

# 2022 Hazard Mitigation Plan Update

City of Cranston, Rhode Island

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PREPARED FOR



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PREPARED BY



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August, 2022

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RESOLUTION NO. XXXX-XX

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CRANSTON  
AUTHORIZING THE ADOPTION OF THE  
2022 CRANSTON HAZARD MITIGATION PLAN UPDATE**

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

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

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

**WHEREAS**; the 2022 Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Cranston from impacts of future natural hazards and disasters; and

**WHEREAS**, adoption by the City Council demonstrates their commitment to hazard mitigation and achieving goals outlined in Cranston's 2022 Hazard Mitigation Plan Update.

**NOW, THEREFORE, BE IT RESOLVED** that the City of Cranston

- 1) Adopts in its entirety, Cranston's 2022 Hazard Mitigation Plan Update (the "Plan") as the jurisdiction's Natural Hazard Mitigation Plan and resolves to execute the actions identified in the Plan that pertain to this jurisdiction.
- 2) Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.
- 3) Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.
- 4) Will continue its support of the Hazard Mitigation Committee as described within the Plan.
- 5) Will help to promote and support the mitigation successes of all participants in this Plan.
- 6) Will incorporate mitigation planning as an integral component of government and partner operations.
- 7) Will provide an update of the Plan every five years.

PASSED AND ADOPTED on [insert date]

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XXXXX, Mayor and Council Chair, City of Cranston

ATTEST: \_\_\_\_\_  
XXXXX, City Clerk, City of Cranston



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## Executive Summary

Cranston’s 2022 Hazard Mitigation Plan Update is a product of the Cranston Hazard Mitigation Committee (HMC). It has been approved by the Cranston City Council, the Rhode Island Emergency Management Agency, and the Federal Emergency Management Agency in accordance with the Disaster Mitigation Act of 2000.

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

The risk assessment portion of the plan confirms that the City has much to lose from these events. The identified vulnerabilities (in no particular order) include flood prone drainage systems, streets and infrastructure, bridges, wastewater systems, dams, critical municipal hazard response facilities, communication equipment, dams, populations, businesses, schools, recreation facilities, historic and natural resources.

To address these risks the 2022 HMP put forth a clear mission, a distinct set of goals and over 12 specific mitigation actions. The City’s hazard mitigation mission is to protect public health and safety and create sustainable economic growth by limiting losses to lives, public and private and private property, and natural resources/systems.

To implement the plan, important goals must be met. The City’s mitigation strategy was created to help protect its citizens, visitors, businesses and property from the effects of various natural hazards.

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# 1

## Introduction

### Plan Purpose

The purpose of Cranston’s 2022 Hazard Mitigation Plan Update is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life or property from natural hazardous events such as hurricanes, Nor’easters, flooding, and high wind. This plan was constructed using input from a variety of municipal and private stakeholders and the general public involved in the planning process. This plan serves as guidance to help the City reduce their losses and vulnerabilities relating to natural hazards.

### Hazard Mitigation and its Benefits

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

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

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

More than twenty years later, some communities are updating their Plan for the fourth or fifth time. Elements of the hazard mitigation plans are being integrated into other planning elements such as comprehensive or economic development plans. Current Plans also consider the effects of climate change on the natural, social, and built infrastructure.

The purpose of this Plan is to recommend actions and policies for the City of Cranston to minimize the social and economic loss of hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to critical infrastructure and critical facilities, loss/interruption of jobs, loss/damage to businesses, and loss/damage to significant historical structures. To protect present and future structures, infrastructure and assets and to minimize the social and economic hardships, the City of Cranston implements the following general actions and policies:

- › Revisions to the City's Comprehensive Plan and Future Land Use Plan
- › Revisions to the City's Capital Improvement Plan
- › Incorporation of hazard mitigation into the permit review process
- › Local building code review
- › CRMC's Critical Hazards Assessment

The City of Cranston also recognizes the important benefits associated with hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach, which accommodates these interdependencies. The City's Comprehensive Plan (2012) addresses land use, economic development, housing, community services and facilities, transportation and circulation, open space and recreation, natural resources, historical and cultural resources, energy, water; and natural hazards and climate change. While the entire hazard mitigation plan will not be formally incorporated into the revised Comprehensive Plan, certain, applicable

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

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

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

mitigation actions will be incorporated during the update process. The City recognizes coordination between the HMP and the Comprehensive Plan to be of benefit because it will ensure a unified planning approach into the future and ensure that risk reduction remains a critical element of municipal planning. This is also in alignment with current goals of Rhode Island Statewide Planning.

A second benefit of hazard mitigation is endorsing a proactive planning approach focused on sustainability, whereby the City of Cranston could minimize the social and economic hardships that have resulted from the occurrence of previous natural disasters. These social and economic hardships include: the loss of life/injuries, destruction of property, interruption of jobs, damage to businesses, and the loss of historically significant structures and facilities. This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns.

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

Lastly, the participation in a hazard mitigation planning process establishes funding priorities. The formal adoption and implementation of this plan will allow the City of Cranston and its residents to become more involved in several programs offered by the Federal Emergency Management Agency (FEMA) including: the Community Rating System Program (CRS); the Building Resilient Infrastructure and Communities (BRIC) program<sup>1</sup>; the Flood Mitigation Assistance (FMA) Program; and the Hazard Mitigation Grant Program (HMGP). Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow.

## Mission Statement and Goals:

It is the mission of the City and the HMC to protect and enhance the quality of life, property and resources by identifying areas at risk from natural hazards and implementing hazard mitigation actions to protect the City's residents; infrastructure; economy and its historical, natural and cultural resources.

### Goals

This mitigation strategy is adopted by the City of Cranston to present actions which help protect its citizens, visitors, businesses and property from the effects of various natural hazards. It is the intent of the City of Cranston to:

1. Upgrade infrastructure and protecting property,
2. Integrate planning and management approaches,
3. Strengthen regulatory control,

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<sup>1</sup> The BRIC program has replaced the Pre-Disaster Mitigation (PDM).

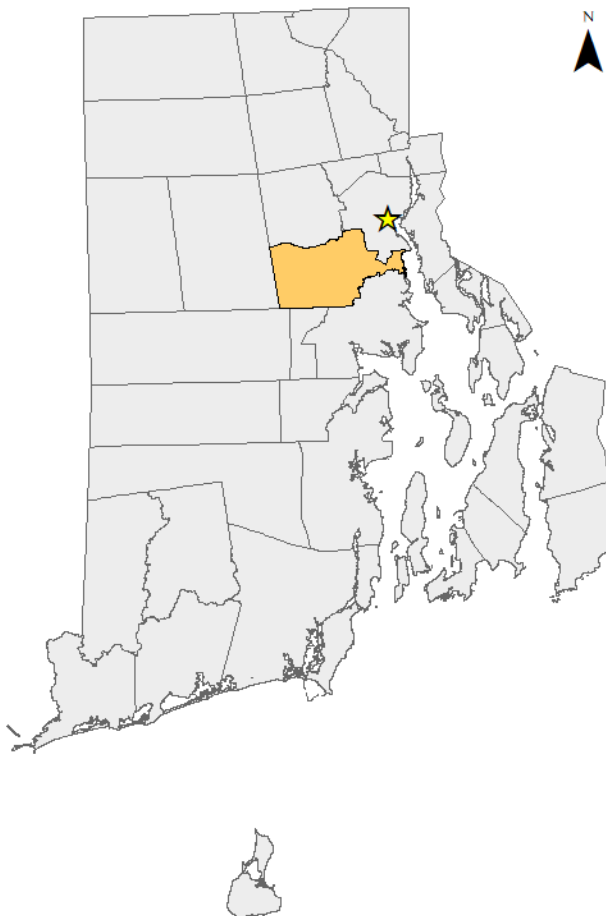
4. Improving response effectiveness, and
5. Raise awareness of hazard mitigation benefits and procedures.

## Background

The City of Cranston is located on the western shore of the Providence River, just north of the head of Narragansett Bay. Cranston is directly south of the Capital City of Providence and north of the City of Warwick. Cranston is located in the southeastern part of Providence County. The 2020 U.S. Census American Community Survey set the city's population at 81,252<sup>2</sup> a figure which ranks it as the second largest in the state behind Providence. The City's 39 square miles of area are primarily drained by the Pocasset River and the Pawtuxet River.

Cranston is a network of places (urban, suburban, rural neighborhoods, and village centers) that exist within the City boundaries. The development pattern of the City is distinctive in that it is densely developed in an urban fashion in the east and gradually transitions to a suburban nature and ultimately to a rural state as one heads west. Land use within the city is approximately 34% residential, 8% industrial, 4% commercial, 6% agricultural, 4% recreational, 11% transportation, 20% forested or vacant, with the remaining 13% classified as other uses. Between 1990 and 2008, the City's residential development grew at an average rate of 0.36% per year. Between 1990 and 2008, a total of 1960 new housing units were constructed for an average rate of 109 units per year. The housing market crash in 2008 significantly slowed the rate of growth. Since 2010, numbers are steadily increasing; the City sees about 10-15 new homes being built per year.

Figure 1: Locus Map



<sup>2</sup> For consistency in the demographic analysis, the 2020 American Community Survey was used. Please note that the newer 202 Decennial Redistricting Data estimates the population to be 82,934.

## Overview of Cranston

### Demographics<sup>3</sup>

Note: The most recent census data to include housing characteristics is the 2020 American Community Survey. For consistency, that dataset was used for the following analysis.

The City of Cranston is an urban community with a population of 81,252. The median age in Cranston is 39.8, roughly the same as the State average of 40.6.

Approximately 21% of the population is 65 and older. The City of Cranston is predominantly white at 76%, Hispanic or Latino 16%, Asians 7%, and Black or African American make up 6.5% of the population (some identify as more than one race). A language other than English is spoken in 22% of the homes.

The 2020 American Community Survey 5-Year Estimates reported an estimate of 33,284 housing units, 94% of which are occupied). Approximately 30% of the housing units were built before 1939. Approximately 66% of the housing units are single family detached or attached (condo). The remaining 34% of the housing units are considered multi-family. The greatest concentration of residential housing units is located in the eastern part of the City and near Providence.

### Economic Conditions

Cranston has a stable economy with low vacancy rate for commercial properties and a high demand for new commercial/industrial/retail spaces. An estimated 60% of the Cranston’s municipal revenue comes from real estate taxes.<sup>4</sup>

Unemployment in Cranston is generally lower than the overall Providence metropolitan area, and below national unemployment levels. In Providence County, education and health care services represent the largest component of the economy.

Annually, about 68% of the housing units in Cranston are owner-occupied (compared to 62% for the state), and median family income (\$72,930) is similar to the statewide median family income of \$74,425. An estimated 7% percent of the population has income below the poverty level.<sup>5</sup>

**Table 1 Demographic Changes**

	2010	2020	% Change
<b>Housing Units (total)</b>	32,256	33,284	3.2%
<b>Population</b>	80,580	81,252	0.8%
<b>Owner-occupied housing units</b>	20,125	21,227	-4.0%

<sup>3</sup> United States Census data, 2020 American Community Survey, <https://data.census.gov/cedsci/table?q=cranston,%20RI&tid=ACSDP5Y2020.DP05>

<sup>4</sup> City of Cranston, Proposed 2021-2022 Municipal Budget <https://www.cranstonri.gov/mayor-kenneth-i-hopkins-budget-address/>

<sup>5</sup> United States Census data, 2020 American Community Survey, <https://data.census.gov/cedsci/table?q=cranston,%20RI&t=Poverty&tid=ACSST5Y2020.S1701>



## Government

The City of Cranston, by charter, is governed by a Council-Mayor form of government. Council members are elected every two years, three members serving at large, and six members serving from a specific ward of the city. The Council is empowered to enact local legislation, adopt budgets, and determine policy. The Council chooses one of its members who was elected at large as President and another of its members as Vice-President.

The City Mayor is the Chief Executive Officer authorized to execute the laws and administer the government of the city. The Mayor is charged with specific duties in connection with the administration of the city. Under the provisions of the City of Cranston's charter, the Mayor is responsible for the appointment of department heads within the city administration.

### City Boards and Commissions

City governance receives assistance from a large number of residents of the city who make a substantial commitment of time, talent, and energy to serve on the City of Cranston's many boards and commissions. Members of these are appointed by the Mayor, Council President, or City Council.

The following boards and commissions are active in Cranston:

- › Architects and Engineers Board
- › Arts Commission
- › Audit Committee
- › Board of Canvassers
- › Building Appeal Board
- › Charter Review Commission
- › City Plan Commission
- › Community Development Block Grant Board
- › Conservation Commission
- › Contract and Purchase
- › Harbor Master
- › Historic District Commission
- › Historical Cemeteries Commission
- › Housing Authority
- › Investment Commission
- › Juvenile Hearing Board
- › Parks and Recreation Advisory
- › Pawtuxet River Authority
- › Personnel Appeal Board
- › Probate Judge Advisory
- › Public Library of Trustees

- › School Buildings Committee
- › Senior Services Advisory Board
- › Tax Assessment Board of Review
- › Zoning Board of Review

## Land Use Patterns<sup>6</sup>

The development of Cranston has not followed an organized city plan. Rather, the city has a distinct east/west split in land use patterns: residential development and preservation of open space in western Cranston and redevelopment and improvement of existing neighborhood and commercial centers in eastern Cranston.

There is an equal amount of land designated for residential use as there is for institutional, commercial, and industrial uses combined. Public agencies (local, state and federal governments) and non-profits such as churches and schools occupy about 14% of the land in Cranston. Over 11% of the residential land is vacant.

There are several key parcels and properties throughout Cranston that can accommodate further development. The development of these properties (mainly in the western part of the city) could offer multiple benefits that include improved access, significant property upgrades, and the potential to improve the surrounding area.

The village and neighborhood centers in many parts of Cranston need to maintain their character and economic vitality. There are opportunities to improve these areas with mixed-use developments, neighborhood open spaces, streetscape, and zoning changes.

The City has an excellent supply of open space, historic, and natural resources and their use has increased over the past ten years. This trend is anticipated to continue into the future.

## Roads and Bridges

The City maintains an estimate 320 miles of city streets. Collector roads handle low to moderate volume traffic, providing vehicular access to residential areas. Local roads connect to residential neighborhoods and provide access primarily for single and multi-family homes to connect to the collector and arterial road system.

North-south routes continue to provide good access between local and arterial streets to the Interstate Highway system, Providence, and points to the south. Interstate 95 and Interstate 295 carry traffic through and to/from Cranston. Route 37 connects traffic to/from Interstate 295 (mid-city) to/from Interstate 95 on the eastern border. Without any direct east/west corridors through the whole city, traffic along the smaller roads often becomes congested.

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<sup>6</sup> Cranston 2012 Comprehensive Plan

There are 61 state-owned bridges in Cranston. These overpasses cross the Pawtuxet River, Pocasset River, Meshanticut Brook, Interstate 95 and 295, the Washington Bike Path, railroads, and other roads.<sup>7</sup>

## Dams

In 2020 the Department of Environmental Management (DEM) identified 23 dams in the City of Cranston (5 high hazard, 1 significant hazard, and 17 low hazard). The high hazard dams are Clarke’s Pond Upper, Stone Pond, Curran Upper Reservoir, Curran Lower Reservoir, and Cranston Print Works Dam. None are owned by the City.

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

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

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

## Utilities

The City of Cranston’s Department of Public Works is responsible for maintaining the city’s water and sewer infrastructure. Providence Water manages water distribution, and Veolia Water manages the sewer treatment plant for the city. Sewage is not collected in the western part of Cranston where most buildings utilize onsite wastewater treatment systems. The sewage collection system is adequate for the developed parts of the city although illegal tie-ins continue to be a problem.

The public water lines extend to areas not serviced by sewer but the western most portion of Cranston is serviced by individual wells.

National Grid is responsible for delivering natural gas and electricity throughout Cranston. While regional gas and electric utilities are regularly maintained by the entities that own them, the City’s public utility infrastructure is maintained as needed.

The City of Cranston through a contract with Waste Management Inc. provides services for the curbside collection of residential refuse and yard waste. The City of Cranston also coordinates a mandatory recycling program in cooperation with Rhode Island Resource Recovery.

The City of Cranston’s communication equipment is located throughout the city. Private cellular towers are also located throughout the city.

## Water Resources

Cranston is mainly within the Pawtuxet River watershed which includes the Pawtuxet River, the North Branch of the Pawtuxet River, the Pocasset River, and the Scituate Reservoir. A small corner in the northeast part of the City is located in the Woonasquatucket River/Moshassuck River watershed.

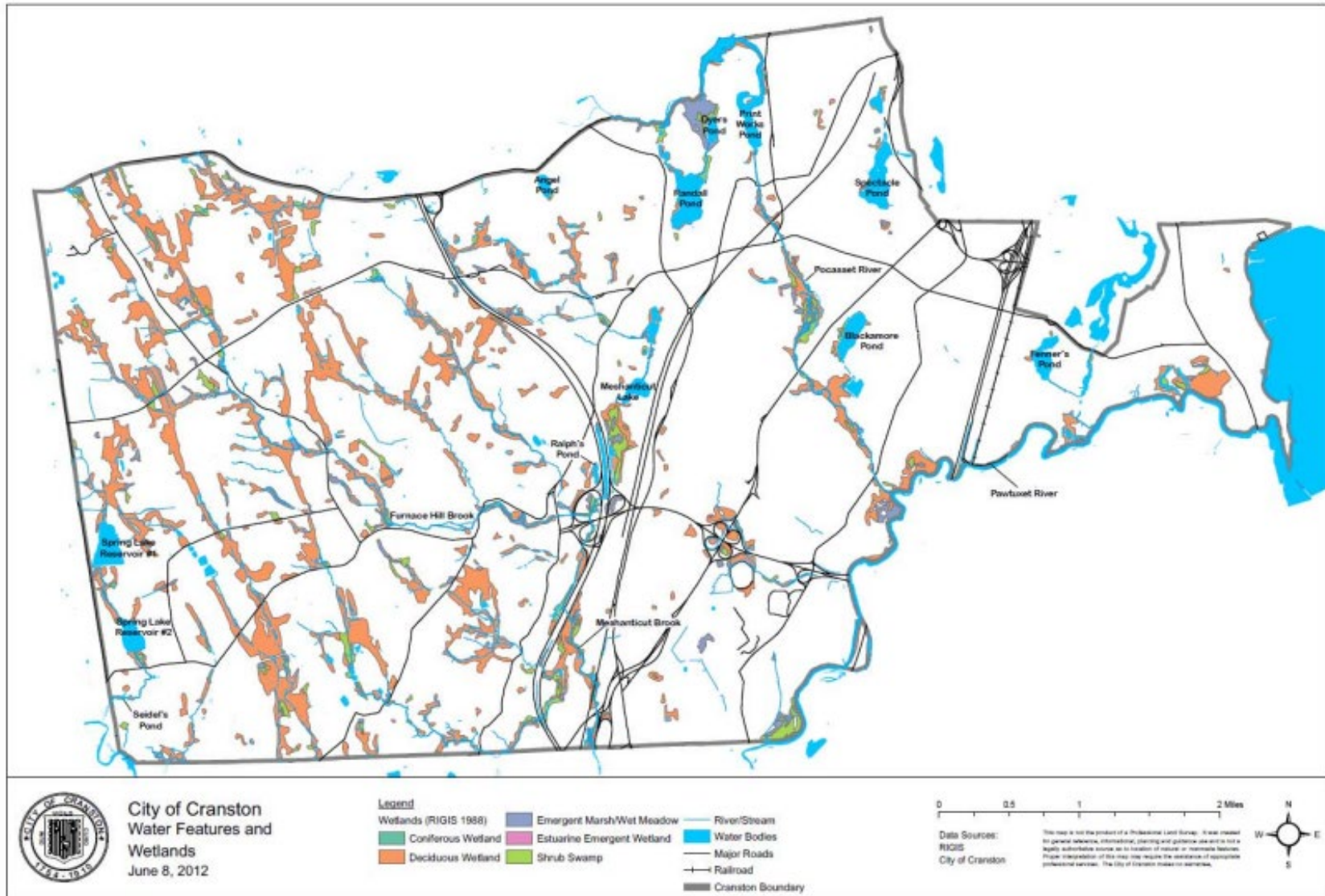
<sup>7</sup> Rhode Island State Owned Bridges, 2015 [http://www.dot.ri.gov/documents/travel/bridgeinfo/RIDOT\\_Owned\\_Bridges.pdf](http://www.dot.ri.gov/documents/travel/bridgeinfo/RIDOT_Owned_Bridges.pdf)

Cranston’s principal water bodies are limited to the rivers which are tidally influenced near the coast, and inland ponds. These are all vulnerable to impacts associated with sea level rise and coastal storm surge, non-point source pollution, eutrophication, sedimentation, and invasive species.

Cranston’s drinking water is managed by Providence Water. The main source of water is from the Scituate Reservoir which is the terminal reservoir in a network of six interconnected reservoirs: the Scituate Reservoir, Regulating Reservoir, Barden Reservoir, Ponaganset Reservoir, Westconnaug Reservoir, and Moswansicut Reservoir.

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Figure 2: Water Resources



## Open Space

Open space including wetlands, water bodies, grassland, forests, and connecting greenways, are found throughout Cranston. Although mostly developed, eastern Cranston still has important recreation areas and valuable water bodies such as the Pawtuxet River. Western Cranston is characterized by large undeveloped tracts of open space, farmland, ponds, rivers, and small streams. While the City has maintained large areas of open space, they are constantly under development pressure.

## Cultural and Historic Resources

Cranston has many important historic and cultural resources that are woven into the city's identity. Nationally and locally recognized areas include:

### National Register Districts

- › Pawtuxet Village Historic District.
- › Oak Lawn Village Historic District - this is also a Local Historic District.
- › Furnace Hill Brook Historical and Archeological District.
- › Edgewood Historic District- Arnold Farm Plat- Arnold Ave., Albert Ave., Columbia Ave. bound by Broad Street to the west and Narragansett Bay to the east.
- › Edgewood Historic District- Shaw Plat- Shaw Ave., Marrison Avenue. Bound by Broad Street to the west and Narragansett Bay to the east.
- › Edgewood Historic District- Taft Estate Plat- Windsor Avenue, Stratford Rd., Circuit Drive. Bound by Broad Street to the west and Narragansett Boulevard to the east.
- › Lippitt Hill Historic District
- › Norwood Avenue Historic District- Norwood Avenue. Bound by Roger Williams Park to the west, Broad Street to the east.
- › Nathan Westcott House (local district)

### National Register Properties

- › Rhodes on the Pawtuxet – 60 Rhodes Place
- › Nathan Westcott House- 56 Scituate Avenue
- › Sheldon House- 458 Scituate Avenue
- › Thomas Fenner House- 53 Stony Acre Drive
- › Governor Sprague Mansion – 1351 Cranston Street
- › The Joy Homestead- 179 Whiting Street

- › Knightsville Meeting House- 67 Phenix Avenue (recent renovations may remove it from the historic database)
- › Potter Remington House – 571 Natick Avenue
- › Rosedale Apartments – 1180 Narragansett Boulevard
- › Arad Wood House- 407 Pontiac Avenue

The City has recognized the need to enhance historic preservation efforts through traditional preservation techniques, protection through a National Register listing, and public education.

