2024
STRATEGY FOR REDUCING RISKS FROM NATURAL HAZARDS

Town of Glocester, Rhode Island

Prepared for: Town of Glocester, Rhode Island
1145 Putnam Pike, Chepachet, Rhode Island 02814
Prepared by: iParametrics, LLC

STRATEGY FOR REDUCING RISKS FROM NATURAL HAZARDS IN GLOCESTER, RHODE ISLAND

Glocester Town Council
William A. Worthy, Jr., President
Stephen W. Arnold, Vice President
Walter M. O. Steere, III
Jonathan E. Burlingame
Cheryl A. Greathouse

Members of the Glocester Natural Hazard Mitigation Committee
Gerry Mosca, Emergency Management Director*
Karen Scott, Town Planner*
Chief Joseph DelPrete, Chief of Police
Dennis Huestis, Chepachet Fire Department Chief*
Steve Quattrini, Harmony Fire Department Chief
Dennis Begin, Building/Zoning Official*
Gary Treml, Director of Public Works*
Elizabeth Beltram, Finance Director
Heidi Blank, Glocester GIS Specialist
Elizabeth Decorte, public member
Jeffrey Stevens, iParametrics

This project was made possible by the commitment of the Glocester Natural Hazard Mitigation Committee and leadership and support from the Glocester Town Council President and Town Council. This commitment, leadership, and support will result in better preservation and enhancement of the quality of life, property, and resources of the Town of Glocester.

RI Emergency Management Agency
Marc Pappas, Director
Rae-Anne Culp, State Hazard Mitigation Officer

State Assistance
The project has moved forward thanks to the support and resources provided by the Rhode Island Emergency Management Agency (RIEMA) with special acknowledgement to Rae-Anne Culp, State Hazard Mitigation Officer.

The State of Rhode Island and Providence Plantations

Town of Glocester

Resolution 2024-X

To Adopt the FEMA Approved Strategy for Reducing Risks from Natural Hazards
Town of Glocester, 2024

WHEREAS, the Town of Glocester recognizes that the threat natural hazards pose to people and property; and

WHEREAS, the Town of Glocester has prepared a multi-hazard mitigation plan, hereby known as the Strategy for Reducing Risks from Natural Hazards, Town of Glocester, 2024 in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the 2024 plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Glocester from impacts of future hazards and disasters; and

WHEREAS, adoption by the Town Council demonstrates their commitment to hazard mitigation and achieving goals outlined in the Strategy for Reducing Risks from Natural Hazards, Town of Glocester, 2024; and

NOW, THEREFORE BE IT RESOLVED, that the Glocester Town Council accepts and adopts the Strategy for Reducing Risks from Natural Hazards, Town of Glocester, 2024.

_____
William A. Worthy, Jr.
Glocester Town Council President

_____
Jean M. Fecteau, CMC
Town Clerk

Dated this XX day of XX 2024

Table of Contents

Section 1 Background

Natural hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and their property from the effects of natural hazards. Mitigation activities may be implemented prior to, during or after an incident. However, hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that has been developed before a disaster occurs.

1.1 What Mitigation Can Do for Glocester

An important benefit of hazard mitigation is that money spent today on preventive measures can significantly reduce the cost of post-disaster cleanup tomorrow. By implementing strategies outlined in this plan, Glocester will minimize the economic and social disruption that can result from hurricanes and other natural disasters.

During this Plan update, members of the Glocester Natural Hazard Mitigation Committee (NHMC) assessed the risks to the Town. By creating a mitigation strategy based on risk and vulnerability, Glocester has established a process that will make hazard mitigation a routine part of municipal government. The Town Council is committed to the process through the establishment of an internal hazard mitigation committee that meets once a year and after every major event, to review and revise the plan and to move forward with addressing natural hazard issues within the Town.

The adoption of this mitigation strategy also increases Glocester's eligibility for federal grants for hazard mitigation, including the Federal Emergency Management Agency's (FEMA) Building Resilient Infrastructure and Communities (BRIC) Program, Flood Mitigation Assistance (FMA) Program and Hazard Mitigation Grant Program (HMGP). In addition, the Rhode Island Emergency Management Agency (RIEMA) gives funding priority to municipalities that have completed a risk assessment and established mitigation projects with detailed information on the cost, timeline, and municipal department responsibility for completing the project. Regulations pertaining to FEMA's flood mitigation grants and local hazard mitigation plans are provided in the Code of Federal Regulations (CFR), Title 44, Part 201.

1.2 Glocester's Mission Statement

The mission of the 2024 Glocester Natural Hazard Mitigation Plan is to preserve and enhance the quality of life, property and resources by identifying vulnerable areas at risk from natural hazards and implementing strategies to mitigate their effects to Glocester's population, infrastructure, and historical, cultural and natural resources.

1.3 Goals

The goals developed by the NHMC are related directly to the mission, and described further in Section 5 Natural Hazard Mitigation Strategy. These goals reflect current community priorities and include:

1. Protect the public health, safety and welfare from all hazards;
2. Reduce present and future property damages caused by hazard impact;
3. Protect critical infrastructure (i.e. dams, roads, utilities and essential services);
4. Increase public understanding and support for natural hazard mitigation through public education;
5. Protect cultural, historical, natural and economical environments; and
6. Reduce the dependence and need for disaster assistance funding after disasters.

1.4 Community Planning Area

1.4.1 Location, Geography and Land Use

The Town of Glocester is located in northwestern Rhode Island. It is bordered on the north by Burrillville, on the east by Smithfield, on the south by Scituate and Foster, and on the west by Killingly and Putnam, Connecticut. It is connected to these various other communities by Route 44, which runs east-west, and by Route 102, which runs north-south. The state capital, Providence, is approximately 35 minutes to the east.

Glocester is a rural community, dotted throughout by lakes and ponds. Several of these bodies of water are part of the Providence Water Supply System. Much of the northern portion of the Town is set aside as state-owned parks and forests. The highest point in Glocester, and second highest point in the state of Rhode Island, is Durfee Hill at 804'. Chepachet, the largest of the villages to spring up over the years, was the seat of government and a bustling trading center during the 18th and 19th centuries. Chepachet, like its more eastern neighbor, Harmony, continues to flourish.

Prior to 1965 when Glocester adopted its first zoning ordinance, land use, intensity and location were primarily determined by matters of commerce and personal choice. Villages grew near areas of manufacturing activity and/or transportation systems. Farms were scattered throughout the remainder of the community. Most of the land remained fallow or unimproved due to its physical limitations for farming or community development. High water tables, wetlands, slope and stoniness were the dominating features characteristic of Glocester's land that constrained and directed development activities.

The first zoning effort sought to establish a logical assembly and order of land uses. Due to the low-intensity development and rural nature of the Town's historical development, the land area was zoned for low-density residential use with a small allowance for commerce uses around the village centers. Several evolutionary amendments were made to this original zoning ordinance; however, the historical pattern of low density and agricultural development has been carried forward into the current zoning ordinance. Table 1.1 below outlines the current land uses in Glocester.

Table 1.1 Existing Land Use (Source: Source: Town of Glocester 2040 Comprehensive Community Plan)

Land Use	Acres	% of Area
Active Recreation	170.32	0.47%
Cemeteries	88.43	0.24%
Commercial	439.64	1.21%
Industrial	540.98	1.48%
Institutional	1,211.63	3.32%
Mixed Use	355.96	0.98%
Protected Open Space	5,516.12	15.13%
Residential < 1acre*	765.28	2.10%
Residential 1-2 acres*	728.92	2.00%
Residential >2 acres*	15,594.91	42.76%
Right of way	473.82	1.30%
Undeveloped	8,882.57	24.36%
Water	1,700.50	4.66%
Total	36,469.10	100.00%

** Includes agricultural uses*

1.4.2 Demographics

The population growth rate in Glocester for the 50-year period 1960-2010 was about 195%, an almost tripling of the population over the past half-century. However, the Rhode Island Division of Planning's Statewide Planning Program completed population projections for all municipalities. The projections indicate a much slower rate of growth for the next 30 years than for the previous decades. Whereas Glocester grew by 195% from 1960 to 2010, it is expected to only grow by 3% by 2040. The State's population projections show that the State as a whole will continue to have very slow population growth through 2040.

Table 1.2 Population and Projections, 1960-2040 (Source: US Census, American Community Survey (1960-2015), RI Population Projections, RI Statewide Planning Program, 2013 (2020-2040))

Year	Persons	Numerical Change	Percent Change
1960	3,300		
1970	5,200	1,900	57.6%
1980	7,550	2,350	45.2%
1990	9,227	1,677	22.2%
2000	9,948	721	7.8%
2010	9,746	-202	-2.0%
2015	9,897	151	1.5%
2020	9,820	77	0.8%
2025	9,957	137	1.4%
2030	10,057	100	1.0%
2035	10,102	45	0.5%
2040	10,080	-22	-2.2%

As of 2022, the population count in Glocester was 10,039, representing a 3% increase (+293) from the population in 2010 of 9,746. The population total in April 1, 2020 represented a +2% change (+228) from the 2010 population total of 9,746. In 1990, Glocester ranked 30th in population among Rhode Island's 39 cities and towns.

Glocester's population is composed mostly of Caucasian, not Hispanic or Latino (see Table 1.3 and 1.4, respectively). The largest group of population is between 45 years old and 59 years old (Table 1.5).

