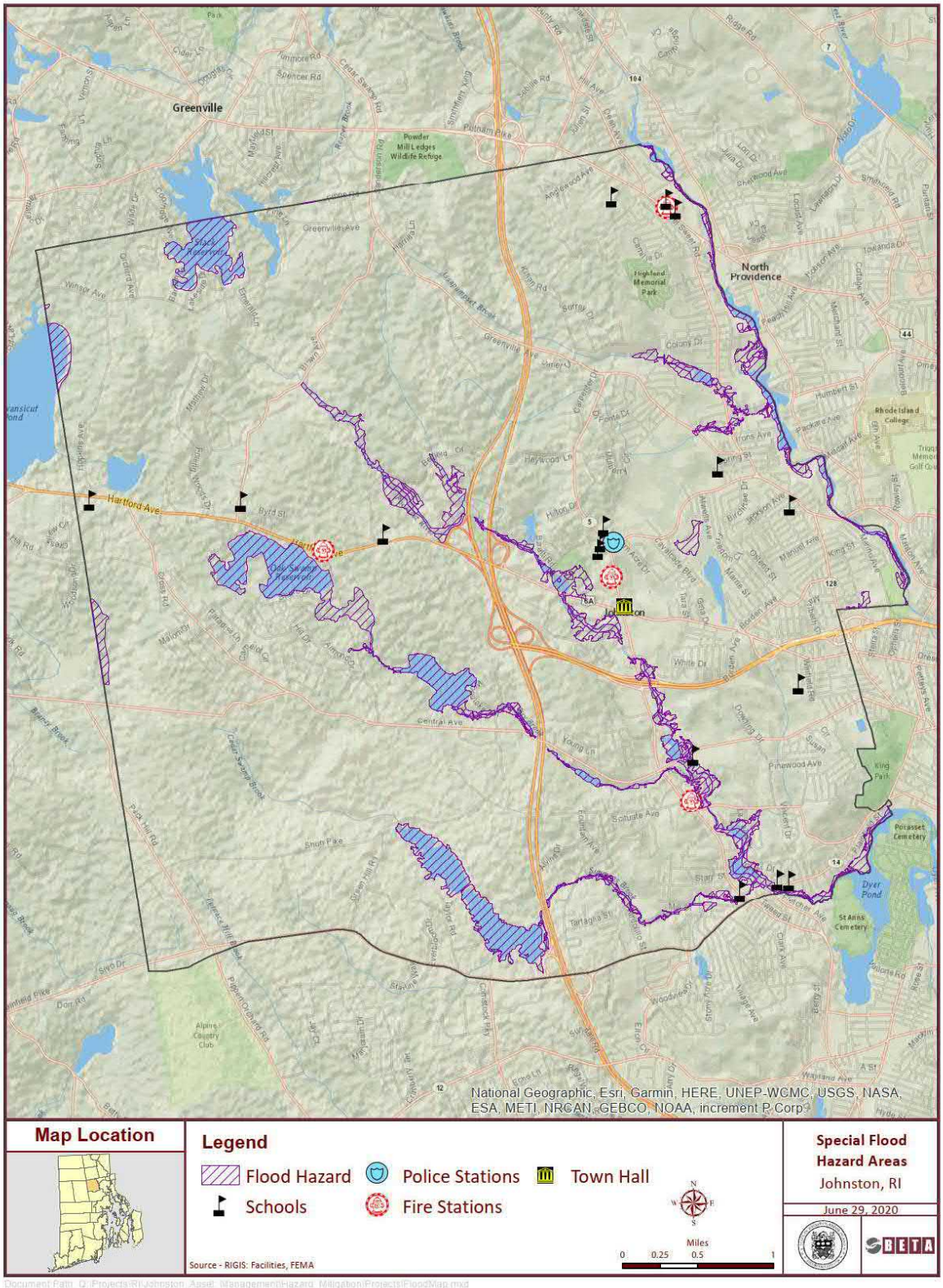
Pocasset River System
The Pocasset River and its numerous tributaries are located within the Pawtuxet River Basin drainage area. The Pocasset River Sub-Basin and covers approximately 9,200 acres. The headwaters for the Pocasset River are located in the northwest quadrant of the Town. From its headwaters, the Pocasset River flows generally southward from north of the I-295/US-6/6A interchange to the Johnston/Cranston border; at this point, the river veers eastward, then southward again to its confluence with the Pawtuxet River. Tributaries to the Pocasset within the Town of Johnston include Oak Swamp Reservoir, Jillson/Almy Reservoir, Simmons Brook, Dry Brook, and Upper/Lower Simmons Reservoirs.

[1] *Town of Johnston Comprehensive Community Plan* adopted by the Town of Johnston and approved by the RI Division of Planning, November 17, 2009.

Map 1: Watersheds, Johnston, RI



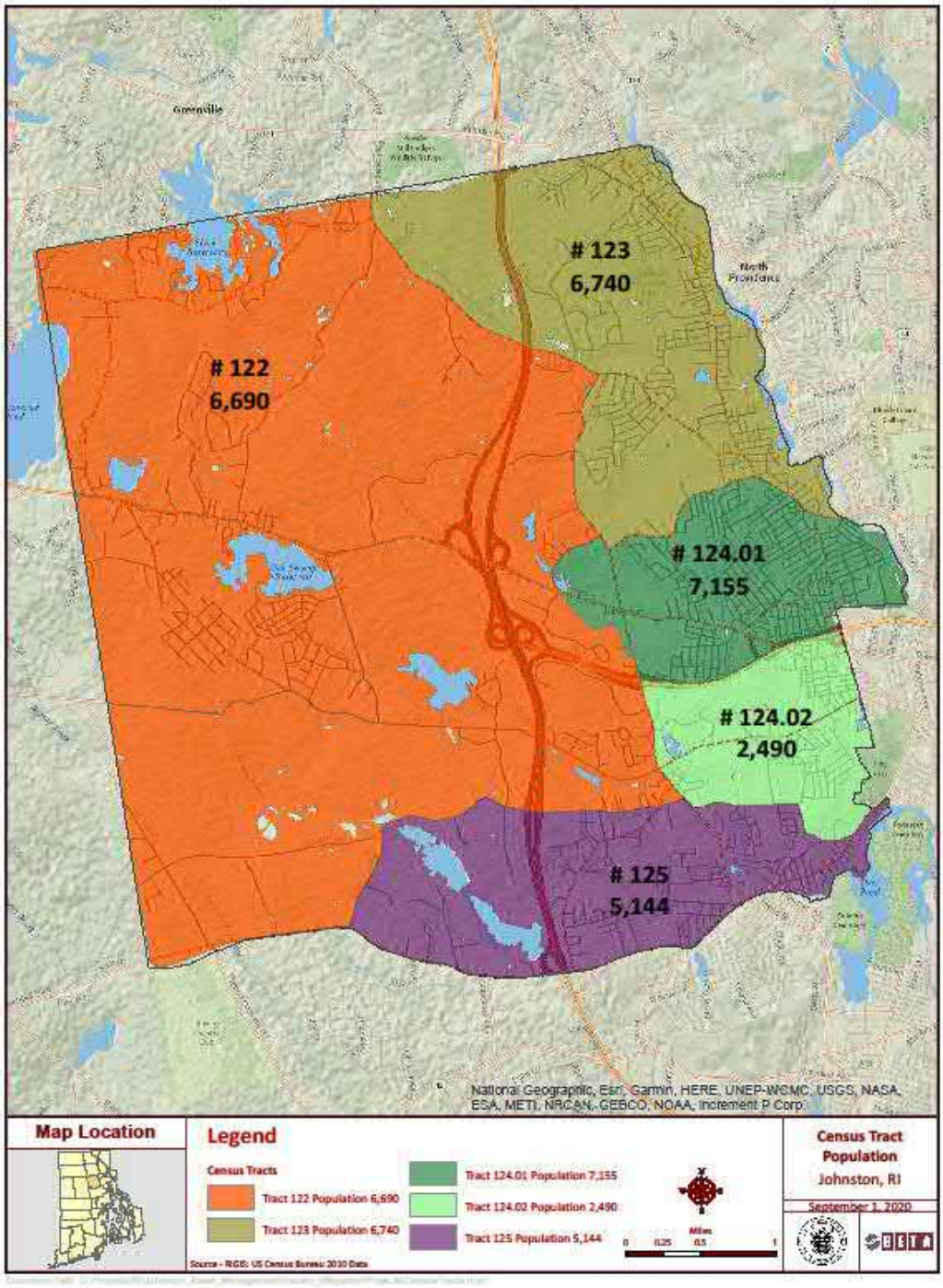
Map 2: Special Flood Hazard Areas and Waterbodies



1.2.2. Demographics / Census, Housing

The Amercian Community Survey (ACS) estimated the Town of Johnston's population at 29,471 in 2019, up from 28,769 as reported in the 2010 census. The Town of Johnston's overall density is 1,207 people per square mile. However, as illustrated in Map 3, the majority of the Town of Johnston's population resides in the easterly portion of the town.

Map 3: Population by Census Tracts



The ACS reported mean annual income to be $63,973 for the period between 2014 -2018, with 7% of the population to be living at or below the poverty level. According to the ACS, in 2018 the Town of Johnston had 13,061 housing units, which was a 5% increase over the number of housing units reported in the 2010 census. Sixty-eight percent (68%) of those units were owner occupied and 32% were rental units.The ACS also reports that 17.8% of the population speak a language other than English at home.

Socio-economic:

Population:	29,471
Over the age of 65:	19.8%
Under the age of 5:	4.5%
Caucasian:	89.9%
Black/African American:	1.9%
Hispanic or Latino:	8.6%
Mean Annual Income:	$63,973
Living at Poverty Level:	7.0%

1.2.3. Land Use & Infrastructure

Approximately one-third of the Town of Johnston can be classified as urban and the remainder of the town predominantly rural or exurban, that is, not quite rural due to the medium density of residential properties in nature. Table 1 identifies the existing land use in the Town of Johnston by land use category as of 2011. Even with development that has occurred over the past 10 years in the Town of Johnston, areas classified as urban do not exceed more than 45% of the town.

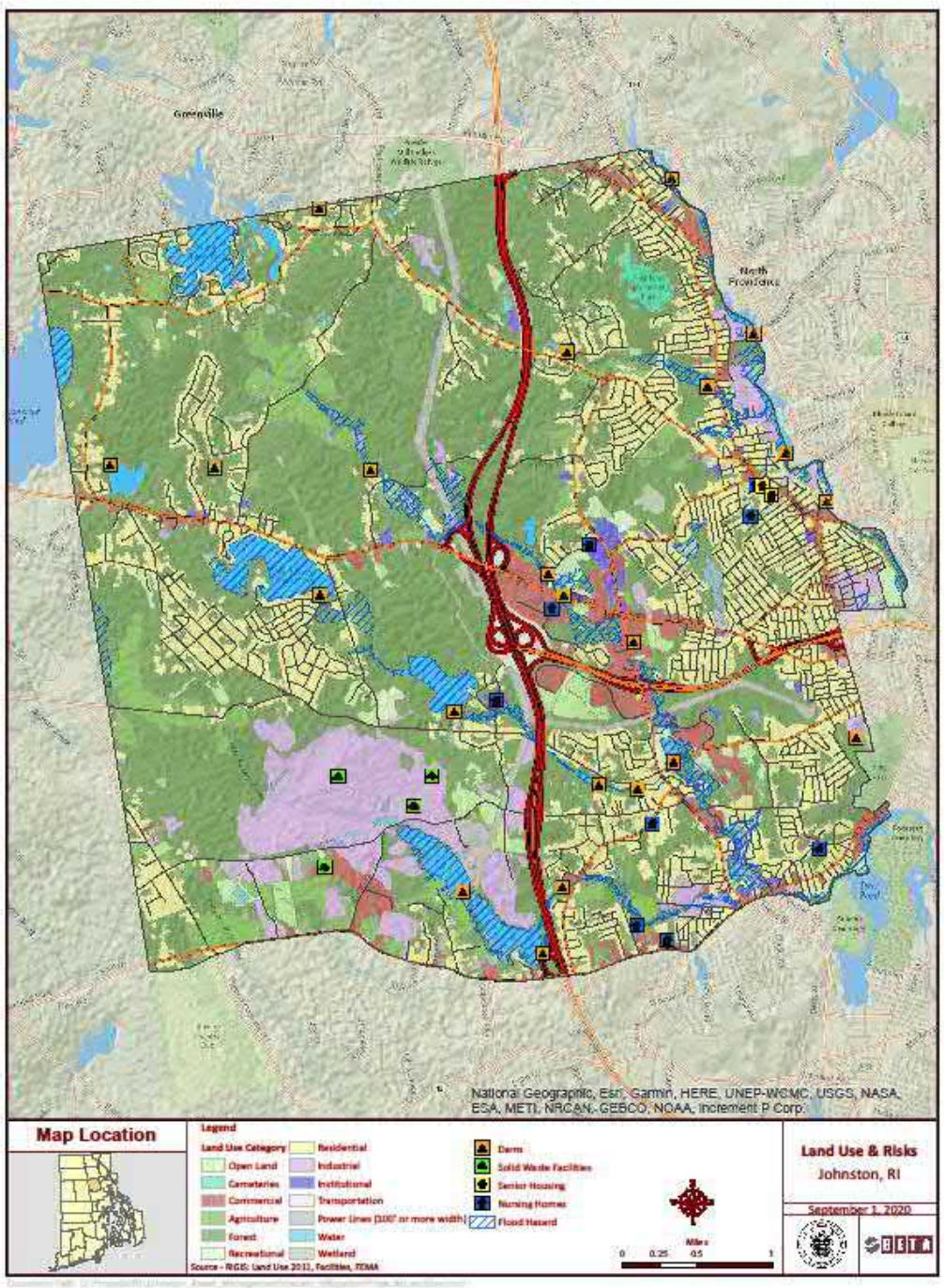
Table 1: Existing Land Use by Category

LAND USE	ACRES	%
Residential - Low (>2 acre lots)	49	0.3
Residential - Medium Low Density (1 to 2 acre lots)	118	0.8
Residential - Medium Density (1 to 1/4 acre lots)	1,933	12.5
Residential - Medium High Density (1/4 to 1/8 acre lots)	1,640	10.6
Residential - High Density (>1/8 acre lots)	258	1.7
Urban Transitional (infill potential)	168	1.1
Agriculture (Cropland, Orchards, Pasture, Idle)	887	5.7
Commercial (sale and services)	618	4.0
Commercial/Industrial Mixed	140	0.9
Industrial (manufacturing, design, assembly, etc.)	212	1.4
Mines, Quarries and Gravel Pits	60	0.4
Waste Disposal (landfills, junkyards, etc.)	801	5.2
Institutional	107	0.7
Transportation, Communications, Utilities	644	4.1
Recreation, Conservation, Open Space	1,132	7.3
Forest, Brushland	5,088	32.8
Freshwater Wetland	1,125	7.2
Water Bodies	541	3.5
	15,521	100.0

Source: RIGIS mapping, *2011*

The existing land uses in the Town categorized as urban include densely populated residential areas, commercial uses, industrial uses, mixed industrial-commercial uses, urban infill areas, gravel pits, quarries, waste disposal, government and institutional, transportation, communications, utilities, and abutting wetland areas. The exurban land uses identified in this Plan include areas used for medium density residential uses. The remaining rural areas include low density residential properties, recreation, conservation, and open space properties, forest, brushland, and remaining abutting freshwater wetlands and water bodies. These land use patterns and conditions consist of characteristics that each present unique threats and concerns. Refer to Map 4 below of the Town of Johnston.

Map 4: Land Uses & Risks



1.2.4. **Community Development and Development Trends**

The current Zoning Ordinance that guides development in the Town of Johnston was adopted in 1994 and has been amended several times in the intervening years. Existing development in the Town of Johnston represents characteristics that are near the extremes. In the urbanized portion east of I-295, the Town is densely developed with historical filling of flood plains and urbanization of river areas.

While the past development defines the town's place in history as representative of the American Industrial Revolution, it has created flooding problems and other conditions that threaten the community. Subdivisions constructed prior to the Rhode Island Freshwater Protection Act in 1971 likely filled wetlands and may have been built with inadequate drainage systems.

The State's primary landfill, RI Resource Recovery Corporation (RIRRC)'s Central Landfill, is located in the southwestern section of Town. Access to and continuation of operations at the landfill is critical to state operations. As the state's primary landfill, debris resulting from floods and other natural hazards generated throughout the state is trucked to the Town of Johnston and disposed at the Central Landfill and construction and demolition debris is sorted for recycling at the Central Landfill or at various private operations in the Town of Johnston. Construction of full access ramps from I-295 to Shun Pike alleviated many of the issues related to diversion of odorous trucks through state and town roads in proximity to neighborhoods and local businesses.

The western portion of the Town of Johnston includes undeveloped regions considered exurban. The narrow, underdeveloped roadways and lack of utilities present threats to both population and property in the event of flooding from dam failure or storms, snow/ice/wind/rain events that affect road networks, and fire. The pavement design of many of these substandard roads may not be able to withstand damage from stormwater flow or may have inadequate drainage swales or catch basins. Fire presents a greater threat due to limited or non-existing public water supplies and limited access across local roads.

Residential development, which consists of a mixture of tenement mill housing areas interspersed with concentrations of single-family development is located primarily in the eastern portion of this district and includes the densely populated villages of Thornton and Simmonsville. Newer construction consists of single-family subdivisions. Commercial development in the Town of Johnston along Plainfield Pike, which serves as the boundary between the Town of Johnston and Cranston consists primarily of strip commercial development mixed with residential development. The Cranston side of the pike supports a heavy concentration of commercial development and several large light industrial parks. Industrial operations continue along the Simmons Brook and Pocasset River in the Thornton section.

The area identified in the Town of Johnston, Rhode Island Comprehensive Community Plan, 2007, as Thornton, Simmonsville and Simmons Reservoir Planning District, has experienced significant change in the past 30 years west of Simmonsville Avenue. Large parcels of land west of Simmonsville Avenue and I-295 have converted from agriculture use to industrial uses. The 2009 plan addresses the importance of several waterways in this district. "The existence of the Simmons Brook and the Pocasset River in this Planning District has also restricted development in the past. Flooding has become a major issue in this area…recent studies by the US Department of Agriculture, Natural Resource and Conservation Service, have documented problems in this District resulting from over-development upstream from this District." In the coming years, partnerships must be established between the communities, the State of Rhode Island, and the United Government to implement the recommendations of the report generated from these studies

On average, the Town of Johnston Planning Board receives around fifty applications a year for development projects. Most of these projects are smaller, two to four lot subdivisions, expansions of existing buildings and infill development. Over the past several years, the Town of Johnston has approved several major projects including the new 450,000 sq ft Citizens Banks headquarters located off Greenville Avenue, just

west of Route 295, a thirty lot subdivision in the western portion of the Town of Johnston, and an 80,000 sq ft Market Basket on Hartford Avenue. Seven wind-turbines were installed along Plainfield Pike and Shun Pike west of Route 295. The Town of Johnston has also seen several waste-to-power facilities constructed along Shun Pike in proximity to the landfill and RIRRC.

1.2.5. Historic and Natural Resource/Environmental Significance

Johnston was substantially a farming community when it separated from the Town of Providence and incorporated in 1759. Beginning in the 19th century the Town of Johnston began evolving from an agrarian community to "industrialized centers concentrated around local mill villages while the "west end" retained its farming" roots.[2] Old mill buildings are still in existence in many parts of the old mill centers.