## Development Trends Since the 2016 Plan

The development pattern of the City is distinctive in that it is densely developed in an urban fashion in the east and gradually transitions to a suburban nature and ultimately to a rural state as one heads west. Land use within the city is approximately 34% residential, 8% industrial, 4% commercial, 6% agricultural, 4 % recreational, 11 % transportation, 20% forested or vacant, with the remaining 13% classified as other uses. Based on the American Community Survey (5 year average 2017), the City of Cranston's current number of housing units totaled 32,752. According to the City's Planner, a near max buildout in eastern Cranston and a soft market in western Cranston has slowed the rate of residential development. On average, 15-20 new housing units are constructed each year. Development is occurring outside of the floodplain, there is no increased vulnerability to flooding or other natural hazards.



# 2

## Planning Process

### Overview

The City of Cranston initiated the hazard mitigation planning effort in 2021 at the recommendation of the City Planner. This Hazard Mitigation Plan Update is the result of a dedicated group of individuals working for nine months identifying natural hazards and proposing ways to improve Cranston’s resiliency.

### Cranston Hazard Mitigation Committee

This updated Hazard Mitigation Plan (HMP) is a product of the Cranston Hazard Mitigation Committee (HMC). The 2021/2022 Committee members include:

- › Jason Pezzullo, City Planner
- › Kenneth Mason, Director of Public Works (retired in 2021)
- › James Warren, Fire Department \*
- › Edward Collins, School Department
- › Ryan Shore, Police Department
- › Stan Pikul, Building and Zoning
- › Franklin Paulino, Economic Development
- › Nick Lima, Canvassing Authority
- › Edwardo Marines, RealPro by the Water
- › Anthony Moretti, Chief of Staff \*
- › Paul McAuley, Deputy Chief of Staff \*
- › Peter Lapolla, Former Planning Director
- › Josh Berry, Planning Department
- › Alex Berardo, Planning Department

\* denotes Cranston resident.



## The Planning Process

This 2022 HMP update is the result of a 7-step process that was initiated in July 2021 with the establishment of the HMC. Membership of the HMC consisted of City staff and positions that participated in the development of the previous Hazard Mitigation Plan completed in 2014, as well as identified stakeholders, by invitation from the Mayor. The City hired a consultant to assist with this planning effort.

Step two started the plan development process and included the first meeting of the HMC on August 5, 2021. The HMC met in-person at Council Chambers.

The City's previous plan was dated 2014, so the first meeting focused on re-ranking hazards and discussing the process for updating the plan. At this initial meeting, the group reviewed a set of questions to be included in an online public survey. The purpose of the survey was to capture the local residents' perception of natural hazards.

The link to the survey was widely distributed on social media and on the City's website. Over 100 people responded to the survey. See Appendix A for survey results.

Step three began with the HMC meeting on September 9, 2021. After reviewing the hazards of concerns and survey results, the HMC identified Cranston's critical infrastructure and community assets. Sixteen areas of vulnerability were identified: flood prone drainage systems/streets, or infrastructure; bridges; wastewater; other services/utilities; communication equipment; dams; critical municipal hazard response facilities; populations; high density residential properties in the floodplain; businesses; state facilities; schools within the floodplain; recreational facilities; natural resources; and historic resources.

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

Current municipal capabilities were discussed at the meeting on October 7, 2021. Many different departments, committees, and programs already engage in activities that help Cranston become more resilient to a variety of hazards. It is important to highlight these capabilities and show how they support the City's hazard mitigation efforts.

Step four was creating an updated list of mitigation actions to reduce the impact to the identified vulnerable areas. At the October 7 meeting, the HMC reviewed goals and mitigation items that were proposed in the 2014 plan. Status updates were given for all the previous actions. The incomplete actions that were still important were rolled into the list of actions for this 2022 plan update. The HMC also began to brainstorm new mitigation actions at this meeting.

Step five was conducted during the December 2, 2022, meeting where the group continued to with proposing new actions, establishing action timelines, costs, and identifying responsible parties.

Step six focused on the prioritization of the mitigation actions. This occurred during the latter part of the December 2 meeting. After this meeting the consultant finished the draft of the plan for committee review.

Step seven furthered the public input and review process with the Cranston City Council, and the general public for review and comment. The plan was posted on the City’s website, Facebook for public review. The Hazard Mitigation Plan was also emailed to Town Planners in the neighboring towns of Providence, Johnston, Scituate, Coventry, West Warwick, and Warwick for their review and comments. XX comments were received.

Table 2 below provides a summary of the Committee’s meeting dates and the activities that they conducted:

**Table 2 Hazard Mitigation Committee (HMC) Meetings**

Date	Meeting Summary
08/05/2021	› Kick off meeting with new contractor, VHB. HMC discussed the plan purpose and hazards of concern. Reviewed survey questions.
08/25/2021	› Natural Hazards survey posted online.
09/09/2021	› The HMC reviewed the hazards of concern and listed critical infrastructure and community assets.
10/07/2021	› Review of community assets and discussion of current capabilities. › Review status of 2014 actions.
12/02/2021	› Drafted mitigation actions.
12/02/2021	› Prioritization of mitigation actions.
09/03/2021	› Sent to City Planner for review and additional information.
05/26/2022	› Distributed to HMC for review.
06/16/2022	› Virtual Meeting of HMC to review plan.
	› Posted for public comment and distributed to City Council and neighboring communities.
	› Delivered to Rhode Island Emergency Management Agency for Review.
	› Delivered to FEMA for Approval.
	› Adopted by the City Council.

## Public Input

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

Early in the planning process, the HMC promoted and distributed a “Hazard Perceptions” survey online. The purpose of the anonymous survey was to hear from residents the hazards and neighborhoods they are most concerned about. Over 100 individuals participated in the survey. Not surprisingly, most were concerned about street flooding from heavy rain, hurricanes, winter storms, and high winds. The survey also provided the HMC with a list of problematic areas that are susceptible to flooding. The HMC used the input from the survey to focus their mitigation planning efforts.

The 2021/2022 HMC included city residents and local employees. The HMC’s roles focused on reviewing the content of the risk assessment matrix to ensure proper classification of problems and estimates of potential impacts; formulation of mitigation actions and sequencing of primary tasks; and identification of feasible implementation methods and schedules. Their comments were incorporated into the final 2022 Hazard Mitigation Plan.

Prior to public release of the 2022 HMP, the HMC drafted the plan through a series of committee meetings. While these meetings did not rise to the level of public hearings, they were posted on the Secretary of State’s website and were open to the public. Local media and businesses did occasionally attend when invited.

Another public input strategy was geared toward the general public as opposed to specific stakeholders. During the draft review portion of the plan development, an electronic copy of the draft 2022 HMP was posted to the City’s website. The public was informed of both the webpage posting and the public hearing. See Appendix B. They were encouraged to review the document, comment on the HMP and attend the virtual meeting. Notice of the public hearing was also posted as an agenda item on the City’s website in accordance with state law. During the public review period, a few comments were received suggesting ways to make the city and residents better prepared to withstand storms. On XXX, the City Council held a discussion on the HMP as part of their regular public meeting. At the City Council meeting. Council members did not request any edits to the plan but they did entertain a discussion about mitigation actions and future grant funding.

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

Members of the HMC are involved in the Comprehensive Plan update (to be completed in 2025) and will be incorporating elements of this document into the other plan.



# 3

## Natural Hazards

### Hazards of Concern

The Rhode Island 2019 State of Rhode Island State Hazard Mitigation Plan Update and Cranston 2014 Natural Hazard Mitigation Plan were used as a starting point for identifying hazards that pose the largest threat to the City. The following table summarizes the natural hazards identified by the Cranston Hazard Mitigation Committee (HMC). These hazards generally align with FEMA's National Risk Index and do not include infectious disease, human caused hazards, or technological hazards.

**Table 3 Hazards Identified by the Cranston Hazard Mitigation Committee**

Natural Hazards Identified by the State	Identified by the Hazard Mitigation Committee	Notes
<b>Severe Winter Weather</b>		
<i>Ice Storm</i>	✓	Included with Winter Weather
<i>Snow</i>	✓	
<b>Flood</b>		
<i>Riverine (streams and rivers)</i>	✓	
<i>Coastal</i>	No	Very little of Cranston's land area borders the ocean.
<i>Flash</i>	✓	
<i>Urban/Street</i>	✓	
High Wind	✓	
Extreme Heat	✓	
<b>Hurricane and Tropical Storms</b>		
<i>Nor'easter</i>	✓	
<i>Storm Surge</i>	No	Very little of Cranston's land area borders the ocean.
<i>Extreme Cold</i>	✓	
<i>Thunderstorm</i>	✓	
<i>Hail</i>	✓	

**Table 3 Hazards Identified by the Cranston Hazard Mitigation Committee**

Natural Hazards Identified by the State	Identified by the Hazard Mitigation Committee	Notes
<i>Lightning</i>	✓	
<i>Dam Failure</i>	✓	
<b>Fire</b>		
<i>Urban</i>	No	Not covered by this natural hazard plan.
<i>Wildfire/Brushfire</i>	✓	
Sea Level Rise	No	Very little of Cranston’s land area borders the ocean.
Infectious Disease	No	Not covered by this natural hazard plan.
Drought	✓	
Earthquake	✓	
Tornado	✓	
<b>Human-Caused Hazards</b>		
Cyber Security	No	Not covered by this natural hazard plan.
Chemical Incident	No	Not covered by this natural hazard plan.
Terrorism	No	Not covered by this natural hazard plan.
Biological Incident	No	Not covered by this natural hazard plan.
Radiological Incident	No	Not covered by this natural hazard plan.
Civil Unrest	No	Not covered by this natural hazard plan.
<b>Technological Hazards</b>		
Infrastructure Failure	No	Not covered by this natural hazard plan.

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

<b>Probability of Future Occurrence</b>	
Highly likely:	Near 100% probability within the next year;
Likely:	Between 10% and 100% probability within the next year or at least one chance in next 10 years;
Possible:	Between 1% and 10% probability within the next year or at least one chance in next 100 years;
Unlikely:	Less than 1% probability in next 100 years.

Damage Extent	
Low:	Some local property damage not city wide, minor injuries/ loss of life
Medium:	50% of property could be damaged and possible injuries/loss of life
High:	Major town wide property damage, injuries and loss of life.
Level of Concern/Risk Rank	
Developed by the HMC to rank the various hazards based on frequency and damage potential.	
Low:	Not expected to occur with any frequency, damages will be limited.
Medium:	Will occur within the next 10 years but the City has resources to reduce risks.
High:	Expected to occur within the next 5 years and is a major concern for the city. City wide impacts.

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

**Table 4 Hazards Ranked**

Hazard	Level of Concern/Risk Rank
Nor'easters	High
Hurricanes	High
Flooding (Street and Riverine)	High
Flooding (Heavy Rain/Runoff/Flash)	High
Winter Storms and Ice	High
High Wind	Medium
Heat Wave	Medium
Extreme Cold	Medium
Lightning	Medium
Microburst	Medium
Hail	Low
Drought	Low
Earthquakes	Low
Tornadoes	Low
Brushfires	Low
Dam Failures	Low
Coastal Erosion	Low
Landslides	Unlikely

In this hazard mitigation plan, climate change is treated as an ongoing amplifier to the identified natural hazards, not profiled as an independent hazard. "Extreme weather events have become more frequent during the past half-century, and this trend is projected to continue.<sup>8</sup> For instance, more frequent intense precipitation events may translate into more

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

frequent flooding episodes. The National Climate Assessment and Development Committee has documented that the average temperature across the United States has increased 1.5°F since 1895, with the majority of the increase since 1980. Weather events have and will continue to become more intense and frequent and will result in health and livelihood related impacts such as water supply, agriculture, transportation, and energy. The impact of dynamic storm events includes, but is not limited to, more frequent and intense heat waves, increases in ocean and freshwater temperatures, frost-free-days, heavy downpours, floods, sea level rising, droughts, and wildfires.”<sup>9</sup>

Potential climate change impacts will be mentioned for each hazard.

The following subsections are organized by the level of risk as identified in Table 4 Hazards Ranked.

## Nor'easters

### Description

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

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

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

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

The extent of a severe winter storm (including Nor'easters that produce snow) can be classified by meteorological measurements and by evaluating its combined impacts. For measuring wind effects, the Beaufort Wind Scale is a system that relates wind speed to

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

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

observed conditions at sea or on land (See Table 9). The snow impact of a Nor'easter can be measured using NOAA's Regional Snowfall Index (See the section *Winter Storms*).

### **Location**

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

### **Probability of Future Occurrence**

Highly Likely.

### **Extent (Event Magnitude)**

On average, Cranston experiences or is threatened by a Nor'easter every year or two.

### **Impact and Damage Extent**

Minor. Most damage in Cranston would be to utilities, roads, stormwater infrastructure, personal property, trees, and snow loads on roofs. Expected wind damages are similar to those from a hurricane (see below). The Blizzard of 1978 was the largest Nor'easter on record. Many people in Rhode Island were without heat and electricity for over a week.

### **Climate Change Impacts**

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



## History

**Table 5 Nor'easter History<sup>11</sup>**

Date	Comments
02/11/1994	Major Nor'easter in the region. School closed by noon, business and highway travel disrupted.
02/18/1998	Heavy rainfall, isolated flash floods, and thunderstorms to mainly central and southern Rhode Island. 2.16 inches of rain at T.F. Green Airport in nearby Warwick during a 12-hour period.
02/23/1998	Second Nor'easter to affect region in less than one week brought heavy rainfall and strong winds. Winds of 56 mph reported in nearby Providence.
03/21/1998	Spring nor'easter brought a mixture of snow, sleet, and rain to Rhode Island. Strong northeast winds gusting from 35 to 50 mph occurred over the central and southern portion of the state.
05/09/1998	Three-day Nor'easter. A total of 4 inches of rain fell in Cranston.
05/25/2005	Late season Nor'easter brought strong winds and heavy rains which mainly effected the western part of the state.
10/25/2005	A strong coastal storm (i.e. a Nor'easter) entrained with energy and moisture from the remnants of Wilma brought rainfall amounts between 2 and 2.5 inches or rain and damaging winds to portions of Rhode Island. The high winds brought down limbs, trees, and wires, resulting in scattered power outages.
02/12/2006	A strong Nor'easter produced heavy snow and windy conditions across Rhode Island. Snowfall ranged from 9 to 14 inches.
10/30/2011	A rare and historic October Nor'easter brought very heavy snow and high winds. Three to six inches of snow fell in Providence County.
02/08/2015	Long duration Nor'easter dumped 7 to 13 inches of snow in southeastern Providence County.
03/2018	Three (3) Nor'easters in the month of March brought high winds, rain, and eventually snow throughout the area.
11/15/2018	Moderate to heavy snow with strong winds.

<sup>11</sup> NOAA Storm Event Database, Providence County. <https://www.ncdc.noaa.gov/stormevents/>

## Hurricanes

### Description

Hurricanes (also called tropical cyclones) are low pressure systems that usually form over the tropics. These storms are referred to as “cyclones” due to their rotation. Hurricanes are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As hurricanes move inland, they can cause severe flooding, downed trees and power lines, and structural damage. Once a tropical cyclone no longer has tropical characteristics it is classified as an extratropical system.<sup>12</sup>



Hurricane Irene caused road damage in 2011.  
Photo credit: *Cranston Patch*

There are three categories of tropical cyclones:

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

Most Atlantic hurricanes begin as atmospheric “easterly waves” that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This situation produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult<sup>13</sup>.

Hurricanes are categorized according to the Saffir/Simpson scale (Table 6) with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or sooner.<sup>14</sup>

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

<sup>12</sup> Rhode Island Emergency Management Agency (RIEMA), State of Rhode Island 2018 Hazard Mitigation Plan Update

<sup>13</sup> Ibid

<sup>14</sup> Ibid

**Table 6 Saffir/Simpson Hurricane Wind Scale<sup>15</sup>**

<b>Wind Speed</b>	<b>Typical Effects</b>
<b>Category 1 – Weak</b> 74-95 MPH (64-82kt)	<i>Minimal Damage:</i> 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.
<b>Category 2 – Moderate</b> 96-110 MPH (83-95kt)	<i>Moderate Damage:</i> Considerable damage is done to shrubbery and tree foliage; some trees are blown down. Major structural damage occurs to exposed mobile homes. Extensive damage occurs to poorly constructed signs. Some damage is done to roofing materials, windows, and doors; no major damage occurs to the building integrity of structures.
<b>Category 3– Strong</b> 111-130 MPH (96-113kt)	<i>Extensive Damage:</i> 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).
<b>Category 4 – Very Strong</b> 131-155 MPH (114-135kt)	<i>Extreme Damage:</i> 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.
<b>Category 5 – Devastating</b> Greater than 155 MPH (135kt)	<i>Catastrophic Damage:</i> 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.

### Location

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

### Probability of Future Occurrence

Likely.

### Extent (Event Magnitude)

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

### Impact and Damage Extent

Minor. Hurricane strength storms can cause coastal, riverine and street flooding. Extensive rain, wind and storm surge, could damage homes, roads, and cripple the city. The high winds could down power lines and trees, and damage historic structures. Hurricane- and gale-force

<sup>15</sup> National Weather Service, National Hurricane Center

winds can also cover roadways with debris, making them impassable to conventional vehicles. During extremely dangerous conditions, the City may elect to open shelters. Damage extent is dependent upon the size and timing of the storm. A slow-moving storm may bring more rain to the area than a fast-moving storm.

## Climate Change Impacts

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

## History<sup>16</sup>

In August 2011, Hurricane Irene hit Cranston as a tropical storm. Despite the relatively low wind speeds, sustained winds over a 6 to 12-hour long duration resulted in widespread tree damage and resulted in power outages to roughly half a million customers throughout the state. Numerous trees, poles, and wires were downed throughout the area. Local roads were also flooded. Collective effects throughout Massachusetts and Rhode Island resulted in 1 fatality, no injuries, and \$127.3 million in property damage. Impacts in Cranston were generally limited to minor road flooding and power outages.

In October 2012, Hurricane Sandy severely impacted coastal Rhode Island as it came ashore with Tropical Storm strength winds. Wind gusts in southeastern Providence County were reported to be between 46 and 52 mph. The City of Cranston had very little impacts from Hurricane Sandy.

Tropical Storm Isaias (downgraded from a hurricane) knocked out power to tens of thousands of Rhode Island residents on the evening of August 4, 2020. There were reports of trees and wires down in nearby Providence. The City was spared any major impacts from this tropical storm.

## Flooding (Street/Urban)

For the purpose of this plan, two types of flooding will be discussed: street/urban flooding, and stream/riverine flooding. Since these hazards are ranked in order of concern, the first is street/urban flooding caused by heavy rain.

### Description

A flood is defined by the National Flood Insurance Program (NFIP) as:

- › A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow; or
- › The collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of

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<sup>16</sup> NOAA Storm Event Database (accessed August 2021).

water exceeding anticipated cyclical levels that result in a flood as defined above.”

Flooding due to runoff occurs when water runs over the land’s surface impervious surfaces (paved areas, building subdivisions, and highways) faster than it can be absorbed by the soil or conveyed into the stormwater system. This type of flooding is mainly evident in the eastern, more developed part of Cranston. Two major environmental modifications responsible for drastically altering the rain fall-runoff relationship include:

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

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

**Table 7 Flood Zones Found in Cranston**

<b>Flood Zone</b>	<b>Description</b>
VE	Coastal areas with 1% annual chance of flooding with additional hazards due to storm-induced velocity wave action. 26% chance of flooding over the life of a 30-year mortgage
A	1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. No recorded Base Flood Elevation
AE	1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base Flood Elevation is provided.
X	Areas of moderate flood hazard located outside of the 1% annual chance floodplain.

### **Location**

During heavy or extensive rain events, flooding around Cranston is generally caused by undersized catchbasins and poor natural drainage. These areas include but are not limited to:

- › Garden Street at Laurens Street
- › Zinnia Drive Area
- › Wedge Street

### **Probability of Future Occurrence**

Street/urban flooding is highly likely.

### **Extent (Event Magnitude)**

Localized flooding can be expected to occur on an annual basis.

## Impact and Damage Extent

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

Vulnerable structures include stormwater infrastructure, dams, residential homes, water supply lines, wastewater infrastructure, and roads. Natural environments that aren't accustomed to water can also be impacted by flooding. Long-term standing water can also be a public health and safety issue.

## Climate Change Impacts

Changing weather patterns may lead to more severe rain events.

## History

The City of Cranston regularly experiences street/urban flooding on the nuisance level. The larger events in the county are outlined in the following table.

**Table 8 History of Flooding in the Cranston area of Providence County Since 2010 (includes street/urban and riverine)<sup>17</sup>**

Date	Damage (reported)	Comments
03/30/2010	\$3.2 million	Significant statewide flood event. Six to nine inches of rain fell across Providence County. Heavy rain caused the Pawtuxet River in Cranston to rise to record heights. Many basements were and homes were flooded in Cranston. About 120 homes were evacuated in the Valley View neighborhood, and a condo complex on Fordson Ave. was evacuated. The Cranston wastewater treatment plant failed during the flooding, sending untreated sewage into the Pocasset River.
09/08/2011	\$30,000	Remnants of Tropical Storm Lee brought flooding to the rivers and small streams in urban areas. Heavy rain stranded cars on Oaklawn and Wilbur Avenue in Cranston.
07/11/2013	\$3,000	Quick heavy rain caused flooding at Atwood Avenue and Pontiac Avenue in Cranston.
09/02/2013	\$1.5 million	Heavy rain caused flash flooding in Cranston. Some cars were stranded on flood streets. Dean Estates apartment buildings were evacuated by boat as flood waters inundated the basement/garden level apartments. Budlong Road was damaged. Reservoir and Pontiac Avenues, as well as Route 10 at I-95 were closed due to flooding.
01/11/2014	0	Over one inch of rain in a short time resulted in flooding on parts of Oaklawn Avenue, Atwood Avenue, and Plainfield Street in Cranston where as much as 1 to 2 feet of water covered the road. One car was stranded in flood waters on Wilbur Avenue. The right lane of I-95 northbound by Route 10 was flooded.
07/17/2016	0	Isolated showers. The intersection of Wilbur and Oaklawn Avenues was flooded and impassable.