Table 1.3 Population Race (Source: American Community Survey DP05, 2022)

Race	Population	% of Population
White	9,779	97.4%
Black or African American	0	0.0%
Asian	58	0.6%
Other	20	0.1%
Two or more races	182	1.8%
Total	10,039	

Table 1.4 Population Ethnicity (Source: American Community Survey DP05, 2022)

Ethnicity	Population	% of Population
Hispanic or Latino (any race	58	0.6%
Not Hispanic or Latino	9,981	99.4%
Total	10,039	

Table 1.5 Population Age (Source: American Community Survey DP05, 2022)

Age	Population	% of Population
Under 5 years	311	3.1
5 to 9 years	674	6.7
10 to 14 years	757	7.5
15 to 19 years	672	6.7
20 to 24 years	515	5.1
25 to 34 years	807	8.0
35 to 44 years	1,075	10.7
45 to 54 years	1,340	13.3
55 to 59 years	1,395	13.9
60 to 64 years	840	8.4
65 to 74 years	1,191	11.9
75 to 84 years	324	3.2
85 years & over	138	1.4
Total	10,039	

1.4.3 Housing

According to the 2040 Glocester Comprehensive Plan[1], the following are facts about Glocester's housing:

- The Town of Glocester has 4,059 units, an increase of 273 units since 2000.
- Of the total housing units, 3,624, or 89.3% are occupied, while 435 or 10.7% are vacant.
- 3,881 units or 95.6% of the total housing units are year-round.
- 178 or 4.4% of total housing units are seasonal housing units.
- 3,707 or 91.3% of total housing units are single-family houses.
- 259 or 6.4% of total housing units are multi-family.
- 93 or 2.3% are classified as other types of housing units.
- 91.7%, or 3,324 of occupied housing units are owner occupied and,
- 300 or 8.3% are rental housing units.
- The median age of housing units is 46 years, and the median year built is 1970.

As can be seen from the above information, Glocester's housing stock is mainly single family owned and the housing stock is aging. The rate of housing growth in Glocester has mirrored population growth between 2016 and 2023 and remained relatively flat (Table 1.6).

[1] Glocester, RI. Glocester 2040 Comprehensive Community Plan, Effective Date, May 3, 2018.

Table 1.6 Annual Construction, New Homes, 2016 – 2023 (Source: Glocester Building and Zoning Department, 2023)

Year	Units
2016	27
2017	36
2018	33
2019	40
2020	52
2021	32
2022	24
2023	36
Total	280

1.4.4 Infrastructure

The Town uses a systematic maintenance and improvement process to manage its roadways. All roads are catalogued and evaluated for condition by the Department of Public Works (DPW). An annual work program maintains and upgrades roads determined to be in need. This listing is contained in the Town's Capital Improvement Program and its operating and capital budgets prepared by the Budget Committee and Town Council and submitted to the Town Meeting for consideration and action.

According to pavement management system data maintained by the DPW, there is a total of 147 linear miles of roadway in Town. Approximately 77 miles are Town-owned roads, 30 miles are privately-owned roads, and 38 miles are State-owned roads. There are an additional 2 miles of park-access roads.

There is no rail, marine or terminal facilities located in Glocester. US 44 serves a regional commerce function as an alternative east - west route between the Providence and Hartford metropolitan market areas.

1.4.5 Community Development and Development Trends

Populations increased in the suburban and rural areas of Rhode Island because of urban decentralization. From 1960 to 2000, Glocester's population nearly tripled going from 3,300 to 9,746. This occurred while the City of Providence was seeing population loss. People were moving from the centers of employment to primarily undeveloped outlying areas and commuting became more common. In the last decade though, the population has remained steady. Community development and development trends in Glocester will be dictated by established local ordinances that promote low density and agricultural development.

1.4.6 Historic and Natural Resources

Significant Historic Resources

The Town has had a rich history since its first European settlements occurred in the early 18th century. Glocester was inhabited by Native American Nipmucs well before the first European settlers arrived. In 1638, Roger Williams received a deed from the Narragansett Tribe for land that included the area known today as Glocester. Many of the events and circumstances that have shaped Glocester are detailed in two reports: The Historical and Architectural Resources of Glocester, Rhode Island, prepared by the Rhode Island Historical Preservation Commission (1980), and Glocester, The Way Up Country, compiled by the Glocester Bicentennial Commission (1976).

National Register of Historic Places

The Historical and Architectural Resources of Glocester 1980 report identified historically significant buildings, sites and areas. This inventory serves as the primary source for all local historical preservation efforts. Several sites/districts of historical significance are included on the National Register of Historic Places and other sites/districts have been identified as eligible for listing on the National Register. The National Register listing is assembled and maintained by the U.S. Department of the Interior. National Register properties gain recognition, protection, and financial assistance for preservation or restoration.

In Glocester, there are 5 national register listings. In addition, over 150 properties were identified in the Historical and Architectural Resources of Glocester report as meriting further consideration regarding their historical significance and potential to be determined eligible for listing on the National Register. Other significant historical or archeological features in the Town include cemeteries, farm roads and stonewalls (Appendix C). As of 2024, there are no updates to the National Register listings.

John H. Chafee Blackstone Valley National Heritage Corridor

In addition, Glocester is one of 25 cities and towns in Rhode Island and Massachusetts that encompasses the John H. Chafee Blackstone River Valley National Heritage Corridor. The Heritage Corridor was established in 1986 for the purpose of "preserving and interpreting for the educational and inspirational benefit of present and future generations the unique and significant contributions to our national heritage of certain historic and cultural lands, waterways and structures within the Blackstone Valley in order to provide a management framework to assist the states….and their units of local government in the development and implementation of integrated cultural, historical, and land resource management programs in order to retain, enhance, and interpret the significant values of the lands,

waters and structures of the Corridor."[2] The law was amended in 2014 to establish the Blackstone River Valley National Historical Park. The entity charged with coordinating the activities of the Park and Corridor is the Blackstone River Valley National Heritage Corridor, Inc.

Significant Natural Resources

Glocester's natural resources have played an important role in the Town's development, settlement pattern, and the character of the Town. Of the 36,469 acres of area that comprise the Town of Glocester, 1,700 acres are surface water and 2,405 acres are wetlands, accounting for 6.6% of the Town's total area. Flood storage capacity areas or flood plains, which constitute 2,382 acres and 6.5% of the Town are another important local water resource. Approximately 2,382 acres of the Town's land area is comprised of floodplains. The Glocester Zoning Ordinance regulates development within all flood-hazard areas in the Town. The Glocester Building Official is given authority to require a development permit for construction within a flood-hazard zone. Special building code standards apply to structures erected in a flood-hazard area. Additional building standards are contained in the Rhode Island State Building Code.

The proper functioning of these resources is critical to the environmental health of the community and safety of its citizens. 10,631 acres, or 29% of the Town lies within the Scituate Reservoir watershed. The Providence Water Supply Board is the owner and operator of the Scituate Reservoir water supply and distribution system. In addition to these surface water resources are the subsurface or groundwater resources. The Town does not provide a public water supply or distribution network. All potable water in Glocester is obtained from groundwater, captured and distributed by private individuals or firms. Water quality preservation and enhancement including groundwater protection are of paramount importance to the well-being of Glocester's citizens and the nearly 60% of the State's population supplied water from the Scituate Reservoir.

In Glocester, there are 8 watersheds, two of which (Barden Reservoir-Ponaganset River and Moswansicut Pont-Huntinghouse Brook) contribute to the larger Scituate Reservoir. Within the watershed area is a dynamic natural water resource system comprised of rivers, streams, creeks, ponds, lakes, wetlands and floodplains. A stream, creek, pond or lake is an important part of the hydrological cycle. The hydrological cycle is a process where precipitation from the atmosphere falls onto the earth; percolates into groundwater preserves; runs off or leaches from the ground water reserves into surface water bodies or wetlands; and is evaporated by the sun or

[2] Public Law 99-647, November 10, 1986

transpired by plants back into the atmosphere. Surface water bodies, streams, creeks and wetlands serve two parts of this cycle. First, they serve to drain the surface of the land and, second, they are interconnected with groundwater movement.

In Glocester, 100% of the potable water supply is obtained from groundwater sources. Thus, aquifers are an important public resource. The Rhode Island Department of Environmental Management (RIDEM) has estimated that the Town's primary groundwater reservoir occupies approximately 900 acres, with an associated recharge area of over 5,000 acres. This one aquifer area lies beneath about 16% of the Town's total land area. Other aquifers have been catalogued and evaluated by the Environmental Protection Agency (EPA) and the US Geological Survey (USGS). They include aquifers surrounding the Keech Pond, Smith and Sayles Reservoir, Chepachet River, and Pascoag Reservoir.

1.4.7 Commerce, Industry, and Academic

According to the Rhode Island Department of Labor and Training's Labor Market Information Division "Benchmark" revision (2023), Rhode Island ended 2023 with a 3.4% unemployment rate. Between December 2022 and December 2023, the Rhode Island labor force increased by 6,000. However, Glocester's unemployment rate increased from 1.6% to 2.7% between December 2022 and December 2023. Between 2016 and 2022, the unemployment rate for Glocester decreased by 37.5% while the employment rate increased by 8.4%.

According to the Rhode Island Department of Labor and Training's State of the State publication (2024), employment growth in Rhode Island was up 4.1% between 2021 and 2022 while it was up 2.3% in Glocester. In 2022, the unemployment rate in Rhode Island was 3.2%, while it was 2.5% in Glocester, which was the 5th lowest in the State.

Between 2020 and 2022, employment in Glocester increased by 130 jobs (8.5%). Private sector employers reported a growth of 127 jobs (12.1%) while public sector employment increased by 3 jobs (0.6%). In 2022, about 81% of Providence County residents worked in Rhode Island while 17.7% worked in Massachusetts, 0.8% worked in Connecticut, and 0.5% worked elsewhere.

FM Global is the Town's single largest taxpayer. FM Global is Rhode Island's largest private company and one of the world's largest commercial and industrial property insurers. The company specializes in engineering-driven underwriting and risk management solutions and property loss prevention research.

The remainder of Glocester's economic base is small and concentrated on the non-basic services sector. The typically lower-paying employment opportunities available in these sectors are not adequate for persons to reside in a median-priced Glocester home, even should there be a two-income, average wage-earner household. The bulk of Glocester's civilian labor force must commute to other labor market areas to find adequate income employment opportunities. It is the regional market that provides Glocester's labor force with gainful employment opportunities and adequate income to assure economic survival.

There are no institutions of higher learning in Glocester, but it is in close proximity to Bryant University in Smithfield, Rhode Island.