While the eastern section of the Town of Johnston is substantially urban development, much of the north central and westerly section is undeveloped land. Development has been constrained, in part, by the extent of wetlands and floodplains associated with the Woonasquatucket and Pocasset River watersheds. The Scituate Reservoir, which is located in the neighboring Town of Scituate, provides water to more than 60 percent of the state's population. A narrow band of land extending in a north to south direction at the border of the Town of Johnston and Scituate is within the protected Scituate Reservoir Watershed. There are several areas of land that were identified in the 2007 Johnston Community Comprehensive Plan as being important natural resources and should be considered for preservation. Much of that land remains undeveloped:

> ***Western Johnston (Planning District #4)****: An area of approximately 194 acres located within the Scituate Reservoir Watershed area and the proposed R-80 Overlay District. The vast majority of this property is wetland as defined by State law and thus valuable for preservation.*
>
> ***Plainfield Pike (Planning District #4):*** *An area totaling over 80 acres located north of Plainfield Pike, just east of the Scituate border. Although this area is in close proximity to the RIRRC Central Landfill facility (a portion is within the 2,000' buffer for the landfill) and the more industrialized portion of RI Route 14, the land is important for preservation due to its prime agricultural soils.*
>
> ***Winsor Hill Open Space and Recreation area*** *- West of Winsor Hill School (Planning District #2) This parcel is approximately 25 acres of vacant, forested land located adjacent to the Winsor Hill Elementary School; local officials are encouraged to investigate the potential for acquiring this property for the expansion of outdoor recreational resources as well as for the open space it could provide in this densely populated area of the Town.*
>
> ***Winsor Avenue and Hopkins Avenue vicinity (Planning District #4)****: A large area of several hundred acres in the vicinity of Winsor Avenue, Hopkins Avenue, and Rollingwood Drive which was the former location of various historic homestead farm properties. This area's value for conservation and open space is due to its predominantly undeveloped state, its proximity to the Scituate Watershed area and the rural Scituate town line boundary, and its location adjacent to the heavily developed and developing area of Hartford Avenue. The pressure to populate this property in the next few years will intensify as family members sell their interests in the properties to developers.*

[2] Johnston, Rhode Island Comprehensive Community Plan, 2007

Railroad Avenue-Allendale Avenue vicinity (Planning District #1)*: A parcel of over 25 acres in the heavily industrialized and urbanized area off George Waterman Road. The large vacant parcel on Allendale Avenue along the Woonasquatucket River, a National Heritage River, is important for acquisition and preservation due to the critical role it serves and resource it provides for filtration as a result of its proximity to the river.*

Land Adjacent to Town forest (Planning District #4): *A large area adjacent to the Town's forest off Memorial Avenue and Interstate-295. The property in the area is important for acquisition and preservation as open space and its desirability for the expansion of the Town's conservation property and its potential for the maintenance of the quality of life of the Town's residents.*

Greenville Avenue-Cherry Hill Road ((Planning District #2)*: A 50+ acre area located between Greenville Avenue and Cherry Hill Road remains vacant in this densely populated area. This area contains freshwater wetlands in addition to upland.*

Snake Den State Park, which was named in recognition of the canyon-like stone fissure located within the park, is located on 1,000 acres of farm and woodland. The park provides walking trails, wooded lands and a working farm.

1.2.6. Commerce, Industry

Commercial development, consisting primarily of strip commercial, restaurants, gas stations and motels is concentrated along Hartford Avenue, U.S. Route 6/6A. Another concentration of commercial development is located along Atwood Avenue, which includes several large office complexes and some light manufacturing. Industrial operations, including several large heavy manufacturing uses, auto salvage operations and metals recycling facilities. commercial development and several large light industrial parks are concentrated along the Cranston side of Plainfield Pike and Several industrial operations continue along the Simmons Brook and Pocasset River.

The State's primary landfill, Rl Resource Recovery Corporation (RlRRC)'s Central Landfill, is located about a half mile west of Route I-295 and a half mile north of Route 18, Plainfield Pike. Access to and continuation of operations at the landfill is critical to state operations. The land surrounding the southern end of the landfill supports heavy industrial uses including extractive operations, waste hauling operations and smaller industrial activities.

According to the Rhode Island Department of Labor and Training, the top ten employment sectors in the Town of Johnston are as follows:

Table 2: Largest Employment Sectors - Johnston, RI

Industry	# of Employers	Avg. Employees
Finance & Insurance	25	4,111
Health Care & Social Assistance	139	2,192
Retail Trade	140	1,729
Administrative Support & Waste Mngmnt.	130	1,635
Government	15	1,369
Accommodation & Food Services	95	1,258
Construction	176	969
Manufacturing	67	808
Other services (except Public Admin.)	97	523
Transportation & Warehousing	37	469
Real Estate & Rental & Leasing	44	384

1.2.7. NFIP, CRS Community

Flood Insurance Policies

Policies issued:	52
Annual Premium:	$63,883
Total Coverage:	$16,266,700
Claims paid since 2010:	27
Amount paid in claims:	$960,616

R.I. Emergency Management Agency, NFIP Planner, June 202

The Town of Johnston has been participating in the National Flood Insurance Program (NFIP) since March 1978. Communities participating in the NFIP must adopt Flood Insurance Rate Maps (FIRMS) and the community Flood Insurance Study (FIS) produced by FEMA. Participating municipalities must also adopt and regulate a FEMA compliant floodplain management ordinance that regulates activity in the community's floodplains. Federal flood insurance is required for all buildings in Special Flood Hazard Areas (SFHAs) shown on the FIRMS if they are financed by federally backed loans or mortgages. All homeowners, business owners, and renters in communities that participate in the NFIP may purchase federal flood insurance on any building even if outside a mapped flood zone. Flood insurance covers property owners from losses due to inundation from surface water from any source. The NFIP Program is administered in the Town of Johnston by the Town Engineer as the NFIP coordinator. All flood plain mapping and map changes are available for review through the Town Engineer.

The Town of Johnston Building Official implements and enforces the state building code and fully participates in the NFIP as outlined in the code. The Town of Johnston does not currently participate in the community rating system. The Director of Public Works, Building Official, Town Engineer, and the Town Planner are educated on current NFIP policies and ordinances. The Town does not engage a Certified Flood Plain Manager. The Town of Johnston understands that participation in the NFIP is an essential step in mitigation flood damage and is working to consistently enforce NFIP compliant policies to continue participation in this program.

1.3 Significant Events

SINCE 2010

Fall, 2018

Over the month of November Johnston experienced a record-breaking amount of precipitation resulting a rise in water levels in the flood zone near Belfield Drive. Flooding along the corridor became a significant issue and the impacted area was declared a local disaster zone. Johnston received $55,000 through the State of Rhode Island to procure a pump and operating crew to mitigate the issue. The pump was operational for one week dispersing approximately 35 million gallons of water to the Pocasset River without residual effects downstream.

Fall, 2017

Johnston experienced a significant microburst that made its way through the west of town downing many trees and causing power outages for several days.

January 26 – 27, 2015 – Severe Winter Storm and Snowstorm

Over the course of January 26-27, 2015, a blizzard deposited more than 16 inches of snow in the Providence area. Over the next five weeks, a snowstorm would hit the region each week, for a total accumulation of over thirty inches that year.[3]

In response to a request from the governor of Rhode Island, a major disaster for the State of Rhode Island was declared on April 3, 2015. The Primary Impact of the Public Assistance request was identified as Emergency Protective Measures, at an estimated cost of $4,716,944.[4]

February 8, 2013

On February 8, 2013, two storm systems converged over the Northeast, dumping more than 18 inches of snow in Providence before ending the next day on February 9.[5]

In response to a request from the governor of Rhode Island, a major disaster for the State of Rhode Island was declared on April 3, 2015. The Primary Impact of the Public Assistance request was identified as Emergency Protective Measures, at an estimated cost of $7,057,671.[6]

August 27, 2011

Tropical Storm Irene hit Southern New England on August 27, 2011, with sustained winds reported in Rhode Island at 71 mph, a 4-foot storm surge, and 8-foot storm tide.[7]

October 2, 2012

[3] National Weather Service office, Taunton, Mass. as reported by The Weather Channel. (March 23, 2015) retrieved June 17, 2020 *New England Record Snow Tracker: Boston Breaks All time Seasonal Snow Record in 2014-2015* *https://weather.com/news/news/new-england-boston-record-snow-tracker*

[4] Rhode Island – Severe Winter Storm and Snowstorm, FEMA -4212-DR, Declared April 3, 2015

[5] National Weather Service, as reported by aer, A Verisk Business, retrieved June 17, 2020, *Blizzard of 2013* https://www.aer.com/science-research/climate-weather/climate-dynamics/blizzard-2013/

[6] Rhode Island – Severe Winter Storm and Snowstorm, FEMA-4107-DR, Declared March 22, 2013

[7] The University of Rhode Island, HURRICANE RESILIENCE, Long Range Planning for the Port of Providence, (June 18, 2020), *Hurricane Impacts, Historical Storms in Rhode Island*

Superstorm Sandy hit Rhode Island on October 29, 2012, with sustained winds reported at 51 mph and product 4-6-foot storm surge. The storm caused $11.2 million in damages and resulted in power outages across the state for many days [8]

HISTORICAL

March 12 – March 31, 2010

Development of the 2010 Hazard Mitigation Plan (HMP) was initiated after severe flooding that occurred between the period of March 12 through March 31, 2010. The impacts from that event included damage to pavement, guardrails, drainage structures and sewer pump stations that were submerged during the flooding. Flooding prevented passage through streets, requiring traffic to be rerouted. On Belfield Drive more than a dozen homes were inaccessible due to the flooding and access to a nursing home located on Old Pocasset Road was affected. Over 100 Individual Assistance claims were filed.

[8]The University of Rhode Island, HURRICANE RESILIENCE, Long Range Planning for the Port of Providence, (June 18, 2020), *Hurricane Impacts, Historical Storms in Rhode Island*

Section 2 Planning Process

2.1 Purpose, Overview and Background

The purpose of updating the Town of Johnston HMP is to update the short- and long-term actions identified in the 2010 HMP to reflect actions already taken and goals achieved; assess and evaluate the most current information available on recent natural hazards and changing weather patterns and risks resulting from the effects of climate change. The HMP is being updated in conformance with 44 CFR Parts 201 and 206 Hazard Mitigation Planning and Hazard Mitigation Grant Program, Interim Final Rule. Once adopted by the Town and approved by FEMA, the Town of Johnston remains eligible for the Hazard Mitigation Assistance (HMA) program funding. Resources available through the HMA program may be used to mitigate the effects of hazards on both public and private property (FEMA, 2013a).

To complete the 2020 Hazard Mitigation Plan Update the 2010 HMP was reviewed to determine what measures from that plan had been achieved, what components of the plan were either not completed or were ongoing and still relevant, and what had changes, such as frequency and intensity of natural events, land development, changes in population, are trending or have occurred during the intervening years since the 2010 plan was approved by FEMA.

It is important to understand where the planning process for the Town of Johnston's 2010 HMP began. On March 23, 2010 the Rhode Island Emergency Management Agency (RIEMA) State Flood Coordinator conducted a National Flood Insurance Program (NFIP) Community Assistance Visit (CAV) with representatives from the Town of Johnston. This meeting was attended by town officials including the town planner, public works director, EMA director and others. Following the CAV, the Hazard Mitigation Team met routinely in the aftermath of the March 30-31, 2010 floods to both identify projects for FEMA reimbursement and to discuss funding opportunities to mitigate future damage from storm-related flooding. Priorities for flood mitigation emerged that were later vetted with the stakeholder committee and the public at two public workshops. The March 2010 floods were influential in identifying measures to mitigate future flooding such flood events and to reduce future flood damage and severity.

The final 2010 HMP was issued on November 12, 2010 and approved by FEMA on May 10, 2011.

2.2 Building Support: Community Involvement, Roles & Responsibilities

2.2.1. The Planning Team, Technical Assistance & Local Leadership

This 2020 update began in April of 2020. A Hazard Mitigation Team was dedicated to the process, comprised of Thom Deller (Town Planner), Chief Joseph Razza (Emergency Management Director), Battalion Chief Thomas Marcello; Robert Parker, and George Lazzareschi. In May of 2020 a Stakeholder's meeting was held to give an update of the project and to receive input comments from the Hazard Mitigation Team and stakeholders, the primary focus of the meeting was risk assessment. A complete draft of the updated plan was reviewed by members of the Hazard Mitigation Team in September of 2020. Comments were incorporated into the plan which was presented to the Johnston Planning Board and public on December 8, 2020 during a public meeting. During the forum no additional input or comments were received from the public and the Planning Board accepted the plan update as received. The Plan is ready for submission to FEMA for review and approval.

2.2.2. Stakeholders

To ensure the plan included the perspective of people with different interests, perspectives and expertise, the Town of Johnston sought input from members of the community, including business owners, various

caregivers and other community leaders during the Planning Board public hearing on December 8, 2020. Additionally, prior to the meeting the Town posted the Draft Plan on the Town's website.

2.2.3. Public

The plan was posted to the Town's website and shared with the general public for input and comment during the Planning Board public hearing on December 8th, 2020, there was no input or comments received from the public. The Town Clerk provides notification to abutting communities regarding meeting agenda for the Town Council and Planning Board. The Town did not receive input or comments from the neighboring communities in response to the notice.

2.3 Understanding the Community's Risks

The 2010 HMP identified three major categories of risk to the community:

1. ***Residential and Commercial Structures –*** *Structures that house people and services. This Risk Category is subject to flooding, wind, fire, and earthquakes.*

2. ***Roads, Bridges, and Dams –*** *Public Infrastructure constructed for access and protection, structures constructed to protect people, structures, and services. The Risk Category is subject to flooding and earthquakes.*

3. ***Environmental Resources –*** *"Natural" resources and habitats to balance the environment, the ecology, and our quality of life. This Risk Category is subject to flooding, fires, and earthquakes.*

In preparing this update, the Town of Johnston looked at recent storm events and weather patterns that have affected the town since the 2010 HMP was approved. During this plan update, the Town of Johnston reviewed the current action plan, determined what actions have been completed, updated actions that need to be completed and added new action items to

2.4 Updating the Mitigation Strategy

2.4.1. Identification and Review of Goals, Actions, Priorities, Changes, Progress

The primary goal for the Town of Johnston in updating this plan is to reduce, or, wherever possible, eliminate losses from future disasters. Mitigation measures that require correcting an existing condition, such as inadequate drainage systems, inferior dam structures, or development within flood prone areas, can be costly. An updated, FEMA-approved HMP ensures the Town of Johnston is eligible for funding that can be used for mitigation action. Other ways to mitigate potential losses is through policies, such as land-use ordinances, that restrict development within areas prone to natural hazards or require certain standards be met that increase resiliency to specific hazards.

2.4.2. Review and Incorporation of Stakeholder and Public Input

Development of this plan update began on April 8, 2020 with a kickoff meeting, a project team and schedule were developed under direction of Thom Deller. A meeting for stakeholders was held on May 26, 2020, to provide a project update and receive input from stakeholders regarding risk assessment. On December 8, 2020 a town meeting was held were the Planning Board accepted the draft plan update as received; there was no comments from the residents of Johnston during the public forum.

2.4.3. Bringing the Plan to Life: Implementation and Maintenance

The highest priority identified in the 2010 HMP was the implementation of the Pocasset River Watershed Program. That plan, which includes the acquisition of sixteen three-bedroom residential homes for demolition and the conversion of the underlying property to compensatory floodplain, is commencing. This is a voluntary buy-out program and will occur over a period of time as homeowners choose to participate in the program.

Two pump stations, located at South Bennett Drive and River Drive, were inundated during the March 2010 floods, and have since been relocated out of the floodplain.

2.4.4. Method, Responsibilities, & Schedule

This plan has been prepared in accordance with the Local Mitigation Planning Handbook published by FEMA March 2013, and the requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). Updates are required every five years. The Johnston Emergency Management Agency, with the support of the Department of Public Works and the Office of Planning and Economic Development will evaluate the plan, the status of implementation, and prepare an update in 2025. It is recommended annual evaluations be conducted by the director of the Johnston Emergency Management Agency, in consultation with the Department of Public Works and the Office of Planning and Economic Development. In year three of the cycle, the update process should include participation from stakeholders and the general public to assure that the plan achieves the necessary FEMA approval prior to the expiration.

Section 3 Risk Assessment

3.1 Defining Risks and Methodology

Town officials identified risks and developed mitigation recommendations using the "Risk Assessment" and "Mitigation Strategy Matrices". The Town of Johnston identified risks, assessed the degree of vulnerability of those areas "at risk" (e.g. building structures, public infrastructure population, and natural resources), and examined possible impacts from natural disasters (e.g. loss of life, environmental damage, inconvenience to residents). Risks in the Town of Johnston, including nursing homes, senior housing, RI Resource Recovery (RIRRC) landfill operations, and dams are presented in Map 4: Land Uses & . Map 3 Critical Facilities Johnston, RI depicts the location of critical facilities within the Town of Johnston.

"Risk" describes the characteristics of the hazard and can be defined in terms of magnitude, duration, distribution, area affected, frequency, and probability.

"Vulnerability" indicates what is likely to be damaged by the identified hazards and how severe that damage could be. The Town's vulnerability to natural disasters is measurable in terms of the risk factors to the population, property and natural and economic resources, and in terms of the probability and magnitude of the event.

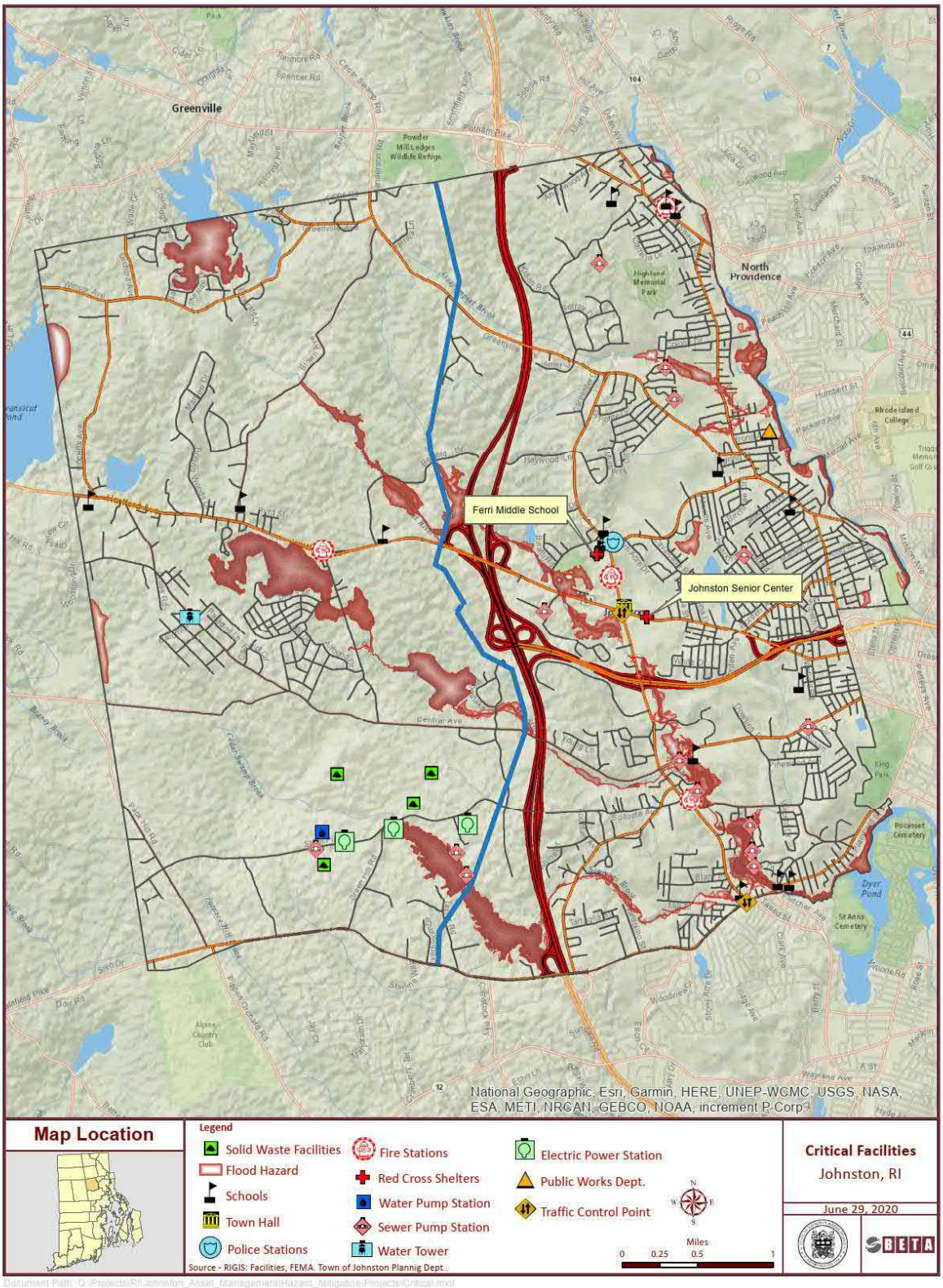
After identifying the risks to the Town, local officials developed mitigation actions addressing a mix of structural initiatives to minimize the effects of future hazards (e.g. building code enforcement, retrofitting existing structures, and removal of vulnerable structures) and nonstructural initiatives (e.g. educational programs, preventing construction in high-hazard areas, enforcing regulations). By creating this strategy, Johnston established an ongoing process that incorporated hazard mitigation as a routine function of municipal management.