17 NOAA National Centers for Environmental Information, Storm Event Database. <https://www.ncdc.noaa.gov/stormevents/>

**Table 8 History of Flooding in the Cranston area of Providence County Since 2010 (includes street/urban and riverine)<sup>17</sup>**

Date	Damage (reported)	Comments
08/12/2016	\$5,000	Heavy showers. One foot of water flooded the intersection of Wilbur and Oaklawn Avenues. A car was stuck in flood waters under Wilbur Avenue bike path bridge.
09/30/2017	0	Locally heavy downpours with hail. Pontiac Avenue in Cranston was flooded.
01/13/2018	0	Rainfall of three to four inches. Standing water closed Fletcher Avenue.
08/04/2018	\$5,000	Heavy showers. A car was trapped in flood waters on Wilbur Avenue.
09/25/2018	0	Three to five inches of heavy rain submerged cars at an apartment complex on Oaklawn Ave.
Annually		Fletcher Avenue experiences regular nuisance flooding (low levels of inundation) that do not pose a threat to life or safety.

The City has not experienced a major flood event for the past few years. Lately, the winter storms have been more of an issue, with heavy snow blocking storm drains.

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## Flooding (Riverine/Stream)

### Description

Riverine flooding occurs when heavy rainfall or snow melt causes the water in rivers and streams to flow over their banks. The severity of the flood depends on the saturation of the surrounding ground, the amount of precipitation, and duration of the event. Riverine flooding is most likely to occur in the late summer and early spring due to snow melt and spring rainfalls.

### Location

Overtopped stream banks combined with heavy rain and a high-water table can easily flood parts of Cranston. Low-lying areas around the Pawtuxet River, Meshanticut Brook, and Pocasset River are the most vulnerable.

### Probability of Future Occurrence

River and stream flooding is likely. More likely conditions include the addition of locally heavy rainfall or snowmelt on land.

### Extent (Event Magnitude)

Localized flooding can be expected to occur on an annual basis. The flood event which occurred in March 2010 was a 250 year +/- event with about 5 ½ inches of rain in a short period of time.

### Impact and Damage Extent

Severe to extensive. Damages are localized but can be serious. In addition to inconveniencing populations, severe flooding can impact the wastewater infrastructure and local businesses.

Bridges along the flooded streams can be compromised as waters rise and scour away at the foundations.

### Climate Change Impacts

Changing climate conditions are likely to bring more rainfall events to Cranston and fewer snowstorms. More intense storms will stress the rivers and natural floodplains designed to carry floodwaters.

### History

The Floods of 2010 are the most memorable and damaging riverine flooding in recent history.

The flood during week of March 28, 2010, is considered the flood of record for the main channel of the Pawtuxet River since the construction of the Scituate Reservoir. The flooding that occurred originated from a series of rain events that culminated with 6 to 9 inches of



rainfall over the Pawtuxet River Basin on March 29, 2010. Peak discharge within Pawtuxet was approximately 10,400 cubic feet per second (cfs) and flood evaluations reached 11.79 feet above the 9-foot flood stage (20.79 feet in total). While stream gauge data are not available for the Pocasset River and Meshanticut Brook, the March, the 2010 flooding event was also the record flood event for both bodies. The March 2010 flooding affected properties along Meshanticut Brook, along the Pocasset River (especially at Fordson Avenue and south of Reservoir Avenue in the flood plain near Blackmore Pond) and along the Pawtuxet River main stem (especially in the Perkins Avenue neighborhood). During this flood event, the Natick Avenue, Elmwood Avenue and Warwick Avenue bridges were all impacted resulting in their closure.

## Winter Storms

### Description

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

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

### Location

A severe winter storm could have a serious impact in private and public structures, as well as the general population throughout Cranston.

### Probability of Future Occurrence

Highly Likely.

### Extent (Event Magnitude)

On average, Cranston receives about 35 inches of snow during the winter months<sup>18</sup>. The average winter temperature (December-February) in Cranston is 39 degrees Fahrenheit.<sup>19</sup>

Blizzard conditions (sustained winds of 35 mph or more, with snow reducing visibility to a quarter of a mile or less for at least three hours) are experienced with some of the larger winter storms in Cranston.

<sup>18</sup> Average snowfall in nearby T.F. Green Airport <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ri6698>

<sup>19</sup> U.S. Climate Data <https://www.usclimatedata.com/climate/providence/rhode-island/united-states/usri0094>

## Impact and Damage Extent

Minor. The combination of wind, ice, and snow can have a crippling effect on Cranston. Heavy and/or excessive snowfall amounts can stress roofs and slow plowing efforts, as well as cause power outages. The local economy slows when businesses are closed due to winter weather. Fortunately, the City has experience and equipment to handle the extensive plowing effort needed to keep the roads passable.

## Climate Change Impacts

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

## History

Cranston has been subjected to annual snowstorms and Nor'easters. A few of the more significant ones are crippled not only Cranston but the entire state. The blizzard of 1978 is still regarded as the storm of the century and is the storm to which all subsequent storms are compared. Cranston (and nearby T.F. Green Airport) received 28 inches of snow. Businesses across the state were closed for several days. More than 9,000 people in Rhode Island sought refuge in makeshift shelters, hotels, and movie theaters.

In February 2013, Winter Storm Nemo temporarily crippled the region. Power lines were downed, and heavy snow hampered driving conditions. The governor declared a state of emergency and enacted a state travel ban that lasted nearly 24 hours. Strong winds and wet snow lead to extensive power outages. Seventeen to twenty-one inches of snow fell across southeastern Providence County during this event.

Blizzard conditions were present in Cranston during a late January 2015 winter storm. Again, the Rhode Island governor issued a travel ban to keep people off the roads. Fourteen to twenty inches of snow fell across southeastern Providence County.

Eight to ten inches of snow fell in southeastern Providence County in early January 2017.

In March 2018 twelve to seventeen inches of snow fell in southeastern Providence County. Blizzard conditions were observed locally, wind gusts of up to fifty miles per hour were observed.

Damaging winds and up to a foot of snow hit Cranston in December 2020.

In January 2022, the "fourth-largest" snowstorm hit the Providence area with heavy snow and high winds. At nearby T.F. Green Airport, 19.3 inches of snow fell.<sup>20</sup>

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<sup>20</sup> <https://turnto10.com/weather/weather-blog/blizzard-of-2022-ranks-as-the-fourth-biggest-snowstorm>

## Ice Storm<sup>21</sup>

### Description

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



*Ice Storm. Photo credit: NOAA.*

### Location

All of Cranston is susceptible to ice storms.

### Probability of Future Occurrence

Highly Likely.

### Extent (Event Magnitude)

Ice storms can be the most devastating winter weather phenomena and are often the cause of automobile accidents, power and communication system outages, personal injury, and death. Moreover, they can hinder the delivery of emergency services needed in response to these catastrophes and endanger the responders. Ice storms accompanied by wind gusts cause the most damage.

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

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

<sup>21</sup> For the purpose of this Hazard Mitigation Plan, ice storms were discussed by the Hazard Mitigation Committee as part of the Winter Storm Hazards.

Figure 3 SPIA Index

**The Sperry-Piltz Ice Accumulation Index, or “SPIA Index” – Copyright, February, 2009**

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) <small>*Revised-October, 2011</small>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	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	
<b>2</b>	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	
<b>3</b>	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	
<b>4</b>	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	
<b>5</b>	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

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

### Impact and Damage Extent

Minor. The Cranston Hazard Mitigation Committee is most concerned about ice taking down trees, knocking out power, blocked roads, and structure damage. Falling trees have taken out power lines, damaged buildings, and essentially shut down the city. Flash freezes and icy roads can also cause dangerous driving conditions.

### Climate Change Impacts

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

### History

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

## High Winds

### Description

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

**Table 10 Beaufort Scale**

Beaufort Number	Description	Wind Speed (km/h)	Observations
0	Calm	<1	Smoke rises vertically
1	Light Air	1-5	Smoke drifts slowly
2	Light Breeze	6-11	Leaves rustle, wind vanes move
3	Gentle Breeze	12-19	Leaves and twigs on trees move
4	Moderate Breeze	20-29	Dust picked up from ground
5	Fresh Breeze	30-38	Small trees sway in wind
6	Strong Breeze	39-51	Large branches move
7	Near Gale	51-61	Trees move, hard to walk
8	Gale	62-74	Twigs break off trees
9	Strong Gale	75-86	Branches break off trees
10	Whole Gale	87-101	Trees uprooted
11	Storm	102-120	Buildings damaged
12	Hurricane	>120	Severe building and tree damage

The Beaufort Wind Scale is a 12-level scale used to describe wind speed and observed wind conditions at sea and on land. A wind classification of 0 has wind speeds of less than 1 mile per hour are considered calm. On the other end, a classification of 10 with wind speeds reaching 63 miles an hour will blow down trees and cause considerable damage.

### Location

Wind events are expected throughout the year in Cranston.

### Probability of Future Occurrence

Highly Likely.

### Extent (Event Magnitude)

The windier part of the year lasts for 6.1 months from October 23 to April 27, with average wind speeds of more than 6.4 miles per hour (5.6 kts).<sup>22</sup>

### Impact and Damage Extent

Serious. Strong wind gusts of 40 miles an hour (Beaufort Scale of 8) can blow twigs and small branches from trees. Occasional gusts and sustained winds at this speed (and above) are of concern to the City. Damages from wind events range from power outages, property damage to vehicles and buildings and fallen trees/limbs. Previous wind events in Cranston have resulted primarily in power outages and downed tree limbs with minimal property damage. It is important that the City of Cranston maintain their public tree trimming program that will reduce the likelihood of fallen trees/limbs from disrupting transportation routes, taking down power lines, and/or creating damage to the tree canopy.

### Climate Change Impacts

Changes in atmospheric circulation are predicted to occur. See “Hurricanes” and “Nor’easters.”

### History

**Table 9 Recent History of High Winds in the Cranston area of Providence County<sup>23</sup>**

Date	Magnitude (kts)	Comments
10/29/2017	52	Strong to damaging winds from Tropical Storm Phillipe. Trees and wires were reported down in Cranston on Narragansett Blvd, Taft Street, Glenham Road, Cranston Street, Phippen Orchard Road, Lippit Avenue, Seven Mile Road, Sagamore Road, Massachusetts Street, Natick Avenue, Sheldon Street, and Curry Road.
10/16/2019	52	Heavy rain and strong wind, including gusts of 60 mph (52 kts) were reported in Cranston.
02/07/2020	49	Widespread power outages and gusts up to 49 kts.
04/13/2020	42	Wind gusts of 42 kts reported at nearby T.F. Green Airport.
09/30/2020	44	Trees and wires down on Main Street in Cranston. High winds caused damage to two boats in the harbor. Wind gusts of up to 48 kts were reported at nearby T.F. Green Airport.

<sup>22</sup> WeatherSpark <https://weatherspark.com/y/26142/Average-Weather-in-Cranston-Rhode-Island-United-States-Year-Round> accessed 02/07/2022

<sup>23</sup> NOAA Storm Event Database (2022). Wind types: high wind, thunderstorm wind.

**Table 9 Recent History of High Winds in the Cranston area of Providence County<sup>23</sup>**

Date	Magnitude (kts)	Comments
11/30/2020	52	Wind gusts of up to 50 kts reported at nearby T.F. Green Airport.

## Extreme Temperatures

### Description

**Extreme cold** may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. The definition of extreme cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.”<sup>24</sup> In Rhode Island, extreme cold usually involves temperatures below zero degrees Fahrenheit.

The wind chill index attempts to quantify the cooling effect of wind with the actual outside air temperature to determine a wind chill temperature that represents how cold people and animals feel, based on the rate of heat loss from exposed skin. A wind chill index of -5 indicates that the effects of wind and temperature on exposed flesh are the same as if the air temperature alone were five degrees below zero, even though the actual temperature could be much higher. The NWS issues the following a wind chill alerts:

- › A wind chill warning is issued within 12 to 24 hours before the onset of extremely dangerous cold conditions. Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
- › A wind chill watch is issued when conditions are favorable for excessive cold in the next 24 to 72 hours.
- › A wind chill advisory is issued within 12 hours of the onset of dangerous cold conditions.

NOAA’s National Weather Service issues **extreme (or excessive) heat** warnings when the maximum expected heat index is expected to be 105° F or higher for at least 2 consecutive days and nighttime air temperatures are not expected to fall below 75°. In the northeast, these criteria are generally modified to a heat index of 90° for higher for 3 consecutive days.<sup>25</sup>

The following are the types of heat event warmings that are issued by NOAA’s National Weather Service:

- › An excessive heat warning is issued within 12 to 24 hours before the onset of extremely dangerous heat conditions.
- › An excessive heat watch is issued when conditions are favorable for excessive heat in the next 24 to 72 hours.
- › A heat advisory is issued within 12 hours of the onset of dangerous heat conditions.

<sup>24</sup> National Weather Service, Extreme Cold. <https://www.weather.gov/dlh/extremecold>

<sup>25</sup> Rhode Island Emergency Management Agency (RIEMA), State of Rhode Island 2018 Hazard Mitigation Plan Update

## Location

An extreme heat or cold event would be a regional issue affecting Cranston and significant portions of Southern New England.

## Probability of Future Occurrence

Likely. (Excessive Heat)

Likely/Possible. (Extreme Cold)

## Extent (Event Magnitude)

NOAA's National Weather Service has issued Wind Chill Advisories, Watches, and Warnings, as well as Excessive Heat Warnings, Excessive Heat Watches, and Heat Advisories for Cranston.

## Impact and Damage Extent

Minor. Extreme temperatures could have a serious impact on private and public structures, as well as the general population throughout Cranston. During a heat wave, there is an increased stress to the power grid causing more outages.

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

Extreme cold conditions may occur during, after, or without any connection to a winter storm. Exposure to extreme cold can lead to hypothermia and frostbite. Property owners need to be concerned about frozen water pipes and heating fuel.

## Climate Change Impacts

Over the coming century, extremely hot days (over 90 degrees F) is projected to increase in New England.<sup>26</sup>

"Extreme cold in Rhode Island is projected to continue as extreme weather events experience an upswing due to climate change. The specific likelihood of extreme cold is unpredictable, as days of frigid, arctic air and below freezing temperatures may be followed by days of mild temperatures in the 40s or 50s."<sup>27</sup>

## History<sup>28</sup>

NOAA's Storm Events Database as documented the following extreme temperature events.

- August 2, 1975, was a previous record as the hottest day on record, 104 degrees without the heat index at nearby T.F. Green Airport.
- In July 30, 2020, there were two heat waves, the second having a day with a heat index of 104.

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<sup>26</sup> Confronting Climate Change in the Northeast, by the Northeast Climate Impacts Assessment Group, July 2007

<sup>27</sup> RI Emergency Management Agency, State of Rhode Island Hazard Identification and Risk Assessment. November 2016

<sup>28</sup> NOAA Storm Event Database (2021).



- In February 2015, the T.F. Green Airport recorded wind chills as low as 26 degrees below zero.
- Wind chills of 32 degrees below zero were reported at T.F. Green Airport in February 2016.

## Lightning/Thunderstorms

### Description

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. The National Weather Service (NWS) classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 MPH or greater, or a tornado. About 10 percent of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe. Thunderstorms affect a smaller area compared with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce localized flooding.

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

### Location

All of Cranston is susceptible to lightning/thunderstorms.

### Probability of Future Occurrence

Highly Likely.

### Extent (Event Magnitude)

There is no universally accepted standard for measuring the strength or magnitude of a lightning storm. Similar to modern tornado characterizations, lightning events are often measured by the damage they produce. Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a

lightning strike. A rough estimate of a structure’s likelihood of being struck by lightning can be calculated using the structure’s ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to.

**Impact and Damage Extent**

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

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

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

**Climate Change Impacts**

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

**History**

There has been no reported loss of human life in Cranston in the past 50 years due to lightning.

**Table 10 Recent History of Lightning in the Cranston Area**

Date	Comments
04/03/2002	Lightning from an isolated thunderstorm moving across Rhode Island struck a woman as she waited at a bus stop.
08/02/2002	Lightning struck a communications tower and several utility poles.

**Microbursts**

The Cranston Hazard Mitigation Committee has chosen to consider the damaging effects of microbursts separate from lightning and thunderstorms.

## Description

According to the National Weather Service, a microburst is “a localized column of sinking air (downdraft) within a thunderstorm and is usually less than or equal to 2.5 miles in diameter (a microburst is larger than 2.5 miles in diameter and lasts longer). Microbursts can cause extensive damage at the surface, and in some instances, can be life-threatening. There are two primary types of microbursts: 1) wet microbursts and 2) dry microbursts. Wet microbursts are accompanied by significant precipitation and are common in the Southeast during the summer months.”<sup>29</sup>

## Probability of Future Occurrence

Likely.

## Location

All of Cranston is susceptible to microbursts.

## Extent (Event Magnitude)

A microburst is a very local event with winds of up to 100 mph.

## Impact and Damage Extent

Minor. A sudden microburst can cause major damage to homes, buildings, utilities, and trees.

## Climate Change Impacts

Changing weather patterns may lead to more severe thunderstorms which contain microbursts.

## History

The following microbursts/macrobursts have been noted throughout the state in recent years.

- › June 2011: Cranston
- › July 2012: Cranston
- › September 2013: Warren
- › July 2015: Narragansett
- › August 2015: Warwick and Cranston

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<sup>29</sup> National Weather Service [https://www.weather.gov/bmx/outreach\\_microbursts](https://www.weather.gov/bmx/outreach_microbursts)

## Hail

### Description

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 mph. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Hail larger than 0.75 inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter. Hail causes about \$1 billion in damages annually in the U.S.<sup>30</sup>

**Table 11 Hail Size**

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

<sup>30</sup> Rhode Island Emergency Management Agency (RIEMA), State of Rhode Island 2018 Hazard Mitigation Plan Update

**Location**

All of Cranston is susceptible to hail.

**Probability of Future Occurrence**

Likely.

**Extent (Event Magnitude)**

The hail in Cranston is usually 1 inch or smaller.



**Impact and Damage Extent**

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

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

**Climate Change Impacts**

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

**History**

**Table 12 Recent History of Hail in Cranston<sup>31</sup>**

Date	Size	Comments
07/23/2008	1.75"	Ping pong to golf ball sized hail fell in Cranston. Associated with a tornado.
04/22/2010	1.00"	Penny-sized hail fell in Cranston.
06/30/2019	0.75"	Hail reported in Cranston.

<sup>31</sup> National Climate Data Center, 2018

## Drought

### Description

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



*Drought in nearby Connecticut.*

*Photo credit: Bob Luckey Jr./ Hearst Connecticut Media*

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

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

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

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

**Table 13 Drought Severity** <sup>32</sup>

Severity	Category	PDSI Index Value	Drought Level	Possible Impacts
Exceptional Drought	D4	-5 or less	Emergency	Widespread crop/pasture losses, shortages of water creating water emergencies.
Extreme Drought	D3	-4 to -4.9	Warning	Major crop/pasture losses, widespread water shortages or restrictions.
Severe Drought	D2	-3 to -3.9	Watch	Crop or pasture losses likely, water shortages common, water restrictions imposed.
Moderate Drought	D1	-2 to -2.9	Advisory	Some damage to crops/pastures, developing water shortages, voluntary water-use restrictions requested.
Mild Drought/Abnormally Dry	D0	-1 to -1.9	Normal	Short term dryness slowing planting or crop growth.
Incipient Dry Spell		-0.9 or less	–	–

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

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

### Location

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

### Probability of Future Occurrence

Likely.

<sup>32</sup> <http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx>

## Extent (Event Magnitude)

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

## Impact and Damage Extent

Minor to Major. The main impacts of meteorological drought are periods of very high fire danger and low drinking water supplies. Cranston draws its drinking water from the Scituate Reservoir as well as three wellhead protection areas. Changes in water levels can impact not only the quantity of available water but also the quality. Dangerously low water levels could restrict water availability to residents.

## Climate Change Impacts

Even though rain events may intensify due to climate change, the periods between them may be longer. Rhode Island expects longer periods of drought. According to the 2016 Rhode Island Hazard Identification and Risk Assessment, "Recent climate change studies<sup>33</sup> have indicated that although precipitation is projected to increase throughout this century, it will be in the form of short duration, intense, and less frequent events. In addition, it is projected by the Northeast Climate Impacts Assessment Group (NECIA) and the New York City Panel on Climate Change (NPCC) that most of this increased precipitation may occur during colder times of the year, such as winter, in the form of snow or ice. Furthermore, it is projected that the frequency and intensity of both long-term and short-term droughts throughout the Northeast will increase throughout the century with the impacts beginning to occur with a greater degree of frequency beginning in the mid-century (2050s)."

## History

Historically, Rhode Island has ranged from near-normal moisture conditions to moderate and severe droughts throughout the past century. Since 2000, the longest duration of drought (D1–D4) in Rhode Island lasted 36 weeks beginning on May 19, 2015 and ending on January 19, 2016. The most intense period of drought occurred the week of September 29, 2020, where D3 affected 99.21% of Rhode Island land.<sup>34</sup>

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<sup>33</sup> Information derived from two recent studies: *Confronting Climate Change in the Northeast*, by the Northeast Climate Impacts Assessment Group, July 2007, and *Climate Risk Information*, by the New York City Panel on Climate Change, 2/17/09.

<sup>34</sup> NOAA National Integrated Drought Information System <https://www.drought.gov/states/Rhode-Island> Accessed July 2021.



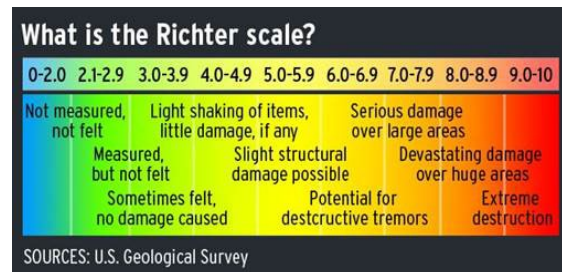
**Table 14 History of Droughts<sup>35</sup>**

Date	Area Affected	Category	Remarks
1930-31	Statewide	D1/D2	Stream flow of 70% normal.
1941-45	Statewide	D1	Stream flow of 70% normal in Blackstone and Pawtuxet Rivers.
1949-50	Statewide	D1/D2	Stream flow of 70% normal.
1963-67	Statewide	D1-D3	Water restrictions/well replacements common.
1980-81	Statewide	D1	Groundwater deficient in eastern part of state. Considerable crop damage.
1987-88	Southern part of the state	D0/D1	\$25 million crop damage.
1998-99	Statewide	D1-D3	Spring through summer the State experienced 75% of normal flow.
2012	Statewide	D2	January –April 2012. Meteorological drought due to precipitation levels one half of normal.
2016	Statewide	D2	August to November. Severe Drought due to below normal precipitation.
2020	Statewide	D3	September to November. Extreme Drought

## Earthquake

An earthquake (also known as a quake, tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. The size or magnitude is recorded on a device known as a seismograph. Earthquakes with a magnitude 3 or lower are mostly imperceptible (too low to recognize) and magnitude 7 earthquakes cause serious damage over large areas.