1.5 Significant Events Since the Last Plan Update

Significant Rhode Island natural hazard events since the last plan update (including updates from Strategy for Reducing Risks From Natural Hazards in Glocester, Rhode Island, Adopted 2005, Revised in 2011, 2018):

Severe Flooding of 2010 (FEMA DR-1894)
The flooding that occurred between March 12th and 30th 2010 (FEMA declaration DR-1894) was the worst in over 100 years in the State of Rhode Island, and was unprecedented in scale, ubiquity, and overall impact to the State. The disaster was caused by exceptionally heavy spring rainfall along the North East coast. Fully 16.32 inches of rain accumulated in Rhode Island in March, eclipsing the previous record precipitation by more than an inch; more than 8.6 inches of rain all over March 28-30th.

This downpour had two major effects on Rhode Island's physical geography: 1) the Blackstone, Pawtuxet, Woonasquatucket, Pawcatuck and other rivers reached record heights and overflowed. The Pawtuxet crested at 20.79', 11' above the 9' flood level. 2) The month of rain had led to super-saturation of permeable surfaces, which led to not only a lessening of the effectiveness of watersheds and other river-flood mitigating features, but also to the pooling of non-river waters in low topographies and the seepage of ground waters into basements and foundations. The March 2010 disaster was widespread and delocalized, as flood damage occurred around multiple rivers and low-altitude points.

The flooding itself led to in excess of $200 million dollars of damage, as conservatively estimated by the Governor's office, to Rhode Island infrastructure, homes and businesses. Multiple utility substations, including a major substation in Westerly, Rhode Island, were flooded, and more than 10,000 households lost power for multi-day periods. Sections of forty major arterial roads and highways were closed, with many incurring significant

structural damages; sections of I-95 were shut down for three days, restricting north-south movement in the State. Numerous bridges, dams and wastewater treatment plants were damaged to the point of requiring replacement or major structural repairs.

Several hundred Rhode Islanders were evacuated during the flood; over 25,000 applied for FEMA Individual Assistance related to disaster needs. Displaced and affected homeowners were disproportionately comprised of low income individuals (39%), according to the Preliminary Damage Assessment. Total damage to homes and individual property is estimated to have exceeded $100 million.

In Glocester, the total FEMA damage payout to homes and individual properties was $175,867.82 for 88 eligible Individual & Household Program (IHP) applications.[3] For FEMA DR-1894, FEMA paid $172,175 to 87 property owners for housing assistance and other needs (ON) totaled $3,693 for 10 residents. Other Needs is defined as disaster-caused expenses including, medical and dental, child care, funeral and burial, essential household items, moving and storage, vehicle, and some clean-up items.[4] FEMA also paid out $116,720 in public assistance funds to rebuild infrastructure lost to flooding and to reimburse flood associated costs. Chepachet Fire District received $8,908 and the West Glocester Fire Department received $7,202.00 and $52.00, respectively.[5]

Tropical Storm Irene – August 2011 (FEMA DR-4027)
In Southern New England, Tropical Storm Irene produced sustained winds over a six (6) to 12-hour long duration resulted in widespread tree damage and power outages to roughly half a million customers throughout the state. Some of these customers did not get their power back until the Friday following the storm (some five (5) days later). During the passage of Tropical Storm Irene, the Glocester response and recovery efforts resulted in $46,945 in FEMA Public Assistance. The specific FEMA public assistance reimbursements in Glocester were:[6]

- PW#1 $4,207.50 (Paid 1/17/12)
- PW#130 $17,673.92 (Paid 12/9/11)
- PW#131 $25,063.58 (Paid 12/9/11)

The collective effects of Tropical Storm Irene on August 28, resulted in one (1) fatality, 0 injuries, and $127.3M in property damage in the following

[3] State of RI Action Plan, 2010 Floods, RI Office of Community Development, December 2010.
[4] Ibid.
[5] Ibid.
[6] RIEMA Grant Support, August 7 2018.

counties: Barnstable, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester (all in MA), Hartford, Tolland, and Windham (all in CT), Cheshire and Hillsborough (all in NH), and Bristol, Providence, Kent, Washington, and Newport (all in RI).[7]

Superstorm Sandy – October 2012 (FEMA DR-4089)
Hurricane Sandy (FEMA-4089-DR) made landfall in New Jersey on Monday, October 29, 2012. Its enormous dimensions (tropical force winds spanned almost 900 miles) created widespread devastation and affected approximately 300,000 Rhode Island residents, or 28% of the State's population. Fortunately, there were no fatalities. Mandatory local evacuations were ordered in eight communities. Approximately 120,000 electric customers lost power (out of 482,000 customers), and 1,200 natural gas customers lost service (out of 252,000 gas customers). Nine substations went out of service, 1,433 sections of wires went down, and 63 poles were broken. An estimated 40,000 customers remained without power for two or more days. Five days passed until National Grid was able to restore electric service to 100% of customers. Four of the State's six fuel terminals were forced to shut down during storm[8].

While Glocester experienced extensive power outages, the highest concentration of damages from Superstorm Sandy were located in the southern coastal communities. There was no FEMA Hurricane Sandy public assistance or individual assistance and reimbursement needs for Glocester.

Severe Winter Storm and Snowstorm – February 2013 (FEMA DR-4107)
A major disaster declaration was declared on March 22, 2013 due to a severe winter storm and snowstorm in Washington, Kent, Newport, Providence and Bristol Counties. Reports indicated that this storm stretched from New Jersey to Maine and into Canada. More than two feet of snow fell in Rhode Island from Friday night to Saturday morning. By Saturday night, 129,000 customers in Rhode Island remained without power.[9] The total FEMA public assistance reimbursement paid to Glocester was PW#71 $27,696.14 (Paid 12/13/13)[10]. There was no FEMA individual assistance reported for Glocester. National Grid estimated more than 180,000 customers lost power.

[7] National Centers for Environmental Information (NCEI) formerly known as National Climatic Data Center (NCDC). Retrieved from http://www.ncdc.noaa.gov/.
[8] State of RI Action Plan, Hurricane Sandy Disaster, RI Office of Community Development, September 2016
[9] National Centers for Environmental Information (NCEI) formerly known as National Climatic Data Center (NCDC). Retrieved from http://www.ncdc.noaa.gov/.
[10] RIEMA Grant Support, August 7 2018.

Severe Winter Storm and Snowstorm – January 2015 (FEMA DR-4212)
An historic winter storm brought heavy snow to southern New England with blizzard conditions to much of Rhode Island and eastern Massachusetts starting on Monday, January 26, 2015 and lasting into the early morning hours of Tuesday, January 27, 2015. The highest snowfall totals, averaging two to three feet, extended from extreme northeast Connecticut and northwest Rhode Island into much of central and northeast Massachusetts, including greater Boston. Much of southeast Massachusetts and the rest of Rhode Island received one to two feet of snow. Totals dropped off dramatically west of the Connecticut River Valley where 4 to 8 inches were observed.[11]

The storm was well-forecast with Blizzard Watches and Winter Storm Watches issued two days before the snow began. Low pressure tracked northeast from the Carolinas and strengthened rapidly as it slowly passed southeast of Nantucket on Monday evening, January 26. All of the precipitation fell as snow with this storm. At its peak, snowfall rates of two (2) to three (3) inches per hour were common.[12] For this event, the total FEMA public assistance reimbursement paid to Glocester PW#34 $37,711.29 (Paid 10/15/15).[13] Glocester did not have any individual assistance and reimbursement needs for this event.

COVID-19 – March 2020 (DR-4505-RI)
The Rhode Island Governor Dan McKee issued Executive Order 20-100 Emergency Declaration in response to the dangers posed by COVID-19.[14] This emergency declaration was made on March 9th 2020. According to the Center for Disease Control and Prevention (CDC), the total reported national hospitalizations from COVID-19 as of March 4, 2024 is 6,851,629; while the total deaths reported is 1,181,607.[15]

The Coronavirus Disease is an infectious respiratory illness caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2). It was first identified in December 2019 in Wuhan, China and quickly spread into a global pandemic. COVID-19 is primarily spread through respiratory droplets when an infected person coughs, sneezes, or breathes. Symptoms can range from mild to severe with older adults and individuals with underlying health conditions remain at greater risk for hospitalization. COVID-19 had a profound impact on the State of Rhode Island. To date, 14,759 individuals

[11] Ibid.
[12] National Centers for Environmental Information (NCEI) formerly known as National Climatic Data Center (NCDC). Retrieved from http://www.ncdc.noaa.gov/.
[13] RIEMA Grant Support, August 7 2018.
[14] Executive Order 20-100, Governor's Office, State of Rhode Island
[15] CDC COVID Data Tracker, Maps by Geographic Area, March 4, 2024

have been hospitalized for COVID-19 in Rhode Island since August 2020 and 4,116 deaths have been reported from COVID-19[16].

The Glocester response and recovery efforts resulted in $57,690.06 in FEMA Public Assistance. The specific FEMA public assistance reimbursements in Glocester were:[17]

- PW#11 $9,428.81 (Paid 8/10/20)
- PW#434 $23,646.55 (Paid 5/2/22)
- PW#522 $24,614.70 (Paid 8/19/22)

Hurricane Henri – August 2021 (FEMA-3563-EM-RI)
A presidential emergency declaration was issued on August 21, 2021 for the state of Rhode Island and on August 22, 2021 for the state of Connecticut, the Mashpee Wampanoag Tribe, and the states of New York and Vermont.[18] Hurricane Henri receded to a tropical storm when it made landfall in southwest Rhode Island on August 22, 2023. Henri moved slowly northwestward across northern Connecticut. Henri brought flash flooding and wind gusts up to 70 mph. As Henri moved across southern New England, it produced 3 tornadoes in Massachusetts on August 23rd.[19] Over 140,000 homes were left without power across Connecticut, Rhode Island, Massachusetts, and New York. Henri is reported to have caused an estimated $700 million in damage in the United States.[20]

Severe Winter Storm and Snowstorm – May 2022 (FEMA-4653-DR-RI)
A major disaster declaration was issued by the president on May 12, 2022, due to a severe winter storm and snowstorm during the period of January 28 to January 29, 2022. In the State of Rhode Island, the following regions were adversely affected by this major disaster: Bristol, Kent, Newport, Providence, and Washington Counties, including the Narragansett Indian Tribe.[21] The Glocester response and recovery efforts resulted in $59,107.63 in FEMA Public Assistance. The specific FEMA public assistance reimbursements in Glocester were:[22]

- PW#70 $55,413.40 (Paid 11/23/22)
- PW#97 $3,694.23 (Paid 12/28/22)

[16] Ibid
[17] OpenFEMA Public Assistance Funded Projects Details, March 19, 2024.
[18] FEMA
[19] National Center for Environmental Information, National Oceanic and Atmospheric Administration, Storm Events Database, 2023
[20] National Hurricane Center Tropical Cyclone Report, Hurricane Henri, 2022
[21] FEMA, 4653-DR-RI
[22] Ibid

Rhode Island Exeter Fire – April 2023 (FM-5465-RI)
On April 14, 2023 a fire management declaration was issued for the State of Rhode Island. The fire was expected to cover 700 acres while the Rhode Island National Guard, Rhode Island State Police, and the Rhode Island Department of Environmental Management were called to respond to the fire.[23] Evacuations from William Reynolds Road north to Route 102 were in place on April 14, 2023.[24]

Severe Storms, Flooding, and Tornadoes – September 2023 (DR-4753-RI)
A major disaster declaration was made by the president on January 7, 2024 for severe storms, flooding, and tornadoes during the period of September 10 to 13, 2023. A preliminary damage assessment report has identified 323 residences impacted by the disaster. As of January 2024, $1,635,330.00 in Individual Assistance is estimated for the State of Rhode Island. [25] Disaster recovery efforts are still ongoing for this declaration.