3.2 Hazards

A natural hazard is defined as an event or physical condition that has the potential to cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. In addition, a human-caused hazard includes any disastrous event caused directly by one or more identifiable deliberate or negligent human actions, while a technological hazard is a hazard originating from technological or industrial conditions, including accidents, dangerous procedures, or failures.[9]

[9] RIEMA, October 2018 *Rhode Island State Hazard Mitigation Plan*

Map 5: Critical Facilities



3.2.1. Hazard Identification

Table 3 lists the natural, human-caused and technological hazards that could reasonably be expected to occur within the state as identified in the Rhode Island 2019 Hazard Mitigation Plan.

Table 3: Natural Hazards - Johnston, RI

Natural Hazards	Human-Caused Hazards	Technological Hazards
Severe Winter Weather: • **Ice Storm** • **Snowstorm**	Cybersecurity Incident	Infrastructure Failure • Communications • Emergency Services • Energy • Information Technology • Transportation Systems • Water and Wastewater Systems
Flood: • Riverine • Coastal • Urban	Chemical Incident	
High Wind	Terrorism Foreign and Domestic	
Extreme Heat	Biological Incident	
Hurricane and Tropical Storms: • Nor-easter • Storm Surge	Radiological Incident	
Extreme Cold	Civil Disturbance	
Thunderstorm • Hail • Lightning		
Dam Failure		
Fire: • Urban • Wild		
Sea Level Rise		
Infectious Disease		
Drought		
Earthquake		
Tornado		

After reviewing the history of past events, as well as current and predicted future weather patterns and conducting a multi-hazard threat analysis, the Town of Johnston identified dam failure, flood, hurricane, severe winter storm and wind storms as the primary hazards of concern to the community.

DAM FAILURE
FLOOD
HURRICANE
SEVERE WINTER STORM
WINDSTORM

At the time, this update was being prepared, the country was in the midst of the COVID-19 pandemic. On January 31, 2020, the President declared a public health emergency under the Public Health Service Act, followed on March 13, by a national emergency declaration under the Stafford Act, which was subsequently followed by the invocation of emergency powers via Executive Order under the Defense Production Act on March 18. The Governor of Rhode Island issued a Declaration of Disaster Emergency on March 9, 2020. The impact of the pandemic on the Town of Johnston's emergency response system was considered by the Hazard Mitigation Team, both as a stand-alone

emergency and as an emergency occurring in conjunction with another disaster. The consensus reached was the primary risk was road closures due to flooding or snow and ice cover.

Table 4 below estimates the level of impact each hazard could have on humans, property and business and averages them to establish an index of severity. The estimated probability for each hazard is multiplied by its severity to establish an overall relative threat factor. This matrix also shows the frequency of future occurrence, based on a 25-year window.

Table 4: Multi-hazard Threat Analysis

Column	A	B	C	D	E	F
Scoring 0=NA 1=Low 2=Moderate 3=High	Probability of death or injury	Physical losses and damages	Interruption of service	Likelihood of occurrence within 25 years	Avg of human/property/ business loss	Relative threat
					Average Columns A, B, C	Column D x E
Hazard	**Human Impact**	**Property Impact**	**Business Impact**	**Probability**	**Severity**	**Risk Severity x Probability**
Flood	1.0	3.0	3.0	3.0	2.0	7.0
Severe Winter Storm	1.0	2.0	2.0	3.0	2.0	5.0
Windstorm	1.0	2.0	1.0	2.0	1.0	3.0
Hurricane	1.0	1.0	1.0	2.0	1.0	2.0
Dam Failure	2.0	2.0	2.0	1.0	2.0	2.0
Earthquake	2.0	2.0	2.0	1.0	2.0	2.0
Hailstorm	1.0	2.0	1.0	1.0	1.0	1.0
Land Subsidence	1.0	2.0	1.0	1.0	1.0	1.0
High Heat	1.0	1.0	0.0	2.0	1.0	1.0
Drought	2.0	1.0	1.0	1.0	1.0	1.0
Wildfire	1.0	1.0	0.0	1.0	1.0	1.0
Tornado	2.0	1.0	1.0	1.0	1.0	1.0
Avalanche	0.0	0.0	0.0	0.0	0.0	0.0
Coastal Erosion	0.0	0.0	0.0	0.0	0.0	0.0
Expansive Soils	0.0	0.0	0.0	0.0	0.0	0.0
Levee Failure	0.0	0.0	0.0	0.0	0.0	0.0
Landslide	0.0	0.0	0.0	0.0	0.0	0.0
Tsunami	0.0	0.0	0.0	0.0	0.0	0.0
Volcano	0.0	0.0	0.0	0.0	0.0	0.0

3.2.2. Hazard Profiles

DAM FAILURE

Description

Dam failure can occur as a result of natural events, human-induced events, or a combination of the two. Failures due to natural events, such as prolonged periods of rainfall and flooding, can result in overtopping, which is the most common cause of dam failure. Overtopping occurs when a dam's spillway capacity is exceeded and portions of the dam that are not designed to convey flow begin to pass water, erode, and ultimately fail. Other causes of dam failure include design flaws, foundation failure, internal soil erosion, inadequate maintenance, or mis-operation. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water that rushes downstream, damaging or destroying everything in its path. An additional hazard concern is the cascading effect of one dam failure causing multiple dam failures downstream due to the sudden release of flowing water.

While dam failures that occur during flood events compound an already tenuous situation and are certainly problematic, dam failures that occur on dry days are the most dangerous. These "dry day" dam failures

typically occur without warning, and downstream property owners and others in the vicinity are more vulnerable to being unexpectedly caught in life threatening situations than failures during predicted flood events. The hazard classifications are defined in the Rhode Island Dam Safety Regulations as follows:

- **Low Hazard:** Dams where, if failure occurred, it would result in no probable loss of human life and low economic/environmental losses.
- **High Hazard:** When dam failure or mis-operation will result in a probable loss of human life.
- **Significant Hazard:** When dam failure or mis-operation results in no probable loss of human life, but can cause major economic loss, disruption of lifeline facilities, or detrimental concern to the public's health, safety, or welfare.

Locations

There are a number of dams in the Town of Johnston. Roads located at the base of spillways of the dams of Town reservoirs include Reservoir Avenue (Oak Swamp Reservoir), Central Pike (Jillson/Almy Reservoir), Plainfield Pike (Simmons Reservoirs), Memorial Avenue, Hartford Avenue, Atwood Avenue, Morgan Mill Road, Plainfield Street (Pocasset River Ponds). Table 5 lists dams located in the Town of Johnston as identified by the RIDEM Dams Section, relative to their Risk Status.[10] High hazard dams are town-owned.

[10] http://www.dem.ri.gov/programs/benviron/compinsp/pdf/damlist.pdf

Table 5:Dams Located in Johnston

State Id	Dam	River/Stream	Hazard	Regulated
169	Almy Reservoir	Dry Brook	High	Yes
313	Hughesdale Pond	Upper Dry Brook	High	Yes
168	Oak Swamp Reservoir	Dry Brook	High	Yes
171	Simmons Lower Reservoir	Cedar Swamp Brook	High	Yes
170	Simmons Upper Reservoir	Cedar Swamp Brook	High	Yes
311	Brown Sawmill Pond	Pocasset River	Low	No
312	Hughesdale Pond Lower	Dry Brook	Low	Yes
422	Memorial Park Pond	Pocasset River	Low	Yes
315	Pierce Pond Lower	Simmons Brook	Low	Yes
307	Sampson-Almy Pond	Pocasset River-Trib	Low	Yes
523	Stamp Farm Pond	Reaper Brook	Low	Yes
647	Pocasset Upper	Pocasset River	Low	UNK
314	Pierce Upper	Simmons Brook	Low	UNK
316	Chapel Mill	Simmons Brook	Low	UNK
317	Victoria Mill	Simmons Brook	Low	Yes
319	Priscilla Worsted	Simmons Brook	Low	
309	Colwell Pond	Pocasset River-Trib	NA	No
306	Morgan Mill	Pocasset River	NA	No
308	Old Mill	Pocasset River	NA	No
318	Tarp	Simmons Brook	NA	
322	Prophet Spring		NA	No
127	Belknap Pond	Assapumpset Brook	Significant	Yes
323	Caesarville Pond	Assapumpset Brook	Significant	Yes
504	Dexter Farm Pond	Pocasset River-Trib	Significant	Yes
346	Kimball Reservoir	Moswansicut Brook	Significant	Yes
310	Pocasset Pond	Pocasset River	Significant	Yes
131	Greystone	Woonasquatucket River	Low	Yes
134	Lymansville	Woonasquatucket River	Low	Yes
135	Manton Mill Pond	Woonasquatucket River	Low	Yes

Source: RIDEM Dam Inventory,

Extent

Failure of any one of these dams can have serious consequences to private homes and to the roadway network. In addition to the obvious threat to adjacent properties and roadways, some dam failures would directly threaten hazardous materials and/or waste stored in a diverse range of quantities at various locations. Examples of major economic loss include but are not limited to washout of a state or federal highway, washout of two or more municipal roads, loss of vehicular access to residences, (e.g. a dead end road whereby emergency personnel could no longer access residences beyond the washout area) or damage to a few structures.[11]

The Department of Public Works facility at 100 Irons Avenue is located immediately adjacent to the Woonasquatucket River, within the 100-year flood plain. This facility, constructed in the 1970s, houses trucks, plows, and other equipment needed to maintain public access and safety on town roads. Diesel fueling for municipal vehicles is provided immediately adjacent to the river. Town vehicles are serviced and maintained at the DPW garage.

[11] Rhode Island Department of Environmental Management Office of Compliance and Inspection, *Rules and Regulations for Dam Safety***,** December 2007 (adopted pursuant to Chapters 42-17.1, 42-17.6, 42-35, and 46-19 of the Rhode Island General Laws of 1956, as amended).

Offices of the Department of Public Works, Engineering, Building Official/Inspections, and Planning and Economic Development are located in this building. Plans are stored for projects reviewed in accordance with municipal regulations by the Planning and Zoning Boards.

As a former asphalt facility, the DPW site is contaminated (detected petroleum compounds were associated with three release areas). The DEM Environmental Land Usage Restriction for this site outlines emergency protocol in events including but not limited to fire and flood[12]. Additionally, the adjacent Woonasquatucket River is the subject of efforts for remediation of toxic dioxins in the river sediment by the Environmental Protection Agency (EPA). Any flood waters would disperse contaminated sediment to upland areas including adjacent neighborhoods and the DPW building.

Previous Occurrences, Disasters and Probability of Future Events
While the last dam failure in the Town of Johnston occurred in 1840 when the Simmonsville dam failed[13], several dams rated as High Hazard are in need of repairs as indicated in Table 6 below.

Table 6: Johnston Dams with Unsafe Conditions[14]

Dam #/Name	Hazard Class	Unsafe Conditions	Owner
127 Belknap	Significant	Vegetation prohibited inspection; embankment leakage, improper trash rack inhibiting flow, failed downstream wall	Private owner
169 Almy	High	Vegetation prohibited inspection; spillway not functioning properly, low-level outlet inoperable	Town of Johnston
170 Simmons Upper			Town of Johnston
171 Simmons Lower	High	Vegetation prohibited inspection; severe embankment erosion, spillway not functioning properly, low-level outlet inoperable	Town of Johnston
313 Hughesdale Upper	High	Low section of embankment, low-level outlet inoperable	Private owner
346 Kimball	Significant	Vegetation prohibited inspection	Providence Water Supply Board, City of Providence

FLOODS

Description
A flood is defined by the NFIP as: a general and temporary condition of partial or complete inundation of two (2) or more acres of normally dry land area or of two (2) 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.

[12] Environmental Land Usage Restriction, C. Pezza & Sons, Incorporated, 55 and 100 Irons Avenue, Johnston RI. (Case No. 2003-005)
[13] Johnston's dams rated for safety, Cranston Herald (November 25, 2016)
[14] Annual Dam Safety Report 2017, RIDEM Dam Safety

Floodplains are the low, flat, periodically flooded lands adjacent to rivers, lakes, and oceans, and are subject to geomorphic (land-shaping) and hydrologic (water flow) processes. During and after major flood events the connections between a river and its floodplain become more apparent. These areas form a complex physical and biological system that supports a variety of natural resources and provides natural flood and erosion control. The floodplain represents a natural filtering system, with water percolating back into the ground and replenishing groundwater. When a river is divorced from its floodplain with levees and other flood control structures, the natural benefits are either lost, altered, or significantly reduced. Floods are measured by the crest height of the water, how many feet over the flood stage it has reached, and the recurrence interval. More intense rainfall, as a result of climate change, is likely to increase the magnitude of flash flooding, particularly in urban environments.

Riverine Flooding

Riverine flooding is a function of precipitation levels (both rain and snow) and water runoff volumes within the stream or river. Riverine flooding is defined as the periodic occurrence of overbank flows of rivers or streams resulting in partial or complete inundation of the adjacent floodplain. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrences of a flood of a particular magnitude and an equal or larger flood, or more accurately by the annual chance of the occurrence of that magnitude of flood. Floods with a higher magnitude typically are referenced by their statistical recurrence interval. Flooding at the 1%-annual-chance (100-year) level is higher than at the 4%-annual-chance (25-year) level for the referenced location. When land next to or within the floodplain is developed, these cyclical floods can become costly and hazardous events.

Flash Flooding

A flash flood is the fastest-moving type of flood. It happens when heavy rain collects in a stream or gully, turning the normally calm area into an instant rushing current. Any flood involves water rising and overflowing its normal path. A flash flood is a specific type of flood that appears and moves quickly across the land, with little warning, making it very dangerous.

Flash floods are the result of heavy rainfall concentrated over one area. Most flash flooding is caused by slow-moving thunderstorms, thunderstorms that repeatedly move over the same area, or heavy rains from hurricanes and tropical storms. Dam failures can create the most damaging flash flood events. A dam failure occurs when a dam or levee breaks, suddenly releasing a large quantity of water downstream. The force of this water release can destroy structures in its immediate path and cause flash flooding in surrounding areas. The best response to any signs of flash flooding is to move immediately and quickly to higher ground.

Urban Flooding

Urban flooding occurs when water flows into an urban area faster than it can be absorbed into the soil or stored in a lake or reservoir. Flash flooding, river floods, and rapid snow melt can all cause urban flooding. Increased development in the floodplain can increase the frequency of urban flooding because of the increase in pavement and therefore decrease in soil area for water to absorb into.

In Rhode Island, flooding in urban areas occurs frequently in cities adjacent to waterbodies. A lot of the state's cities were established during times when waterways were used for transportation. Sites adjacent to rivers and coastal inlets provided convenient places to ship and receive commodities. Floodways and wetlands, which are the natural storage basins for flood waters, were filled to accommodate development. Urbanization can decrease the permeable area in a city. As a result, stormwater has less places to go and can overwhelm insufficient drainage systems, leading to urban flooding. Often, when heavy rains occur, Rhode Island's aging sewer systems are overrun, resulting in raw sewage flowing into Narragansett Bay, often creating bay closures to shell fishing and swimming.

Locations
In general, the location of flood events varies by type of flooding. Coastal areas are most at risk from flooding caused by hurricanes, tropical storms, and nor'easters. Low-lying coastal areas in close proximity to the shore, sounds, or estuaries are exposed to the threat of flooding from storm surge and wind-driven waves, as well as from intense rainfall. Areas bordering rivers may also be affected by large discharges caused by heavy rainfall over upstream areas. Urbanized and inland areas with poor drainage capabilities are most at risk from flash flooding caused by intense rainfall over short periods of time. Stream flow tends to increase rapidly. Large amounts of impervious surfaces in urban areas increase runoff amounts and decrease the lag time between the onset of rainfall and stream flooding. Human-caused channels may also constrict stream flow and increase flow velocities.

The *Flood Plain Management Study: Pocasset River Watershed*, Providence County, Rhode Island[15] has documented historic flooding on the Pocasset River in both the Town of Johnston and the City of Cranston. "Flooding in the Pocasset River Watershed has been a problem since the 1950s, according to residents living within the river's flood plain. Although the City of Cranston has been subjected to major flooding due to its downstream location, flooding begins in the headwaters and along the Pocasset River in the Town of Johnston." As indicated in Table 1, based on risk severity and probability, flooding and severe winter storms are the two most important hazard threats in the Town of Johnston.

Extent
Populations and property are extremely vulnerable to flooding. homes, businesses and industry may suffer damage and be susceptible to collapse due to heavy flooding. Floodwaters can carry chemicals, sewage, and toxins from roads, factories, and farms; therefore, any property affected by the flood may be contaminated with hazardous materials. Debris from vegetation and man-made structures may also be hazardous following a flood. In addition, floods may threaten water supplies and quality, and initiate power outages.

Previous Occurrences, Disaster, and Probability of Future Events
Heavy rainfall during November 2018, one of the wettest on record in the Providence area, the Town of Johnston experienced localized flooding in the area of Belfield Drive. After 1.5 inches of rain fell on November 25, 2018, residents from the affected area were being shuttled by Johnston Police personnel to and from their residents. While traffic was not impeded by the flood waters, the fire department and Department of Public Works were called on to pump water from the area to mitigate the flooding.[16]

Between March 12 and 31, 2010, the State of Rhode Island experienced heavy rainfall and documented hurricane-force winds during storms that affected the state. Rhode Island also had its warmest month on record.[17] The monthly rain total in Providence (located immediately east of the Town of Johnston), was 16.32 inches, making March the city's all-time wettest month on record, breaking the previous record of 15.38 inches set for October, 2005.[18] In Providence, 5.32 inches of rainfall was observed on March 30 which was the 5th largest daily rainfall recorded. The two-day total (30-31 March, 2010) was 8.79 inches, breaking the previous all-time record of 7.84 inches set on October 14-15, 2005.