Although earthquakes are not considered to be a major problem in the Northeast United States, they are more prevalent than one might expect. Table 18 presents historical seismic activity for Rhode Island. It highlights the earthquake epicenter, the Richter magnitude at the epicenter, and the Mercalli Intensity Level. Richter magnitudes are technical quantitatively based calculations that measure the amplitude of the largest seismic wave recorded. Richter magnitudes are based on a logarithmic scale and are commonly scaled from 1 to 8. See the graphic below. The higher the magnitude on the



<sup>35</sup> USGS; RI Water Resources Board [http://www.wrb.ri.gov/work\\_programs\\_drought/Drought\\_Facts\\_110607.html](http://www.wrb.ri.gov/work_programs_drought/Drought_Facts_110607.html); and NOAA National Centers for Environmental Information <https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx>

Richter Scale, the more severe the earthquake. Mercalli intensity levels are based on qualitative criteria that use the observations of the people who have experienced the earthquake to estimate the intensity level. The Mercalli scale ranges from I to XII. The higher the intensity level on the scale, the closer the person is to the epicenter.

**Table 15 Mercalli Scale**

Modified Mercalli Intensity	Description of Intensity Level
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level distorted. Objects thrown into the air.

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

- › **Hard Rock:** Due to the geological makeup of New England's base rock, seismic energy is conducted on a greater scale (four (4)-10 times that of an equivalent Richter magnitude earthquake in California).
- › **Soft Soil:** Many coastal regions of New England are made up of soft soils. These soils can magnify an earthquake as much as two times.
- › **Structures:** The New England region, being one (1) of the first settled areas of the United States, has an abundance of older, unreinforced masonry structures that are inherently brittle and very vulnerable to seismic forces.

- › **Low Public Awareness of Vulnerability:** Little public recognition of earthquake threat, and no established system of educating or informing the public of the threat or how to prepare for or respond during an earthquake. Therefore, higher losses will occur here than in other regions of the country.

### **Location**

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

### **Probability of Future Occurrence**

Possible.

### **Extent (Event Magnitude)**

Damaging earthquakes do not normally occur in this region. Rhode Island is located in an area of “moderate” seismicity and “high” risk. Seismic risk applies to the seismic hazard, location demographics, and regional economics to the vulnerabilities of the structure or lifeline on the site. Seismologists have estimated that there is about a 50% probability of a very damaging magnitude 5.0 earthquake occurring anywhere in New England, in a 50-year period.<sup>36</sup>

### **Impact and Damage Extent**

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

### **Climate Change Impacts**

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

### **History**

No major earthquakes have happened in Cranston but they have occurred in the region.

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

**Table 16 Historic Seismic Activity in/near Rhode Island<sup>37</sup>**

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
10/16/1963	Coastal MA	4.5	Caused some cracked plaster (MMI V) at Chepachet, Rhode Island.
6/14/1973	Western Maine	unknown	The intensities in Rhode Island were IV at Charlestown and I-III at Bristol, East Providence, Harmony, and Providence.
03/11/1976	Near Newport, RI	3.5	Intensity level VI shock effects felt throughout Southern New England. This earthquake has the distinction of being the largest earthquake to originate in Rhode Island.
04/20/2002	Plattsburgh, NY	5.2	Intensity level II to III shock effects felt throughout Rhode Island.
03/11/2008	Central Connecticut	2.9	No data reported for Rhode Island.
06/23/2010	Ontario-Quebec	5.0	Felt throughout Rhode Island.
2011	Rhode Island	0.9	Felt locally in RI.
2012	Rhode Island	1	Felt locally in RI.
2013	Kingston, RI	Unknown	Felt locally in RI.
04/04/2013	Hope Valley, RI	1.8	Felt locally in RI.
01/12/2015	Wauregan, CT	3.3	Felt locally in RI.
07/22/2015	East Providence, RI	2.3	Felt locally in RI.
12/01/2019	Newport, RI	2.0	Felt locally in RI.
11/08/2020	Buzzards Bay	3.6	Felt locally in RI.
11/22/2020	Buzzards Bay	2.0	Felt locally in RI.

## Tornadoes

### Description

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

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

<sup>37</sup> United States Geologic Survey [http://neic.usgs.gov/neis/states/rhode\\_island/rhode\\_island\\_history.html](http://neic.usgs.gov/neis/states/rhode_island/rhode_island_history.html) and Earthquake Hazards Program "Did You Feel It" Archives.

damage. Relatively speaking, the size of a tornado is not necessarily an indication of its intensity. On August 7th, 1986, a rare outbreak of seven tornadoes occurred in New England. One such tornado, rated F2 on the Fujita Scale, carved its way through Cranston, RI, and Providence, RI, causing twenty injuries and \$2,500,000 in damages. Table 15 highlights more tornado events that have affected, Rhode Island.

**Table 17 Fujita Scale**

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

### Probability of Future Occurrence

Likely/Possible.

### Location

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

### Extent (Event Magnitude)

Historically, Cranston isn't known to be a hotbed of tornado activity. In 2018 an EF-1 tornado touched down in nearby North Providence and caused scattered tree damage and roof damage.<sup>38</sup> It is expected that future tornadoes will be 0 or 1 on the F-Scale of magnitude.

<sup>38</sup> NOAA Storm Event Database (2021).

## Impact and Damage Extent

Could cause widespread destruction. Tornadoes can cause significant damage to buildings, trees and above ground utility lines. Flying debris can be cause injuries to residents.

## Climate Change Impacts

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

## History

There is no history of tomadoes in Cranston but there have been occurrences in Rhode Island.

**Table 18 Recent Tornado Events in Rhode Island<sup>39</sup>**

Date	EF-Scale	Injuries	Damage	Location
8/16/2000	0	0	\$0	Providence County
8/7/2004	0	0	\$0	Kent County
7/23/2008	1	0	\$47,987	Bristol County
8/10/2012	0	0	\$50,000	Washington County
10/24/2018	1	0	unknown	North Providence and Lincoln
10/02/2019	0	0	\$5,000	Portsmouth, RI
11/13/2021	0/1	0	unknown	3 tornadoes in Foster, Westerly, and North Kingstown <sup>40</sup>

## Brushfire

### Description

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

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

Brushfires are dependent upon the quantity and quality of available fuels. Fuel quantity is the mass per unit area. Fuel quality is determined by a number of factors, including fuel density,

<sup>39</sup> Rhode Island Emergency Management Agency (RIEMA), State of Rhode Island 2018 Hazard Mitigation Plan Update; NOAA Storm Event Database [www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)

<sup>40</sup> <https://www.wpri.com/weather/pinpoint-weather-alerts/nws-two-confirmed-tornadoes-in-rhode-island/>

chemistry, and arrangement. Arrangement influences the availability of oxygen. Another important aspect of fuel quality is the total surface exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark and twigs, are easily ignited when dry.

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

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

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

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

### **Location**

The open fields, forested areas, and grassy areas throughout western Cranston are most at risk.

### **Probability of Future Occurrence**

Highly Likely.

### **Extent (Event Magnitude)**

Eastern Cranston is largely built out but does maintain pockets of open space in places such as parks. Western Cranston has a lot more vegetated land that can provide fuel for brushfires. While the threat of wildfires may be slim, fires could still occur under the right conditions. Brushfires average about once per year with a burn area of generally one acre. The extent has decreased over the years due to better response equipment, faster response time, and the widespread use of cell phones used to report fires. However, the wildland-urban interface is growing, potentially putting more infrastructure and lives at risk.

### **Impact and Damage Extent**

Minor. Individual buildings may be more or less vulnerable to damage from brushfires based on factors such as the clear distance around the structure and the structure's construction materials. Brushfires primarily impacts timber and forest ecosystems, although the threat to nearby buildings is always present.

The likelihood of brushfires occurring and having widespread impacts has decreased over the years as fields and wooded areas are taken over by development.

### Climate Change Impacts

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

### History

There have been no significant brushfires in the past 25 years in Cranston.

## Dam Failure

### Description

Dams are classified as high hazard, significant hazard or low hazard. The classification is not based on whether a dam is deemed safe or unsafe. As of 2020, there are 95 high hazard dams, 81 significant hazard dams and 493 low hazard dams in the state.<sup>41</sup> Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted.

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

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

### Location

In 2020, RIDEM identified 22 dams in the City of Cranston however none are owned by the City. The high hazard and significant hazard dams located in Cranston are:

- › Clarke's Pond Upper (high hazard)- privately owned
- › Cranston Print Works (high hazard)- privately owned
- › Curran Lower Reservoir (high hazard)- owned by RIDEM

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41 2020 Annual Report to the Governor on the Activities of the Dam Safety Program. [STATE OF RHODE ISLAND, RIDEM, Office of Compliance and Inspection, Dam Report 2019](#)



- › Curran Upper Reservoir (high hazard)- owned by RIDEM
- › Stone Pond (high hazard)- privately owned
- › Meshanticut Park Pond (significant hazard)- owned by RIDEM

### **Probability of Future Occurrence**

Likely.

### **Extent (Event Magnitude)**

The extent of a failure would vary. The Cranston Hazard Mitigation Committee has identified failure as a break in the dam, sending water downstream.

### **Impact and Damage Extent**

Minor. The Cranston Hazard Mitigation Committee recognizes that a dam failure is not a natural hazard in itself but several of the hazards listed in the hazard list could bring dam failure upon the City of Cranston. Severe winter storms, flooding, and a hurricane could all bring enough rain and or snowfall to cause a dam failure. The age of these nearby dams also poses a risk to their structural integrity.

### **Climate Change Impacts**

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

### **History**

There is no history of dam failure in Cranston in the recent past.

## **Coastal Erosion**

### **Description**

Erosion is the gradual wearing away of the land. Although this can happen along rivers and streams, for the purpose of this Hazard Mitigation Plan, erosion will focus on coastal erosion as a hazard.

Coastal zones are dynamic areas that are constantly undergoing change in response to a multitude of factors, including sea level rise (SLR), wave and current patterns, hurricanes, coastal flooding and human influences. High winds and associated marine flooding from storm events such as hurricanes, nor'easters, flooding, and sea level rise, increase the risk exposure along developed coastal lands.

## Location

The city of Cranston is relatively protected from this hazard by its location in the low energy environment of the upper bay and due to the fact that 90% of its shoreline has been hardened; but it is not immune. Stillhouse Cove on the eastern shore of Cranston is the largest coastal area without shoreline armoring. Its shoreline is about 0.3 miles long. Residential structures are located landward of Narragansett Boulevard which runs adjacent to Stillhouse Cove.

## Probability of Future Occurrence

Possible.

## Extent (Event Magnitude)

Historical rates of erosion are unavailable but due to the hardened shoreline in Cranston, and the small area exposed to the coast, the event magnitude is expected to be small.

## Impact and Damage Extent

Minor. Most properties in Cranston are protected from mild coastal erosion because they are behind a hardened shoreline structure. Those that aren't located landward of a road are thusly protected from seasonal erosion.

## Climate Change Impacts

Cranston expects erosion to be a growing concern as storms become more intense and sea levels rise.

## History

There is no history of coastal erosion; most of shoreline is protected by seawalls or rock.

# Climate Change

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

- › Heavier, more frequent precipitation events, which may cause more riverine flooding, street flooding, and flash flooding events.
- › Longer periods of drought which may affect water availability and increase the threat for wildfires.
- › More frequent high heat days and heat waves.

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

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

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# 4

## Risk Assessment

### Facilities/Resources Inventory

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

- › Flood prone drainage systems, streets, or infrastructure
- › Bridges
- › Wastewater facilities
- › Water supply systems
- › Other services/utilities
- › Public communication equipment
- › Dams
- › Critical municipal hazard response facilities
- › Populations
- › High density residential properties within the floodplain
- › Businesses
- › State facilities
- › Schools within the floodplain
- › Recreational facilities
- › Natural resources
- › Historic resources

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

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

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

## Hazard Mitigation Mapping

The City's GIS database, including parcel data, orthophotography and FEMA flood zone information, were utilized to complete the assessment. The use of this system allowed the HMC to estimate potential fiscal and population impacts for individual parcels.

The facility inventory has remained largely unchanged since the 2014 Hazard Mitigation Plan. The final output of this exercise is the City of Cranston Community Assets Map in Appendix C. The focus of the maps is not to duplicate all of the spatial information generated through the inventorying process but rather to present the location of the identified risks as they relate to the City's response facilities.

## Fiscal Impact Analysis

Although wind and heavy snow can certainly rack up substantial damages, flooding is one of the hazards that most frequently affects area populations. The City of Cranston's parcel data and FEMA's 1% annual chance floodplain data were utilized to generate estimates of potential fiscal impacts from natural hazard events such as flooding. The information utilized from the tax assessor's database and GIS included the improvement values, land usage, and unit counts. The analysis showed that Cranston is comprised of 18,507 acres of land (30 square miles), with nearly 1,110 acres in the regulatory floodplain. These 1,110 acres of land are spread throughout eight geographic areas of the City. Six of these geographic areas include properties along and within the following six flood plains: Pocasset River, Pawtuxet River Main Stem, Meshanticut Brook, Furnace Hill Brook, Spectacle Pond, and Spring Lakes. The final two geographic areas are the two neighborhoods of Pawtuxet Village and Edgewood, which are within the coastal flood zone.

HAZUS-MH is a software tool that contains models for estimating potential losses from earthquakes, floods, and hurricanes. HAZUS-MH was used to further understand the potential risk from a large hurricane. For the purpose of this plan, a scenario was run that capture the city's risk from hurricane damage. The table below summarizes some of the potential damages. The hurricane scenario model uses the same path as Hurricane Carol in 1954 which tracked west of Cranston.

In 1954 Hurricane Carol (Category 1, peak gusts at 95 mph) tore through Southern New England, causing extensive damage throughout Rhode Island. If this same storm were to strike again today, wind damage alone would cause over \$133 million dollars in total

economic losses (property damage and business interruption loss) in Cranston.<sup>42</sup> About 405 buildings are expected to be at least moderately damaged.<sup>43</sup>

**HAZUS Qualitative Damage Description**

- › No Damage or Very Minor Damage
- › Little or no visible damage from the outside. No broken windows, or failed roof deck.
- › Minimal loss of roof over, with no or very limited water penetration.

**Minor Damage**

- › Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.

**Moderate Damage**

- › Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water

**Severe Damage**

- › Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.

**Destruction**

- › Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.

**Table 19 HAZUS-MH Scenarios for Cranston, RI**

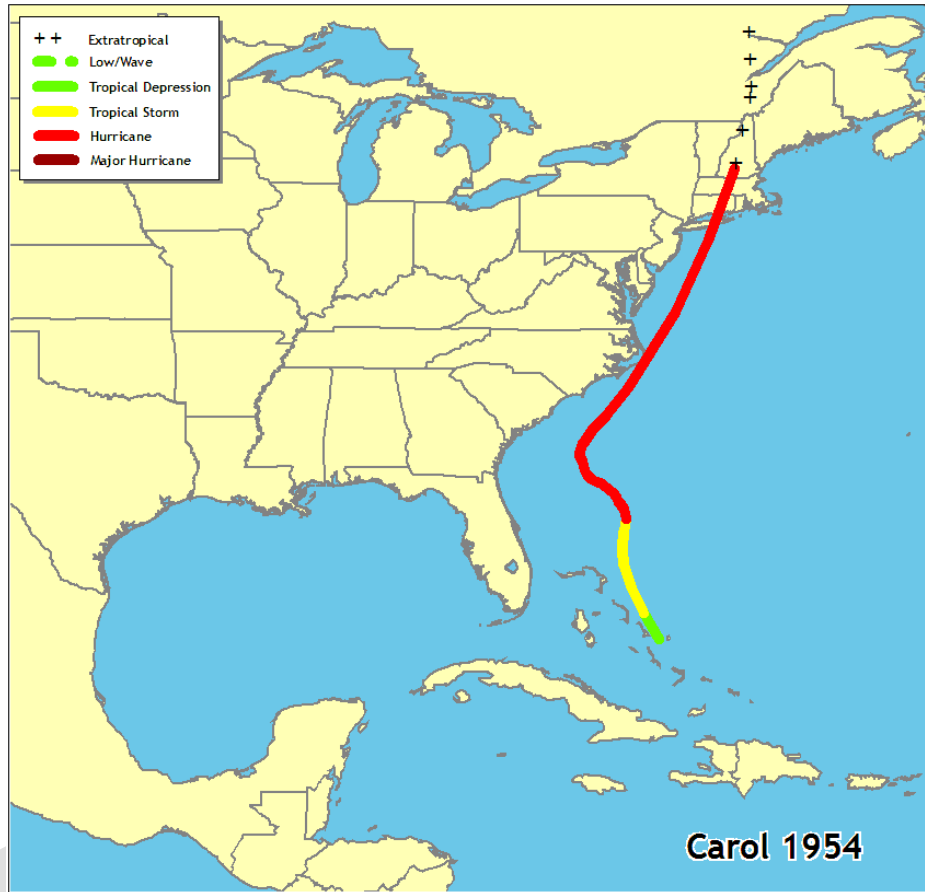
**1954 Hurricane Carol Scenario – If It Happened Today**

<b>Estimated Damage</b>	<b>Amount</b>
Debris generated	29,901 tons
Buildings destroyed	4
Buildings at least moderately damaged	405 (over 1% of total number of buildings)
Displaced households	135 households may be displaced. 81 people out of a population of 80,387 will seek temporary shelter in public shelters.
Essential Facility Damage (fire, police, schools)	54 facilities would expect to be non-operational for less than a day.
Residential Property (capital stock)	\$113,185,060
Business interruptions	\$9,168,620

<sup>42</sup> 2014 dollars.

<sup>43</sup> A representative analysis. No particular buildings are identified.

Figure 4 Hurricane Carol Path



During non-cyclone events, flooding can still impact the City. Table 20 displays potential damage estimates of property values of buildings within the City’s Special Flood Hazard Area (SFHA), or regulatory floodplain. The parcel information, using the best available data, provides the number of parcels in the SFHA, and values of the buildings on each property. Land value was not considered for this exercise. The values provided are an estimate considering some properties are located in more than flood zone. This percentage was calculated in order to assist with identifying which areas are at greater risk. According to Table 24, the city-wide total potential building damages for these floodplain areas are nearly \$300 million.

Approximately 60% of Cranston’s revenue is generated from real estate taxes.<sup>44</sup> Should any of the properties forming the tax base be destroyed by a hazardous event, a causal effect would be those property owners whose parcels remain intact would carry and increased

44 City of Cranston, Proposed 2021-2022 Municipal Budget <https://www.cranstonri.gov/mayor-kenneth-j-hopkins-budget-address/>

financial burden with regards to property taxes. It is an important course of action for the City to protect both lives and property from natural disasters.

Using data from the E-911 structure data from the RI Geographic Information System (RIGIS) and information from the Cranston Tax Assessor, the following table summarizes the value of the building improvements (building value, not including land value) that are located within the Special Flood Hazard Areas. The floodplain designation for the parcel was determined by the location of the property structure.

**Table 20 Property Values of Parcels with Structures in Special Flood Hazard Areas by Flood Zone<sup>45</sup>**

Flood Zone	# of Parcels	Total Acres	# Structures By Types	Building Improvement Value
VE	17	41	11 Residential 1 University 4 Government	\$15,138,300
AE	689	390	574 Residential 53 Commercial 57 Industrial 34 Government	\$274,583,800
A	1	0.1	1 Residential	\$150,800
<b>TOTAL</b>	<b>707</b>	<b>431</b>		<b>\$289,872,900</b>

**Table 21 Property Values with Structures in Special Flood Hazard Areas by Land Use Type<sup>46</sup>**

Land Use Type	# of Parcels	Total Acres	Building Improvement Value
Residential	586	218	\$132,947,500
Commercial	54	35	\$26,143,200
Government <sup>47</sup> (Federal/State/Municipal)	8	178	\$412,405,700
Industrial	59	113	\$118,376,500
<b>TOTAL</b>	<b>707</b>	<b>431</b>	<b>\$289,872,900</b>

<sup>45</sup> Based on RIFIS e911 Sites, FEMA 2015 Flood Insurance Rate Maps, and 2021 parcel information from the City. Accuracy of the data was not verified. This data is to be used for planning purposes only to provide estimate values.

<sup>46</sup> May include some accessory structures that are in adjacent parcels, forcing the counts, but not the values.

<sup>47</sup> Includes 1 University property



## Built Environment

According to HAZUS-MH, Cranston has over an estimated 27,000 buildings with a total replacement value (excluding contents) of \$10.8 billion (2014 dollars). Approximately 90% of the buildings and 71% of the value are associated with residential housing.

Using the Rhode Island GIS e911 structure file, and the City’s GIS, it was determined that there are total of 736 structures within 707 parcels that are located in City’s Special Flood Hazard Areas.

There are 344 flood insurance policies in place for a municipality that has 736 buildings in the regulatory floodplain (VE, AE, and A-zones). In the lower risk X-zones, 177 policies are in place, just in case it floods. These polices are more affordable than those in the A-Zones.

The City also has 86 properties which have had multiple flood claims filed. These are categorized as either a repetitive loss or severe repetitive loss property. A repetitive loss property is defined as an NFIP-insured structure that has had at least 2 paid flood losses of more than \$1,000 each in any 10-year period, since 1978, while a severe repetitive loss property is defined as a residential property that is covered under an NFIP flood insurance policy and: (a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

**Table 22 Flood Insurance Information<sup>48</sup>**

<b>Total Number of Policies</b>	344
<b>Total Premiums</b>	\$205,584
<b>Insurance in Force</b>	\$52,194,200
<b>Total Number of Closed Paid Losses</b>	507
<b>\$ of Closed Paid Losses</b>	\$14,684,432.20
<b>Repetitive Loss Properties</b>	80 (70 residential, 10 nonresidential)
<b>Severe Repetitive Loss Properties</b>	6 (3 residential and 3 nonresidential)
<b>Number of Policies in Each Zone:</b>	
<b>Zone</b>	<b>Policies</b>
A-Zone	0
AE-Zone	167
VE-Zone	0
X-Zone (Standard)	177
X-Zone (Preferred) <sup>1</sup>	0

<sup>48</sup> As per the RIEMA Risks and Hazard Planner 2/09/2022

1 Preferred Risk Policies (PRP) are more affordable policies cover structures that were built in an X zone but due to new mapping, are now located in a Special Flood Hazard Area.