Severe Storm and Flooding – December 2023 (DR-4765-RI)
A major disaster declaration was made by the president on March 20, 2024 for severe storms and flooding during the period of December 17 to 19, 2023. A preliminary damage assessment report has identified 485 residences impacted by the disaster. As of March 2024, $2,764,990.00 in Individual Assistance is estimated for the State of Rhode Island. [26] Disaster recovery efforts are still ongoing for this declaration.

Severe Storms and Flooding – January 2024 (DR-4766-RI)
A major disaster declaration was made by the president on March 20, 2024 for severe storms and flooding during the period of January 9 to 13, 2024. A preliminary damage assessment report has identified 977 residences impacted by the disaster. As of March 2024, $5,468,397.00 in Individual Assistance is estimated for the State of Rhode Island. [27] Disaster recovery efforts are still ongoing for this declaration.

[23] RI Governor Dan McKee, McKee Administration Update 2 on Exeter Fire, 2023
[24] RI Governor Dan McKee, McKee Administration Update on Exeter Fire, 2023
[25] FEMA, Preliminary Damage Assessment Report 4753, 2024
[26] FEMA, Preliminary Damage Assessment Report 4765, 2024
[27] FEMA, Preliminary Damage Assessment Report 4766, 2024

Section 2 Planning Process

2.1 Purpose, Overview and Background

As defined in 44 CFR 201.2, hazard mitigation means any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (e.g. wind, fire, floods, nor'easters, hurricanes, earthquakes, etc.). As the direct and indirect costs of disasters continue to rise, it becomes particularly critical that preparing for damage from these events must be done in order to reduce the amount of damage and destruction. This strategy is commonly known as a mitigation strategy.

The purpose of multi-hazard mitigation is twofold: 1) to protect people and structures from harm and destruction: and 2) to minimize the costs of disaster response and recovery. To ensure the national focus on mitigation, the Federal Emergency Management Agency (FEMA) introduced a National Mitigation Strategy in 1995. The FEMA strategy promotes the partnership of government and the private sector to "build" safer communities. Hazard mitigation encourages all Americans to identify hazards that may affect them or their communities and to take action to reduce risks.

Mitigation actions help safeguard personal and public safety. Funds spent today on preventative measures can significantly reduce the impact of disasters in the future, including the cost of post-disaster cleanup. The following is stated under Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Section 104 of the Disaster Mitigation Act of 2000:

"To obtain Federal assistance, new planning provisions require that each state, local and tribal government prepare a hazard mitigation plan to include sections that describe the planning process, an assessment of the risks, a mitigation strategy, and identification of the plan maintenance and updating process."

2.2 Building Support: Community Involvement, Roles and Responsibilities

2.2.1 Glocester Natural Hazard Mitigation Committee

In 2004, the Town formed a Natural Hazard Mitigation Committee (NHMC) comprised of the Town of Glocester Emergency Management Agency (EMA) Director, Chief of Police, Town Planner, Building/Zoning Official, Director of Public Works (DPW), Finance Director and Chiefs of all three (3) local fire districts to create the Natural Hazard Mitigation Plan. This NHMC has been responsible for creating and updating the plan every 5 years. In February of 2024, the NHMC convened with a consultant to provide mitigation strategies and hazard updates to the current 2024 plan.

The 2024 NHMC planning team is comprised of the EMA Director, Chief of Police, Town Planner, Building/Zoning Official, Director of Public Works, Finance Director and Chiefs of all three (3) local fire districts and the Town's consultant (facilitator). Technical assistance was sought from the Rhode Island Department of Environmental Management (RIDEM), the Rhode Island Emergency Management Agency (RIEMA), and FEMA. Over the first half of 2024, the NHMC met to define natural hazards in terms of location, the scale or intensity of the event, the history of the natural disaster events, action items, and the probability of the natural disaster occurring in the future. The NHMC was led by the Town Planner and the Town's consultant. The NHMC met on the following dates:

- January 24, 2024: Initial Workshop Meeting
- February 12, 2024: Mid-term Workshop Meeting
- September 18, 2024: Draft Plan Review Meeting (virtual)

2.2.2 Review and Incorporation of Existing Resources

As part of the drafting process several sources were reviewed and incorporated into this 2024 plan including the State Hazard Mitigation Plan (2024), the Glocester 2040 Comprehensive Community Plan, the Strategy for Reducing Risks From Natural Hazards in Glocester Rhode Island (Adopted 2005, Revised in 2011 and 2018), and several data sources including the Rhode Island Climate Change Resiliency Rhody and the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information.

2.2.3 Public Participation

In developing the Plan, the Town sought public engagement to ensure a diverse range of perspectives and feedback on potential hazards and mitigation strategies. The public was invited to participate in the following ways:

- INSERT DATE to INSERT DATE: Once a draft plan was completed, the draft was opened for public comment. The plan was posted on the Town's website and made available in hard copies at the libraries and the senior center.
- INSERT DATE: During the public comment period, the plan was presented at a Planning Board meeting as a way to introduce the plan and its purpose, solicit additional public input, and answer any questions from the public.

Once approved by FEMA and adopted by Glocester Town Council, the final plan will be available at Glocester Town Hall, Glocester Manton Library, Harmony Library and through the Town's website (www.glocesterri.org).

The Town will continue to create public participation outreach events after the plan has been approved and during the plan's implementation, monitoring and evaluation by regularly convening the NHMC. The Town Planner will convene and document Committee meetings every year and will be responsible for ensuring that there is an update to the Hazard Mitigation Plan at least once every 5 years. These meetings will be publicly announced and the public will be welcomed and encouraged to attend.

2.2.4 Additional Stakeholders

On INSERT DATE, the draft plan was also sent to the neighboring communities of Burrillville, Smithfield, Foster, Scituate, Killingly Connecticut, and Putnam Connecticut for comments, suggestions, and opportunities to coordinate. Copies of the Plan have also been provided to the organization listed in Table 2.1. Please reference table below for stakeholder titles and community/organization represented.

Table 2.1 Community/Organization Stakeholders

Community/Organization	Title
Rhode Island Emergency Management Agency	State Hazard Mitigation Officer
Northern RI Chamber of Commerce	Executive Assistant
Glocester Business Association	Secretary
Providence Water Supply Board	Manager, Scituate Reservoir Watershed
Northern RI Conservation District	Executive Director
Blackstone Valley Rivershed Council	President
Multiple Management and Recreation Areas (RI DEM)	Director, Bureau of Natural Resources, Parks and Recreation
Natural Resource Conservation Service (NRCS)	State Conservationist
Glocester Historical Society	President
Save the Lakes	President
Keech Pond Association	Director
Preservation of Waterman Lake	Secretary
Save the Bay	River Restoration and Dam Removal
Glocester Manton and Harmony Libraries	Non-circulating copy
Burrillville	Town Planner
Smithfield	Town Planner
Foster	Town Planner
North Smithfield	Town Planner
Scituate	Town Planner
Johnston	Town Planner
Killingly, CT	Town Planner
Putnam, CT	Town Planner

All valid comments that were received have been incorporated into this Plan update. Verbal comments to the Glocester Emergency Management Agency (EMA) were also included in the Plan.

2.3 Understanding the Community's Risk

2.3.1 Discovery and Gathering of Resources

This updated Plan has incorporated knowledge, resources and comments from Town employee interviews, and information contained within the Glocester Emergency Operations Plan, and Glocester Comprehensive Plan. In line with past updates, the NHMC reviewed the 2018 Plan, the accomplished mitigation activities, and the changes in programs and policies since 2018, and then incorporated those changes into the 2024 Plan update. Previously, the NHMC conducted the same process by reviewing the 2011 Plan, the accomplished mitigation activities, and the changes in programs and policies since 2011, and then incorporated those changes into the 2018 Plan. For the 2024 Plan, the NHMC developed new mitigation strategies by relying on experience and guidance from RIEMA staff, other FEMA approved municipal hazard mitigation plans, the State of Rhode Island Hazard Mitigation Plan 2024, RI Hazard Risk Identification and Risk Assessment, August 2017 (HIRA) and the 2023 FEMA Mitigation Planning Handbook.

Section 3 Risk Assessment

3.1 Defining Terms and Methodology

The Natural Hazard Mitigation Committee (NHMC) conducted a risk assessment to determine the potential impacts of natural hazards to the built and natural environments, the citizens and the local economy. The risk assessment tool provides the foundation for the rest of the mitigation planning process, which is focused on identifying and prioritizing mitigation actions to reduce risks to hazards. This tool involves a risk and vulnerability assessment. A risk and vulnerability assessment allows decision makers to compare and evaluate potential hazards, set priorities on what kinds of mitigation are possible, and determine where to focus resources and further study.