Rainfall in the Town of Johnston in the March 2010 storms was especially heavy in the Pocasset River Watershed with flood waters rising significantly on impoundments and tributaries to the Pocasset River. The Town of Johnston Department of Public Works responded to 387 requests for water-related emergency assistance during and following the storm while the Fire Department received 207 calls for storm-related

[15] US Department of Agriculture, *op. cit.*
[16] Joseph Razza, Town of Johnston EM Director, November 2018. *After Action Analysis, Belfield Drive Flooding*
[17] State of the Climate National Overview, March 2010, National Oceanic and Atmospheric Administration National Climatic Data Center, http://lwf.ncdc.noaa.gov/
[18] Received from FEMA, June 2010

emergency response including requests to pump flooded basements.[19] Additional emergency requests were made to the Police Department and the mayor's office.

Extensive damage was reported to roads, bridges and to residences not located in flood-prone areas. Damage included the following:

Figure 2: Mill Street closed due to flooding on March 31st, 2010

- The Mill Street bridge was closed when flood waters overtopped the culvert and destroyed pavement and guardrails. The flooding of Simmons Brook on March 31, 2010 created hardships for residents and businesses, resulting in circuitous detours through narrow residential streets. This Low/Moderate Income neighborhood includes older residential areas in close proximity to the mills for which Mill Street was named. Steep terrain and Simmons Brook have resulted in discontinuous street patterns. The resultant detour is 1.25 miles and requires that trucks destined for industries travel through narrow residential streets including Shaw Avenue and Venice Avenue.

- Flood waters several feet deep on the Jillson Reservoir outfall stream overtopped Old Pocasset Road, severely affecting access to Briarcliffe Manor (a 165-bed skilled nursing home and rehabilitation facility) and a neighborhood of a dozen homes. No other vehicular access is provided to this neighborhood.

- Belfield Drive was flooded by surface runoff into tributary streams and wetlands associated with the headwaters of the Pocasset River, northwest of the I-295/Route 6 interchange. Flooding up to five feet in depth prohibited access to over a dozen homes. The Fire Department conducted emergency evacuation by boat to the neighborhood on this dead-end road. The DPW an pumped an estimated 9.16 million gallons of water from the roadway and adjacent areas utilizing a trailer-mounted over the span of five days. Following the storm, the Town of the Town of Johnston constructed (and later restored) an emergency access from I-295 to the easternmost portion of this roadway.

- Mulberry Circle and the adjacent neighborhood were especially hard hit by flooding when a brick storm drain, designed to handle storm runoff from DiPonte Drive to the north, burst, sending floodwaters throughout the Mulberry Circle, Truman Street, Belvedere Street, and Strawberry Lane neighborhood. The stormwater system was designed for this 1960s neighborhood prior to adjacent residential development, and it appears undersized to handle projected rainfall with global warming and increased rainfall trends.

- The Morgan Avenue bridge guardrail was damaged by rising Pocasset River waters. Surface water runoff in the steeply graded neighborhoods north of Morgan Avenue severely damaged pavement and drainage features in the areas near Monson Street and Ipswich Street. The drainage system in the neighborhood of Sprague Circle and Vincent Drive located south of Morgan Avenue, also sustained damage to a culvert headwall and pavement.

- Central Avenue sustained pavement damage from I-295 runoff that cascaded onto the roadway below.

[19] Johnston Department of Public Works and Fire Department, August 2010

- Other areas where pavement was damaged by stormwater flow included Roberts Circle where sinkholes developed. Reservoir Avenue, where floodwaters overtopped Oak Swamp Reservoir. Boulder Drive, where surface runoff cascaded down the street toward an undeveloped drainage outfall northeast of Primrose Lane. Malom Drive, Lincoln Drive, Shun Pike, and many other streets had damaged pavement and drainage structures as result of the storm event. Most are not located in special flood hazard areas and had never experienced this extent of flooding.

- Additional stress was placed on eleven sewer pump stations which, although they did not fail during the storm event, have subsequently been subject to failure. The sewer pump stations on River Drive and South Bennett were submerged by Pocasset River flood waters.

Although flooding on the Woonasquatucket River was more limited during the March 2010 storm than on the Pocasset, the National Weather Service Gauge in Centerdale, located on the North Providence-Johnston line, recorded at 9.20 feet on March 30, 2010, the highest historical crest on record.[20] For comparison, the action stage is elevation 5.0 feet, flood stage at elevation 5.5 feet, moderate flood stage at elevation 6.5 feet, and major flood stage at elevation 7.5 feet.

In October 2005 the all-time wettest month on record, at the time, in Rhode Island (15.38" rain), resulted in significant flooding in northern Rhode Island. The Woonasquatucket River at Centerdale crested at 8.26 feet on October 15, 2005, at the highest elevation recorded (surpassed in 2010 at elevation 9.2 feet). Other crests at this location include 7.75 ft on March 18, 1968, 7.33 ft on June 6, 1982, and 7.26 ft on June 30, 1998.[21] The Department of Public Works reported damage to Mill Street for bridge and roadway repair, Vincent and Sprague Circle for road repair, Old Pocasset Road bridge/culvert repair, Monson and Ipswich Roads road repair, and Morgan and Downing Roads road repair.

2001. A deep ground frost set in during a season of constant snow events and snow cover. Nearly 6 feet of snow and close to a foot of ice were deposited over the course of more than a dozen storms. Four winter storms on the 8th, 14th, 22nd and 30th of December 2000, deposited 15 inches of snow and about an inch of ice. In 2001, storms on the 5th, 8th, 13th, 15th, 20th January 5, 8, 13, 15, 20, and 21, deposited another 16 inches of snow, as well as two to three inches of freezing rain and ice. One month later, February brought 18 inches of snow and three inches of ice in storms on the 5th, 23rd, and 26th. Storms on March 5-7 and March 9th left 18 inches of heavy snow and more than three inches of ice. All winter long, temperatures remained cold enough that there was minimal snow melt during the days; not enough to provide icing conditions at night.

Two weeks after the March storms, four inches of rain fell in 72 hours. The ground was still substantially frozen, unable to absorb the runoff. One week later, another three inches of rain fell in 48 hours. Flooding was extraordinary. The Mayor declared a "State of Emergency." The Governor sought a declaration of a "Federal Disaster Area" to make post-event funds available to those affected by the floods.

Several areas were significantly affected by flooding during these two storm events. An especially hard hit spot was the area south of Atwood Avenue (Route 5) and Hartford Pike (Route 6) intersection, where the Pocasset River passes beneath a bridge under Route 5. Several commercial properties were flooded including a supermarket, storefronts, and several restaurants. Economic losses in this area included a reduction in business, increased police and fire costs, and direct property damage. Several business owners installed stream bank stabilization to control scouring.[22]

[20] National Weather Service Advanced Hydrologic Projection Service, http://water.weather.gov/
[21] US Department of Agriculture, o*p. cit*
[22] *Ibid*

Another area impacted by flooding in 2001 was the intersection of Central Avenue and Atwood Avenue, where Dry Brook discharges into the Pocasset River. The former Factory Mutual Global office park is located just northeast of the intersection and outlying buildings owned by FM Global were flooded.

The Morgan Mill Road Industrial Park previously experienced instances of severe flooding. There are approximately ten light industrial facilities located in the park. In 1999, flooding caused damage to Morgan Mill Road, including the bridge that crosses the Pocasset River and associated riverbanks. The Town of Johnston requested Emergency Watershed Program (EWP) funding to restore the riverbanks. Funding was provided through NRCS, and a stone revetment was installed. Flooding still occurred in March of 2001 but no damage resulted, due to the bank being protected from erosion by the revetment.

South of Morgan Mill Road is the residential neighborhood comprised of River Drive, Melody Lane, and South Bennett Drive. Many of the homes are located adjacent to the Pocasset River or adjacent to a large flood plain wetland located on the River. The floods of 2001 caused significant damage including loss of property and riverbank erosion resulting in substantial cleanup costs.

South of the River Drive neighborhood is River Avenue, located immediately north of the Cranston-Johnston border, near the intersection of Route 5 (Atwood Avenue) and Route 14 (Plainfield Street). This is the area where Simmons Brook enters the Pocasset River. Flooding causes significant impacts to both commercial and residential properties located in the area adjacent to River Road, as well as properties located along Simmons Brook. Losses from the 2001 floods included damage to residential properties, loss of industrial materials, stream bank erosion, clean-up costs, and loss of production time. At least one industrial mill complex located on Simmons Brook still has vacant areas due to previous flood damage.

Flooding in 2001 was severe enough in this area to cause stream bank erosion along Simmons Brook. Again, the Town of Johnston applied for EWP assistance through NRCS. A portion of Simmons Brook adjacent to St. Rocco's Church parking lot needed to be stabilized and construction was completed in October of 2002.

1982. A storm of just under six inches of rainfall caused some of the most serious flooding in the history of Cranston with $1.5 million in damages within the City. While these damages were cited in Cranston, upstream areas of the watershed in the Town of Johnston received commensurate damage.[23]

1979. A storm on January 31st caused "The Great Flood of "79." Local newspapers reported in excess of $900,000 in damages from the flood, with Fletcher Avenue (immediately downstream of the Johnston line) being one of the harder hit sections of the City of Cranston. The Johnston Fire Department responded to over 250 water emergencies.[24]

A graphical representation of several storm events (1999-2010) that resulted in significant flooding within the Town of Johnston are shown in Table 7 on the next page.

[23] *Ibid*
[24] *Ibid*

Table 7: Recent Area Significant Flood Events

Date	Locale	Comments
March 30-31, 2010	Johnston	Significant flooding (8.79" rain)
October 2005	Providence	All-time wettest month on record (15.38" rain)
March 30, 2001	Johnston	Significant flooding (3" rain)
March 22, 2001	Johnston	Severe flooding (4" rain)
April 22, 2000	Region	
April 8-9, 2000	Region	Event incl. winds of 50 knots
September 16, 1999	Region	
September 10, 1999	Region	
August 26, 1999	Johnston	

Source: Town of Johnston Public Works Department and National Climate Data Center

In the future, climate change will cause more intense rainfall which is likely to increase flood crest elevations and frequency of flooding, particularly in urban environments. It is estimated that rainfall could increase by roughly 18% to 20% between 2018 and 2099. Similarly, Rhode Island is likely to experience more extreme precipitation events per year (one [1] inch in 24 hours or two [2] inches in 48 hours) [25]

HURRICANES (TROPICAL AND EXTRATROPICAL STORMS)

Description

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that 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 effects include high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical cyclones move inland, they cause severe flooding, downed trees and power lines, and structural damage. Once a tropical cyclone no longer has tropical characteristics, it is then classified as a post tropical cyclone.

There are three (3) categories of tropical cyclones:

- **Tropical Depression**
  - Maximum sustained surface speed is less than 39 mph
- **Tropical Storm**
  - Maximum sustained surface wind speed from 39–73 mph
- **Hurricane**
  - Maximum sustained surface wind speed exceeds 73mph

Most Atlantic tropical cyclones begin as atmospheric easterly waves that propagate off the coast of Africa and cross the tropical North Atlantic Ocean and Caribbean Sea. When a storm starts to move toward the north, it leaves the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This produces the eastward curving pattern of most tropical cyclones 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.

[25] Rhode Island Executive Climate Change Coordinating Council, 2017. RIEC4 Annual Report. http://climatechange.ri.gov/documents/ec4ar17.pdf

Nor'easter

An extratropical cyclone, known as a Nor'easter, is typically a large, counter-clockwise wind circulation around a low-pressure center. The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 mph, traveling up the eastern United States coast. Short-term wind speeds gusting up to 70 mph are common for a Nor'easter. Unlike hurricanes and tropical storms, Nor'easters can sit offshore, causing damage for days. Nor'easters are a common winter occurrence in New England as the polar jet stream meets the warm air from the Gulf to form a storm. They result in flooding, various degrees of wave and erosion-induced damage to structures, and erosion of natural resources, such as beaches, dunes, and coastal bluffs. The erosion of coastal features results in greater potential for damage to shoreline development from future storms. Nor'easters can produce wind gusts to near hurricane force, significant storm surge, flooding rain, and crippling snowfall. These storms also produce varying amounts of coastal erosion depending on the intensity and the duration of the storm; the tidal phase at the time of the storm (neap or spring tide); the path of the storm; and the time interval between storms. Back-to-back storms do not allow time for the beaches and dunes to recover sand that has been transported offshore.

A storm surge is the abnormal rise in water level caused by the wind and pressure forces of a tropical storm, hurricane or Nor'easter. Nationally, storm surge flooding has caused billions of dollars in damage and hundreds of deaths. As population density in coastal communities increases, the need for information about the potential for flooding from storm surge becomes even more important. The breaking wave height is related to water depth so that as water depth over a given surface increases with storm surge, larger waves can be generated. Sea level rise caused by storm surge during a hurricane, or even during coastal flooding unrelated to a hurricane event, can increase the severity of impact.

The fundamental forcing mechanism of storm surge is wind and the resultant frictional stress it imposes on the water surface. Winds blowing over a water surface generate horizontal surface currents flowing in the general direction of the wind. These surface currents in turn create subsurface currents which, depending on the intensity and forward speed of the hurricane or Nor'easter, may extend from one (1) to several hundred feet below the surface. If these currents are in the onshore direction, water begins to pile up as it is impeded by the shoaling (shallow) continental shelf causing the water surface to rise. This dome of water will increase shoreward until it reaches a maximum height at the shoreline or at some distance inland. Storm surge heights in Rhode Island can reach more than 10 feet during hurricanes. The continental shelf slope also determines the scale of storm surges; wide, gently sloping shelves create larger storm surges.

The magnitude of storm surge during a hurricane or tropical storm within a coastal basin is governed by both the meteorological parameters of the hurricane and the physical characteristics of the basin.

The meteorological aspects include:

- Hurricane size measured by the radius of maximum winds. (Measured from the center of the hurricane to the location of the highest wind speeds within the storm. This radius may vary from as little as four (4) miles to as much as 50 miles.)
- Hurricane intensity, measured by sea level pressure and maximum surface wind speeds at the storm center.
- Hurricane path, or forward track of the storm.
- Hurricane forward speed.

The counterclockwise rotation of the hurricane's wind field in combination with the forward motion of the hurricane causes the highest surge levels to occur to the right of the hurricane's forward track. This phenomenon has been observed in regions where the shoreline is typically straight and not fragmented by large inlets and bays, and when a hurricane travels generally perpendicular to the shore. In Rhode Island, the increased wind stress from the rotational wind field has a large effect on the level of surge. The

contribution to surge generation from the forward motion of the storm can be greater than the contribution made by an increase in hurricane intensity.

Most of the Rhode Island contiguous shoreline faces south, resulting in storms passing to the west raising the highest storm surges for Rhode Island. Narragansett Bay funnels the surge northward where decreasing surface area amplifies the surge height. The 1938 hurricane made landfall west of Rhode Island as a Category 3 hurricane with a forward speed in excess of 50 mph. Because the center of the 1938 hurricane made landfall in Connecticut to the southwest of the State, the Rhode Island shoreline experienced the highest storm surge levels.

The reduction of atmospheric pressure within the storm system results in another surge-producing phenomenon known as the inverted barometer effect. Within a region of low pressure, the water level rises at the approximate rate of 13.2 inches per inch of mercury drop. This can account for a water level rise of one (1) to two (2) feet near the center of the hurricane. This effect is a more important factor in the open ocean where there are no depth-related restrictions to water flow.

Locations
The entire State of Rhode Island is vulnerable to impacts from the wind and rainfall associated with hurricanes, tropical, and extratropical storms.

Extent
Hurricanes are categorized according to the Saffir-Simpson hurricane wind scale, which was developed in 1971 by Herbert Saffir and Robert Simpson. The scale rates the intensity and effects of hurricanes based on wind speed and barometric pressure measurements as shown in Table 8. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest. It gives an indication of the potential flooding and wind damage associated with each hurricane category. The scale is designed to give public officials and the general public usable information on the magnitude of a storm. A hurricane watch is issued when hurricane conditions could occur within the next 48 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 36 hours or less. Storm surge watches, storm surge warnings, and extreme wind warnings also indicate hazardous conditions related to hurricanes.

Table 8: Saffir/Simpson Scale of Hurricane Intensity

Wind Speed	Typical Effects
Category 1 Hurricane – Weak	
74-95 mph	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 Hurricane – Moderate	
96-110 mph	Moderate Damage: Considerable damage is done to shrubbery and tree foliage; some trees typically 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 Hurricane – Strong	
111-129 mph	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 Hurricane– Very Strong	
130-156 mph	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 Hurricane – Devastating	
Greater than 156 mph	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.

Previous Occurrences and Probability of Future Events

Rhode Island has experienced tropical depressions, tropical storms, and hurricanes ranging from Category 1 to Category 3. Hurricanes can have potentially devastating effects on Rhode Island. Hurricane wind damage can be costly, but storm surge is by far the most destructive force acting on the Rhode Island coast. The highest storm surges recorded at the Newport tide gauge were 9.45 feet and 6.76 feet above the mean higher high water (MHHW) during the Great September Hurricane of 1938 and Hurricane Carol, in August 1954, respectively. By comparison, the Providence gauge recorded surges of 12.66 feet and 9.96 feet above MHHW respectively during those events. The duration of high surge and winds in a hurricane is six (6) to 12 hours, while a Nor'easter's duration can be from 12 hours to three (3) days. The amount of damage resulting from a strong hurricane is often more severe than a Nor'easter, but Rhode Island has historically suffered more damage from Nor'easters because of the greater frequency with which they occur.

The damage and severity of hurricanes for Rhode Island depends largely on where the storm makes landfall. Hurricanes are generally classified as *Eastward, Westward,* or *Rhode Island.*

The eye of an *Eastward* hurricane passes east of the state, offshore to the south, and east of Cape Cod. This classification of hurricane is more of a threat to inland areas, including the Town of Johnston, and less of a threat to the coastal areas. Rhode Island may experience significant rainfall for several days prior to the actual arrival of an *Eastward* hurricane.

A *Westward* hurricane poses a greater threat to Rhode Island's coastal areas. The eye of these storms makes landfall to the west of Rhode Island. Areas east of this hurricane class will experience high winds which produce storm surges in coastal areas. Typically, a *Westward* hurricane generates less rain than an *Eastward* hurricane.

Rhode Island hurricanes include storms where the eye makes landfall on the south coast and therefore travels over the state. *Rhode Island* hurricanes have only occurred twice (the September Hurricane of 1944 and Hurricane Bob in 1991). Since both of these hurricanes made landfall on the southern coastline of Rhode Island at its most westerly point, in the vicinity of Watch Hill in the Town of Westerly, most of the state was located east of the eye of the storm. Strong winds and heavy rainfall were reported along the state's coastline areas. Table 9 lists hurricanes that have impacted Rhode Island.

Table 9: Rhode Island Hurricanes

Date	Hurricane Name	Type	Winds [mph]	Property Damage (million $)	Number of Deaths
September 21, 1938	"Hurricane of 38"	Westward	95	100.0	262
September 14, 1944	"Hurricane of 44"	RI	82	2.0	0
August 31, 1954	Carol	Westward	110	90	19
September 11, 1954	Edna	Eastward	40	.1	0
August 19, 1955	Diane	Eastward	45	170	0
September 12, 1960	Donna	Westward	58	2.4	0
September 27, 1985	Gloria	Westward	81	19.8	1
August 19, 1991	Bob	RI	63	115	0
August 26, 2011	Irene[26]		71	9.2	0
October 29, 2012	Sandy		51	39.4	0

Note: Wind velocities may have diminished to less than 75 mph before reaching Rhode Island.[27]

Based on historical frequency of occurrence, Rhode Island is likely, with between 50% and 89.9% annual probability, to experience a hurricane in the next 12 to 60 months. High magnitude events, such as Category 4 or Category 5 hurricanes, are less likely to occur in the next 12 to 60 months. Nor'easters, while typically less severe, have a high probability of occurring in the next 12 to 60 months, with an average annual frequency of one (1) to two (2) events and storm surges greater than two (2) feet. Nuisance flooding and heavy rain events are more common and likely to occur in the next five (5) years. Table 10 provides the annualized events qualitative ranking used for determining probability of future events. The hazard ranking includes the probability of future events by county. Long-term global climate models under the Intergovernmental Panel on Climate Change (warming scenarios indicate that it is possible that hurricanes will become more intense, with stronger winds and heavier precipitation throughout the twenty-first century.