Areas that didn't used to flood are now more vulnerable as riverine flood intensity and frequency increases. While the City has been encouraging more resilient re-development many vulnerable areas remain unprepared to face a storm of any significance.

Tables 20-22 display potential damage estimates of property values of parcels with structures that are located within the City's Special Flood Hazard Area. The only limitation noted, using the best available data, is that the tax assessor database does not reflect the current market value of real estate.

Table 22 was calculated in order to assist with identifying which areas are at greater risk. As reflected in the table, the areas with the largest number of parcels in floodplains are the Pocasset River (63%), and the area of the Furnace Hill and Meshanticut Brooks (26.3%).

Although the properties in the SFHA associated with the Pawtuxet River are fewer and smaller, the cost to rebuild lost structures is high at over \$92 million.

**FEMA A-Zone vs. AE-Zone**

Both are considered Special Flood Hazards Areas- areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage.

**AE Zone:** Base Flood Elevations (BFEs) are provided on the FEMA maps. Formerly A1-A30 numbered zones.

**A Zones:** Detailed studies have not been conducted which indicate depth or base flood elevation.

**Table 22 Location of Properties in the Special Flood Hazard Area**

Natural Resource	# of Parcels	% of Total	Total Acres	Building Improvement Value
Pocasset River	443	63%	193	\$127,343,000
Furnace Hill and Meshanticut Brooks	186	26%	138	\$45,508,000
Stillhouse Cove/Providence River	48	7%	48	\$24,103,600
Pawtuxet River	29	4%	52	\$92,767,500
Deep Spring Lake (Providence)	1	0.1%	0.1	\$150,800
<b>TOTAL</b>	<b>707</b>	<b>100%</b>	<b>431</b>	<b>\$289,872,900</b>

The HMC has identified critical infrastructure listed in the Community Asset Matrix (Table 22). The list includes flood prone drainage systems, streets or infrastructure; bridges; wastewater; water supply; services/utility facilities; public communication equipment; dams; critical municipal hazard response facilities; populations; businesses; schools; recreational facilities; and historic resources. All of these important community resources have the potential to be affected by natural disasters. The magnitude of the losses would be dependent upon the type, location, and extent of each unique hazard.

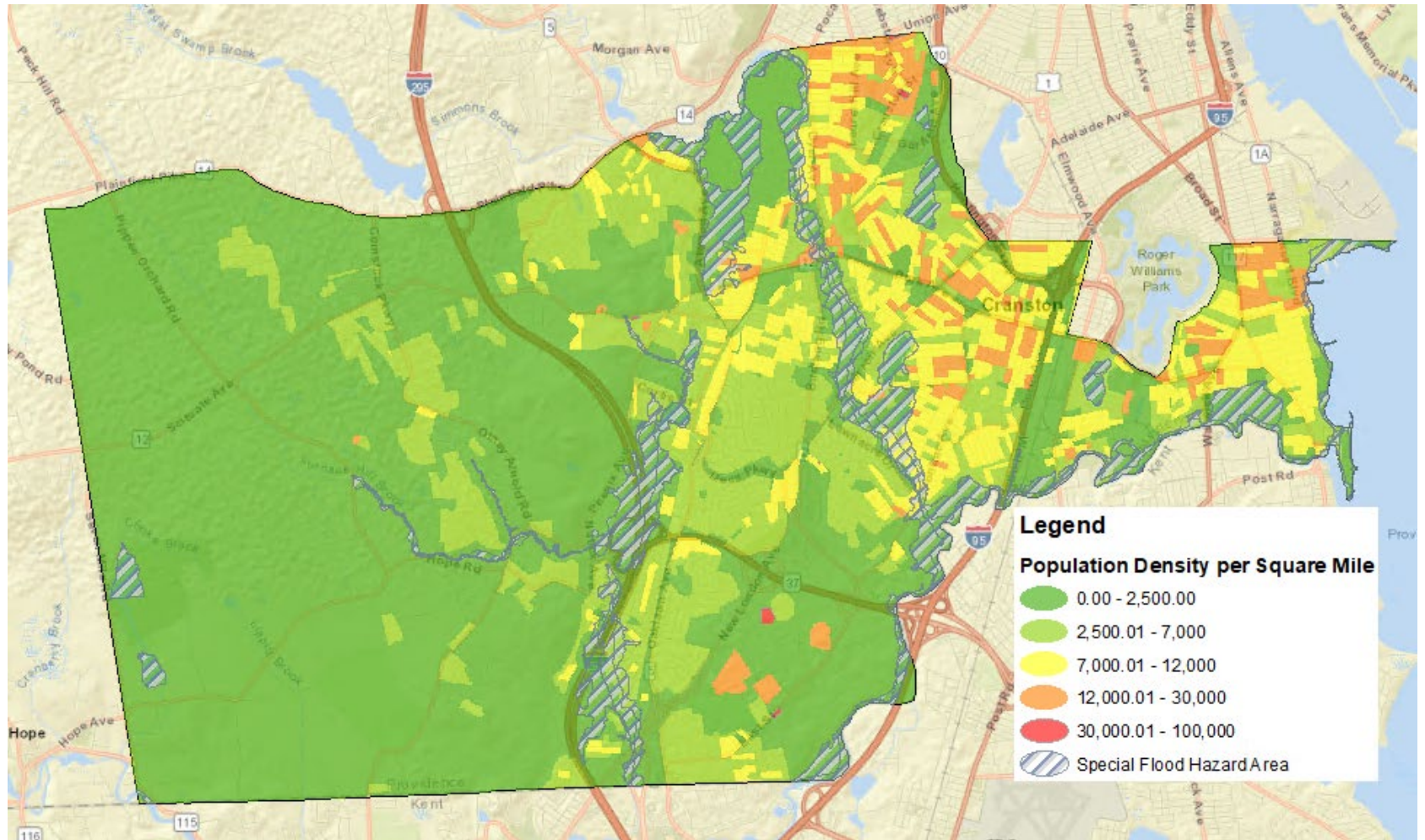
The City's zoning laws help dictate future development in Cranston. Continued enforcement of Rhode Island State building codes and new regulations as required will lessen potential damage caused by a natural hazard event. The codes adopted by the City of Cranston range from building codes and design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

## Population Impact Analysis

Of primary concern during a hazard event is protecting the health and safety of Cranston residents. In addition to knowing the total and seasonal population, it's also important to estimate how many people would be impacted by loss of service or need to evacuate. According to the 2020 American Community Survey 5-Year Estimates, there are 33,284 housing units in Cranston supporting a population estimate of 81,252. The population in Cranston is generally clustered in the eastern part of the City near Providence. The 2010 Population data was used in Figure 5 to estimate the most densely populated areas based on the best available data.

A significant hazard can significantly cripple the City. In addition to direct damage to personal property, impacts can include the disruption of vital services, the loss of utilities, and the emotional strain from financial and physical losses. This is especially jarring when residents are forced to evacuate their homes.

Figure 5 Population Density of Cranston



## Natural Environment

The natural resources of Cranston serve critical functions for the environment as well as to provide recreation and scenic vistas. Some of the critical natural resources include:

- › Rivers
- › Ponds
- › Wetlands
- › Forests
- › Farmlands
- › Contiguous open space

The biggest threats to the natural environment in Cranston are non-point source pollution, point source pollution, and existing development patterns. While the eastern part of the City is largely built-out, the development pressures are extending westward.

Severe weather events can impact the natural environment and include loss of habitat, damage to trees, threats to ecosystems/ species, and contamination of potable water supply.

In Western Cranston, the City has been acquiring parcels to retain their current use as farm or forest. This adds to the diversity of protected and natural resources in western Cranston.

The Cranston 2012 Comprehensive Plan outlines a series of programs and strategies to help resolve future and existing issues with natural resources. A few examples include:

- › Adopt watershed management plans to reduce non-point source pollution.
- › Develop a comprehensive septic system management program.
- › Continue to implement the open space preservation strategy for Western Cranston.
- › Develop management programs for specific water bodies in order to improve water quality and foster increased recreational use.
- › Create restoration plans for the banks of the Pocasset and Pawtucket rivers where roadways and development have degraded the rivers.

Since 2012, the City continues to promote open space preservation in Western Cranston and address non-point source pollution and water quality at Spectacle Pond.

## Vulnerability of Future Structures

A preliminary buildout analysis produced by the Cranston Planning Department projects that the potential exists for an additional 2,760 residential, 231 commercial, and 84 industrial units to be constructed within the city over the years to come.<sup>49</sup> Whereas all of these may be

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<sup>49</sup> A new buildout analysis is currently underway in coordination with an updated Comprehensive Plan.

at risk to hazards such as earthquakes, hail, hurricanes, lightning, tornados, severe winter storms, high wind events and thunderstorms; the possibility does exist for 551 residential, 21 commercial, and 9 industrial units to be developed specifically within flood zones. The HMC has reviewed the buildout analysis and has determined that, given the significant downturn in the economy since 2010, the assumption and conclusions of the buildout analysis remain unchanged.

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

## Future Vulnerability

As climate conditions change, increased storm intensity or frequency coupled with rising sea level may put considerable stress on the infrastructure and population in Cranston. Drainage infrastructure may be overwhelmed more often during more intense rain events. Urban areas such as Eastern Cranston has more impervious surfaces, intensifying the flood risk. Fire hydrants, pump stations, and sewer and water lines will be stressed or inaccessible by the rising streams. Residents in areas that are not used to flooding may see flood waters inch closer to their property.

Longer periods of elevated heat during the summer will cause increase stress on vulnerable populations including the elderly, disabled, and those that do not have access to cooling.

## Community Assets Matrix

The matrix (Table 23): Critical Infrastructure/Community Assets represents the culmination of the risk assessment process and is the final product. Its purpose is to gather all the pertinent results in one place for ease of presentation and to serve as a starting point for discussion of specific mitigation actions. It not only lists the specific areas of concern, but provides detailed location information, summarizes the applicable hazard, problem, and mitigation benefits

DRAFT

**Table 23 Cranston Critical Infrastructure/Community Assets**

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
<p><b>Flood Prone Drainage Systems, Streets, or Infrastructure</b></p>	<p><u>Pocasset River Floodplain</u></p> <ol style="list-style-type: none"> <li>1. Fletcher Avenue Industrial Park Area - Regularly floods from Plainfield Pike (State Highway), southerly along Fletcher Avenue to approximately Tabor Street including bridge number 8101</li> <li>2. Lower Eden Park Neighborhood - Area of concern lies between Reservoir Avenue and Pontiac Avenue northeast of the Pocasset River including Davis Court, Autumn Street, and Fordson Avenue.</li> <li>3. Garden City Neighborhood - Area of concern lies primarily along Lawnacre Drive between Reservoir Avenue (State Highway) and Pontiac Avenue (State Highway) on the southerly section of the Pocasset River including bridge numbers 2301, 20101, and 75801.</li> <li>4. Garden City Center- Specifically Midway Road behind Garden City Center, Hillside Road which runs through the northern portion of the mall area, and the retail area between Route 2 (Reservoir Ave.) and Midway Road which sits lower than Route 2 experience flooding from street runoff.</li> <li>5. Upper Eden Park Neighborhood - Area of concern lies between Reservoir Avenue (State Highway) and Pontiac Avenue (State Highway), northeast of the Pocasset River including Aqueduct Road, Delway Road, Interavale Road, and Longway Road.</li> <li>6. Park Avenue Area - Floods in the vicinity of Old Park Avenue including bridge numbers 48001 and 49401.</li> <li>7. Cranston Print Works Area - Area of concern is bounded by the Pocasset Cemetery to the north, Dyer Avenue to the east, the Dyer Avenue Industrial Park to the south and Southern Street to the west including bridge number 99501.</li> <li>8. Pontiac Avenue Area – The apartment complex located at 825 Pontiac Avenue.</li> <li>9. Zinnia Drive Area – In 500-year flood plain. Drainage system suffers flash floods and includes the Greylawn trucking depot downstream. Ties into State system on Pontiac Avenue before discharge into the Pocasset</li> </ol>	<p>Hurricane/Nor’easters Flooding</p> <ul style="list-style-type: none"> <li>• Development in natural drainage areas</li> <li>• System cannot handle intense short rainfalls, esp. during high tides. Soils are poor for infiltration (clay).</li> <li>• Incremental infill (such as driveways) slowly reduces impervious surfaces</li> </ul>	<p>Residential buyouts in Pawtuxet River floodplain</p> <p>Drainage improvements at Lodge and Abbott (Meshanticut Brook), and Fordson (Pocasset River)</p> <p>Pocasset River: NRCS to buyout Eastland foods and other industrial/commercial sites off Reservoir Ave. \$48 million grant (w the Town of Johnston).</p> <p>Pocasset River: NRCS has funded a project for buyouts and floodwall off Reservoir and Willowbrook apartments.</p> <p>Beaver dam removal within the Meshanticut Brook Culvert System.</p> <p>Enhanced maintenance of drainage in Auburn Street/Garden Street Area.</p> <p>Dam downstream of Elmwood Ave and Pawtuxet River has been lowered, improving drainage.</p> <p>Prepared to respond to MS4 permits when due.</p> <p>Require erosion and sediment control plans for development.</p>	<ol style="list-style-type: none"> <li>1. Address ongoing flood issues at Wedge Street.</li> <li>2. Continue buyouts along Meshanticut and Pawtuxet Rivers.</li> <li>3. Complete hydraulic mapping of the stormwater drainage system.</li> <li>4. Improve stormwater education.</li> </ol>



At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	<p>River. Poplar Circle and Dellwood Drive which are upstream of Zinnia Drive also suffer from flash flooding. This entire area located to the east of the mall is part of the Garden City shopping center watershed.</p> <p><u>Meshanticut Brook Floodplain</u></p> <ol style="list-style-type: none"> <li>1. Meshanticut Area - Primary area of concern is the flooding that occurs on Wilbur Avenue including Burdick Drive, Redfern Drive, Amanda Court, Amanda Street, Rodel Street, Clay Street, Warren Avenue, Ellison Street, and Benjamin Avenue, including bridge numbers 42401 and 2401, and culvert number 81901.</li> <li>2. Meshanticut Brook Culvert System - This is the largest culvert system in the City of Cranston (owned by the State) and is located beneath Interstate 295 and Route 37, and includes culvert numbers 81221, 81401, 81421, 81501, 81601 and 81701.</li> <li>3. Wedge Street – In 100-year flood plain. Drainage system suffers from flash flooding. Connected to Oaklawn Avenue, Dean Parkway watershed area. Oaklawn Avenue and Dean Parkway are State drainage systems.</li> </ol> <p><u>Furnace Hill Brook Floodplain</u> - Natick Avenue floods in the vicinity of Furnace Hill Brook including bridge number 42401, a bridge on Phenix Avenue and a bridge on Hope Hill Terrace, and culvert number 81801.</p> <p><u>Pawtuxet River Floodplain (Main Stem)</u></p> <ol style="list-style-type: none"> <li>1. Elmwood Area - Floods occur on Wellington Avenue including bridge number 101, specifically in the vicinity where the Amtrak main line bridge crosses over the Pawtuxet River and intersects with Elmwood Avenue (State Highway).</li> <li>2. Parkview Area - Floods occur at Perkins Avenue including bridge numbers 15001 and 19001, a private footbridge and private abandoned bridge on Mill Street.</li> </ol> <p><u>Pawtuxet Coastal Flood Zone</u> - Floods occur at Ocean Avenue after the intersection with Commercial Street, and on Narragansett Boulevard in the vicinity of Stillhouse Cove.</p>		<p>Capture rainwater on single family houses into galleys depending on topography. Requiring developers to construct on-site retention basins for excessive stormwater and as a firefighting water source.</p> <p>Used stream restoration to ensure adequate drainage and diversion of stormwater.</p>	

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	<p><u>Auburn Area</u> - Garden Street has a flash flooding drainage issue before intersection at Laurens Street. Connected to State Route 95 system with final discharge to Fenner Pond.</p>			
<p><b>Bridges</b></p>	<p>Oaklawn Bridge at Wilbur Avenue Elmwood Bridge Park Ave Bridge</p>	<p>Hurricane/Nor'easters Flooding Winter Storms Tornadoes Earthquakes</p>	<p>Ongoing improvements to RIDOT-owned bridges.</p>	<p>None at this time.</p>
<p><b>Wastewater</b></p>	<p>Pettaconsett Sewage Treatment Facility -Pettaconsett Avenue (A.P. - 10/2 Lot 27)</p> <p><u>Pumping Stations within Flood Plain</u></p> <ol style="list-style-type: none"> <li>1. Allard Pumping Station – Historically has flooded. 85 Allard Street.</li> <li>2. Randall Street Pumping Station – Historically has flooded. 176 Randall Street.</li> <li>3. Seaview Avenue Pumping Station – Pumping station within velocity zone. 85 Seaview Avenue</li> <li>4. Bay View Avenue Pumping Station – 9 Bay View Avenue.</li> <li>5. Dyer Avenue Pumping Station - 399 Dyer Avenue.</li> <li>6. Hollow Tree Pumping Station – 1771 Pontiac Avenue.</li> <li>7. Howard Pumping Station – 103 Kenney Drive.</li> <li>8. Sheldon Street Pumping Station – 115 Sheldon Street.</li> <li>9. Sherman Avenue Pumping Station – 90 Sherman Avenue.</li> <li>10. Woodbury Road Pumping Station - 110 Woodbury Road.</li> <li>11. Worthington Road Pumping Station – 54 Worthington Road</li> <li>12. Youlden Avenue Pumping Station - 7 Youlden Avenue</li> <li>13. Pontiac Pumping Station – 900 Pontiac Ave</li> <li>14. Mayflower Pump Station – 140 Mayflower Dr.</li> </ol>	<p>Flooding (riverine)</p>	<p>Planned Improvements to Pump Stations:</p> <ul style="list-style-type: none"> <li>• Allard Street</li> <li>• Burnham Avenue</li> <li>• Mayflower Drive</li> <li>• Pontiac Avenue</li> <li>• Randall Avenue</li> <li>• Seaview Avenue</li> <li>• Worthington Road</li> <li>• Youlden Avenue</li> </ul>	<ol style="list-style-type: none"> <li>5. Rebuild the Mayflower, Howard, and Plainfield pump stations and elevate pump station generators.</li> </ol>
<p><b>Water Supply Systems</b></p>	<p><u>Public Drinking Water System</u> – The area bounded by Plainfield Pike to the north, Town of West Warwick to the south, Interstate 295 to the east, and Seven Mile Road to the west. This system is now privately owned by Providence Water and Kent County Water Authority</p>	<p>Extreme Heat Drought</p>		<p>None at this time.</p>

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
<b>Other Services/Utilities</b>	Gatehouse Metering Station - 65 Laten Knight Road Tennessee Valley Gas Transmission <u>General Transmission Lines</u> Substations 1. Well Avenue Substation - Well Avenue (A.P. - 5/3 Lot 2538). 2. Huntington Park Substation - Corner of Kenwood Street and Niantic Avenue (A.P. - 7/2 Lot 2581). 3. Knightsville Substation - Corner of Park Avenue and Palmer Street (A.P. - 11/2 Lot 1754). 4. Pontiac Substation - End of Ross Simon Drive (A.P. - 13 Lot 44). 5. West Cranston Substation - Laten Knight Road approximately 500' west of Pippin Orchard Road (A.P. - 28 Lot 47). 6. Elmwood Substation – 510 Wellington Avenue (A.P. – 3/3 Lot 508).	Hurricane/Nor'easter High Winds	Emergency Action Plans in place.	6. Coordinate with National Grid on more frequent tree trimming around powerlines.
<b>Communication Equipment</b>				7. Assess and make upgrades throughout the City's Information Technology System.
<b>Dams</b>	A. Angell's Pond B. Arrow Lake #1 C. Arrow Lake #2 D. Clarke's Pond Upper #373 (high hazard)- Lois Labrie E. Clarke's Pond Lower F. Colvin Pond G. Cranston Print Works Pond (high hazard)- Private H. Curran Lower Reservoir (high hazard)- RIDEM I. Curran Upper Reservoir (high hazard)- RIDEM J. Fedorowicz farm pond K. Judge Farm Pond L. Marsella Farm Pond M. Meshanticut Park Pond (significant hazard)- RIDEM N. Pawtuxet Reservoir Lower O. Pettaconsett	Flooding	Dam Safety Plan on file for Cranston Print Works Pond.	No new actions at this time.