A natural hazard is defined by the American Planning Association as "an event or physical condition that has the potential to cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss."[28] A natural hazard can also be exacerbated by societal behavior and practice, such as building in a floodplain hazard zone. Natural hazards are inevitable, but the impacts of natural hazards can, at a minimum, be mitigated or, in some instances, prevented entirely through enforcing building code standards, and reinforcing community preparedness.

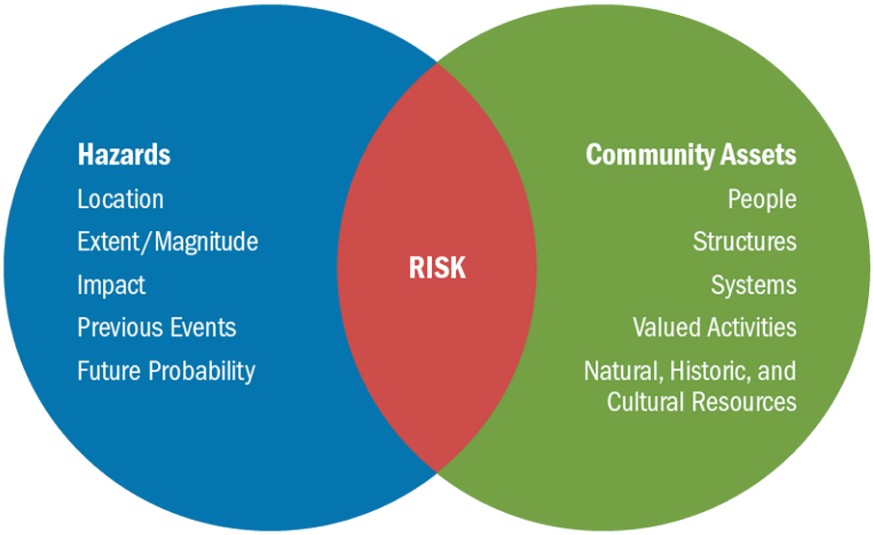
The assessment of risk in Glocester was determined by the intersection or overlap of natural hazards and community assets; the greater the overlap the greater the risk (Figure 3.1). Risk is defined in hazard mitigation planning as the potential for damage, loss or other impacts created by the natural hazard, destruction to people, homes, businesses and everyday life routines. Moreover, vulnerability is defined as a characteristic of a community asset that makes it more susceptible to damage from a given hazard.

The NHMC identified 6 hazard types and determined probability of future events using local historical occurrences of natural hazards, the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) Severe Weather database and Rhode Island Emergency Management Agency's (RIEMA) Hazard Identification and Risk Assessment (HIRA). A profile was created on each hazard through the process of defining and describing the hazard, including its physical characteristics, magnitude and severity, probability and frequency, and locations or areas affected. The Risk Assessment Matrix is a combination of

[28] Chapter 4: Flood Risk Assessment. https://training.fema.gov/.

the NHMC's work to identify and rank the vulnerable areas with the associated natural hazard impacts and effects, with a summary statement of the mitigation benefit (Table 3.19 Risk Assessment Matrix).

Figure 3.1 Relationship between Hazards, Community Assets, and Risk (Source: FEMA)



3.2 Natural Hazards

3.2.1 Natural Hazard Identification

The natural hazards identified in this plan are designed to fulfill the planning guidelines outlined in Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000).[29] Therefore, this plan only addresses natural hazards, and does not consider man-made hazards (for example, structural fires, hazardous materials, chemical spills or weapons of mass destruction).

3.2.1.1 Hazards Excluded from Risk Assessment

The following natural hazards were excluded from the risk assessment given the location, geography and/or geology of Glocester and if, according to available historical data, the natural hazard never or rarely occurred in Glocester (low risk). The natural hazard events that were excluded are: avalanche, drought, earthquake, expansive soils, flash floods, land subsidence, landslide, tornado, tsunami, urban flooding, volcano, and wildfire.

[29] Disaster Mitigation Act of 2000, Public Law 106-390

The natural conditions in Rhode Island are not suited for natural hazards such as avalanche (Rhode Island has very little mountainous terrain), expansive soils (the soils in the Northeast are characterized by soils with little to no clays with swelling potential), land subsidence (coastal), landslides, tsunami (coastal), urban flooding (urban), volcano and wildfire (Fire Chiefs all agreed that wildfire is a low risk for the Town of Glocester).

Furthermore, natural hazards that were ultimately not chosen were considered and discussed during NHMC meetings. It was concluded that these events are possible, but the probability and/or magnitude are minimal. Therefore, the lack of frequency in which these hazards occur, minimal probability, and the lack of resources to devote any amount of time to further research hereby excludes them from further consideration. If one of these events should occur and sustain a pattern in Glocester, it will be incorporated in the next update to the Plan.

The following Providence County or statewide historical data was collected on the NOAA NCEI website on the unlikely natural events occurring in Glocester to illustrate the infrequent occurrences of drought, earthquake, flash flood and tornadoes. Data for these hazards has been updated through year 2023, or as to the most recent data available.

Drought[30]
There was reported below normal monthly precipitation that began in March of 2016 and continued through August. In August, rainfall throughout much of Rhode Island was below normal. The governor of Rhode Island issued a drought advisory for the entire state on August 17, 2016. As part of the advisory, voluntary water conservation and adherence to any local water restrictions were encouraged. Soil moisture (measured by the Climate Prediction Center) was on the low end of normal while groundwater conditions (measured by the United States Geological Survey) were found to be normal to below normal for much of the state. Some privately owned wells were reported to have gone dry in Burrillville. River and streamflow conditions were below to well below normal with 27 gage sites in southern New England at record low levels. Farmers had to irrigate their crops much more than normal for August and September 2016.

In September 2016 brought more dry weather and continued drought conditions to much of southern New England. The drought was categorized largely by well below normal precipitation and groundwater and agricultural impacts. Most of the region experienced below normal rainfall during the

[30] National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Storms Events Database, Providence County, Drought, 1950-2023.

month of September and a drought advisory was issued. Soil moisture was abnormally dry or drier. Groundwater conditions (measured by the United States Geological Survey) were found to be below to well below normal for most of Massachusetts. River and streamflow conditions were below to well below normal with 16 gage sites in southern New England at record low levels. Providence County was declared a primary disaster county due to the drought. Farms in the county were eligible for assistance from the Farm Service Agency and the Livestock Forage Disaster Program.

The only other drought on record in Providence County was on April 12, 2012. The U.S. Drought Monitor declared a severe drought across Rhode Island, the eastern half of Massachusetts, and most of northern Connecticut. A moderate drought was declared over western Massachusetts and southwestern New Hampshire. This was declared as the result of a meteorological drought determined by precipitation that had been approximately one half of normal from January 2012 through April 2012. Rivers and streams were most affected as most ran at record low levels during the spring run-off season. No southern New England state issued drought declarations as reservoirs were at normal levels, thanks largely to above normal precipitation falling between August 2011 and November 2011.

From January 1 through April 15, 2012 precipitation levels were 6 to 8 inches below normal across northeast Connecticut, Rhode Island, and southeast Massachusetts. Across the remainder of southern New England, precipitation levels were 5 to 7 inches below normal. This translates to around or less than 50 percent of normal precipitation for much of southern New England in 2012.

Earthquake

Significant earthquakes on record in Rhode Island[31]:

- October 1, 1974, a 2.5 magnitude earthquake was measured in West Warwick, RI
- March 11, 1976, a 3.5 magnitude earthquake was measured in Portsmouth, RI
  September 3, 1978, a 2.8 magnitude earthquake was measured at Narragansett RI; and,
- April 3, 1981, a 2.7 magnitude earthquake was measured in Portsmouth, RI.
- March 22, 1996, a 3.1 magnitude earthquake was measured in Bristol, RI

[31] https://www.earthquaketrack.com/p/united-states/rhode-island/biggest

- July 22, 2015, a 2.3 magnitude earthquake was measured in East Providence, RI
- March 1, 2019, a 2.3 magnitude earthquake was measured in Charlestown, RI

Flash Flood[32]
From September 10 through 13, 2023 a combination of slow-moving storms caused widespread flash flooding to Rhode Island and Massachusetts. On September 10th, multiple water rescues were conducted for vehicles stranded in flood waters. Water would continue to flood basements and roads, rendering cars stranded in flood waters for the 3-day period. On September 13th, Rhode Island would withstand 2 tornadoes in conjunction with heavy rain, flash flooding, and thunderstorms.

On July 16, 2023, a substantial flash flood event crossed much of Southern New England. Roads were closed in Eastern Providence due to flood waters. Pawtucket Avenue at Allerton Avenue and Gano Street at Wickenden Street were flooded.

On July 4, 2023, a mid-level trough led to widespread flash flooding across Southern New England. In Providence, multiple streets flooded including, Jastram Street was flooded and 5 cars became stuck in floodwaters, Valley Street and Atwells Avenue became impassable, and Pawtucket Avenue was flooded. The American Red Cross requested help to displaced residents after a basement level of an apartment complex became compromised due to flood waters.

On September 5, 2022, a cold front stalled over New England causing significant flash flooding. In Providence 7 to 10 inches of rain fall was reported generating flash flooding. Interstate 95 was completely flooded and closed in both directions. Multiple cars were stuck on streets resulting in water rescues. Altogether, there were 3 injuries related to vehicle accidents and about 25 individuals rescued during the storm. A total of 41 homes and businesses were flooded as a result of flash flooding.

On August 23, 2022, a stationary front moved across Rhode Island and provided heavy rain and scattered thunderstorms. In Providence, 4 to 6 inches of rain fall was reported. In East Providence, flash flooding caused travel lanes on I-195 westbound to be blocked. Broadway was flooded

[32] National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Storms Events Database, Providence County, Flash Flood, 1950-2023.

between Juniper and Laura streets and Waterman Avenue was impassable due to flood waters.

On June 28, 2020, a mid-level short wave trough combined with a cold front and warm environment produced severe thunderstorms and flash flooding across Massachusetts and northern Rhode Island. One foot of street flooding was reported on Main Street in the Harrisville section. Flood waters rendered Victory Highway in Burrillville impassible between Oakland School Street and Remington Avenue. Armistice Boulevard in Pawtucket was also rendered impassible due to flood waters.