[26] Irene was downgraded to a tropical storm by the time it hit Rhode Island

[27] *"RI Hurricanes and Tropical Storms: A Fifty-six Year Summary", National Weather Service Office, Providence, RI and the 1998 Journal Bulletin: RI Almanac 112th Annual Edition*

Table 10: Tropical and Extratropical Storms Hazard Priority

Jurisdiction	Likelihood of Hazard	Likely Range of Impact (Refer to Appendix C)	Probable Hazard Magnitude					Composite Hazard Index
			People (Injures & Death)	Critical Infrastructure	Property (Structures & Facilities)	Environment	State Operations	
Bristol County	**Likely** *Between 50% and 89.9% annual probability*	**Medium** *10% to 40% of the total jurisdictional boundaries*	**Limited** *Some injuries*	**Limited** *Short shutdown of critical infrastructure and facilities*	**Negligible**[169] *Scattered incidental residential and commercial structure damages*	**Limited** *Less than 20% of land or natural resources impacted*	**Limited** *Some operations impacted for small amounts of time*	**High**
Kent County								
Newport County		**Large** *40% to 100% of the total jurisdictional boundaries*			**Limited** *Less than 10% of residential and commercial structure damages*			
Providence County		**Medium** *10% to 40% of the total jurisdictional boundaries*						
Washington County		**Large** *40% to 100% of the total jurisdictional boundaries*						

WINTER WEATHER

Description

Severe winter weather includes heavy snow and ice storms that can affect the entire state. A heavy snow is generally defined as having more than nine (9) inches of accumulation in less than 24 hours (Winter Storm Warning for Heavy Snow). Heavy snow can bring a community to a standstill by inhibiting transportation, knocking down trees and utility lines, and causing structural collapse in buildings, and infrastructure not designed to withstand the weight of the snow. Repair and snow removal costs can be significant and surpass annual municipal salt and snow removal budgets, often before the end of the season. A winter storm warning is issued when there is an expected winter weather event within the 12 to 36 hours with more than one (1) predominant hazard (i.e., heavy snow and blowing snow [below blizzard conditions], snow and ice, snow and sleet, sleet and ice, or snow, sleet and ice) meeting or exceeding warning criteria for at least one (1) of the precipitation elements. It may also be issued when there are over eight (8) inches of sleet, snow, or ocean effect snow expected averaged over a forecast zone in a 24-hour period.

The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Ice storm warnings are issued in the event of one-half inch (0.5) or greater accretion of freezing rain. 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.

Locations

Average annual snowfall based on extrapolation of weather station snow climatology data is shown in Figure 3 on the next page. Although somewhat more variable in terms of distribution, northwest portions of Providence and Kent counties experience these heavy snowfall events with greater frequency (roughly five (5) or six (6) events per year) compared to Bristol, Newport, and Washington counties that tend to have less than two (2) significant events per year. Providence County will likely see annual snowfall totals over 57 inches, with the greatest impacts and vulnerability in western Glocester and northern Foster communities. Burrillville and Scituate also have an elevated risk and associated damages. The majority of the estimated annualized damage for Providence County will be located within these four (4) municipalities.

Heavy snow can affect the entire State of Rhode Island, but the highest amounts occur in the northern areas of the state and some coastal communities as shown in Figure 3 below. This figure is based on best available data from NOAA's Global Historical Climate Network Daily dataset. This dataset summarizes daily snowfall totals reported by stations in Rhode Island. The total snowfall from 2010 to 2018 was summarized by station and averaged for the reporting time period.

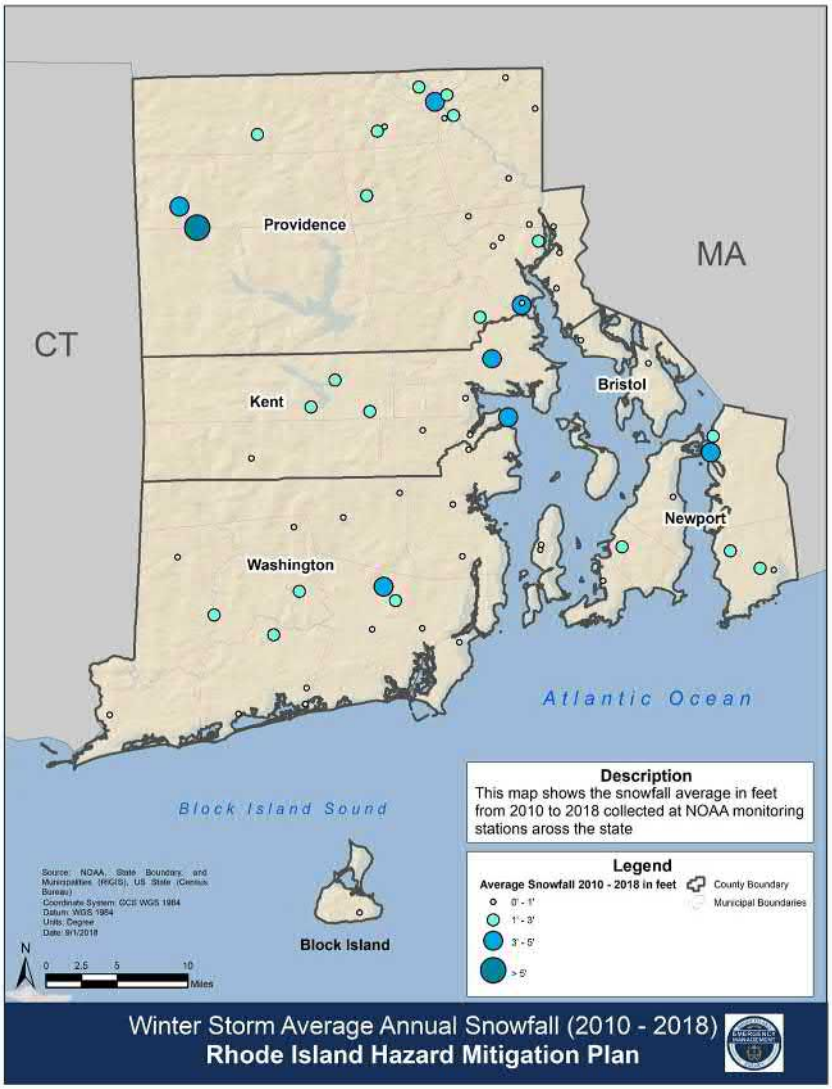


Figure 3: Rhode Island Average Annual Snowfall Reported 2010 - 2018

Extent

Based on the data collected from 1981 to 2010, the average annual snowfall for Rhode Island is 33.8 inches, which exceeds the national average of 22.4 inches. The known record snowfall occurred from February 5th to February 7th, 1978, during the Blizzard of 1978. The storm produced hurricane- force winds and resulted in over 27 inches of snow accumulation in Providence and up to 38 inches of snow accumulation in other parts of the state. This event serves as the storm of record for Rhode Island.

Even though there is no universally accepted scale to measure a snowstorm, the Northeast Snowfall Impact Scale (NESIS), developed by Paul Kocin and Louis Uccellini of the National Weather Service (NWS), characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10-inch

snowfall accumulations and greater. 133 The five (5) categories of NESIS are: Extreme, Crippling, Major, Significant, and Notable shown in Table 11. The index differs from other meteorological indices in that it uses population information, considering how many people live in the path of the storm, in addition to meteorological measurements.134 Thus, NESIS gives an indication of a storm's societal impacts. The Blizzard of 1978 scored a 6.25 on the scale and was classified as Crippling based on its widespread impact and extreme conditions.

Table 11: NESIS Values

Category	NESIS Values	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

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 damage on structures, especially exposed overhead utility systems. Sid Sperry of the Oklahoma Association of Electric Cooperatives and Steven Piltz from the NWS office in Tulsa, Oklahoma, developed the index together. The SPIA Index uses forecast information to rate an upcoming ice storm's impact from zero (0) (little impact) to five (5) (catastrophic damage to exposed utility systems), as shown on the next page in Figure 4 SPEA Index.

Previous Occurrences, Disasters and Probability of Future Events

Major disaster declaration DR-4212, or Winter Storm Juno, was declared on April 3, 2015 for Bristol, Kent, Newport, Providence and Washington counties. This Severe Winter Storm and Snowstorm occurred during the period of January 26, 2015, to January 28, 2015. The Governor requested that federal assistance funds be available to the state and eligible local governments and private nonprofit organizations on a cost-sharing basis for emergency work and the repair or replacement of damaged facilities in Bristol, Kent, Newport, Providence, and Washington counties. In addition, the disaster declaration authorized snow assistance for a period of 48 hours for Bristol, Kent, Newport, Providence, and Washington counties.

Another major disaster declaration DR-4107 was declared on March 22, 2013, due to a severe winter storm and snowstorm in Bristol, Kent, Newport, Providence, and Washington counties. Reports indicated that this storm stretched from New Jersey to Maine and into Canada. More than two (2) feet of snow fell in Rhode Island overnight. National Grid estimated more than 180,000 customers lost power.

Other significant past snowstorms:

- February 14-19, 2003 15”
- January 20-23, 2005 23.5”
- December 26-27, 2010 13”

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.)

Figure 4: SPEA Index

Severe winter weather events within the state are highly likely to occur with an annual probability of greater than 90%. Severe winter weather events have a large range of impact, affecting 40% to 100% of the jurisdictions in the state. The probable magnitude for severe winter weather ranges from negligible magnitude, with no shutdown of critical infrastructure and facilities, to limited magnitude, including some injuries and less than 10% of residential and commercial structures damaged from the events.

The impact on state operations is believed to be limited. The overall impact on the environment is expected to be limited with less than 20% of land and natural resources being impacted by this hazard.

Table 12:Severe Winter Weather Hazard Priority

Jurisdiction	Likelihood of Hazard Occurrence	Likely Range of Impact (Refer to Appendix C)	Probable Hazard Magnitude					Composite Hazard Index
			People (Injures & Death)	Critical Infrastructure	Property (Structures & Facilities)	Environment	State Operations	
Bristol County Kent County Newport County Providence County Washington County	**Highly Likely** *Greater than 90% annual probability*	**Large** *40% to 100% of the total jurisdictional boundaries*	**Limited** *Some injuries*	**Limited** *Short shutdown of critical infrastructure and facilities*	**Limited** *Less than 10% of residential and commercial structures damaged*	**Limited** *Less than 20% of land or natural resources impacted*	**Limited** *Some operations impacted for small amounts of time*	**High**

3.2.c. Climate Change

NOAA's State Climate Summaries were released in 2017 to meet a demand for state-level information in the wake of the Third U.S. National Climate Assessment.[28] This assessment considers projected temperature and precipitation patterns that are likely to occur using both a lower Greenhouse Gas Emissions (GME) projection and a lower GME projection.

The key messages the summary for Rhode Island provides are:

- Rhode Island has warmed by more than 3°F over the past century. Under a high emissions pathway, historically unprecedented warming is projected by the end of the 21st century. Increased intensity of heat waves is also projected, but (with) a decreased intensity of cold waves.
- Both mean and extreme precipitation has increased during the last century, with the highest number of extreme events occurring over the last decade. Continued increases in frequency and intensity of extreme precipitation events are projected.

Figure 5 and Figure 6 on page 41 are graphs produced as part of the NOAA Climate Summary that illustrate observed data and project future trends of temperature in the state of Rhode Island.

[28] NOAA, Satellite and Information Service, 2017, NESDIS 149 – NOAA State Climate Summaries, https://www.nesdis.noaa.gov/content/technical-reports

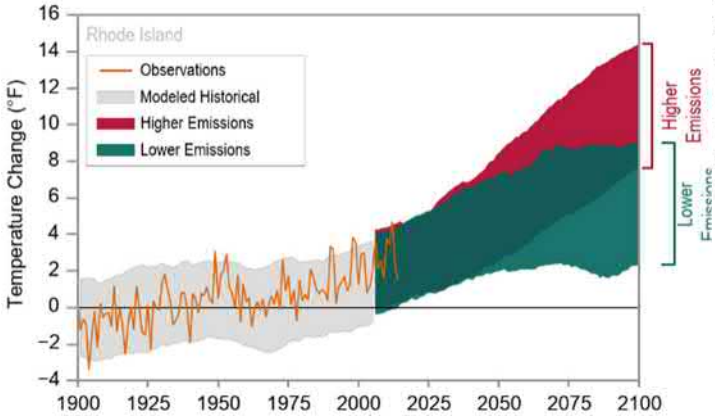


Figure 5: Observed & Projected Temperature Change, Rhode Island

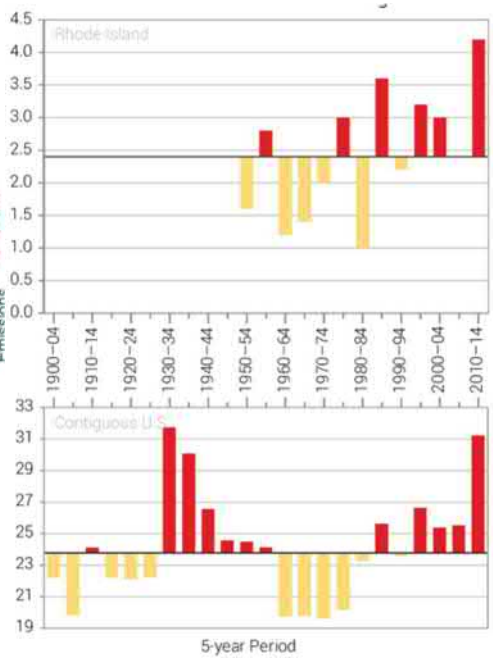


Figure 6: Observed Number of Warm Nights

Extreme heat conditions pose a threat to young children, the elderly and people already suffering from chronic diseases. People who work outdoors are likely to be more susceptible to heat stroke during days when temperatures reach 90° and above, as are low-income populations with limited access to air conditioning and places to cool.[29] When temperatures do not drop substantially overnight during a heat wave, additional stress is placed on human health.

Increases in the frequency and intensity of storm events will have an impact on the frequency and magnitude of flooding, which may pose risks to life, property, and infrastructure.

3.3 Vulnerability

Flooding is a significant threat, particularly in the more urbanized areas of the Town. According to FEMA, a "flood is a general and temporary condition of partial or complete inundation…of normally dry land areas from: (1) overflow of inland or tidal waters; (2) unusual and rapid accumulation or runoff of surface waters from any source; (3) mudflow; (4) collapse of subdivision 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." Approximately 8% of the Town is located in an "A" Zone, defined as "areas subject to inundation by the 100-year flood event". A Flood Insurance Study for the Town of Johnston was conducted by FEMA in 1993 and established Base Flood Elevations for several of the Special Flood Hazard Areas in the Town. Mandatory flood insurance purchase requirements apply."[30]

Development, historical filling of wetlands, and an antiquated infrastructure drainage system combine to result in street and property flooding during even routine rain events. When significant storms are experienced, these areas become inundated. The damage to property and "built" or "human" resources (i.e.,

[29] Center for Disease Control, Extreme Heat Can Impact Our Health in Many Ways, https://www.cdc.gov/climateandhealth/pubs/extreme-heat-final_508.pdf

[30] FEMA, Flood Insurance Study, Town of Johnston, Rhode Island, Providence County, November 17, 1993

businesses, buildings, roads, driveways, and our way of life), as well as our natural resources, unavoidably threatens quality of life and overall community. Furthermore, any flooding experienced in the Town of Johnston along the already overburdened and flood-prone Pocasset River system results in severe impacts downstream on, the City of Cranston. North Providence, to the east, shares our flooding risks along the Woonasquatucket River. In all cases, it must be remembered that flooding results from both rainfall events and significant thaws. Life and property may be at risk from any breaches of the five high hazard dams identified in Table 6 on page 24.

Based on risk severity and probability, fire, lightning and earthquakes are among the top 10 hazard threats in the Town of Johnston. Fire poses a risk to life and property. In the urbanized areas, the benefit of a public water supply and fire hydrants is potentially offset with the density of older structures, which are vulnerable to fire and often not equipped for fire retardance. Five high-rise structures (over 65 feet in height) may be at risk based on fire truck ladder heights and truck access limitations. In the less developed portion of the Town, there are many areas that are not provided with a public water supply. These areas are potential fire victims based on a limited ability to control a fire should one develop in these largely wooded and unoccupied areas. In addition to infrastructure improvements in areas serviced or serviceable with public water, the ability to control fire in the Town of Johnston, particularly forest fires, is challenged by every Town's need for newer firefighting capital equipment as the result of constrained funding resources.

Unlikely, but high-risk events such as earthquakes, must also be considered. Damage and injury could result from an earthquake of even slight magnitude because much of the Town of Johnston includes "steep" slopes of grades greater than 15% and composed of till or outwash material, making slides a real threat. In addition to the potential damage from earth and mud slides and their potential flooding results, the residents' drinking water supplies could be severely threatened (Providence Water Supply, Johnston Water Supply, and individual wells). While the Town's housing stock is generally in good condition, earthquake damage may still present a threat. The potential threat to the roadway system from fissures and blockages due to earth, water and trees must also be considered.

3.4 Risk Analysis & Assessment Matrix

Johnston identified risks, assessed the degree of vulnerability of those areas "at risk" (e.g. building structures, public infrastructure population, and natural resources), and examined possible impacts from natural disasters (e.g. loss of life, environmental damage, inconvenience to residents). Risks in the Town of Johnston, including nursing homes, senior housing, RI Resource Recovery (RIRRC) landfill operations, dams and land use are presented in Map 5 on page 20.

"Risk" describes the characteristics of the hazard and can be defined in terms of magnitude, duration, distribution, area affected, frequency, and probability.

"Vulnerability" indicates what is likely to be damaged by the identified hazards and how severe that damage could be. The Town's vulnerability to natural disasters is measurable in terms of the risk factors to the population, property and natural and economic resources, and in terms of the probability and magnitude of the event.

Having identified the risks to the Town, local officials then developed mitigation actions that address a mix of structural initiatives to minimize the effects of future hazards (e.g. building code enforcement, retrofitting existing structures, and removal of vulnerable structures) and nonstructural initiatives (e.g. educational programs, preventing construction in high-hazard areas, enforcing regulations). By creating this strategy, the Town of Johnston established an ongoing process that will incorporate hazard mitigation as a routine function of municipal management.

After identifying these primary threats,[31] the Town summarized these risks and determined that there are three major categories at risk or particularly vulnerable in the community:

1. ***Residential and Commercial Structures – Structures that house people and services. This Risk Category is subject to flooding, wind, fire and earthquakes.***

Many densely developed residential areas are negatively impacted by stormwater runoff. Underdeveloped or overburdened drainage infrastructure does not have the capacity to retain, detain, and otherwise attenuate the drainage and mitigate the damage. Erosion is a chronic threat and low-lying properties receive large quantities of uncontrolled stormwater, even after relatively minor rain events.