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	P. Powers Pond Q. R.I. Printworks Pond R. Sargent's Pond S. State Prison Upper T. Stone Pond (high hazard)- Private U. Wood's Mill Pond V. Confreda			
<b>Critical Municipal Hazard Response Facilities</b>	<p><u>Municipal Offices</u></p> <ol style="list-style-type: none"> <li>1. Cranston City Hall - 869 Park Avenue</li> <li>2. Cranston Fire Department Headquarters/ Cranston Emergency Management Agency Headquarters - 301 Pontiac Avenue.</li> <li>3. Cranston Police Station –5 Garfield Avenue.</li> <li>4. Cranston Public Works Garage – 929 Phenix Avenue.</li> <li>5. Cranston Building Inspection and Engineering Department – 35 Sockanosset Ave.</li> </ol> <p><u>American Red Cross Approved Emergency Shelters</u></p> <ol style="list-style-type: none"> <li>1. Cranston Senior Services Center – 125-person capacity, 1070 Cranston Street.</li> <li>2. Western Hills Middle School – 250-person capacity, 400 Phenix Avenue.</li> <li>3. Park View Middle School – 378-person capacity, 25 Park View Boulevard.</li> <li>4. Hope Highland Elementary School – 1555 Scituate Avenue.</li> <li>5. Peter Pastore Youth Center – 155 Gansett Avenue.</li> </ol> <p><u>Ocean Avenue - Narragansett Boulevard Evacuation Route</u></p>	All Hazards  Continuity of operations	Replaced generators.  Improved energy efficiency.  New generators at Park View.  Schools undergoing major capital expansions.	<ol style="list-style-type: none"> <li>8. Three aging fire stations need to be relocated into larger facilities to safely accommodate equipment and staff.</li> </ol>
<b>Populations</b>	<p><u>Public/Assisted Senior Housing</u></p> <ol style="list-style-type: none"> <li>1. Randall Manor - 175 Mathewson Street - 168 units</li> <li>2. Jennings Building - 125 Harris Avenue 152 units</li> <li>3. Arlington Manor - 50 Birch Street - 151 units</li> <li>4. Knightsville Manor - 85 Briggs Street - 99 units</li> <li>5. Hall Manor - 70 Warwick Avenue - 79 units</li> <li>6. Budlong Manor - 100 Arthur Street - 71 units</li> </ol>	All Hazards  Public safety and health	Requested more Evacuation route signage in Summer 2021.	<ol style="list-style-type: none"> <li>9. Develop public education and outreach programs on disaster mitigation and preparedness.</li> </ol>

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	<p><u>Private Housing</u></p> <ol style="list-style-type: none"> <li>1. Scituate Vista – private/assisted senior housing – 125 Scituate Vista Drive - 233 units</li> <li>2. Meshanticut Vista – private/assisted senior housing - 225 New London Avenue 99</li> <li>3. Park Avenue Apartments – private/assisted housing - 315 Park Avenue - 71 units</li> <li>4. Victoria Court - private/assisted senior housing - 55 Oaklawn Avenue - 43 units</li> <li>5. Harris House - private/assisted senior housing - 28 Harris Avenue - 60 units</li> <li>6. Scandinavian Retirement Home - private/assisted senior housing - 50 Warwick Avenue - 35 units</li> <li>7. New Life Estates, Inc – private handicapped housing -20 Phenix Avenue – 12 units</li> </ol> <p><u>Private Nursing Homes</u></p> <ol style="list-style-type: none"> <li>1. Cedar Crest – private nursing facility - 125 Scituate Avenue - 99 units</li> <li>2. Cra-Mar – private nursing facility -575 Seven Mile Road - 40 units</li> <li>3. Scandanavian Home – private nursing facility - 1811 Broad Street - 30 rooms with 130 beds</li> </ol>			
<p><b>High Density Residential Properties within the Floodplain</b></p>	<ol style="list-style-type: none"> <li>A. Willow Brook Apartments - 825 Pontiac Avenue - 252 units</li> <li>B. Riverbend Apartments - 575 Dyer Avenue - 168 units</li> <li>C. Johnson and Wales Hospitality Center – 1150 Narragansett Boulevard - 134 units</li> <li>D. Pocasset Apartments - 941thru 945 Dyer Avenue -120 units</li> <li>E. Garden Village Apartments - 935 Pontiac Avenue -95 units</li> <li>F. Western Hills Village Apartments - 2 thru 7 Western Hills Lane - 84 units</li> <li>G. Farmington Terrace Apartments - 151 Farmington Avenue - 56 units</li> <li>H. Riverview Acres Apartments - 130 Fordson Avenue - 48 units</li> <li>I. Rosedale Landing s - 1180 Narragansett Boulevard - 34 units</li> <li>J. King Philip Arms Apartments - 2015 Broad Street - 24 units</li> </ol>	<p>Flooding</p>	<p>Fordson Avenue improved to reduce flooding.</p> <p>Pontiac Avenue improved to reduce flooding.</p> <p>NRCS wants to do sweeping buyouts. There are no engineering solutions and no funds available.</p> <p>Seeking partnering opportunities with NRCS for buyouts.</p>	<p>No new actions at this time.</p>

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	K. Aqueduct Apartments - 292 Aqueduct Road - 17 units L. Harbor Apartments - 1224 Narragansett Boulevard - 11 units M. Belleview Apartments - 100 Arcadia Avenue - 8 units N. Conetta’s Trailer Park - 443 Dyer Avenue - 20 trailers O. Boulevard - 148 Student units/576 beds P. Springfield Apartments - 100 Elena Street - 216 units. <i>Not in a floodplain but part of foundation is situated on a rock wall revetment.</i>			
<b>Businesses</b>	Edgewood Yacht Club - 1 and 3 Shaw Avenue Pawtuxet Athletic Club – 12 Aborn Street Rhode Island Yacht Club – 1 Ocean Avenue Pawtuxet Cove Marina - 8 Aborn Street and 69 Fort Avenue Rhodes on the Pawtuxet – 60 Rhodes Place Johnson & Wales facilities on 100 Harborside Blvd Polling Places throughout the City Eastland Foods- 69 Fletcher Avenue Scituate Vista Apartments- 115 Scituate Avenue	Flooding Storm surge High winds Hurricanes Nor’easters		10. Small Business Hazard Mitigation Training and Disaster Outreach Program  11. Structural repairs for Rhodes on the Pawtuxet.
<b>State Facilities</b>	Pastore Complex: Eleanor Slater Hospital, Homeless Shelter, Prison- <i>City supplies generators and emergency response</i> Department of Motor Vehicles RI Office of the Attorney General-4 Howard Avenue State Board of Elections-2000 Plainfield Pike COVID Supplies Facilities Field Hospital and Vaccine Center at Sockanosset Cross Road RIEMA National Guard	High winds Hurricanes Nor’easters		No new actions at this time.
<b>Schools within Floodplain</b>	<u>Elementary Schools</u> 1. George J. Peters Elementary - Historically has flooded. (Peters also doubles as a YMCA child daycare facility). 15 Mayberry Street - Grades K – 5. 2. Oak Lawn Elementary - 28 Stoneham Street - Grades K - 5.  Cranston West Vocational Facility - 80 Metropolitan Avenue - Grades 9 - 12	Flooding		Proposed wetland restoration off I-295 may help flooding near Oak Lawn Elementary School.

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
<b>Recreation Facilities</b>	A. CLCF Recreation – 970 Pontiac Avenue. Next to Marine Drive, floods B. Budlong Pool - 222 Aqueduct Road C. Fay Memorial Field- 869 Park Avenue D. Cranston Stadium – 35 Flint Avenue. <i>Not in floodplain.</i> E. Cranston Veterans Ice Rink (inflatable dome) – 900 Phenix Avenue. <i>Not in floodplain.</i> Atwood/Veterans Field Playgrounds Washington Bike Path	All hazards		No new actions at this time.
<b>Natural Resources</b>	Pawtuxet River and its tributaries Pocasset River and its tributaries Agricultural Land Open Space Lakes and Ponds Wetlands Meshanticut Brook Contiguous tracts of woodland in the western part of the City.	Flooding Hurricane/Nor’easter High Winds Drought Brushfire	Spectacle Pond TMDL, Stormwater BMPs	12. Converting city and state land between Interstate 295 and Warren Ave. to wetlands/floodplains.
<b>Historic Resources</b>	<u>National Historic Districts</u> 1. Pawtuxet Village Historic District. 2. Oak Lawn Village Historic District - this is also a Local Historic District. 3. Furnace Hill Brook Historical and Archeological District. 4. Edgewood Historic District- Arnold Farm Plat- Arnold Ave., Albert Ave., Columbia Ave. bound by Broad Street to the west and Narragansett Bay to the east. 5. Edgewood Historic District-Shaw Plat- Shaw Ave., Marrison Avenue. Bound by Broad Street to the west and Narragansett Bay to the east. 6. Edgewood Historic District- Taft Estate Plat- Windsor Avenue, Stratford Rd., Circuit Drive. Bound by Broad Street to the west and Narragansett Boulevard to the east. 7. Lippitt Hill Historic District 8. Norwood Avenue Historic District- Norwood Avenue. Bound by Roger Williams Park to the west, Broad Street to the east. 9. Nathan Westcott House (local district) National Register Properties	Flooding Hurricane/Nor’easter High Winds Drought Brushfire	Knightsville Meetinghouse, demolished in 2015, was rebuilt.	11. Elevate utilities for Rhodes on the Pawtuxet.

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	<ol style="list-style-type: none"> <li>1. Rhodes on the Pawtuxet – 60 Rhodes Place</li> <li>2. Nathan Westcott House- 56 Scituate Avenue</li> <li>3. Sheldon House-458 Scituate Avenue</li> <li>4. Thomas Fenner House- 53 Stony Acre Drive</li> <li>5. Governor Sprague Mansion – 1351 Cranston Street</li> <li>6. The Joy Homestead- 179 Whiting Street</li> <li>7. Knightsville Meeting House- 67 Phenix Avenue</li> <li>8. Potter Remington House – 571 Natick Avenue</li> <li>9. Rosedale Apartments – 1180 Narragansett Boulevard</li> <li>10. Arad Wood House-407 Pontiac Avenue</li> </ol>			

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# 5

## Programmatic Capabilities

### Purpose

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

### Primary Plans, Regulations, and Departments

**Capital Improvement Plan (CIP):** Updated annually, the CIP was last updated in 2021 for the period 2021-2025, the CIP prioritizes public infrastructure projects over four years. Capital expenses include new or expanded physical facilities that are large, expensive, and permanent. Examples include senior centers, schools, City Hall, public safety buildings and equipment, roads, public libraries, and park and recreational facilities. Such facilities are expensive and cannot normally be financed on a "pay-as-you-go" basis. Actions identified in this tool are reviewed when updating the natural hazard mitigation plan.

**Comprehensive Plan:** The Cranston Comprehensive Plan was originally adopted in February 1992. In 2010 and 2012 Cranston updated its comprehensive plan and amended it in 2021. The updated plan was approved by the City Plan Commission and adopted by the City Council in 2012. The plan outlines the goals, policies, issues, and actions that guide the community to fulfilling its vision for future development. It addresses land use, housing, economic development, natural resources, services and facilities, open space and recreation,

and circulation, with some hazard mitigation activities. Cranston recognizes the importance of hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach which accommodates these interdependencies.

**Continuity of Operations Plan (COOP)/Continuity of Government (COG):** City operations should be performed efficiently with minimal disruption, especially during an emergency. The plan provides an overview of continuity of operations efforts. Departments have further specific plans outlining procedures necessary to maintain essential services on a day-to-day

**Emergency Operations Plan:** The Cranston Emergency Operations Plan (CEOP) addresses the City's planned response to extraordinary emergency situations associated with of natural, technological and human-caused hazards, from nor'easter cyclones, tornadoes and hurricanes to pandemics, urban fires, hazardous materials releases, and acts of terrorism. Cranston's plan combines mitigation, preparedness, response, and recovery.

The purpose of the CEOP is to establish the overall framework for integration and coordination of emergency management activities of government, volunteer organizations, and the private sector. The CEOP is designed to provide guidance and a flexible framework that the State of Rhode Island may utilize to prevent, prepare for, respond to, recover from and mitigate the potential hazards.

Future revisions of the EOP by the Cranston Emergency Management department will continue to incorporate mitigation activities; including those listed in the Plan. This plan is reviewed and updated every few years to include changes in policy, new information, or changes in hazard threats.

**Flood Hazard District:** The provisions of the Cranston Flood Hazard District are implemented by the Planning Department and the Building Inspections Department. The Planning Department determines if a particular flood will take place within a Flood Hazard Area and Building Inspections determines whether construction techniques and calculations conforms to the specifics of the ordinance.

**The Meshanticut Brook Floodplain Management Study: Cranston and Warwick, RI:** The Meshanticut Brook Flood Plain Management Study was published in October 1983 and is known as the "Popular Report". This report was produced by the United States Department of Agriculture: Soil Conservation Service (currently known as NRCS); and it identifies problem areas within the flood plain and provides an analysis of potential alternatives and recommended solutions. Five recommendations originate from this study and are as follows:

1. All property owners in the 100-year flood plain should participate in the NFIP.
2. Flood plain property owners, particularly those within the 10-year flood plain, should consider having a qualified engineer evaluate their property for specific nonstructural measures.
3. Both Cranston and Warwick, with the full participation of and coordination with affected property owners, should develop a flood warning plan.

4. Several wetlands, natural areas, and ponds located along Meshanticut Brook upstream of the Furnace Hill Brook confluence provide significant natural storage for floodwater. These areas moderate flood discharges similar to a dam. Without this existing storage, flood damage would be much worse. The City of Cranston should take action to protect these areas from any alteration that would reduce the volume of storage presently available.
5. The City of Cranston should make full use of the existing erosion and sediment control standards and enforcement ordinances to ensure that development projects within the City will be adequately controlled.

Since the 2014 HMP, the City has encouraged property owners in specific flood-prone neighborhoods to participate in the City's voluntary buyout program. To date, the City has acquired seven properties for demolition.

**Public Education Program:** The fire chief/emergency management officer does implement public education programs that are geared toward school-age children and residents of the City residing in elderly housing. In addition, once a month CEMA does produce a series of public education articles that are published in the Cranston Herald. These articles routinely cover topics ranging from fire safety to natural disaster preparation and response. However, this publication has been temporarily discontinued in order to focus on the enforcement of new fire code safety legislation.

**The Pocasset River Flood Plain Study and Management Plan:** The Pocasset River Flood Plain Study and Management Plan was initiated with the Natural Resource Conservation Service (NRCS), as a result of a storm event that occurred in August of 1999. Funded through the Federal Small Watershed Program it analyzes existing conditions, models present and future hydrology, provides updated Flood Insurance Rate Maps, analyzes alternative solutions to flooding concerns, proposes recommended strategies, and provides connections for needed implementation funds. The updated study has been submitted to Congress for approval.

**Soil Erosion and Sediment Control:** This ordinance was adopted to prevent soil erosion and sedimentation from occurring as a result of non-agricultural development within the city by requiring proper provisions for water disposal, and the protection of soil surfaces during and after construction, in order to promote the safety, public health, convenience and general welfare of the city. The purpose of the ordinance is to also assure that significant development of land within the city is carried out with appropriate measures to control drainage and run-off, sedimentation and off-site water pollution as necessary measures to protect the health, safety and welfare of the citizens of the city. Applicants must file an erosion and sediment control plan which includes erosion and sediment control measures to be implemented. For disturbance areas greater than one-half acre, a stormwater pollution prevention plan (SWPP) must also be approved. Where applicable, a Rhode Island freshwater wetlands permit is required.

**Subdivision Regulations:** Written and approved by the City Plan Commission. The intent of these regulations is to promote the public health, safety and general welfare; to prevent overcrowding of land; to prevent development of unsanitary areas for housing purposes; to secure a well-articulated street and highway system; to promote coordinated development

of unbuilt areas; to secure the appropriate allotment of land area in new developments for all the requirements of community life; to conserve natural beauty and other natural resources; to conform to the Cranston Comprehensive Plan; and to facilitate the adequate, efficient and economic provision of transportation, water supply, sewerage, recreation and other public utilities and requisites.

**National Flood Insurance Program (NFIP):** The City of Cranston is an active and compliant member of the National Flood Insurance Program since 1984. As such, Cranston residents are able to purchase flood insurance to protect their property against flood losses. In order to maintain compliance with the NFIP, the City of Cranston must adopt minimum flood plain management criteria outlined in 44 CFR § 60.3a. As such, the City of Cranston has adopted the most recent (October 2015) Flood Insurance Rate Maps (FIRM) and Flood Insurance Study (FIS); designated the Planning Director as the NFIP Coordinator to manage the program; and adopt and enforce a floodplain ordinance designed to reduce future flood risks. Chapter 17.16 of the City's Code of Ordinances is dedicated to the floodplain management program. The special flood hazard areas make up the floodplain overlay district.

**Floodplain Education-** The NFIP Coordinator is available to answer questions that residents may have about flood insurance, compliance, or floodplains. There are also flood-related print materials available at the Planning Director's office.

**Tree Trimming Program:** In partnership with local utility companies the City of Cranston's Public Works Department regularly maintains trees along public roads. Cranston has a chipper for branches and utilizes the State MPA for larger trimming projects. The City does not work near power lines. Trimming near power and utility lines are done by the various utilities using their own crews and equipment or contractors.

**Harbor Management Plan/Waterfront Storm Preparedness Plan:** The Rhode Island Coastal Resources Management Council (RICRMC) guidelines for Harbor Management Plans require municipalities with approved HMP's to provide waterfront storm preparedness plans. The purpose of these plans is to detail specific measures to be taken in mitigating storm damage, preparing vessels and their structures for storm events, and appropriate response procedures for waterfront boating facilities. On December 17, 2008, the Cranston City Council adopted the City's first Harbor Management Plan and on May 27, 2010 the RICRMC approved said plan had been approved by CRMC. The plan includes a storm preparedness and hazard mitigation plan for the City's coastal areas.

**Zoning Ordinance:** Among other things, the intent of the Cranston Zoning Ordinance is to manage growth and land use; protect of the natural, historic, cultural, and scenic character of the city, provide for the preservation and promotion of agricultural production, forest, silviculture, aquaculture, timber resources, and open space; and promote safety from fire, flood and other natural or man-made disasters.

## Departments/Organizations

**Building and Public Works Department:** The Public Works Department is responsible for the care, maintenance, and control of all phases of public works projects and facilities. This department manages public infrastructure projects including the sewer system, City owned roads, open space, waste and recycling, and the municipal tree services. Elements of this hazard mitigation plan will help the public services department prioritize projects and facilitate grant applications for funding. This department is out in the City every day and offers firsthand experience on vulnerable systems, and infrastructure needs. The Public Works Department handles the following ongoing mitigation actions:

- › snow plowing
- › street sweeping
- › engage in an ongoing tree-trimming program (with National Grid) which reduces the probability of downed utility lines and reduces storm debris.

**Department of Inspections** is also managed with the Building and Public Works Department. It is the responsibility of the Department of Inspections to verify compliance with the provisions of the current edition of The Rhode Island State Building Code, which include The International Codes (ICC) for Building, Residential, Mechanical, Plumbing, Energy, Fuel Gas, Property Maintenance, and The National Electrical Code as amended. Additionally, The Department of Inspections enforces The City of Cranston Zoning Code and other related City Ordinances.

The Department of Inspections also serves as the office of the Cranston Zoning Board of Review.

**Fire Department:** Cranston businesses and residents are protected from fires, medical, hazardous material or environmental mishaps. The City of Cranston is served by six fire stations. The mission of the Cranston Fire Department is to save lives and protect property. The members of the Cranston Fire Department are dedicated to the preservation of life and property from fire or other disaster, the prevention, suppression and investigation of fires, the provision of emergency medical services and the removal of all persons from danger whatever the cause. The Fire Department also checks on the resiliency and storm preparedness of various elderly housing locations during their annual visits.

The Cranston Emergency Management Agency is managed by the fire department. Activities include emergency planning, operating shelters, planning evacuation routes and managing the Community Emergency Response Team (CERT). The permanently established Emergency Operations Center (EOC) is located at 131 Park Avenue. Cranston is in the process of evaluating alternate sites. The EOC has a diesel generator servicing the entire building.

The City is served by over 200 firefighters and staff. Overall equipment inventory includes:

- 6 pump engines (3reserve)
- 3 ladder trucks (1 reserve)
- 5 watercraft – 2 marine/bay units, 3 pond boats

- 5 Rescues (1 reserve)
- 1 Special Hazards/Heavy Rescue Truck

**Harbormaster:** The Cranston harbormaster patrols the 3 1/2 miles of Cranston’s shoreline on the Providence River which broadens into the Narragansett Bay. The harbormaster is dedicated to the boating safety of those boating through Cranston’s waterfront through working with the US Coast Guard and Cranston’s emergency departments for port security, water rescues and aids to navigation.

**Information Technology:** Currently performing a resiliency study to identify system weaknesses, risks, and how to mitigate them.

**Planning Department:** The Planning Department conducts a variety of tasks influencing the City’s physical, economic, and social growth. Property owners interested in subdividing or developing their land are encouraged to consult with the Planning Department before moving forward. Planning staff stands ready to assist any person in need of guidance on the City’s policies as they may relate to the development and/or use of land, preservation of natural and built environments, provision of public services, or the general health, safety, and welfare of Cranston’s residents.

The Planning Director is the lead on the hazard mitigation plan update. Elements from their work on the Comprehensive Plan and flood protection are incorporated into the hazard mitigation plan. Actions as outlined in this hazard mitigation plan will help prioritize the growth and resiliency goals of the community.

Cranston maintains an interactive online public mapping portal for viewing public data such as flood zones, zoning, voting districts, and public works infrastructure.

**Police Department:** The Cranston Police Department is responsible for the responsible for the preservation of the public peace, prevention of crime, apprehension of criminals, protection of persons and property, and enforcement of the laws of the state and the ordinances of the city. The members of the department are empowered to enforce state and local laws to ensure that the peace and tranquility of our neighborhoods are maintained, and that crime and the fear of crime are reduced. The Cranston Police Department is staffed by 147 sworn police officers and supported by 2 animal control officer, one kennel custodian/adoption coordinator at the animal shelter. An additional 27 full-time civilian employees and one part-time civilian employee are assigned to the police department, including 13 full-time civilian dispatchers. While some retired officers work road construction details, they are not employees of the police department, and we do not employ reserve/part-time police officers.

The Department operates twenty-four hours a day and responds to all criminal complaints, calls for service and City-wide emergencies. In 2021, officers responded to over 71,241 calls. The Department is located at 5 Garfield Avenue and has the following equipment:

- 23 marked front-line vehicles
- 10 spare marked vehicles
- 11 marked vehicles used exclusively for traffic/construction details

- 9 multi-purpose vehicles, including 3 Harley Davidson Police Motorcycles
- 3 marked K-9 vehicles
- 3 marked vehicles assigned to the Traffic Unit
- 56 unmarked/detective and administrative vehicles

**School Department; Facilities Department:** In cooperation with Public Works, responsible for the maintenance of all school and municipal buildings and school grounds. This includes sand spreading, and snow and ice clearing from roofs and around storm drains.

## State Programs

**Rhode Island Coastal Resources Management Council (CRMC):** New development along coastal areas in Cranston is regulated by Rhode Island Coastal Resources Management Council (CRMC) and the City of Cranston. One regulation requires a Coastal Buffer Zone, or a “land area adjacent to a Shoreline (Coastal) Feature that is, or will be, vegetated with native shoreline species and which acts as a natural transition zone between the coast and adjacent upland development,” on property within 200 feet of the inland edge of a coastal feature. The benefits of the Coastal Buffer Zone include protection of water quality, protection of coastal habitat, protection of scenic and aesthetic quality, erosion control, and flood control.

Qualifying projects are required to submit a Coastal Hazard Application (CHA) Worksheet when submitting a standard CRMC Application. The purpose of the worksheet is to notify the applicant of potential coastal hazards such as sea level rise, storm surge and associated flooding and shoreline erosion. It is CRMC’s goal to guide development away from these vulnerable areas.<sup>50</sup>

**Rhode Island State Dam Safety Program:** The City of Cranston participates in the State Dam Safety Program because of five high hazard and one significant hazard dam in Cranston. The State Dam Safety Program was created to facilitate the enforcement of the primary dam inspection law (RIGL 46-19, Inspection of Dams and Reservoirs). RIGL 46-19 states that dam owners are responsible for the safe operation, maintenance, repair, and rehabilitation of a dam, which are the essential elements in preventing dam failure; furthermore, dam owners are liable for the consequences of accidents or failures of their dams. According to the State of Rhode Island 2019 Dam Safety Program Report, the following have been identified as program limitations: unclear ownership of numerous high hazard dams, construction of buildings within inundation areas below dams, lack of funding to repair or remove privately owned dams, inadequate spillway capacities and engineering analyses, lack of Emergency Action Plans across the state, inadequate staffing, increase in rainstorm intensities. There is an Emergency Action Plans on file for the Easton’s Pond and Drinking Water Reservoir dams.