May 29, 2001 - A cluster of thunderstorms dumped torrential rainfall and small hail in a narrow corridor of Glocester, causing a washout at the intersection of Route 102 and Snake Hill Road. Rainfall rates exceeded 2 inches per hour in a 10-mile wide corridor in the hilly terrain of western and central Providence County.

On June 12th through June 14th, 1998, a very slow moving complex storm system moved through southeast New England. The combination of its slow movement and the presence of tropical moisture across the region produced rainfall of 6 to 8 inches over much of Rhode Island. The heaviest rainfall amounts of 7 to 8 inches occurred in the northeast corner of the state in Providence County. Numerous small streams flooded over their banks.

On June 13th, 1998, in Glocester, Ponaganset Pond flooded over at 3:25 PM; the Ponaganset River in South Foster reached flood stage of 5 feet at 7:45 PM, crested at 5.3 feet at 10 PM, then fell below flood stage at 4 AM on June 14th. Then, it flooded again at 8 AM on the 14th, crested at 5.3 feet at 1 PM, then fell below flood stage at 7 PM – all on June 14th.

Tornado[33]
September 13, 2023 – A frontal system brought heavy rain, flash flooding, and thunderstorms to Southern New England. This system resulted in extensive tree damage and 2 tornadoes in Rhode Island. An F1 with maximum reported winds of 100 mph began between Chopmist Hill Road and Bungy Road in the town of Glocester. Here the tornado uprooted about 75 trees before blowing away an outbuilding used as a bus stop. A separate F1 tornado with maximum winds of 100 mph was reported in the town of Lincoln. Here the tornado uprooted trees and damaged the roof of a building.

[33] National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Storms Events Database, Providence County, Tornado, 1950-2023.

August 18, 2023 – A combination of cold and warm fronts resulted in flooding, wind damage, and 5 tornadoes across the Great Lakes and into New England. These tornadoes ranged from F0 to F2. A tornado caused significant damage in Scituate, Johnston, and North Providence. It was reported as the strongest tornado to have struck Rhode Island since August 7, 1986. Hundreds of large trees were either uprooted or snapped with one home sustained extensive exterior damage. Winds were reported to be around 115 mph, classifying the tornado as an F2. The tornado moved into Johnston where it lifted a vehicle into the air before dropping it. The driver sustained minor injuries. As the tornado moved through Johnston into North Providence its wind speeds fell to 90- 100 mph, consistent with F1 classification.

November 13, 2021 – A fast-moving cold front produced severe thunderstorms across southern New England. This resulted in an unprecedented outbreak of tornadoes across Long Island, Connecticut, and Rhode Island. The tornado was rated as F0 as it moved through Connecticut to Rhode Island. It caused uprooting of several hardwood trees, sheared trees, and moved a red trailer approximately 50 feet.

October 23, 2018 – An F0 tornado initially touched down in North Providence with wind speeds estimated between 60-70 mph. The tornado moved northeastward toward the southwest part of Lincoln. In Lincoln, wind speeds were estimated to be 90-100 mph, classifying the tornado as an F1. Large tree limbs were broken and shingles from several houses were removed along the tornados path.

August 16, 2000 – A brief weak tornado briefly touched down in a high elevation portion of North Foster. The location was on East Killingly Road, about 2 miles east of the Connecticut state line, south of Glocester, at an elevation of 670 feet. The damage was isolated, with a large part of a tall pine tree snapped off near the top and large branches near one foot in diameter taken down. Large limbs were broken off an oak tree adjacent to the pine. Aside from this, there was no damage evident anywhere else in the vicinity. Based upon the damage observed, the tornado was rated an F0, with wind speeds of 40 to 72 mph. The path length was only 0.2 miles and the width was 15 yards. The funnel was observed moving from southwest to northeast.

August 7, 1986 – Heavy thunderstorms accompanying the tornadoes brought a number of lightning strikes along with torrential rains that flooded many streets, and in Pawtucket, RI caused part of a street to collapse. Heavy street flooding was reported from Lincoln and Central Falls. Two to four inches of rainfall were received in the area of flooding.

August 7, 1986 – A F1 tornado touched down in the Cumberland Hill section of Cumberland in Northeastern, RI. The tornado moved in a north-west to southeast direction, shearing off several trees at about the thirty-foot level before touching down. Some homes experienced structural damage and an unfinished condo project suffered extensive loss of plywood. Most of the damage was to trees and power lines. The occurrence of this tornado was confirmed by National Weather Service investigation.

Later than same day, a second tornado (F2) touched down in a portion of Cranston and moved in an east-northeasterly direction. The tornado skipped over a section of town near the intersection of Cranston and Bridgham streets before touching down again on Broad Street in South Providence. This tornado caused considerable damage to structures including homes in Cranston and South Providence. A very rare event in RI, the twister resulted in millions of dollars of property damage, twenty injuries, and very fortunately, no deaths. The injuries were caused mostly by flying debris. This tornado was easily confirmed by eyewitness accounts and by live media coverage. Up to 6,000 electric customers lost power.

The third tornado (F1) known to strike the state and the county in two days touched down in Burrillville near Wilson Reservoir. The tornado moved along an intermittent path toward the east-northeast and then turned toward northeast as it entered North Smithfield. Then, it crossed the northwest corner of North Smithfield into Millville, MA. The intermittent touchdowns of this storm were influenced by rolling terrain. Many large trees were lifted out of the ground along its path and houses damaged along about one and a half miles of the track. Eight cars, a trailer, and several buildings suffered damage in Slatersville (North Smithfield). This tornado was confirmed by National Weather Service Investigation.

August 25, 1985 - A small F1 tornado moved across the RI/CT state line from East Killingly, CT into a rural section of Foster. The tornado moved along at tree-top level, shearing off some trees and uprooting others, crossed over Route 101 and disappeared. The tornado was confirmed by National Weather Service investigation. Tornados are very rare in Rhode Island, with the last occurrence in Bristol in 1974. The total path length in both states was 1.5 miles.

3.2.1.2 Glocester's Natural Hazard Profiles

Table 3.1 presents a description of each type of natural hazard Glocester may expect to experience, as determined by the NHMC. An in-depth discussion of each local natural hazard can be found later in this Section. The hazards are profiled according to location (geographic area affected),

maximum probable extent (magnitude/strength on a scientific scale), previous occurrences, severity of impact, and probability of future events.

Table 3.1 Glocester Specific Natural Hazard Profiles

Flood Related Hazards	Wind Related Hazards	Winter Related Hazards	Additional Hazards
Heavy Rain and Riverine Flooding	Hurricane	Snow and Ice Storm (including nor'easter)	Extreme Heat
Dam Failure/Breach	Thunderstorm (including wind, lightning and hail)		Extreme Cold
			Mosquito Borne Disease

3.2.2 Risk Assessment

This section details the process used to assess risks and to rank the risk of particular hazards that are most likely to affect the Town of Glocester. The results from this process are outlined in Table 3.19. Generally speaking, the Committee concluded from the risk assessment that the population and infrastructure vulnerability in Glocester is low for all the natural hazards profiled in this section.

3.2.3 Ranking Methodology

Table 3.2 outlines the ranking methodology for each hazard included in the hazard profiles using the frequency and severity of the individual hazard. Those areas highlighted in orange are considered to be high risk, those in yellow, medium risk, and those in gray, low risk. This method will assist in not only assessing the Town's vulnerability to each hazard but to establish a prioritization of each hazard, which is essential to setting an effective and efficient mitigation strategy.

The frequency of the hazard is defined as follows:

1. Highly likely: near 100% probability within the next year;
2. Likely: between 10% and 100% probability within the next year or at least one
   chance in next 10 years;
3. Possible: between 1% and 10% probability within the next year or at least one
   chance in next 100 years;
4. Unlikely: less than 1% probability in next 100 years

The severity of the natural hazards in Table 3.2 is separated into four (4) categories. The results of the ranking methodology are used in the natural hazard profiles (3.3 Natural Hazard Profiles) to discuss probabilities of future events.

1. Catastrophic – The hazard is likely to result in death or irreversible damage
2. Critical – The hazard is likely to result in serious injury or severe reversible damage
3. Serious – The hazard is likely to result in injury or mitigatable damage
4. Minor – The hazard is likely to result in minor injury or minimal damage

Table 3.2 Natural Hazard Ranking Methodology

Frequency of Hazard	Severity of Hazard			
	Catastrophic (1)	Critical (2)	Serious (3)	Minor (4)
High Likely (A)	1A	2A	3A	4A
Likely (B)	1B	2B	3B	4B
Possible (C)	1C	2C	3C	4C
Unlikely (D)	1D	2D	3D	4D

3.3 Natural Hazard Profiles

3.3.1 Heavy Rain and Riverine Flooding

3.3.1.1 Description

Flooding is the most frequent and costly natural hazard in the United States and has caused more than 10,000 deaths since 1900. Approximately 90% of presidentially declared disasters are natural hazard events with flooding as a major component.[34]

Floods have two (2) essential characteristics: the land is adjacent to and inundated by overflow from a river, stream, lake or ocean; and the inundation of land is temporary. Floods are generally the result of excessive precipitation and can be classified under two (2) categories: general floods, precipitation over a given river basin for a long period of time; and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is determined by the following: a combination of stream and river basin topography and physiography; hydrology, precipitation and weather patterns, recent soil moisture conditions, and the degree of vegetative clearing. General floods are usually long-term events that may last for several days.

[34] National Hurricane Center

Riverine flooding is a function of precipitation levels (both rain and snow) and water runoff volumes within the stream or river. Riverine flooding is defined as the periodic occurrence of overbank flows of rivers or streams resulting in partial or complete inundation of the adjacent floodplain. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrences of a flood of a particular magnitude and an equal or larger flood. Flood magnitude rises with increasing recurrence interval. When land next to or within the floodplain is developed, these cyclical floods can become costly and hazardous events.