Historical maps reveal that numerous ponds and wetland systems have been altered by development, particularly over the past 40-60 years. Existing homes, therefore, suffer flood threats all along these corridors, especially along the Pocasset and Woonasquatucket River systems. Many of these homes were constructed in low-lying areas or were not flood-proofed when constructed. In addition, areas which did not flood in years past are now flooding due to the alteration of the floodways and flood plains resulting from the pressure of development.

Total assessed value of real property in the Town of Johnston is $2,849,474,400 (2019)[32]. Currently there are 52 NFIP policies in the Town of Johnston, with $16,266,700 in total coverage.[33] The Town has identified 16 Repetitive Loss structures, of which 4 are considered Severe Repetitive Loss. The 16 structures consist of 12 residential and 2 non-residential. Since 2010, 27 claims have been paid totaling $960,616[34]. NFIP properties represent 0.6 percent of the total assessed real property valuation of the community.

Issues associated with the Pocasset River have been addressed in the NRCS *Flood Plain Management Study: Pocasset River Watershed.*[35] High Hazard areas have been identified by NRCS based on consideration of flood water depth (greater than 3 feet) and velocity of flood flows (greater than 5 cubic feet per second) or where the product of the depth and velocity exceeds 7. These areas must also be used for overnight occupation. The following High Hazard areas have been identified by NRCS:

- Park Place Apartments. 20 Park Street is a 62-unit apartment complex that is home to many low and moderate income residents (including HUD Section 8 Family Assistance). This 2-story building, built in 1972, has over 26,000 square feet on each level. The apartment is built into a steep hill that descends to the Pocasset River floodplain. Much of the parking lot (and the lower level) are subject to flooding.

- Rotary Drive. Approximately 18 homes are within or immediately adjacent to the 100-year flood zone.

- Simmons Brook Bypass Culvert, Mill Street. The 100-year flow at this location is 1,011 cubic feet per second, significantly exceeding the capacity of the exiting culvert (217 cfs).

[31] See the Risk-Mitigation Matrix provided in Section 4.0 of this Plan.
[32] Town of Johnston Assessor's office, July 8, 2020
[33] R.I. Emergency Management Agency, NFIP Planner, June 2020
[34] R.I. Emergency Management Agency, NFIP Planner, June 2020
[35] United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS); Pocasset River Watershed Plan, Pocasset River Watershed, Johnston and Cranston, Rhode Island; GZA GeoEnvironmental, Inc.; February 2009

- South Bennett Drive and River Drive neighborhood (located directly across the river from the Park Place apartments) includes 18 residences within the 100-year flood plain.

- Additional non-structural measures include removal of a debris dam near the Pocasset's confluence with the Simmons Brook, relocation of four buildings (including several on River Avenue off Plainfield Pike), dry flood proofing ten buildings, and moving one building out of the flood plain.

In 2010 the Town of Johnston received a draft Cooperative Agreement from the NRCS to facilitate the implementation of structural and non-structural measures necessary to provide for flood damage reduction in the Town of Johnston. A $1.8 million congressional earmark has been designated for acquisition/demolition of four homes on River Avenue and River Drive and construction of a flood wall designed for South Bennett Drive. As indicated in Section 4, far more work is required to complete flood mitigation along the Pocasset River. The Town of Johnston has a total of 16 Repetitive Loss Structures, of which four are classified as Severe Repetitive Loss Structures. Twelve are residential, two are business-nonresidential and two are other non-residential.

2. ***Roads, Bridges, and Dams – Public Infrastructure constructed for access and protection, structures constructed to protect people, structures, and services. The Risk Category is subject to flooding and earthquakes.***

Historical alteration to wetlands and ponds and long-term sedimentation resulting from runoff occurring at nearby construction projects have significantly affected the character of rivers and their tributaries in floodway area and volume capacity and river bottom elevations. In addition, increased development (over decades) has reduced the land available for natural stormwater infiltration resulting in the elevation of some river "bottoms" therefore flooding areas which historically had never been flooded.

Many Town facilities in this Risk Category are older and perhaps not as structurally capable as newer construction which meets current engineering standards. In addition, some bridges, roads and dams experience heavy hydrologic stress during severe rain events. As a result, some local rivers overflow their banks and flow into roadways. In recent years, records indicate that these rivers have been identified as the Pocasset River, Simmons Brook, Cedar Swamp Brook, and unnamed brooks flowing from Oak Swamp Reservoir and Almy (a.k.a. Jillson) Reservoir.

There are a number of dams in the Town of Johnston. Roads located at the base of spillways of the dams of Town reservoirs include Reservoir Avenue (Oak Swamp Reservoir), Central Pike (Jillson/Almy Reservoir), Plainfield Pike (Simmons Reservoirs), Memorial Avenue, Hartford Avenue, Atwood Avenue, Morgan Mill Road, Plainfield Street (Pocasset River Ponds). Failure of any one of these dams can have serious consequences to private homes and to the roadway network. In addition to the obvious threat to adjacent properties and roadways, some dam failures would directly threaten hazardous materials and/or waste stored in a diverse range of quantities at various locations. As indicated in Table 1 on page 7 , based on risk severity and probability, dam failure is among the top 10 hazard threats in the Town of Johnston. Table 6 on page 24, lists dams located in the Town of Johnston as identified by the RIDEM Dams Section, relative to their Risk Status.[36] High hazard dams are town-owned. "**High hazard dam**" means a dam where failure or misoperation will result in a probable loss of human life. "**Significant hazard dam**" means a dam where failure or misoperation results 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. Examples of major economic loss include but are not limited to washout of a state or federal

[36] http://www.dem.ri.gov/programs/benviron/compinsp/pdf/damlist.pdf

highway, washout of two or more municipal roads, loss of vehicular access to residences beyond the washout area) or damage to a few structures.[37]

The Department of Public Works facility at 100 Irons Avenue is located immediately adjacent to the Woonasquatucket River, within the 100-year flood plain. This facility, constructed in the 1970s, houses trucks, plows, and other equipment needed to maintain public access and safety on town roads. Diesel fueling for municipal vehicles is provided immediately adjacent to the river. Town vehicles are serviced and maintained at the DPW garage.

Offices of the Department of Public Works, Engineering, Building Official/Inspections, and Planning and Economic Development are located in this building. Plans are stored for projects reviewed in accordance with municipal regulations by the Planning and Zoning Boards.

As a former asphalt facility, the DPW site is contaminated (detected petroleum compounds were associated with three release areas). The DEM Environmental Land Usage Restriction for this site outlines emergency protocol in events including but not limited to fire and flood[38]. Additionally, the adjacent Woonasquatucket River is the subject of EPA efforts for remediation of toxic dioxins in the river sediment. Any flood waters would disperse contaminated sediment to upland areas including adjacent neighborhoods and the DPW building.

3. ***Environmental Resources – "Natural" resources and habitats to balance the environment, the ecology, and our quality of life. This Risk Category is subject to flooding, fires, and earthquakes.***

Lakes, ponds, rivers, streams, wetlands, tree stands, and the open air are all considered important environmental resources. As such, they are the subject of federal and state laws protecting their integrity. In addition to providing beauty and an appealing character to our community, natural resources serve many functions. Wetland areas, for example, are critical to managing stormwater runoff. They also serve as important elements of the ecology, often providing habitat, breeding areas, and food sources for critical wildlife species. They exist as barriers between rivers, ponds, and private property which could be potentially threatened by those very same rivers and ponds.

Trees and vegetation serve to stabilize soil, which reduces sedimentation and provides greater stability for houses and other buildings. They also provide shade, which in turn provides some cooling in the summer heat and promotes air movement. Finally, trees help remove carbon dioxide and impurities from the air, making it possible for humans to exist in a relatively healthy atmosphere.

Several waterbodies in town are degraded. The Town of Johnston must comply with Total Maximum Daily Loading (TMDL) requirements for the Woonasquatucket River, Cedar Brook, and Assapumpset Brook. The EPA is currently considering remediation alternatives for the removal of dioxins from Woonasquatucket River sediments as part of the Centredale Superfund project in North Providence and Johnston.

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[37] Rhode Island Department of Environmental Management Office of Compliance and Inspection, *Rules and Regulations for Dam Safety***,** December 2007 (adopted pursuant to Chapters 42-17.1, 42-17.6, 42-35, and 46-19 of the Rhode Island General Laws of 1956, as amended).

[38] Environmental Land Usage Restriction, C. Pezza & Sons, Incorporated, 55 and 100 Irons Avenue, Johnston RI. (Case No. 2003-005)

3.4.1 Life and Property at Risk from Flood Events

Approximately one-third of the Town of Johnston can be classified as urban and the remainder of the town is predominantly exurban or rural in nature. Table 7 on page 30, identifies the existing land use in the Town of Johnston by land use category as of 1995. Although development has continued in the past 15 years in the Town of Johnston, it is not likely that areas classified as urban exceeds half of the town with the majority of development located east of I-295.

Section 4 Capability Assessment

4.1 Purpose

Understanding and evaluating the Town of Johnston's capabilities to prepare for, respond to and mitigate the risks associated with natural hazards, will help the town understand those that have been successful and should be expanded upon and where the town's capabilities may be lacking and either need to be improved or other capabilities developed.

4.2 Types & Evaluation of Capabilities

FORM OF GOVERNMENT

The Town of Johnston was incorporated in 1759 and subsequently adopted under a Home Rule Charter adopted in 1963, establishing a council mayor form of government. The council is vested with enacting local legislation and the mayor is responsible for execution of the town's laws and administration of the town government.

NATIONAL FLOOD INSURANCE PROGRAM

The Town of Johnston enforces the State of Rhode Island Building Code SBC-1 and has been participating in the National Flood Insurance Program since March 1978. The NFIP Program is administered in Johnston by the Town Engineer as the NFIP coordinator. All flood plain mapping and map changes are available for review through the Town Engineer.

The Town of Johnston Building Official implements and enforces the state building code and fully participates in the NFIP as outlined in the code. Johnston does not currently participate in the community rating system (CRS) but anticipates future participation in this program to allow flood insurance policy holders a discount on premiums. The Director of Public Works, Building Official, Town Engineer, and the Town Planner are educated on current NFIP policies and ordinances. The Town does not engage a Certified Flood Plain Manager. Johnston understands that participation in the NFIP is an essential step in mitigation flood damage and is working to consistently enforce NFIP compliant policies in order to continue its participation in this program.

The Town of Johnston has adopted flood plain management in both the Zoning and the Land Development and Subdivision Regulations. Rigorous review of development applications is conducted by a technical review committee including the Town Engineer, Building Official, Town Planner, and Fire Chief to assure that projects are in accordance with the state building code and local regulations. Review of proposed projects integrates concerns for potential damage from flooding, winter storm, windstorm, hurricane, dam failure, and earthquake into the local approval process so that the effects of hazards on new buildings and infrastructures are reduced.

As recognition of building code enforcement in Johnston, ISO, the leading source of information about property/casualty insurance risk, significantly upgraded Johnston's ranking in August 2, 2006.[39] In the administration of the code, plan review, and field inspection, the Town of Johnston exceeded both state and nationwide scores for both residential and commercial applications (achieving a ranking of 80.95 out of 100 points for both applications). This was a dramatic improvement from the 2000 ranking of 44.39 and 36.56 in these categories. Natural hazards including earthquake, tornado, hurricane, flood, and thunderstorm profiles are addressed in this ranking by ISO.

[39] ISO Building Code Effectiveness Grading Schedule, Building Code Enforcement Evaluation Report, Johnston Building Code Enforcement Agency, August 2, 2006 Evaluation.

NATURAL RESOURCE MANAGEMENT

The Town of Johnston, through the Municipal Land Trust, has continued to acquire property for protection as open space. This is especially important in the areas surrounding the many reservoirs that were previously developed by Cranston Print Works and now held by the Town of Johnston. Town or Municipal Land Trust ownership helps protect land around many of the reservoirs located in western Johnston from development.

EMERGENCY MANAGEMENT TRAINING

Johnston's *Emergency Operations Plan* (Emergency Plan, 2007, as amended) has been approved by RIEMA and implemented by the Town. Copies of the Emergency Plan are located in the Police, Fire, and Public Works Departments, as well as other locations. A copy of the Emergency Plan is also held by RIEMA. Hazardous materials sites and issues are identified in the Johnston Emergency Plan. The Emergency Plan also reviews evacuation plans and procedures.

Emergency management training is an ongoing activity that includes participation in local programs and State-sponsored workshops. Johnston applies annually for Federal funding to help support the Emergency Management Director function. Personnel in the police, fire and administration have been trained and certified under the NIMS to IS-700; IS-800; ICS-100,200,300 and 400. Specific training for other departments is on-going and as with the foregoing due to personnel turnover, is continuous. Public safety departments and as appropriate other town functions, employ the NIMS ICS at all incidents by Mayoral decree.

The Johnston EMA warning system utilizes media outlets such as television, radio and cable, to advise residents in the event of an emergency situation. The Town has obtained a R-911 system through the Providence Port USAI and has exercised it, along with all aspects of the Town's EOP including its Reception Center Facility at the Senior Center on Hartford Avenue. The Johnston Police Department utilizes CodeRED a high-speed notification system and weather warning system provided by the Emergency Communications Network. The CodeRED system provides the Johnston officials the ability quickly deliver messages and information to potentially targeted areas or all of the residents of Johnston.

COMPREHENSIVE PLAN

Town of Johnston Comprehensive Community Plan was adopted by Town Council and approved by the RI Division of Planning on November 17, 2009. The *Johnston Comprehensive Community Plan* outlines topics for ongoing development, future pursuits such as economic stability, open space preservation, public infrastructure, and public facilities.

LAND USE

The development pattern within the Town of Johnston can be almost divided between the densely urbanized section of town just west and east of Route I-295 and the westerly section of the town which is more suburban/rural. In the urbanized portion east of I-295, the town is densely developed with historical filling of flood plains and urbanization of river areas. This development has created characteristics that are both cherished for their place in history as representation of the American Industrial Revolution and rued for their propensity to result in flooding and other conditions that threaten the community. Subdivisions constructed prior to the Rhode Island Freshwater Protection Act in 1971 may have filled wetlands with material that since has been eroded or may have included drainage systems that did not anticipate flow from adjacent upland development.

The State's primary landfill, RI Resource Recovery Corporation (RIRRC)'s Central Landfill, is located in the southwestern section of Town. Access to and continuation of operations at the landfill is critical to state operations. As the primary state landfill, debris resulting from floods and other natural hazards generated

throughout the state is trucked to Johnston and disposed at the Central Landfill and construction and demolition debris is sorted for recycling at the Central Landfill or at various private operations in Johnston. As evidenced by the March 2010 floods, debris from flooded basements and demolition of portions of the Rhode Island Mall is trucked to Johnston for disposal or recycling, dramatically increasing the quantities of material handled. Construction of full access ramps from I-295 to Shun Pike has alleviated many of the issues related to diversion of odorous trucks through state and town roads in proximity to neighborhoods and local businesses.

The western portion of Johnston includes undeveloped regions considered "exurban", that is, not quite rural due to the medium density of residential properties. The narrow, underdeveloped roadways and lack of utilities present threats to both population and property in the event of flooding from dam failure or storms, snow/ice/wind/rain events that affect road networks, and fire. The pavement design of many of these substandard roads may not be able to withstand damage from stormwater flow or may have inadequate drainage swales or catch basins. Fire presents a greater threat due to limited or non-existing public water supplies and limited access across local roads.

The comprehensive plan addresses the importance of several waterways to the Thornton, Simmonsville, Simmons Reservoir Planning District. "The existence of the Simmons Brook and the Pocasset River in this Planning District has also restricted development in the past. Flooding has become a major issue in this area. Recent studies by the US Department of Agriculture, Natural Resource and Conservation Service, have documented problems in this District resulting from over-development upstream from this District. In the next few coming years, partnerships must be established between the communities, the State of Rhode Island, and the United Government to implement the recommendations of the report generated from these studies."

EMERGENCY MANAGEMENT

The Johnston High School is primary location of public shelter in the event of an emergency. The Ferri Middle School is the backup emergency facility, both locations are approved public shelters by the American Red Cross. The Johnston Senior Center in the event of a natural disaster would serve as the designated Emergency Operations Center, due the centralized location, size, cooking facilities and standalone generator. The Town of Johnston has a Memorandum of Understanding (MOU) with the American Red Cross through 2024 and is renewed as needed. The purpose of the MOU is to assure cooperation between the Town and the American Red Cross to provide the community assistance before, during and after disaster events. Town officials have completed a variety of specialized training and are certified to open the shelter even without a Red Cross presence. The Town of Johnston has also established, under the direction of the Emergency Management Director, a Meds Point of Distribution (POD) Program. This program acts as a central distribution point for medical treatments and administering vaccines. In extreme heat conditions, the library and senior center serve as cooling centers for residents otherwise unable to escape the heat.

The Emergency Management Director is appointed by the Mayor. Town officials and staff provide the personnel necessary for Emergency Management functions. Town police, fire, and public works vehicles and equipment are utilized by Town staff during emergency situations. The State Police also become involved in certain situations, because of the nature of the arterial roadways through the Town.

General mitigation actions, such as tree trimming, are a part of the work program of the Public Works Department. Additionally, local regulations such as zoning ordinances and land development/subdivision regulations must address significant issues such as flood hazard areas or accessibility as a part of their review and approval processes.

Emergency management recommendations presented in the Comprehensive Plan indicate that the Emergency Management Director should work to increase public awareness of the locations of potential dangers and what to do in the event of an emergency. A second recommendation is that the Town must evaluate whether to make changes to address concerns regarding the Emergency Center or relocate the Center to another property.

GOALS AND PRIORITIES

This *Hazard Mitigation Plan* is consistent with the Goals and Policies of the three elements of the *Town of Johnston Comprehensive Community Plan*: Land Use; Recreation, Conservation and Open Space; and Natural and Cultural Resources.

Section 5 Mitigation Strategy

5.1 Goals

The goal of this HMP is to avoid death or injury, and to reduce or eliminate losses resulting from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. A project's potential savings must be more than the cost of implementing the project.

Mitigation projects can be costly, and like most communities, the Town of Johnston seeks to leverage external funding to achieve the HMP goals. Thus, another goal of this HMP is to maintain eligibility for funding through FEMA's Hazard Mitigation Grant Program (HMGP). HMGP funds may be used to protect public or private property, or to purchase property that has been subjected to, or is in danger of, repetitive damage. Examples of projects include, but are not limited to:

- Acquisition of real property for willing sellers and demolition or relocation of buildings to convert the property to open space use
- Retrofitting structures and facilities to minimize damages from high winds, earthquake, flood, wildfire, or other natural hazards
- Elevation of flood prone structures
- Development and initial implementation of vegetative management programs
- Minor flood control projects that do not duplicate the flood prevention activities of other Federal agencies
- Localized flood control projects, such as certain ring levees and floodwall systems, that are designed specifically to protect critical facilities
- Post-disaster building code related activities that support building code officials during the reconstruction process.

While the HMP is prepared specifically to meet FEMA requirements, several other federal agencies have partnered with the Town of Johnston in flood and hazard mitigation planning. The NRCS and US Department of Agriculture, through the Pocasset River Watershed Plan, has been integral in assessing strategies for flood mitigation along that waterway. This plan has been prepared to be consistent with proposed mitigation strategies of that plan. Additional potential federal funding partners include the US Department of Housing and Urban Development and the Federal Highway Administration.