**Rhode Island Department of Environmental Management (DEM) Division of Law Enforcement:** The Rhode Island DEM Division of Law Enforcement serves to protect the

<sup>50</sup> CRMC Coastal Hazard Application <http://www.crmc.ri.gov/coastalazardapp.html>

natural resources and ensure compliance with all environmental conservation laws through law enforcement and education.

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

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

**Rhode Island Department of Transportation:** The Rhode Island Department of Transportation (RIDOT) designs, constructs, and maintains the state-owned surface transportation system. This includes not only roads and bridges but also the state's rail stations, tolling program, bike paths and ferry service.

**Rhode Island Executive Climate Change Coordinating Council:** The Rhode Island Executive Climate Change Coordinating Council (EC4) is a 12-member council which assesses, integrates, and coordinates climate change efforts throughout state agencies to reduce emissions, strengthen the resilience of communities, and prepare for the effects of climate change.

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

**Rhode Island Enhanced 9-1-1 Telephone System:** Cranston utilizes the state's E-911 system which provides 24-hour public safety communication services from one answering point in North Scituate. Each call is routed to the appropriate response team. The system processes both landline and wireless 9-1-1 calls.

**Rhode Island Infrastructure Bank:** The Rhode Island Infrastructure Bank (RIIB) is the central hub for financing. The City of Cranston has financed improvements to Edgewood Highland Elementary School through RIIB's efficient Buildings Fund. The improvements include new boilers and chillers, new HVAC units and associated structural supports, and a digital control system with programmable thermostats, and are expected to reduce energy consumption at the school by more than 40%. Additionally, the projects that were completed provide significant air quality, temperature and ventilation benefits that will improve the student learning environment.



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

**Rhode Island State Fire Code Regulations:** Cranston has adopted the Rhode Island Fire Safety Codes to safeguard life and property from the hazards of fire and explosives in accordance with safe practice. The Code is enforced by the Cranston Fire Department and provides reasonable minimum requirements for fire prevention and protection.

## Other

**United Way 2-1-1:** United Way 2-1-1 in Rhode Island is a free, confidential service that provides information, referrals, and is available in multiple languages. This service connects residents with community services they may need such as childcare, housing, health insurance, and tax preparation.

## Federal Programs

**Federal Emergency Management Agency:** The Federal Emergency Management Agency (FEMA), an agency of the U.S. Department of Homeland Security, coordinates disaster response when local and state resources are maxed out. The agency also provides grant funding for pre-and post-disaster mitigation projects.



# 6

## Mitigation Actions

### Mission Statement

It is the mission of the City and the HMC to protect and enhance the quality of life, property and resources by identifying areas at risk from natural hazards and implementing hazard mitigation actions to protect the City's residents; infrastructure; economy and its historical, natural and cultural resources.

### Mitigation Goals

To effectuate the mission statement, the City establishes the following hazard mitigation goals which remain unchanged since the 2014 HMP:

1. Upgrading infrastructure and protecting property, integrating planning and management approaches, strengthening regulatory control, improving response effectiveness and raising awareness of hazard mitigation benefits and procedures.
  - › Upgrading infrastructure and protecting property refers to improving the structural facilities needed to sustain and protect residential, commercial, and industrial uses and the people who occupy them. Examples include drainage structures, bridges, dams, and municipal facilities such as schools.
  - › Integrating planning and management refers to the incorporation of hazard mitigation principles into the plans, policies, programs and administrative actions of both public and private entities. Examples include development of a debris management plan and participation in the Community Rating System.
  - › Regulatory change refers to improvements to rules or procedures that regulate the location of new development as well as construction techniques. Examples

include municipal subdivision regulations; flood hazard overlay districts and building codes.

- › Preparedness to reduce losses refers to ensuring that needed facilities are in place to assist people during natural hazard events and that the City is ready to respond effectively. Examples include increasing the capacity of American Red Cross approved shelters and development of repetitive loss strategies.
- › Education and training refers to raising community awareness of how to prepare for and respond to natural hazard events. Examples include flood hazard training workshops for municipal officials, small business disaster outreach programs and public education and preparedness programs.

## Status of Proposed 2016 Actions

Action	Status	Notes
Implement the NRCS Pocasset River Flood Plain Study and Management Plan	Ongoing	Updated by NRCS and submitted to Congress for approval.
Flooding Improvements (Meshanticut Brook Flooding Improvements): The City of Cranston will study and choose the most cost-effective alternative to replace the current drainage system beneath Wilbur Avenue	Partial	Flood warning detection system installed below trestle.
Western Cranston Water District Service Loop: Providence Water Supply Board (PWSB) will be encouraged to complete this secondary distribution main, lying approximately between Pippin Orchard Road and Alpine Estates Drive.	Completed	
Sewage Infiltration and Inflow Analysis: A draft report was developed, and the final report is pending some additional field surveys that are being completed at the time of the report.	Done	
Mitigate Wildfire Risk to Vegetated Areas	Ongoing	
Establish Program of Acquisition or Mitigation for Flood Damaged Properties	Ongoing	State is working on guidance
Stormwater Drainage System Evaluation: Areas of concern include Wedge/Cranston Street, Garden Street, Lodge/Abbott Street, and Zinnia Drive/Poplar Circle	Lodge/Abbott complete Zinnia Drive/Poplar Circle complete. Wedge- enhanced maintenance Garden- enhanced maintenance	
Create a debris management plan	Done	
Participation in the Community Rating System (CRS)	Not done	Not practical.

Action	Status	Notes
Improve sheltering capacity: The City's three emergency shelters are capable of providing public shelter for 753 individuals. Therefore, the City currently faces a deficit of 887 spaces for public emergency sheltering.	Not done	Not necessary to increase sheltering capacity due to their unuse.
Development of a repetitive loss strategy.	Ongoing	The City has done buyouts for flood-prone areas and will continue as long as residents are interested.
Flood Hazard Districts Training for Municipal Officials	Not done	Provided by the State but supported by the City.
Small Business Hazard Mitigation Training and Disaster Outreach Program	Not done	Move to 2022: Provide a list of resources on website.
The City will seek assistance from the Cranston Emergency Management Official (CEMO) and the American Red Cross (ARC) as a phase I effort to develop public education and outreach programs on disaster mitigation and preparedness, and distribute and make material available concerning: evacuation routes, emergency shelters, critical facilities and maps of City risks.	Not done	Move to 2022. Provide a list of resources on website.

## Proposed 2022 Mitigation Actions

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

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

This HMP includes actions which prevent or reduce the consequences of disaster (mitigation), planning and education (preparedness), improved response in the immediate aftermath of an event (response), and improved restoration efforts (recovery). Those with are true mitigation actions are noted as such. There are necessary planning elements that need to be completed before additional mitigation actions can be considered. The Committee has identified a range of actions below, some of which are planning activities. However, there is a mitigation action identified for each vulnerable area where applicable.

### Priority Level

- › **High:** Reduces the greatest risks, is important to accomplish first
- › **Medium:** May need other actions to be completed first

- › **Low:** Less of an impact on safety and property

### Time Frame (from date of plan adoption)

- › **Short Term:** within 1-3 years
- › **Medium Term:** within 3-5 years
- › **Long Term:** greater than 5 years

### Goals

This mitigation strategy is adopted by the City of Cranston to present actions which help protect its citizens, visitors, businesses and property from the effects of various natural hazards. It is the intent of the City of Cranston to:

1. Upgrade infrastructure and protecting property,
2. Integrate planning and management approaches,
3. Strengthen regulatory control,
4. Improving response effectiveness, and
5. Raise awareness of hazard mitigation benefits and procedures.

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

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
1. Address ongoing flooding at Wedge Street.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

During high intensity rain events localized flooding occurs at the intersection of Wedge Street and Cranston Street. The Wedge Street Watershed drains from west to east to a low point in the vicinity of the Dean Estates Apartments, where a culvert carries storm runoff under the Washington Secondary Bike Path to an antiquated open swale and closed conduit drainage system at Wedge and Cranston Streets. Stormwater runoff is divided to two outfall pipes, discharging to unnamed tributaries of Meshanticut Brook. The primary cause of flooding is insufficient stormwater conveyance capacity in the closed conduit and open swale drainage system. A secondary cause of flooding is sediment buildup at the outfall locations and receiving streams.

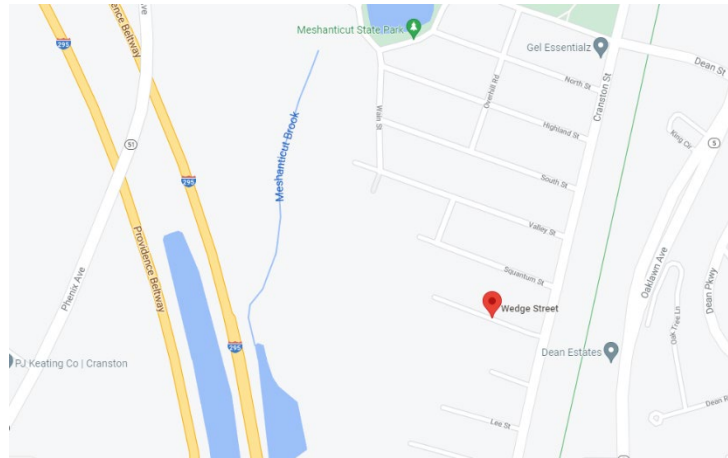
BENEFITS	OBSTACLES	
Reduce local flooding		
LEAD/CHAMPION	SUPPORT	
State DOT	Public Works	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Natural Resources Conservation Services (NRCS)	\$1M	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

Potential solutions include: (1) sediment removal and streambed restoration in Meshanticut Brook tributaries, (2) design and installation of higher capacity stormwater collection and conveyance system, and (3) installation of upstream sedimentation control measures.

Enhanced maintenance of several open stream channels has helped.

Empty area on Plat 17, Lot 690 on Oaklawn Ave. would be ideal for infiltration or retention pond for high flow events.



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

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
2. Continue buyouts along Meshanticut Brook, Pocasset, and Pawtuxet Rivers.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <hr/> <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

During storm events of approximately one-half inch or greater, access to private properties is severely limited, pedestrian access through the public way is impossible, frozen floodwaters create dangerous road conditions, and prolonged flooding can damage the roads.

BENEFITS	OBSTACLES	
Public safety and reduction in flood claims	Cost Benefit (higher real estate prices)	
LEAD/CHAMPION	SUPPORT	
Planning	Public Works	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
FEMA BRIC and HMP grants Natural Resources Conservation Services (NRCS), Army Corps	\$2M*	<input type="checkbox"/> Short Term (0-3 years) <input checked="" type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

Part of a larger ongoing project. The City has applied for HMGP funding for the Meshanticut Brook Floodplain Restoration Scoping Study.

\*The flood control project for the Pocasset River is upwards of \$52 million total, the bulk of the work in Cranston.



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

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
3. Complete hydraulic mapping of the stormwater drainage system.	<input checked="" type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

First, this is a MS4 Requirement. There is some documented stormwater connectivity but still need additional info from RIDOT. Need to add it to the City data, then do hydraulic modeling.

BENEFITS	OBSTACLES	
Better understanding of the stormwater system can help identify areas for improvements.		
LEAD/CHAMPION	SUPPORT	
Public Works	RIDOT	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
City Operating Budget	\$2M	<input type="checkbox"/> Short Term (0-3 years) <input checked="" type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

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

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
4. Enhance stormwater education. Publish seasonal reminders on keeping catch basins clean.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input checked="" type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			<b>ACTION STATUS</b>
			New

**RATIONALE- WHY IS THIS IMPORTANT?**

Clogged catch basins can result in minor street flooding, creating a nuisance for motorists, pedestrians and businesses. Oftentimes, it doesn't take much more than a thin layer of leaves to block these critical drainage elements.

BENEFITS	OBSTACLES
----------	-----------

Reductions in preventable street flooding.

LEAD/CHAMPION	SUPPORT
---------------	---------

City Administration

Public Works

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
---------------------------	----------------	----------

City Operating Budget

Staff time

Southeast New England Program

Providence Stormwater Innovation Center

Short Term (0-3 years)  
 Medium Term (3-5 years)  
 Long Term (more than 5 years)

**OTHER NOTES**

Potential outreach methods:

-Press release with local news outlets Channel 10 and Channel 12.

-Press release in local newspaper (Cranston Herald)

-Use of the Administration/Mayor's multiple social media outlets.

**VULNERABLE AREA: Wastewater**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
5. Rebuild the Mayflower, Howard, and Plainfield pump stations and elevate pump station generators.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

Mayflower pump station is at risk of inland flooding from the Pawtuxet River and sea level rise. Howard pump station is in the floodplain. Localized flood impacts likely for the Plainfield pump stations.

BENEFITS	OBSTACLES	
	funding	
LEAD/CHAMPION	SUPPORT	
Sewer Enterprise Dept.		
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Sewer Enterprise Fund	\$1M per station rebuild. \$4M for all 3 station rebuilds and elevating generators.	<input type="checkbox"/> Short Term (0-3 years) <input checked="" type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

Climate Vulnerability Summary <http://www.dem.ri.gov/programs/benviron/water/pdfs/cvs Cranston.pdf>

Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure.  
<http://www.dem.ri.gov/programs/benviron/water/pdfs/wwtclimstudy.pdf>

**VULNERABLE AREA: Other Services/Utilities**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
6. Coordinate with National Grid on more frequent tree trimming around powerlines.	<input checked="" type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

The City would like to see improved coordination between National Grid and their own tree maintenance efforts in urban areas. Keeping hanging limbs away from power lines reduces the chances for limbs to take out overhead powerlines.

BENEFITS	OBSTACLES	
Healthier tree canopy, fewer damages from storms.		
LEAD/CHAMPION	SUPPORT	
Tree Warden		
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Staff time	Staff time	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

Consider an Urban Tree Management Plan.

**VULNERABLE AREA: Communication Equipment**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
7. Assessments and upgrades throughout the City's Information Technology System.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <hr/> <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

Improve system redundancy and reliability.

BENEFITS	OBSTACLES
----------	-----------

Uninterrupted and faster service.

LEAD/CHAMPION	SUPPORT
---------------	---------

City IT Manager

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
---------------------------	----------------	----------

Help American Vote Act  
 Cybersecurity and Infrastructure Security Agency  
 American Rescue Plan Act of 2021

\$500,000

Short Term (0-3 years)  
 Medium Term (3-5 years)  
 Long Term (more than 5 years)

**OTHER NOTES**

**VULNERABLE AREA: Critical Municipal Hazard Response Facilities**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
8. Three aging fire stations need to be relocated into larger facilities to safely accommodate equipment and staff.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <div style="border: 1px solid black; padding: 2px; text-align: center;"><b>ACTION STATUS</b></div>

**RATIONALE- WHY IS THIS IMPORTANT?**

Undersized buildings have fallen behind in space requirements of a growing fire department.

BENEFITS	OBSTACLES	
Safer critical response facilities.	Locations	
LEAD/CHAMPION	SUPPORT	
Fire Department		
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Cranston Capital Improvements Operating Budget Federal Infrastructure Bill (ARPA) Federal funding for improved air quality	\$9M for the headquarters, and \$5M per station.	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

Need to first conduct assessments and to find locations.

**VULNERABLE AREA: Populations**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
9. Develop public education and outreach programs on disaster mitigation and preparedness.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input checked="" type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> 2016

**RATIONALE- WHY IS THIS IMPORTANT?**

The City would like to create a more comprehensive public education program that is centered around helping its citizens be better prepared to reduce their risks from disasters.

BENEFITS	OBSTACLES	
Better informed residents.		
LEAD/CHAMPION	SUPPORT	
Cranston Emergency Management Official		
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
FEMA BRIC and HMGP U.S. Fire Administration	\$35,000	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

The City will seek assistance from the Cranston Emergency Management Official (CEMO) and the American Red Cross (ARC) as a Phase I effort to develop public education and outreach programs on disaster mitigation and preparedness, and distribute and make material available concerning: evacuation routes, emergency shelters, critical facilities and maps of City risks.

Consider posting information on a dedicated space on the City's website.

**U.S. Fire Administration** <https://www.usfa.fema.gov/prevention/outreach/>

**Flood Safety at Ready.gov** <https://www.ready.gov/flood-toolkit>

**Flood Insurance** <https://www.fema.gov/flood-insurance/outreach-resources>

**VULNERABLE AREA: Businesses**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
10. Small Business Hazard Mitigation Training and Disaster Outreach Program.	<input checked="" type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> 2016

**RATIONALE- WHY IS THIS IMPORTANT?**

BENEFITS	OBSTACLES	
LEAD/CHAMPION	SUPPORT	
EMA Director	Economic Development Coordinator	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
Small Business Association FEMA BRIC CDBG	Staff time	<input type="checkbox"/> Short Term (0-3 years) <input checked="" type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

See FEMA Small Business Program: <https://www.fema.gov/business-industry/doing-business/small-business>



**VULNERABLE AREA: Businesses**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
11. Elevate utilities for Rhodes-on-the-Pawtuxet.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
			<b>ACTION STATUS</b>
			New

**RATIONALE- WHY IS THIS IMPORTANT?**

This historic recreation facility is located on the banks of the Pawtuxet River and has flooded multiple times. Fortunately, the floodwaters have mainly been contained to the basement. But unfortunately that is where the utilities are located.

BENEFITS	OBSTACLES	
Historical preservation		
LEAD/CHAMPION	SUPPORT	
Engineering Department	Rhodes-on-the-Pawtuxet	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
FEMA funding for repetitive loss properties.	\$500,000	<input type="checkbox"/> Short Term (0-3 years) <input checked="" type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

New owners may be interested in elevating utilities.  
 In 2022, the City asked the Engineering Department to assess the extent of scour on the pilings.

**VULNERABLE AREA: Natural Resources**

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
12. Converting city and state land between Interstate 295 and Warren Ave. to wetlands/floodplains.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input checked="" type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <b>ACTION STATUS</b> New

**RATIONALE- WHY IS THIS IMPORTANT?**

Localized flooding, removing a neighborhood from floodplain.

BENEFITS	OBSTACLES	
Increase floodplain capacity.		
LEAD/CHAMPION	SUPPORT	
Public Works		
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
FEMA HMGP and BRIC funding. RIDEM	\$3M	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)

**OTHER NOTES**

City is currently working on a FEMA grant for \$300,00 to complete engineering and plans.

# 7

## Implementation and Adoption

### Prioritization of Mitigation Actions

#### Implementing the Plan

The City of Cranston and the Cranston Hazard Mitigation Committee realize that successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updates to this plan. The City also understands the importance of integrating appropriate sections of the plan into the City's Comprehensive Plan, Emergency Operations Plan, and site plan review process. This updated Hazard Mitigation Plan will be incorporated into the next Comprehensive Plan and used as a reference for City officials when they are considering climate resiliency projects. It is intended that this plan and the ongoing efforts of the HMC will preserve and enhance the quality of life, property, and resources for the City of Cranston.

Adoption of this mitigation plan increases Cranston's eligibility for federal hazard mitigation grants. These grants originate from FEMA's Building Resilient Infrastructure and Communities (BRIC) (formerly Pre-Disaster Mitigation), Flood Mitigation Assistance (FMA), and post-disaster Hazard Mitigation Grant (HMGP) Programs.

#### Monitoring

The HMC, under the leadership of the City Planner, will meet annually (or more frequently if necessary), to monitor and evaluate the actions contained in the plan. At each meeting, the committee members will discuss the actions assigned to them to ensure continual progress with mitigation efforts. The status of each mitigation action will be documented, and minutes recorded for the record. The HMC will also continue to re-evaluate membership on the committee to ensure effective engagement of the appropriate parties. New members may be invited to serve on the HMC as priorities shift.

## Evaluation

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

During the annual evaluation process, the plan will be promoted online for public review. Comments and suggests can be sent directly to City Planner or brought up at the advertised public meeting.

## Revisions

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

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

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

## Adoption

After each evaluation cycle (every 5 years), the Cranston Hazard Mitigation Plan will be presented to and adopted by the City Council. The associated ordinance documentation will be kept as part of this plan.

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## Appendix A: Survey Results

DRAFT

# Cranston Natural Hazards Survey 10-06-2021

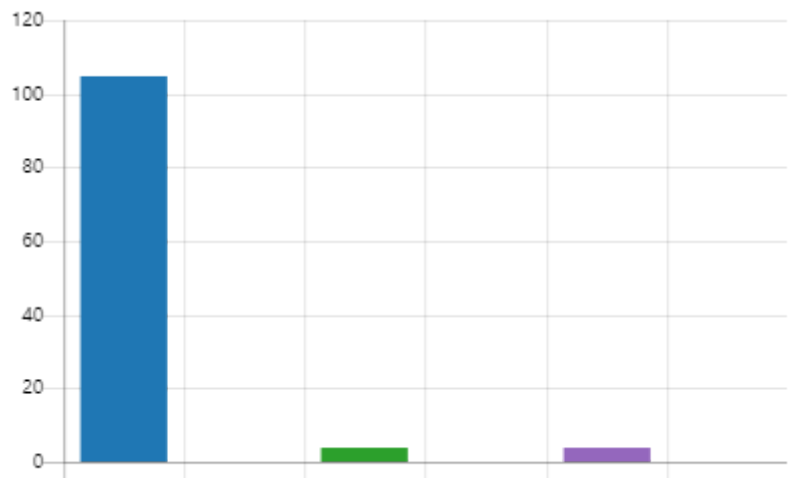
117  
Responses

04:45  
Average time to complete

Active  
Status

## 1. Cranston

Resident	108
Business Owner	0
Resident and Business Owner	4
Non-Resident Property Owner	0
Local Employee	4
Student/Other	0



## 2. How long have you been in Cranston?

Less than a year	1
1 to 5 years	12
6 to 9 years	7
10 to 19 years	21
20 years or more	75



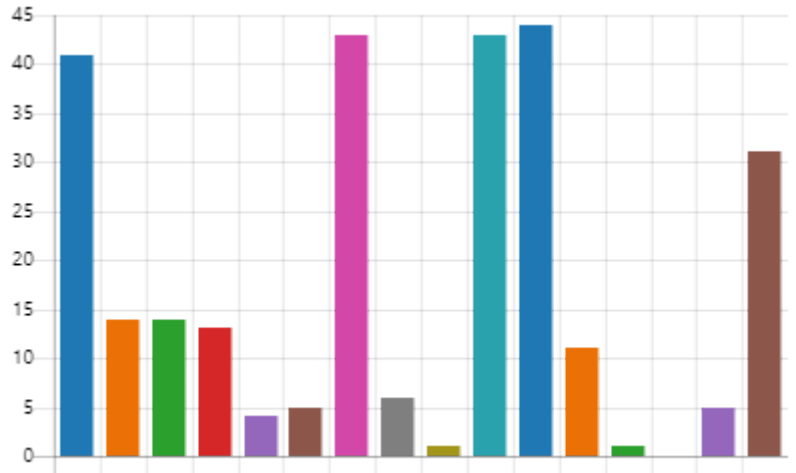
## 3. Have you ever experienced or been impacted by a natural disaster in Cranston?