3.3.1.2 Location

Glocester has several ponds, reservoirs, rivers and brooks that make up a large portion of the Town that is susceptible to flooding. When heavy rains fall in the Town of Glocester, the effects are felt Town-wide. Damage impacts from flooding have been road closures; individual property damage, and in some extreme cases has led to resulted in weakened dam structures.

Over the past several years, the Town has made a targeted effort to upgrade poor drainage areas that were subject to repeated flooding. The Town of Glocester Department of Public Works mitigated issues of poor drainage for the following roads in the last 3 years (2021 to 2023):

- Cranberry Ridge Road
- Durfee Hill Road
- Saunders Brook Road
- Tourtellot Hill Road
- Paris Iron Road
- George Allen Road
- Chestnut Oak Road
- Rustic Hill Road
- Willie Woodhead Road
- Douglas Hook Road

<u>100-year flood area in Glocester susceptible (at risk) to flooding</u>

According to the Flood Insurance Rate Maps, Glocester has the following special flood hazard areas. These special flood hazard areas have a 1% annual chance of flooding. The 100-year flood is a significant flood that has a chance to be equaled or exceeded every given year, even multiple times in one year.

- Wilbur/Bowdish/Clarkville/Hawkins/Pond Complex[35]

[35] USGS Topographic maps, https://viewer.nationalmap.gov/advanced-viewer/

    - Wilbur Pond (originates in Burrillville) feeds Wilbur Brook which flows into Bowdish Reservoir. Bowdish Reservoir flows to Clarkville Pond. Clarkville Pond (Rhode Island Dam No. 556) flows to Hawkins Pond. Hawkins Pond flows to Mary Brown Brook Zone AE (Elevation 497) to an unnamed pond that is split by the Connecticut/Rhode Island border.
    - In a 100-year flood scenario, the Wilbur/Bowdish/Clarkville/Hawkins/Pond Complex could result in flooding on Route 44 and potential negative impacts to the West Glocester Fire Department, 2410 Putnam Pike, West Glocester.
- Burlingame/Pascoag Reservoir Complex[36]
    - Burlingame Reservoir flows to Pascoag Reservoir by Brandy Brook. In a 100-year flood scenario, Pascoag Reservoir (located in Burrillville/Glocester) could have flooding impacts to neighborhoods of off Jackson Schoolhouse Road, Putnam Pike, and Echo Road. On the southern part of the Burlingame Reservoir, the special flood hazard area crosses from Teepee Pond into Burlingame Reservoir over a portion of Durfee Hill Road.
- Keech Pond Rhode Island Dam No. 022[37]
    - In a 100-year flood scenario on Keech Pond, parts of Floral Way, Indian Trail and Lake View Circle could be inundated.
- Other 100-year flood scenarios[38]
    - Dam failure on Smith and Sayles Reservoir could flood Chepachet River dam. Dam failure would flood Route 102, flood historic Chepachet and the Chepachet Fire Department, 1170 Putnam Pike.
    - Dam failure on Coomer Lake could cause portions of Snake Hill Road to wash-out. Additionally, portions of Killingly Road could flood from the overflow of Grist Mill Pond/Cady Brook flowing into Williams Pond.

3.3.1.3 Extent

Floods are measured by stream gauges that are installed in bodies of water located near populated areas. They are installed and operated by the United States Geological Survey (USGS), collecting all data before sending it to the National Weather Service (NWS). These gauges are constantly monitoring water levels and sending this data through a satellite or phone telemetry to be analyzed properly.

[36] Ibid.
[37] Ibid.
[38] Ibid.

While there are many different types of stream gauges, the most commonly used gauge is called the Automated Local Evaluation in Real-Time (ALERT) gauge, and is designed to determine the risk of flooding and distribute warnings in specific areas. If the water level rises dramatically in a specific area, the ALERT gauge sends the warning through a satellite to be analyzed immediately.

The River and Flood program of the NWS is legally responsible for issuing flood warnings to the community based on the data collected by the USGS. They strive for accuracy when delivering these warnings to notify citizens as early as possible and reduce the risk of flood damage.

When the NWS reports flood warnings, they measure the overall water line of the river, marking specific points as "stages." While these stages will vary upon normal elevations above sea level of different locations, the measurements are converted into hazard levels if they reach specific elevations. These levels include the pre-flood "action stage," where the NWS must prepare to send the warning, as well as the minor, moderate, and major "flood stages." Flood level data is constantly being sent to the NWS by the USGS to inform citizens as early as possible before a flood hits their specified area.

When a flood occurs, both the USGS and NWS work together, exchanging and analyzing updated hydrologic data. The NWS will collect the local precipitation data while the USGS focuses on information derived from the stream gauges. Finally, the data from both organizations is combined to determine the overall risk of flooding.

The 2023 FEMA Flood Insurance Study for Providence County, Rhode Island (Flood Insurance Study Number 44007CV001D) lists the principal flood problems by flooding source main flooding sources (Table 3.3).

Table 3.3 Principal Flood Problems for Providence County (Source: FEMA, FIS 44007CV001D)

Flooding Source	Description of Flood Problems
Blackstone River, Seekonk River	The greatest flood of record on the Blackstone River occurred in August 1955 and was the result of Hurricane Diane dropping an average of nearly 12 inches of rain over the drainage basin. This storm was approximately a 0.6 percent annual chance flood event. Some areas were inundated with several feet of water. Flooding was responsible for several dam failures within the Mill and Peters River watersheds that drain into the Blackstone river, including the breaching of

Flooding Source	Description of Flood Problems
	Harris Pond Dam on Mill River in Woonsocket. The second-greatest flood of record occurred in March 1968, the result of about five inches of rainfall combined with snowmelt and nearly 100percent runoff due to the impermeability of frozen ground. The magnitude of this flood would have been about ten percent greater if it had not been reduced by the West Hill flood control dam. This event was estimated to have been a 4 percent annual chance flood.
Miscellaneous within Providence County	Floods have occurred in the area during all seasons of the year, but spring and fall have historically produced those with greatest magnitude and effect. The most severe floods have been caused by storms of tropical origin, such as hurricanes, usually occurring in late summer and early fall. Winter and spring flooding is commonly caused by transcontinental storms in combination with snowmelt or ice jams. Mid-spring and fall thunderstorms can also produce limited local flooding. Several hurricanes have affected Rhode Island in the last two decades, causing minimal to moderate damage to the Rhode Island coastline including Providence County. Hurricane Gloria in September 1985 caused moderate beach erosion along the Rhode Island beaches and wind gusts up to 92 miles per hour (mph) but arrived at low tide so storm surges were less than 5 feet above normal. Hurricane Bob made landfall as a strong Category II hurricane. With winds of 75 to 100 mph, the storm severely affected coastal communities and caused extensive beach erosion. Hurricane Bob caused a storm surge of 5 to 8 feet along the Rhode Island shore. In October 2012, Hurricane Sandy resulted in some storm surge and coastal flooding. Hurricane Sandy caused some property damage and power outages within Providence County. Inland wind gusts ranged from about 48 to 56 knots (55 to 65 mph, respectively) and coastal wind gusts ranged from 61 to 70 knots (70 to 80 mph, respectively). In late February through March 2010, three separate rainfall events resulted in about 17 to 23 inches over much of southern New England, causing major flooding across eastern Massachusetts and Rhode Island. These rain storms caused most rivers in Providence County to rise above flood stage. Several USGS stream gages in Providence County operating during this time experienced their new period of record peak. The 2010 peak flows at stream gages on the Moshassuck River, Pawtuxet River, Tenmile River, and Woonasquatucket were estimated to have an Annual Exceedance Probability (AEP) ranging between 2 to 0.2 percent annual chance flooding events. This flood is often referred to as "the great Rhode Island flood of 2010." From December 2010 through February 2011, the State of Rhode

Flooding Source	Description of Flood Problems
	Island saw a series of six winter storms that led to record snowfalls across the state, causing a number of problems with transportation, power outages, and collapses due to snow accumulations.
Moshassuck River, West River, Woonasquatucket River	In March 1968, high flows occurred on both Woonasquatucket and Moshassuck Rivers. The recurrence interval for this flood on Woonasquatucket River at the USGS gaging station in Centerdale was estimated to be a 2.8 percent annual chance flood event. Flooding on Moshassuck River occurred near Canal and Mill Streets below the USGS gage and along Interstate 95. Gage records showed this flood to be a 2.6 percent annual chance flood event on the Moshassuck River. Flooding resulting from this storm was also extensive on West River.
Pawtuxet River	Flooding from July 18-24, 1938, was a high-flow event for the main channel of the Pawtuxet River since the construction of the Scituate Reservoir. Flooding resulted from a coastal storm producing an average of 7 inches of rainfall over the Pawtuxet River basin at a time when both the Scituate and Flat River Reservoirs were already almost full. The estimated peak discharge at Cranston was approximately 6,300 cubic feet per second (cfs) (U.S. Department of the Interior, 1964). The 1938 hurricane produced an abnormal tide of 15.7 feet in Narragansett Bay near the mouth of the Pawtuxet River, which was 10.2 feet above the crest of the Pawtuxet Dam. Due to the topping of the dam, extensive tidal flooding in the lower portions of the Pawtuxet River occurred. A high-flow event occurred on March 1718, 1968, when 4 to 7 inches of rainfall fell in a 24-hour period, creating a peak discharge of 3,100 cfs at the USGS stream gage on the Pawtuxet River at Cranston. Flooding damages were minor due to the storage capacity of the Scituate Reservoir (U.S. Department of the Interior, 1964).
Seekonk River	The Seekonk River forms the northern tip of Narragansett Bay and is subject to flooding during hurricanes, as evidenced by the hurricane of September 1938 and Hurricane Carol in 1954. The 1938 hurricane, a 1 percent annual chance flood event, caused flood levels of approximately 16 feet on the Seekonk River

3.3.1.4 Previous Occurrences and Probability of Future Events

Though there is no distinct flood season in Rhode Island and major river flooding can occur in any month of the year. The National Oceanic and Atmospheric Administration (NOAA) has studied a number of past floods

from the 1990s to 2000[39] and has noted 3 times of the year of particular importance with regard for the potential of flood activity to occur:

- Late winter/spring melt;
- Late summer/early fall; and
- Early winter

In the Town of Glocester, the likelihood of experiencing future heavy rain and riverine flooding is likely and the severity is minor, scoring a 3B in the hazard ranking, a medium priority (yellow). Impact of heavy rains that lead to riverine flooding are immediate and include road closures along the main evacuation routes causing disruption of evacuation, rescue or fire efforts; treacherous driving due to standing water; power outages which disrupt pumps for private drinking water supplies and onsite wastewater treatment systems; and other public and property damage. Significant heavy rain/flooding events in Providence County are listed in Table 3.4.