5.2 Development of Strategy

As shown in Table 4, the Town of Johnston's assessment of primary multi-hazard threats in Johnston, the primary concerns are for potential damage from flooding, winter storm, windstorm, hurricane, dam failure, and earthquake. The mitigation strategies are proposed to address these threats. The Mitigation and Risk Matrix has been developed by with input by the Stakeholder Committee and review by Town departments to identify action items to reduce risks from natural hazards. Actions have been identified for the following:

- **Residential and Commercial Structures**. These privately owned structures are subject to flooding, winter storms, windstorms, hurricanes, fire and earthquake. Strategies are proposed to reduce the effects of hazards on existing buildings.

- **Infrastructure.** These publicly owned roads, bridges, dams, sewer and water pump stations, and community services are subject to flooding, winter and hurricane storm damage, and earthquakes. Strategies are proposed to reduce the effects of hazards on existing infrastructure.

- **Environmental Resources.** Natural resources that help balance the environment and quality of life are subject to flooding, high winds, fires and earthquakes.

Table 13 identifies priorities for implementation. These strategies will enable the town to mitigate damage from recent flooding and will enable the town to better prepare for winter storm, windstorm, hurricane, dam failure, and earthquake hazards. It is recognized that municipal funding for these initiatives is limited and that funding through federal and state partnerships is critical.

The purpose of a mitigation plan is to reduce a community's vulnerability to hazards. After assessing its risks, a community may consider many mitigation options. However, due to monetary as well as other limitations, it is often impossible to implement all mitigation actions. It is important to select the most cost-effective actions for implementation first, not only to use resources efficiently, but to make a realistic start toward mitigating risks.

Mitigation and Risk Matrix

Table 13

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
Priority 1 **Pocasset River Neighborhoods**	Park Place Apartments - Park Street	Private	• Vulnerable population at risk - 62 units including low / moderate income residents	Flooding Hurricane	• Increase public safety • Lower cost and time for recovery • Maintain access during flood • Maintain utilities during flood • Protect health and property • Reduce NFIP claims • Provide adequate sewer pump station service	H	Yes; 11 units flooded
	Priscilla Lane	Public/Private	• Public safety • Public health • Property damage • Economic hardship • Environmental damage • Repetitive loss/NFIP • Pump stations will not function with flood mitigation measures • Public safety (especially at the one-lane bridge on Morgan Ave where some drivers to speed up to avoid delays, "play chicken") • Creates bottleneck that floods upstream properties			H	Yes
	S. Bennett/ River Dr/Melody Ln/LaFazia Dr					H	Yes
	River St (off Plainfield Pike)					H	Yes
	Rotary Drive					H	No
	Bingley Terrace					H	Yes
	River Dr and S. Bennett Dr sewer pump stations					H	Yes
	Morgan Ave & Morgan Mill Road bridge				• Increase public safety • Support economic development	H	Yes
	Pocasset Mill Flood Wall	Private	• Economic hardship • Public safety		• Economic development	H	Yes
Priority 2	Mill St / Mill St Bridge	Town Road	• Business interrupted • Detours on narrow, winding residential roads	Flooding	• Maintain business access • Support economic development	H	Yes
Priority 3	Mulberry Circle	Town Roads	• Unsanitary conditions • Access hindered • Sinkhole/safety • Public safety	Surface runoff Flooding Hurricane	• Health and safety protection • Pollution prevention • Public Safety	H	Yes
	Vincent/Sprague Circle					H	Yes
	Roberts Circle					H	Yes
	Golden View					H	Yes

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
Upland Neighborhood Flooding	Lincoln/Malom		• Property damage • Environmental damage • Decreased property value			H	Yes
	Starr St / Mill St					H	Yes
	Pembroke Dr					H	Yes
	Maribeth Dr					H	Yes
	Monson St					H	Yes
	Ipswich St					H	Yes
	Harbourd Rd					H	Yes
	Strawberry Ln/ Salina Ave					H	Yes
	Disarro / Assapumpset Brook		• DEM violation for stream erosion	Flooding Scouring		H	Yes
Priority 4 **Local Roads Subject to Stormwater Damage**	Belfield Drive	Town Roads	• Evacuation hindered	Flooding Hurricane	• Public Safety • Maintain access during flood • Reduced detour routes	H	Yes
	Old Pocasset Road at Dry Brook		• Vulnerable population at risk • Emergency access to Briarcliffe Manor			H	Yes
	Boulder Drive		• Access limited • Public safety			H	Yes
	Central at Dry Brook		• Public safety			H	Yes
Priority 5 **Sewer Pump Stations and Treatment Facilities**	Othe municipal pump stations: Sweet Hill Dr, Rotary Dr, Industrial Ln, Susan Cir, Fox Tail Dr, Jennifer Dr, Ostend St, Sprague Cir, Morgan Mill Rd, Candace Ct	Town	• Facilities cannot handle flows • Public health, property damage • Public safety • Potential pollution to waterways	Flood, Ice, Fire, Wind Earthquake, Tornado, Hurricane	• Limits health and pollution risks • No interruption of essential service	H, P	Pumps did not fail but were submerged
	NBC pump station, Central Ave	NBC				H,P	
	RIRRC pump stations, Shun Pike, Lakeshore Commerce Center	RIRRC				P	No
	Ledges Apt pump station	Private				P	No
	Park Place Apt pump sta					P	No
	Package WWTF, Briarcliffe Manor					P	No

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
Priority 6 **DPW Facilities**	100 Irons Avenue (adjacent to Woonasquatucket River)	Town	• Threat to public safety • Lack of access to fueling operations • Damage of development files, plans, and maps	Flooding Hurricane Severe Winter Storm	• No loss of service to public vehicles during storm/flood • Protection of public files • Continued response to emergency needs townwide	P	Yes - roof leak
Priority 7 **Drainage Infrastructure-culverts, detention/ retention basins**	W of Atwood Ave - Plaza strips (Stop & Shop Plaza)	Private	• Business interruption • Public Access	Flooding Hurricane Severe Winter Storm	• Maintain access during flood • Provide redevelopment options with appropriate stormwater mgmt • Health and safety protection • Pollution prevention	H	Yes
	Atwood Ave at Route 6	RIDOT					
	S of Hartford Ave - former Stuarts Plaza	Private	• Redevelopment options limited • Damage to property			H	Yes
	Central Ave at former FM Global	Private				H	Yes
	Greenville Ave at Manton bridge	Public	• Public health • Property damage • Economic hardship • Public safety (especially at the one-			H	Yes
	Hartford Ave at War Memorial Park, / Old Pocasset Road	Public and Private				H	No
	Industrial Lane	Public				H	Yes
	Highland Ave					H	Yes
	Mill & John St					H	Yes
	Niverville					H	Yes
	Reservoir Ave (2 areas)					H	Yes
	Central at I-295	RIDOT	• Stormwater discharged beneath bridge			H	Yes
	Shun Pike at Cedar Swamp	Public	• Access hindered to RIRRC • Business interruption			H	Yes
Priority 8 **Woonasqua-tucket River Neighborhoods**	Riverside Ave	Public/Private	• Public safety • Public health • Property damage • Economic hardship • Environmental damage	Flooding Hurricane Severe Winter Storm	• Health and safety protection • Pollution prevention • Provision of Town services	H	No
	Allendale Ave at Allendale Dam	Public				H	No
	Angell St at Greystone Pond Dam	Public				H	No

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
American Heritage River *EPA Centerdale Superfund - sediment contamination*	Railroad Ave	Public/Private	• Public health • Loss of access			H	No
	Hillside Ave	Public/Private				H	No
	Parks and Bike Path	Town and State				H	Yes
	Johnston DPW 100 Irons Ave	Municipal	*See DPW Facility listing*			P	No
Priority 9 **Residences and Businesses**	Townwide	Private	• Property at risk • Business interruption • Emergency access limited	Heavy Rains Hurricane Severe Winter Storm	• Decrease costs of cleanup • Prevent or minimize damage to property • Lower cost and time for recovery • Decrease or eliminate economic hardship	H, P	
	Properties reporting damage, 2010 flood: • W of Greenville Ave, E of Atwood • N & S of Hartford Ave, Rtes 6 and 6A, E of Dale Ave • N & S of Central, E of Deer View • W & S of Oak Swamp Reservoir • E & W of Atwood, N of Plainfield Pk • SW of Putnam Pk • E & W of Greenville • S of Cherry Hill Rd					H	Yes
	Repetitive Loss Properties					H	Yes
Priority 10 **High Hazard Dams**	• Almy Reservoir • Hughesdale Pond • Oak Swamp Reservoir • Simmons Lower Reservoir • Simmons Upper Reservoir	Town	• Possible loss of life • Downstream property damage • Flooded roads • Loss of recreation areas • Loss of habitat • Safety and health issues	Dam failure Hurricane Flood Earthquake	• Prevent or minimize damage to property • Maintain public access • Maintain recreation assets • Public safety • Protect habitat	P	No
Priority 11 **Tree Damage**	Townwide	Public/Private	• Public safety, loss of traffic signals • Loss of electricity • Debris disposal	Wind, Hurricane Severe Winter Storm	• Health and safety protection • Maintenance of utilities	P, H	No

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
				Ice Storm			
Priority 12 **RIRRC Landfill**	Shun Pike	RIRRC	• Access for solid waste disposal, statewide • Cap damage could result in release of contaminants; habitat destruction	Hurricane, earthquake	• Provide access for safe and sanitary disposal of solid waste and construction & demolition material • Maintain integrity of landfill cap	P	No
Priority 13 **Nursing Homes and Senior Housing**	• Cherry Hill, • Cherry Hill at Greenville • Bridges at Cherry Hill • Morgan Health Center • Briarcliffe Manor *(see Priority 3)* • Pocasset Bay Manor	Private	• Evacuation of vulnerable population • High demand for emergency response	Hurricane, flood, earthquake Hurricane Severe Winter Storm	• Public safety • Emergency response	P	No
	• 8 Forand Circle • 25 Nardolillo St • 10 Cheryl Drive • 204 Greenville • 1609 Plainfield • 150 Rosemont • Simmonsville Ave	Johnston Housing Authority				P	No
Priority 14 ***High Rise Buildings (65'+)***	• Cherry Hill • Bridge at Cherry Hill • FM Global and garage • Atwood Medical Ctr • FPL	Private	• Ladder limitations may constrain emergency evacuation and fire-fighting capability	Fire	• Emergency evacuation • Fire fighting	P	No
Priority 15 **Historical Buildings**	• Clemence-Irons House, Geo Waterman Rd • Historical Society, Putnam Ave	Public/Private	• Loss of Electricity • Public safety; • Property damage	Flood, Fire, Earthquake, Windstorm	• Property protection	P P	No No
Priority 16	• Caesarville Pond	Private	• Loss of recreation areas	Dam Failure,		P	No

Vulnerable Areas	Location	Ownership	Primary Problems/Effects	Natural Hazard	Mitigation Benefits	Risk: Historical = H Potential=P	2010 Flood Impact
Significant Hazard Dams	• Dexter Farm Pond • Kimball Reservoir • Pocasset Pond		• Loss of habitat	Hurricane Flood Earthquake	• Maintain recreation assets • Public safety • Protect habitat		

Priority 1 – Pocasset River Neighborhoods

Johnston is fully participating with the NRCS in implementation of the Pocasset River Watershed program to address properties especially vulnerable to repetitive loss. The following recommendations are presented in the NRCS *Pocasset River Watershed Plan.*[40] Implementation of these strategies would reduce NFIP claims.

Park Place Apartments.
The Pocasset River Watershed study recommends construction of a 900-foot long steel sheet pile wall, ranging between 3 feet and 9 feet in height, to protect the 61 units at the Park Place Apartment Complex (11 units were flooded in March 2010). To improve aesthetics, the inside of the floodwall will be brick faced and planted with trees and shrubs. A large woodland area west of Atwood Avenue drains east to Atwood Avenue toward the river. It is probable that runoff would drain to the proposed floodwall due to the steep topography. A separate drainage systems consisting of catch basins and drainage pipes, two outfalls with flap gates, watertight underground storage for the Park Place Apartments parking lot, roof drains to the collection system, a drain line along the inside of the floodwall and a pump station with diesel generator are required.

Rotary Drive.
The study recommends construction of a 1,500-foot long steel pile wall, between 4 and 5 feet in height to protect the 19 residences along Rotary Drive. To improve aesthetics, the inside of the floodwall will be brick faced and planted with trees and shrubs. Separate drainage systems will be required for the area consisting of catch basins and drainage pipes, three outfalls with flap gates, one detention basin, dry wells, a drain line along the inside of the floodwall, and pump station with diesel generator. Although this recommendation is part of the NRCS study based on computer modeling, this area is not subject to the routine flooding experienced by other neighborhoods.

Simmons Brook Bypass Culvert.
The study recommends the construction of a bypass culvert around the mill building under which the Simmons Brook currently flows. The bypass culvert will eliminate the constriction at the mill culvert, allowing the mill to be used to its full potential. This will minimize business disruptions and reduce flooding for a residence on Priscilla Drive. As part of final design of the bypass culvert, rerouting of the stream channel may be examined and substituted for the bypass culvert if it is a more feasible option.

South Bennett Drive and River Drive Neighborhood Structural and Non-Structural Measures.
The recommended alternative for the South Bennett Drive and River Drive neighborhood consists of a variety of structural and non-structural measures. Structural measures consist of raising approximately 2,200 feet of roadway between 2 and 5 feet to protect 12 homes and replacement of the 36-inch pipe that the tributary discharges at Bennett Drive with a 10-foot by 3 foot concrete box culvert, sized to accommodate 700 cfs. Non-structural measures will consist of removal of seven homes, elevation of six homes, dry flood proofing of six homes, and construction of an earthen dike around one home. Although this is an expensive option involving the replacement of two municipal sewer pump stations and other utilities, it is necessary to protect property and public health.

Additional Non Structural Measures. Non-structural measures not previously discussed include removal of a debris dam near the Pocasset's confluence with the Simmons Brook; relocation of four buildings in Johnston (including two residences on River Street); dry flood proofing of ten buildings in Johnston; and moving one building in Johnston out of the flood plain.

[40] USDA NRCS; Pocasset River Watershed Plan, Pocasset River Watershed, Johnston and Cranston, Rhode Island; GZA GeoEnvironmental, Inc.; February 2009

Cost-Benefit Considerations.
In September 2010, the Town of Johnston anticipates entering into an agreement for purchase of four homes and design of a flood wall. Funding for these initiatives is included in a $1.8 million federal appropriation. The draft Cooperative Agreement between the Town of Johnston and the NRCS includes the following in the detailed budget:

- Complete title searches and three appraisals each for four properties along River Avenue and River Drive - $5,000
- Obtain land rights on four properties including closing services, purchase of land and dwellings/buildings, relocation of property owners, demolition and removal of structures - $1.4 million
- Prepare designs of flood wall for South Bennett Drive - $266,200

With direct and indirect costs, the total cost is approximately $1.8 million.

Only two homes are located on River Avenue, a short road parallel to the Pocasset River with access from Plainfield Pike (additional industrial structures are also located along this road). These homes have been subject to repetitive loss as indicated in Figure 1, not just for the claims in March-April 2010 but have had repetitive losses from 1978 to 2010.

Figure 7: River Avenue flooded on March 31st, 2010

The *Pocasset River Watershed Plan* indicates that seven homes on River Drive have been identified as "buildings to be removed." Funding through the cooperative agreement will enable purchase of two of those dwellings. As indicated in Figure 1, between 4 and 14 repetitive claims have been made in the past for River Drive.

The Johnston Department of Public Works and the Planning and Economic Development Office are working jointly to implement these recommendations.

Priority 2 – Mill Street Bridge Replacement

Although locally referred to as the Mill Street bridge, the structure spanning Simmons Brook is actually a twin cast concrete box culvert that is 30 feet in length. The opening of each box culvert is 7-foot square. There are no wingwalls or other structures to divert flow through the culvert. The capacity of the culverts is routinely exceeded during heavy rain storms when the brook overtops Mill Street. Several businesses including Cerrito Auto Glass & Parts at 75 Mill Street, Bilray Demolition at 73 Mill Street, OC Greenhouses and Recchia Greenhouses at 90 Mill Street, and an auto recycling yard are accessed via the Mill Street bridge. The bridge also provides access to the residential neighborhoods off Venice Avenue. With the bridge closed, circuitous routes through narrow, winding residential streets has resulted for truck traffic associated with Mill Street businesses.

To mitigate flood disruption to Mill Street and adjacent neighborhoods, hydraulic analysis and potential engineering solutions must be investigated. Options may include raising the profile of the Mill Street

roadway and replacement of the culverts to both minimize overtopping the structure, raise the roadway out of the 100-year flood zone, and to improve flow along this Pocasset River tributary.

Replacement of the Mill Street bridge is a priority for the Town of Johnston as it is directly related to economic development initiatives in the Thornton-Simmonsville sections of town. Mill Street, as the name implies, is a significant industrial corridor that is an important economic driver in this low income census tract (2000 US Census).

The Johnston Department of Public Works and the Planning and Economic Development Office are working jointly to secure funding for this recommendation.

Figure 8:Mill Street closed to through traffic

Priority 3 - Upland Neighborhood Flooding

Based on 2010 flooding, flood mitigation in Johnston is not limited to areas within Special Flood Hazard Areas. As indicated in Table 9, the Mulberry Circle, Boulder Drive, Vincent/Sprague Circle, and Roberts Circle neighborhoods require special consideration to reduce future flooding (see Figure 1). Stormwater drainage in several of these areas was not designed to current town standards and may not reflect additional drainage contributions from upland areas that have subsequently been developed. Further analysis is warranted to mitigate this flooding.

The channel of Assapumpset Brook, routed through DiSarro Street (paper street), has been cited by DEM for erosion violations. Stone channel lining previously placed by town DPW personnel has been insufficient to reduce erosion of this channel. The design of channel armoring must reflect watershed characteristics and protect adjacent private development.

Figure 9: Mulberry Circle flooded, March 30th, 2010

The Johnston Department of Public Works is working to secure funding for these recommendations.

Priority 4 - Local Roads Subject to Flooding

Flooding of Mill Street along the Simmons Brook, a tributary of the Pocasset River, has repeatedly been subject to flooding. Although the structure of the twin culverts under Mill Street were not damaged (surface damage included guardrail displacement and pavement damage), the capacity of the culverts is routinely exceeded, resulting in flooding. Access to several businesses in this industrial mill area has been detoured through residential neighborhoods with narrow substandard streets. The conflict between school buses, trucks, and residential traffic has adversely affected both businesses and residents. Redesign of the culvert to accept 100-year flood volumes is required. Raising the profile of Mill Street above the flood elevation may also be required. Further analysis is warranted to mitigate this flooding.

The Johnston Department of Public Works is working to secure funding for these recommendations.

Dry Brook, a stream flowing from the Jillson/Almy Reservoir dam, flows through a culvert beneath Old Pocasset Road that is routinely overtopped. This is the sole means of access to a neighborhood as well as Briarcliffe Manor, a nursing home and Alzheimer unit with 165 beds (expansion for 91 units of assisted living is also under consideration). To maintain both emergency and routine access to this area, the culvert capacity should be increased. Further analysis is warranted to mitigate this flooding.

Priority 5 - DPW Facility

Floodproofing of critical functions should occur to assure that this Town-facility can maintain service and functionality during flooding of the adjacent Woonasquatucket River. File storage is a critical concern for the Engineering, Building Official, Zoning Board, and Planning Board files.

The Johnston Department of Public Works will work to identify funding for this recommendation.

The Town of Johnston conducted a prioritization process using STAPLEE criteria to demonstrate an emphasis on maximizing benefits over costs. This criteria integrates Social, Technical, Administrative, Political, Legal, Economic, and Environmental considerations. The prioritization reflects the realities identified in the STAPLEE method.