Yes	67
No	49



4. If yes, what types of natural events/natural disasters? Check all that apply.

<input checked="" type="checkbox"/> High Winds	42
<input type="checkbox"/> Lightning	15
<input type="checkbox"/> Extreme Cold	15
<input type="checkbox"/> Extreme Heat	13
<input type="checkbox"/> Drought	5
<input type="checkbox"/> Earthquake	6
<input checked="" type="checkbox"/> Winter storm (snow and ice)	44
<input type="checkbox"/> Hail	7
<input type="checkbox"/> Tornado	1
<input checked="" type="checkbox"/> Hurricane/Tropical Storm/Nor'...	44
<input checked="" type="checkbox"/> Street Flooding from Heavy R...	44
<input type="checkbox"/> Riverine Flooding	12
<input type="checkbox"/> Brushfire	1
<input type="checkbox"/> Dam Failure	0
<input type="checkbox"/> Erosion	5
<input checked="" type="checkbox"/> Microburst	32

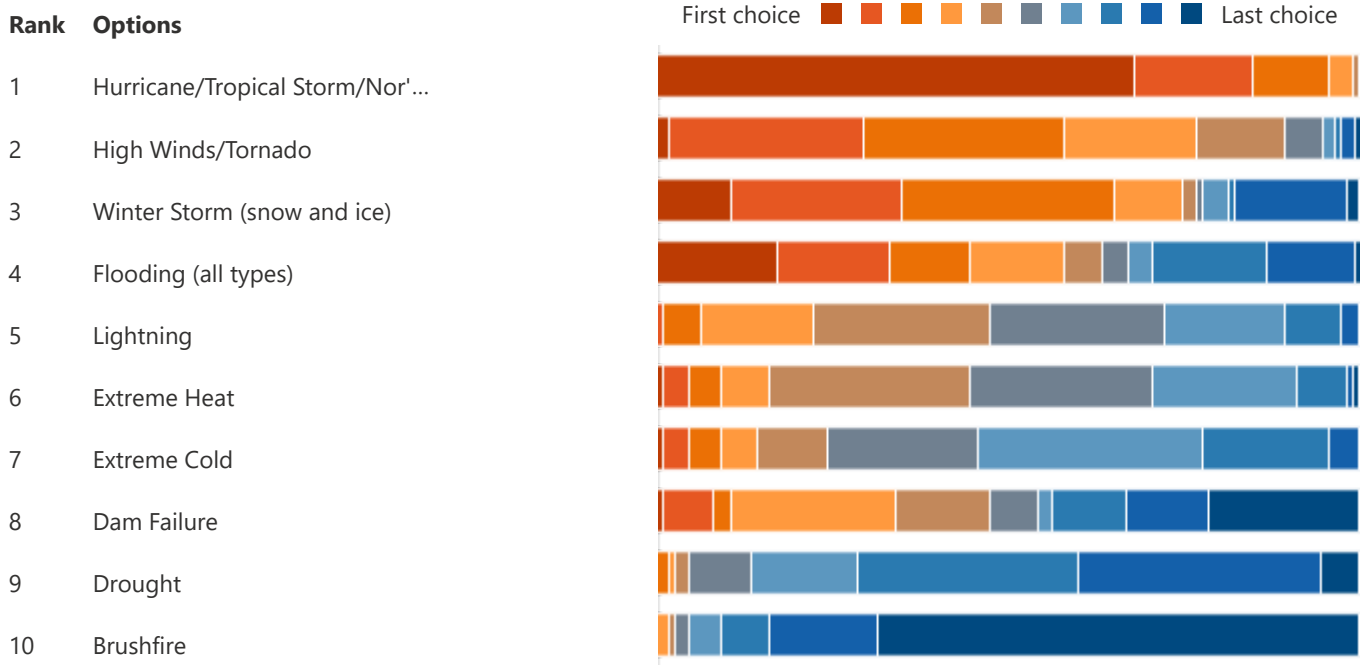


5. How prepared do you feel that you are for the probable impacts of natural hazards?

<input type="checkbox"/> Not Prepared- no need	0
<input type="checkbox"/> Not Prepared- never thought ...	6
<input checked="" type="checkbox"/> Somewhat prepared for some ...	35
<input type="checkbox"/> Prepared for most events	26



6. Please re-order the list of hazards so that the 3 you are most concerned about are at the top.



7. Does your street flood when it rains?

Always	5
Sometimes	25
No	83



8. If "always" or "sometimes", please provide the street name and nearest cross street. Or tell us of a place you know floods.

28

Responses

9. How many times has that street flooded in the last 12 months?

0	0
1	3
2-3	12
Over 5	10
I don't know.	5





Question #8

1	anonymous	Lake Street
2	anonymous	Wilbur Ave
3	anonymous	Boxwood and Harper Ave
4	anonymous	Pontiac and Auburn
5	anonymous	Youlden/Perkins
6	anonymous	Cherry Road /Pawtuxet Avenue
7	anonymous	wilbur/warren
8	anonymous	Woodbury Rd. Parkway
9	anonymous	Mapleton st @ Basswood Rd
10	anonymous	Cranston Street/Urbana Street
11	anonymous	Corner of Potter & Clarence Streets. Problem never resolved water comes further up the street every year.
12	anonymous	Wilbur ave
13	anonymous	Gladstone and Cranston st
14	anonymous	Riverside and Reed
15	anonymous	Allen ave
16	anonymous	Hyde street
17	anonymous	Harwood and Elsie
18	anonymous	Victory St at Lambert St
19	anonymous	Oaklawn Ave
20	anonymous	Potter and Clarence Streets
21	anonymous	BEACON ST, MARLBOROUGH ST.
22	anonymous	Willow road. Oak lawn ave
23	anonymous	Phenix, park, Cranston st.
24	anonymous	Wayland Ave and Grape St
25	anonymous	Wilbur Avenue, Oaklawn Avenue
26	anonymous	Community Drive and Homeside Terrace
27	anonymous	End of tallman ave (aqueduct)
28	anonymous	Fordson, Davis, Norman
29	anonymous	Narragansett Blvd and Grand Avenue
30	anonymous	Narragansett Ave. and Norwood Ave.

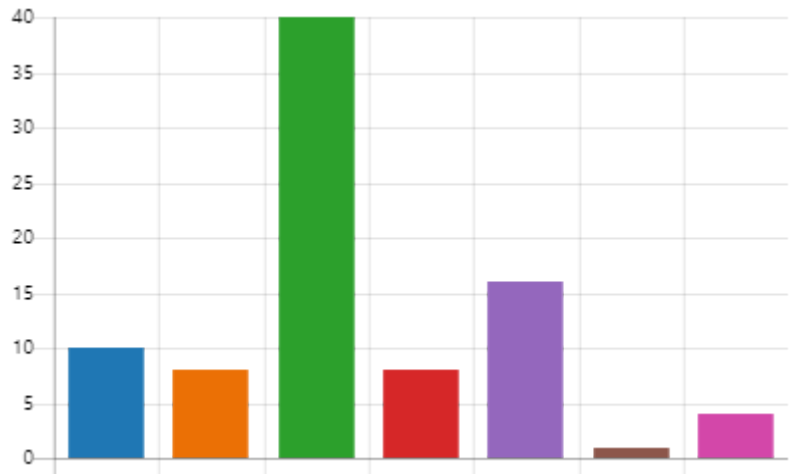
10. Do you currently have flood insurance on your home/business?

Yes	14
No	80
I don't know.	19



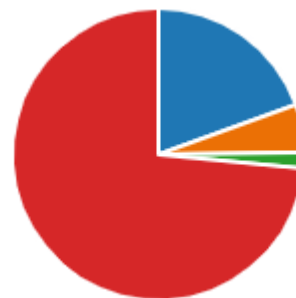
11. If you don't have flood insurance, please indicate the main reason why.

Never really considered it.	10
It never floods.	8
Not located in a floodplain.	40
Too expensive.	8
My house is elevated or other...	17
I don't have a federally backed...	1
Other	4



12. Do you have a generator/emergency back-up power?

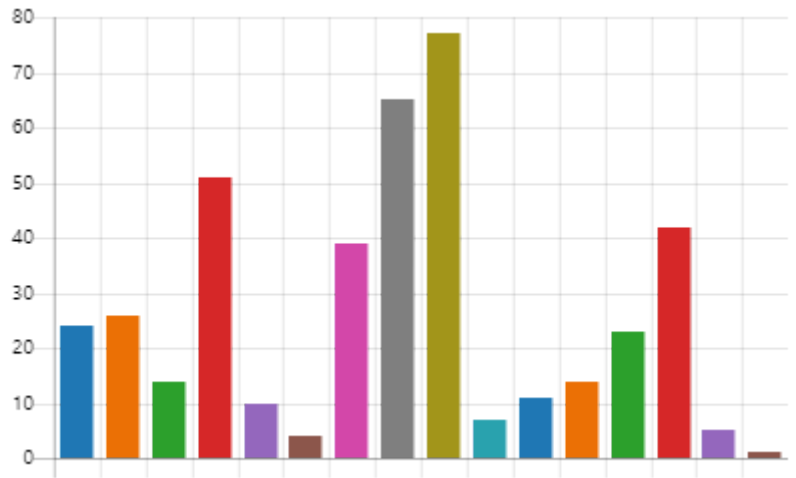
Yes, portable generator	23
Yes, whole house generator (n...)	6
Yes, whole house generator (o...)	2
No.	85
Other	0



13. How do you prefer to receive educational information about how to better protect your home, business, or neighborhood?

Check all that apply. (Don't worry, we aren't adding you to a list.)

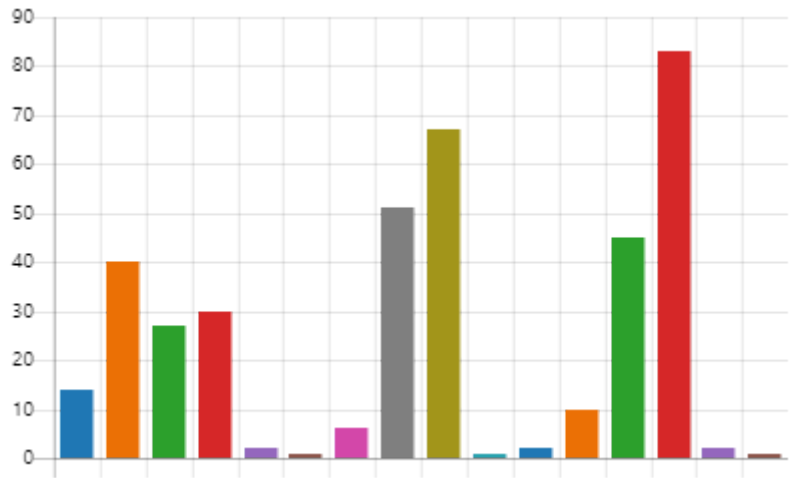
- Local newspaper 27
- Television 28
- Radio 15
- City's Website 53
- Public workshops and meetings 12
- School meetings and messages 4
- Direct mailings 41
- Email 67
- Social media (Facebook, Twitt... 77
- Information at the library 7
- Information on utility bills 11
- Roadside message boards or ... 14
- Phone call from "Code Red"/R... 23
- Text message from "Code Red... 42
- Not interested 5
- Other 2



14. How do you prefer to receive EMERGENCY information about storms or other weather warnings?

Check all that apply. (Don't worry, we aren't adding you to a list.)

Local newspaper	16
Television	43
Radio	29
City Website	32
Public workshops and meetings	3
School meetings and messages	1
Direct mailings	6
Email	52
Social media (Facebook, Twitt...	68
Information at the library	1
Information on utility bills	2
Roadside message boards or ...	10
Phone call from "Code Red"/R...	46
Text message from "Code Red...	84
Not interested	2
Other	2



15. Additional thoughts on how Cranston can better prepare for the next natural event/disaster.

Question #15

1	anonymous	have a mitigation plan in place for state and federal level to receive the assistance need it.
2	anonymous	Survey the Pawtuxet River borders on the neighborhood streets, clean up of the surrounding area, opportunities for the existing land around it, safety and security measures to mitigate flood risk, pump house updates, measures to protect wildlife in those areas.
3	anonymous	Feel current information formats are working for us
4	anonymous	Staffing and Quick Response
5	anonymous	Keeping trees trimmed so that they do not fall during storms keeping neighborhoods without power for days.
6	anonymous	As we prepare for more extreme weather events - a community vulnerability study could be worth while. Also - when a new person moves into the city (purchase of a home) providing the information (maybe a mailer to the home directing the resident to the city website) for information about this & who to call when your street floods out and becomes unsafe for vehicles to traverse. I have watched multiple cars try to go through my street when flooded and stall in the water.
7	anonymous	Be proactive in keeping drains clean and fixing roads.
8	anonymous	Have police enforce parking bans for snow removal. Have city resolve flooding issues. Have city trim and/or remove old overgrown trees that hang over pole lines.
9	anonymous	Thank you for all you are doing to keep us informed!
10	anonymous	I lost all in the historic flood in Cranston in 2010...such a hard time in my life. I think even a simple hand out on where/how to get help would have helped me out.
11	anonymous	Get the bridges fixed! Reservoir Ave Bridge and the Park Ave Bridge - for at least emergency use Have salt and sand ready to go for the winter, have people lined up and ready for snow removal.
12	anonymous	I think a layered approach about communication is best, since people access information different ways now. Library, Senior Center, schools, also social media an email list people can sign up for etc. I mostly think about power outages - elderly people and medically fragile people who need oxygen, refrigeration for medicines etc.
13	anonymous	Very poor snow and ice removal/sanding. Street never fully plowed making dangerous with walk streets or drive. 2 cars cannot pass each other after snow storm.
14	anonymous	Stay current on maintenance and upkeep of infastructure. Clearing storm drains. Be more outspoken about emergency response plans prior to a major event.
15	anonymous	Keep sewers clear of leaves. Plant evergreens instead of leafy trees along highway fences bordering neighborhood streets to control issues from leaf drop such as clogging sewers resulting in flooded streets. Remind folks to maintain trees to protect wires and power workers, and also to clear paths to and around generators.

16	anonymous	Cranston must clean up areas along the Pawtuxet River located in floodways and floodplains. Most are businesses that do not keep floatables tied down and change the topography of the land. This will cause major damage if the river floods.
17	anonymous	Clear debris , garbage, leaves, branches from public drains / sewers prior to storm
18	anonymous	Its been thought out to death, actually start to implement the plans that have been around for years and unacted upon.
19	anonymous	Better tree trimming, we live on hazelwood street and both end of the roads have massive oaks with large limbs over power lines etc. They are always a concern with winds
20	anonymous	Take advantage of social media!! Keep residents in the loop by posting more information on what the city is doing to go forward with this issue, and the many others issues involving our city!! Way too often I see posts from the city way after the fact of what is happening or happened. If the city doesn't have a social media administrator then I suggest you look into it.
21	anonymous	Street flooding is a huge concern in Cranston. I would love to see what can be done to fix that issue.
22	anonymous	Trim trees in prep of storms ! Lots of power outages can be avoided by proactively trimming along w street cleaning and clearing storm drains and grates.
23	anonymous	Implement a municipal rain barrel program with repurposed barrels available for a small cost to residents and workshops on harvesting rainwater. So much water could be repurposed and used during droughts, for yards etc. and diverted from catch basins and help reduce flooding. Programs on rain-friendly landscaping and rain gardens would encourage residents to help be part of the solution with support from the city.
24	anonymous	The brook in back of my yard needs to been cleaned. The city owns it and it causes a flood in my basement when it overflows
25	anonymous	Since people don't pay attention to the flash red lights that say don't drive thru the floods on Wilbur Avenue, put those gates that close, get better solutions for that portion of Oaklawn Avenue
26	anonymous	Stop building and add more green space throughout the city.
27	anonymous	When it rain it pours, the rivers are a problem. Back when it flooded. The Army Core of Engineers suggested to dredge the rivers. I believe it was Governor Carcieri who did not " TO EXPENSIVE " he said
28	anonymous	Street sweepers are helpful but drains need to be attended to more frequently
29	anonymous	I think it would be wise to find a new place to park school busses. It seems sometimes that street is more prone to flooding and school could be in session if the busses were available.

30	anonymous	Alert residents about the importance of keeping street drains free of debris. It's the city's job to clear it, but neighbors can also help rake leaves and debris off drains if they live near one. Take action when neighbors say they have a drain problem, such as the people who live at the bottom of Alhambra circle. Don't just let current admin brush off problems to someone else. Make sure streets have names on them so if there's an emergency and you have to leave via a street name, there's actually a sign for that street. Have people at farmer's markets displaying and selling basic items for emergency kits. When people buy a new house, have an emergency kit info packet as part of the closing, so get realtors involved. Anytime the city has a social event like music on the green, trick or treating, christmas tree lighting, have emergency info printed saying, "This is what needs to be in an emergency kit and this is where you buy it "(Durfees, Ace, CVS). It's not a matter of not wanting to be prepared, it's a matter of not having time, not thinking about it, not knowing where to get it, and not wanting to spend 100\$ on an emergency kit that will sit in a basement and hopefully never be used. Thank you for doing this and for asking the public's opinion!
31	anonymous	Do something about the rat population, a natural disaster in the making...!
32	anonymous	Update flood plain maps; consider additional restrictions and/or requirements for construction of parking lots, commercial and residential buildings in or abutting flood zones. Continue buyout programs for flood prone properties.
33	anonymous	Take climate change seriously when considering new development and redevelopment proposals. Encourage resiliency and adaptive reuse of vacant and under-utilized properties by offering incentives such as expedited approvals.
34	anonymous	Make sure street drains are clear. Educate public about clearing drains near their homes. Have a program for sandbags.



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## Appendix B: Public Outreach

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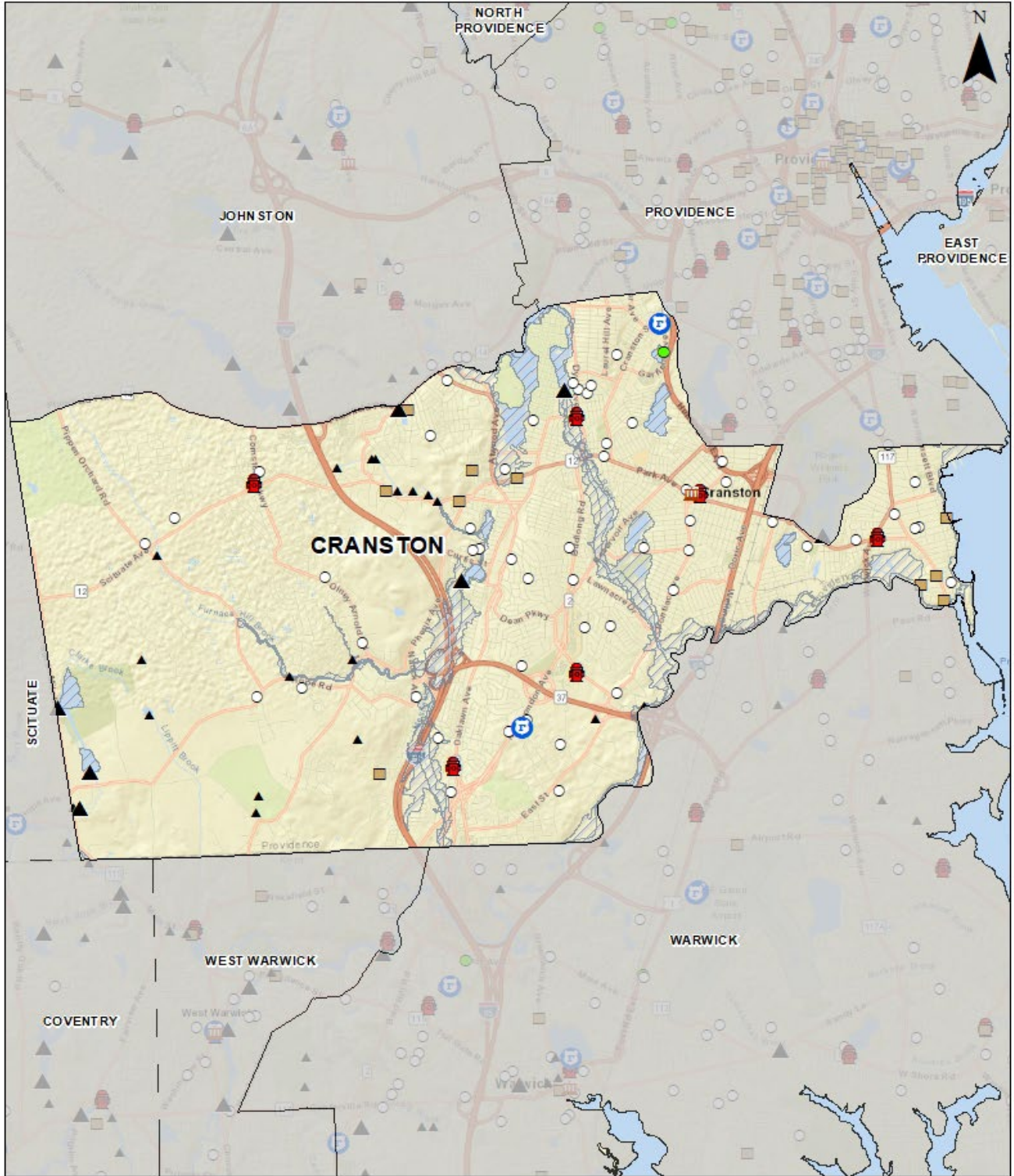
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## Appendix C: Community Assets Map

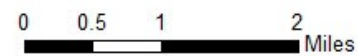
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**Legend**

- |  |  |             |
|--|--|-------------|
|  |  | <b>Dams</b> |
|  |  |             |
|  |  |             |
|  |  |             |

**Community Assets  
Cranston, RI**



Source: RI Geographic Information System, 2021