S-Social	The public must support the overall implementation strategy and specific mitigation actions. Projects will have to be evaluated in terms of community acceptance.
T- Technical	It is important to determine if the proposed action is technically feasible, will help to reduce losses in the longer term, and has minimal secondary impacts. Determine whether the alternative action is a whole or partial solution, or not a solution at all.
A- Administrative	Under the part of the evaluation criteria, examine the anticipated staffing, funding and maintenance requirements for the mitigation action to determine if the jurisdiction has the personnel and administrative capabilities necessary to implement the action or whether outside help will be needed.
P- Political	Understanding how the current community and State political leadership feels about issues related to the environment, economic development, safety, and emergency management. This will provide valuable insight into the level of political support have for mitigation activities and programs. Proposed mitigation objectives sometimes fail because of a lack of political acceptability.
L-Legal	Without the appropriate legal authority, the action cannot lawfully be undertaken. When considering this criterion, determine whether your jurisdiction has the legal authority at the State, Local level to implement the action, or whether the jurisdiction must pass new laws or regulations. Legal authority is likely to have a significant role later in the process when your community will have to determine how mitigation activities can best be carried out, and to what exte4nt mitigation policies and programs can be enforced.
E-Economic	Cost effective mitigation actions than can be funded in current or upcoming budget cycles are much more likely to be implemented than mitigation actions requiring general obligations bonds or other instruments that would incur long term debt to a community. Local communities with tight budget or budget shortfalls may be more willing to undertake a mitigation initiative if it can be funded, at least in part, by outside sources. "Big ticket" mitigation actions such as large-scale acquisition

	and relocation are often considered for implementation in a post disaster scenario when additional Federal and State funding for mitigation is available.
E-Environmental	Impact on the environment is an important consideration because of the public desire for sustainable and environmentally healthy communities and the many statutory considerations, such as NEPA, to keep in mind when using federal funds.

The STAPLEE Method includes a cost-benefit review as part of the Mitigation Actions prioritization process. A more detailed cost-benefit analysis will be done, at the time of applications, for those proposed Mitigation Actions that the town applies for funding under the Pre-Disaster Grant Program and Hazard Mitigation Grant Program.

5.3 Action Plan

Table 14 identifies priority actions, responsible parties, potential funding sources, and time frame for optimal implementation. Implementation is highly dependent upon availability of federal and state funds as local capacity is severely constrained.

Table 14: Implementation

Location	Specific Action	Responsible Party[1]	Existing and Potential Resources[2]	Time frame
Priority 1: Pocasset River Neighborhoods				
Park Place Apartments, Park Street	Design Flood Wall	Department of Public Works (DPW) Director	NRCS/FEMA	
	Construct flood wall	same	HMGP/ BRIC/ SRL/CDBG-DS	
Priscilla Lane	Construct mill bypass	same	NRCS/FEMA	
River Dr/River Street	Property Acquisition	same	NRCS/FEMA	
Melody Ln/ LaFazia Dr	Elevate structures	same	HMGP/ BRIC/ SRL	
Rotary Drive	Flood wall, design and construct	same	NRCS/FEMA	
Bingley Terrace	Acquisition	Town Planner	HMGP/ PDM/ SRL	
River Dr and S. Bennett Dr sewer pump stations	Relocate pump stations	DPW	NRCS/HMGP/BRIC	
Morgan Ave & Morgan Mill Road bridge	Reconstruct bridges	DPW	RIDOT/FHWA	
Pocasset Mill	Flood wall, design and construct	City of Cranston (design); DPW with developer (construction)	HMGP/ BRIC/ NRCS	
Repetitive Loss Properties	Acquisition or elevation	Town Planner	NRCS/HMGP/ BRIC/ SRL	
Priority 2: Mill Street Bridge				
Mill St / Mill St Bridge	Reconstruct bridge	DPW	CDBG/FEMA	
Priority 3: Upland Neighborhood Flooding				
Mulberry Circle	Storm drain replacement	DPW	HMGP/BRIC/CDBG-DS	
Vincent/Sprague Circle	Headwall replacement	DPW	same	
Roberts Circle	Repair sinkholes	same	same	

Location	Specific Action	Responsible Party[1]	Existing and Potential Resources[2]	Time frame
Golden View	Stormwater management	same	same	
Lincoln/Malom	Drain replacement	same	same	
Starr St / Mill St	Drain replacement	same	same	
Pembroke Dr	Stormwater management	same	same	
Maribeth Dr	Manhole and catch basin repairs	same	same	
Monson St	Stormwater management	same	same	
Ipswich St	Stormwater management	same	same	
Harbourd Rd	Drain pipe replacement	same	same	
Strawberry Ln/	Stormwater management	same	same	
Salina Ave	Stormwater management	same	same	
Disarro / Assapumpset Brook	Restore stream banks	same	Section 319 Non-point Source	
Priority 4: Local Roads Subject to Stormwater Damage				
Belfield Drive	Stormwater management	DPW	HMGP/BRIC/CDBG-DS	
Old Pocasset Road at Dry Brook	Increase culvert capacity	same	same	
Boulder Drive	Stormwater management	same	same	
Central at Dry Brook	Stormwater management	same	same	
Priority 5: Sewer Pump Stations and Treatment Facilities				
Other municipal pump stations: Sweet Hill Dr, Rotary Dr, Industrial Ln, Susan Cir, Fox Tail Dr, Jennifer Dr, Ostend St, Sprague Cir, Morgan Mill Rd, Candace Ct	Maintain functionality through equipment upgrade	DPW	HMGP/BRIC/CDBG-DS	
Priority 6: DPW Facilities				
100 Irons Avenue (adjacent to Woonasquatucket River)	Flood proof	DPW	HMGP/ BRIC	
Priority 7: Drainage Infrastructure-culverts, detention/retention basins				
Atwood Ave at Route 6	Stormwater management	RIDOT	FHWA	
S of Hartford Ave – redevelopment of former Stuarts Plaza	Design stormwater management to minimize Pocasset River impacts	Private developer	Private	
Central Ave at former FM Global	Create and maintain ponds for stormwater management and aesthetics	RIDOT	FHWA	
Greenville Ave at Manton bridge	Maintain structure	RIDOT	FHWA	
Hartford Ave at War Memorial Park, / Old Pocasset Road	Stormwater management	DPW	HMGP/BRIC	
Industrial Lane	Same	DPW/RIDOT	HMGP/BRIC/FHWA	
Highland Ave	Same	DPW	HMGP/BRIC	
Mill & John St	Same	Same	Same	

Location	Specific Action	Responsible Party[1]	Existing and Potential Resources[2]	Time frame
Niverville	Same	Same	Same	
Central at I-295	Same	DPW/RIDOT	FHWA	
Shun Pike at Cedar Swamp Bk	Culvert repair	DPW/RIRRC	HMGP/BRIC	
Riverside Ave	Same	DPW	HMGP/BRIC	
Priority 8: Woonasquatucket River Neighborhoods				
Allendale Ave at Allendale Dam	Dam maintenance and site remediation	DPW/EPA	HMGP/BRIC/EPA	
Angell St at Greystone Pond Dam	Same	Same	HMGP/BRIC	
Railroad Ave	Stormwater management	Same	HMGP/BRIC	
Hillside Ave	Stormwater management	Same	HMGP/BRIC	
Parks and Bike Path	Floodplain management	DPW/RIDOT	HMGP/BRIC	
Priority 9: Residences and Businesses				
Townwide: Properties reporting damage, 2010 flood:	Private responsibility		NFIP	*ongoing*
Priority 10: High Hazard Dams				
Almy Reservoir	To be cleared for DEM inspection	DPW	To be determined	
Hughesdale Pond	Same	Same	Same	
Oak Swamp Reservoir	Ready for DEM inspection	Same	Same	
Simmons Lower Reservoir	To be cleared for DEM inspection	Same	Same	
Simmons Upper Reservoir	Same	Same	Same	
Priority 11: Tree Damage				
Townwide	Remove dead limbs; trim around utility lines	DPW, National Grid, private	BRIC	*ongoing*
Priority 12: RIRRC Landfill				
Shun Pike	Maintain operation of statewide facility	RIRRC		
Priority 13: Nursing Homes and Senior Housing				
Cherry Hill	Maintain	JHA		*ongoing*
Cherry Hill at Greenville	Maintain	JHA		*ongoing*
Bridges at Cherry Hill	Maintain	JHA		*ongoing*
Morgan Health Center	Maintain	JHA		*ongoing*
Briarcliffe Manor *(see Priority 3)*	Maintain	JHA		*ongoing*
Pocasset Bay Manor	Maintain	JHA		*ongoing*
8 Forand Circle	Maintain	JHA		*ongoing*
25 Nardolillo St	Maintain	JHA		*ongoing*
10 Cheryl Drive	Maintain	JHA		*ongoing*
204 Greenville	Maintain	JHA		*ongoing*
1609 Plainfield	Maintain	JHA		*ongoing*
150 Rosemont	Maintain	JHA		*ongoing*
Simmonsville Ave	Maintain	JHA		*ongoing*
Priority 14: High Rise Buildings (65'+)				

Location	Specific Action	Responsible Party[1]	Existing and Potential Resources[2]	Time frame
Cherry Hill	Assure emergency access	FD and private		*ongoing*
Bridge at Cherry Hill	Same	FD and private		*ongoing*
FM Global and garage	Same	FD and private		*ongoing*
Atwood Medical Ctr	Same	FD and private		*ongoing*
FPL	Same	FD and private		*ongoing*
Priority 15: Historical Buildings				
Clemence-Irons House, Geo Waterman Rd	Maintain	Historic New England	HMGP/BRIC	As needed
Historical Society, Putnam Ave	Maintain	JHC	HMGP/BRIC	As needed
Priority 16: Significant Hazard Dams				
Caesarville Pond	To be cleared for DEM inspection	DPW	To be determined	
Dexter Farm Pond	Same	Same	Same	
Kimball Reservoir	Same	Same	Same	
Pocasset Pond	Same	Same	Same	
Emergency Communication				
Emergency alerts	Convert to Code Red	FD	To be determined	
Town Policy Amendments				
Low Impact Development	Planning Board Training	Town Planner	none	
Land Development and Subdivision Regulation	Cumulative impact amendment	Town Planner	none	
Land Development and Subdivision Regulation	Design standards upgrade	Town Planner	None	
Soil and Erosion Control Ordinance	Amendment	Town Engineer	none	
Distribution of Flyers	Education	DPW	none	Ongoing
Illegal sewer connections	Smoke testing	DPW	To be determined	
Zoning Map Amendment in high hazard areas (dams)	Non-residential or low density res.	Town Engineer	none	

[1] **Responsible Parties**

Johnston Department of Public Works (DPW)
Johnston Housing Authority (JHA)
Johnston Historical Commission (JHC)
Johnston Fire Department (FD)
Rhode Island Department of Transportation (RIDOT)
Johnston Emergency Management Agency (EMA)

[2] **Funding Sources**

Hazard Mitigation Grant Program (HMGP)
Building Resilient Infrastructure and Communities (BRIC)

Flood Mitigation Assistance (FMA)
Repetitive Flood Claims (RFC)
Severe Repetitive Loss (SRL)
Community Development Block Grant (CDBG)
Community Development Block Grant - Disaster Supplemental (CDBG-DS)
Natural Resources Conservation Service (NRCS)
Federal Highway Administration (FHWA)

Section 6 Moving towards a safe, resilient, and sustainable Rhode Island Community

6.1 Evaluation: Progress & Challenges

Hazard Mitigation Team will be responsible to monitor and evaluate this plan on an annual basis. They will meet regularly to evaluate actions identified within the plan and to monitor the mitigation efforts.

The Hazard Mitigation Team shall prepare an annual evaluation of the plan. The evaluation should include increased public awareness and education, reduction in hazard damage, and implementation actions. The annual evaluation should include public participation including presentation to the Planning Board and Town Council.

6.2 Changes in Priorities

The Hazard Mitigation Team shall update the plan after each annual evaluation or disaster, as conditions warrant. The revisions shall identify any changes in plan priorities. A full revision to the plan will be completed prior to the expiration date of the plan. The update will be prepared in accordance with RIEMA and FEMA requirements.

6.3 Success Stories

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APPENDIX B LOCAL MITIGATION PLAN REVIEW TOOL[41]

[41] Provided by FEMA from approved plan

LOCAL MITIGATION PLAN REVIEW TOOL

Jurisdiction Name & State: Town of Johnston, Rhode Island

The Local Mitigation Plan Review Tool demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this Local Mitigation Plan Review Guide when completing the Local Mitigation Plan Review Tool.

Jurisdiction: Rhode Island	Title of Plan: Hazard Mitigation Plan Update 2020	Date of Plan: December 2020
Single or Multi-jurisdiction plan? Single	New Plan or Plan Update? Update	
Local Point of Contact: Chief Joseph Razza Emergency Management Director Town of Johnston 1651 Atwood Avenue Johnston, RI 02919	Local CEO: Mayor Joseph Polisena Town Hall 1385 Atwood Avenue Johnston, RI 02919	

State Reviewer: Melinda Hopkins	Title: State Hazard Mitigation Officer	Date:

FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region I		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:

REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this Plan Review Guide in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))			
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))			
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))			
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))			
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))			
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))			
ELEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))			
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))			
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))			
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))			
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))			
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))			
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))			
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))			
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))			
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))			
ELEMENT C: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))			
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))			
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))			
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))			
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))			
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Strengths: Opportunities for Improvement: •

Element B: Hazard Identification and Risk Assessment

Strengths: Opportunities for Improvement: •

Element C: Mitigation Strategy

Strengths: Opportunities for Improvement: •

Element D: Plan Update, Evaluation, and Implementation (Plan Updates Only)

Strengths: Opportunities for Improvement: •

B. Resources for Implementing Your Approved Plan

Refer to the State Hazard Mitigation Plan to learn about hazards relevant to Rhode Island and the state's action plan.

Technical Assistance:

FEMA

- FEMA Climate Change: Provides resources that address climate change.
- FEMA Hazard Mitigation Planning Online Webliography: This compilation of government and private online sites is a useful source of information for developing and implementing hazard mitigation programs and plans in New England.
- FEMA Library: FEMA publications can be downloaded from the library website. These resources may be especially useful in public information and outreach programs. Topics include building and construction techniques, NFIP policies, and integrating historic preservation and cultural resource protection with mitigation.
- FEMA RiskMAP: Technical assistance is available through RiskMAP to assist communities in identifying, selecting, and implementing activities to support mitigation planning and risk reduction. Attend RiskMAP discovery meetings that may be scheduled in the state, especially any in neighboring communities with shared watersheds boundaries.

Other Federal

- EPA Resilience and Adaptation in New England (RAINE): A collection of vulnerability, resilience and adaptation reports, plans, and webpages at the state, regional, and community levels. Communities can use the RAINE database to learn from nearby communities about building resiliency and adapting to climate change.
- EPA Soak Up the Rain: Soak Up the Rain is a public outreach campaign focused on stormwater quality and flooding. The website contains helpful resources for public outreach and easy implementation projects for individuals and communities.
- NOAA C-CAP Land Cover Atlas: This interactive mapping tool allows communities to see their land uses, how they have changed over time, and what impact those changes may be having on resilience.
- NOAA Sea Grant: Sea Grant's mission is to provide integrated research, communication, education, extension and legal programs to coastal communities that lead to the responsible use of the nation's ocean, coastal and Great Lakes resources through informed personal, policy and management decisions. Examples of the resources available help communities plan, adapt, and recovery are the Community Resilience Map of Projects and the National Sea Grant Resilience Toolkit
- NOAA Sea Level Rise Viewer and Union for Concerned Scientists Inundation Mapper: These interactive mapping tools help coastal communities understand how their hazard risks may be changing. The "Preparing for Impacts" section of the inundation mapper addresses policy responses to protect communities.
- NOAA U.S. Climate Resilience Toolkit: This resource provides scientific tools, information, and expertise to help manage climate-related risks and improve resilience to extreme events. The "Steps to Resilience" tool may be especially helpful in mitigation planning and implementation.

State

- Rhode Island Departments of Climate Change and Environmental Management can provide technical assistance and resources to communities seeking to implement their hazard mitigation plans.

- Rhode Island Emergency Management Agency: The Rhode Island State Hazard Mitigation Officer (SHMO) and State Mitigation Planner(s) can provide guidance regarding grants, technical assistance, available publications, and training opportunities.
- RI Mapping Portal: GIS data available to download

Not for Profit

- Kresge Foundation Online Library: Reports and documents on increasing urban resilience, among other topics.
- Naturally Resilient Communities: A collaboration of organizations put together this guide to nature-based solutions and case studies so that communities can learn which nature-based solutions can work for them.
- Rockefeller Foundation Resilient Cities: Helping cities, organizations, and communities better prepare for, respond to, and transform from disruption.

Funding Sources:

- Federal Grants Resource Center and Grants.gov: Lists of grant opportunities from federal agencies (HUD, DOT/FHWA, EPA, etc.) to support rural development, sustainable communities and smart growth, climate change and adaptation, historic preservation, risk analyses, wildfire mitigation, conservation, Federal Highways pilot projects, etc.
- FEMA Hazard Mitigation Assistance (HMA): FEMA's Hazard Mitigation Assistance provides funding for projects under the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). States, federally recognized tribes, local governments, and some not for profit organizations are eligible applicants.
- GrantWatch: The website posts current foundation, local, state, and federal grants on one website, making it easy to consider a variety of sources for grants, guidance, and partnerships. Grants listed include The Partnership for Resilient Communities, the Institute for Sustainable Communities, the Rockefeller Foundation Resilience, The Nature Conservancy, The Kresge Climate-Resilient Initiative, the Threshold Foundation's Thriving Resilient Communities funding, the RAND Corporation, and ICLEI Local Governments for Sustainability.
- Rhode Island Department of Environmental Management: Funding for a variety of types of projects that will increase the resilience of local communities, including Local Open Space Grants.
- Rhode Island Emergency Management Agency: The State of Rhode Island administers FEMA HMA grants. Communities are encouraged to work with the State to maximize use of every 406 Hazard Mitigation opportunity when available during federally declared disasters.
- USDA Natural Resource Conservation Service (NRCS) and Rural Development Grants: NRCS provides conservation technical assistance, financial assistance, and conservation innovation grants. USDA Rural Development operates over fifty financial assistance programs for a variety of rural applications.

APPENDIX C RESOLUTION OF TOWN COUNCIL

Town of Johnston

RESOLUTION OF THE TOWN COUNCIL

No. 2020-29

In Favor: 5 Opposed: 0

Council President Date 12/14/20

Be it resolved that:

Whereas, *The Town of Johnston, with the assistance of the Beta Group has gathered information and prepared the Town of Johnston Hazard Mitigation Plan, A Multi-Hazard Strategy; and;*

Whereas, *The Town of Johnston Hazard Mitigation Plan, A Multi-Hazard Strategy has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and*

Whereas, *The Town of Johnston is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and*

Whereas, *The Town of Johnston has reviewed the Plan and affirms that it will be updated no less than every five years;*

Now therefore, be it resolved by the Johnston Town Council that the Town of Johnston adopts the Town of Johnston Hazard Mitigation Plan, A Multi-Hazard Strategy as this jurisdiction's Multi-Hazard Mitigation Plan, and resolves to execute the actions in the Plan.

Robert V. Russo- President
District-4

Joseph M. Polisena, Jr., Vice-President
District-3

Linda L. Folcarelli, Councilwoman
District-1

David J. Santilli, Jr., Councilman
District-2

Robert J. Civetti., Councilman
District-5

Attest:

Vincent P. Baccari, Jr., Town Clerk

Official Document