Table 3.4 Significant Heavy Rain/Flooding for Providence County (Source: National Centers for Environmental Information, NOAA, Storm Events Database, 2023)

Date	Rainfall (inches)	Comments
9/11/2023	n/a	Scattered thunderstorms and widespread flash flooding across Rhode Island and Massachusetts. Multiple street closures, cars stranded in waters, and flooded basements on houses.
7/10/2023	n/a	Showers and thunderstorms lead to flooding in Rhode Island where roads were closed and cars were stuck in flood waters.
9/5/2022	7”-11”	A cold front over Southern New England caused heavy rain and significant flash flooding. Rainfall estimated between 7 to 11 inches. Multiple street flooding
8/23/2022	4”-6”	Street flooding
6/13/2022	n/a	Street flooding that was reported to require DPW assistance. One car stuck in flooding at Argyle Avenue
11/12/2021	2”	2 feet of street flooding with a car stuck in Providence
8/22/2021	5”-6”	Tropical Storm Henri made landfall in Rhode Island, bringing strong wind gusts and flash flooding. The strongest wind gusts were 70 mph and Henri brought 5 to 6 inches of rainfall.
7/17/2021	1”-2”	Street flooding
12/25/2020	2”-4”	Strong winds, heavy rain and minor flooding resulted in 2 to 4 inches of rain fell across New England, with the highest

[39] NOAA, A River and Flash Flood Climatology of Southern New England: Results From 1994-2000.

		totals from Central Rhode Island northwestward across Northern Connecticut and portions of Western and Central Massachusetts.
12/1/2020	2.20”-3.78”	Entire state of Rhode Island received between 2.20 and 3.78 inches of rain leading to street flooding
6/28/2020	n/a	Street flooding
9/2/2019	n/a	Multiple street flooding
8/7/2019	n/a	Street flooding
9/26/2018	3”-5”	Multiple street flooding
9/25/2018	3”-5”	Multiple street flooding and partly submerged vehicles at an apartment complex
8/4/2018	n/a	Flooding trapped car at an underpass on Wilbur Avenue in Cranston
7/6/2018	1.25”	Flooding from heavy rain trapping vehicles on roads in Cumberland
1/13/2018	3”-4”	Standing water to at least one foot across several blocks
9/30/2017	n/a	Minor street flooding
7/7/16	n/a	Minor street flooding
6/21/15	n/a	Remnants of Tropical Storm Bill. Street flooding
10/22/14	n/a	Clogged storm drains caused road flooding
6/13/14	n/a	Street flooding
6/7/13	3”-5”	Remnants of Tropical Storm Andrea. Small stream and road flooding
9/8/11	2”-8”	Street flooding
4/1/10	6”-9”	Street and basement flooding
3/29/10	6"-11"	Small and major rivers flooded, basements flooded
12/12/08	3"-5"	Flooding in poor drainage areas
9/06/08	2"-4"	Rain associated with tropical storm Hanna, no damage reported
3/9/08	2"-3"	No damage reported
2/13/08	2"-4"	Flooding in poor drainage areas
3/2/07	2"-3"	Widespread urban and small stream flooding
6/7/06	2"-5"	Flooding in poor drainage areas
10/15/05	2.5" - 4.5"	Widespread urban and small stream flooding, an earthen dam failed near Spring Grove pond damaging Spring Grove Road and Douglas Hook Road
4/14/04	2”-4”	Minor flooding along the Blackstone River, roads in low lying areas were closed due to flooding, no significant damage reported
03/29/03	2” – 3”	Low pressure tracking from the mid-Atlantic states to Cape Cod brought heavy rain to Rhode Island, where totals of 2 to 3 inches were common. Despite the heavy rainfall, no serious flooding was reported, aside from the usual minor urban and poor drainage flooding.
9/16/99	2” – 5”	Tropical Storm Floyd brought high winds and torrential rainfall to Rhode Island, as it tracked from northern Connecticut into central and northeast Massachusetts.

		Widespread rainfall amounts of 2 to 5 inches were reported throughout the Ocean State, with the heaviest amounts falling across the higher terrain of northwest Providence County. As much as 7.12 inches of rain fell in North Smithfield. The torrential rainfall caused the Pawtuxet River to rise out of its banks in Warwick and Cranston. The Pawtuxet went into flood at 1132 pm on the 16th, and crested at 9.4 feet at 515 am on the 17th, just over its 9-foot flood stage. It returned to its banks at 245 pm on the 17th. No flood damage was reported, including throughout the rest of Rhode Island where flooding of low-lying areas was common.
1/03/99	2” – 3”	Rainfall of 2 to 3 inches were common, much of that fell in a period of less than 12 hours. As much as 2.85 inches fell in Cumberland, with 2.80 inches in Clayville, 2.56 inches in Cranston, and 2.35 inches in downtown Providence. There were no reports of flooding.
6/14/98	7”- 8”	On June 12th through June 14th, a very slow moving complex storm system moved through southeast New England. The combination of its slow movement and the presence of tropical moisture across the region produced rainfall of 6 to 8 inches over much of Rhode Island. The heaviest rainfall amounts of 7 to 8 inches occurred in the northeast corner of the state in Providence County. Numerous small streams flooded over their banks. On June 13th, in Glocester, the Ponaganset Pond flooded over at 3:25 PM; the Ponaganset River in South Foster reached flood stage of 5 feet at 7:45 PM, crested at 5.3 feet at 10 PM, then fell below flood stage at 4 AM on June 14th. Then, it flooded again at 8 AM on the 14th, crested at 5.3 feet at 1 PM, then fell below flood stage at 7 PM -- all on June 14th.
5/09/98	2”-4”	A strong low pressure system to the south and southeast of Cape Cod combined with high pressure over eastern Canada to produce a 3-day nor'easter. Periods of heavy rain occurred from May 9th into May 11th. Rainfall totals of 2 to 4 inches were reported across most of the state, except along south coastal sections, where less than 2 inches fell. A total of 4.00 inches was reported at Cranston and 3.07 inches was reported at Clayville. Woonsocket received 2.27 inches. There were no reports of flooding.
3/08/98	2”-4”	Rainfall totals of 2 to 4 inches were reported across the state, most of it falling in about 30 hours. A record daily rainfall total of 3.02" was set on March 9th at Providence. Some of the maximum totals across the state included: Coventry, 4.05"; Clayville, 3.90"; Johnston, Providence, and Cranston, 3.60". Many roads had to be closed due to flooding for periods varying from a few hours up to 12 to 24

		hours. Flood-prone properties also reported flooding problems.
2/23/98	2" +	The second powerful nor'easter to affect the region in less than a week brought heavy rainfall and strong northeast winds to much of Rhode Island. Rainfall totals for this storm exceeded 2 inches over the eastern and northern part of the state. A total of 2.03 inches was reported from Foster while 2.00 fell in Coventry.

3.3.1.5 Climate Change and Heavy Rain and Flooding

According to the Center for Climate and Energy Solutions, a leader in climate change issues, extreme precipitation events have produced more rain and become more common since the 1950s in many regions of the world, including much of the United States. In the United States, the Midwest and Northeast have seen the strongest increases in heavy precipitation events (Figure 3.2).

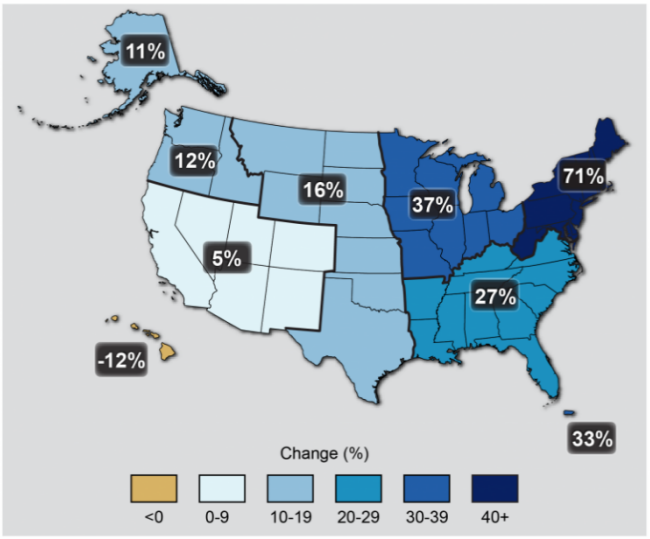
Further, according to the Climate Mapping for Resilience and Adaptation (CMRA) tool, precipitation is expected to increase (Figure 3.3) in Providence County. CMRA assists people in assessing their local exposure to climate-related hazards through data visualization of climate projections based on historical trends. Figure 3.3 below shows that regardless of emissions scenario, both average annual total precipitation and average annual days that exceed 99th percentile precipitation will increase beginning in early century and continue to increase throughout middle century and late century.

Increased flooding risks are also projected into 2050 based off 2020 reported average annual loss (AAL). According to the Fifth National Climate Assessment produced by the United States Global Change Research Program, flooding along United States coastlines is expected to increase over the next 3 decades. These increases will in turn drive greater AAL, especially along coastal areas in the United States (Figure 3.4).

Some scientists expect these trends to continue as the planet continues to warm. Warmer air can hold more water vapor. For each degree of warming, the air's capacity for water intense precipitation events, which is exactly what has been observed. Increases in heavy precipitation may not always lead to an increase in total precipitation over a season or over the year. Some climate models project a decrease in moderate rainfall, and an increase in the length of dry periods, which offsets the increased precipitation falling during heavy events. For example, climate indicators from CMRA indicate an increase in the number of dry days for Providence County. Figure 3.5 provides projections of the number of dry days depending

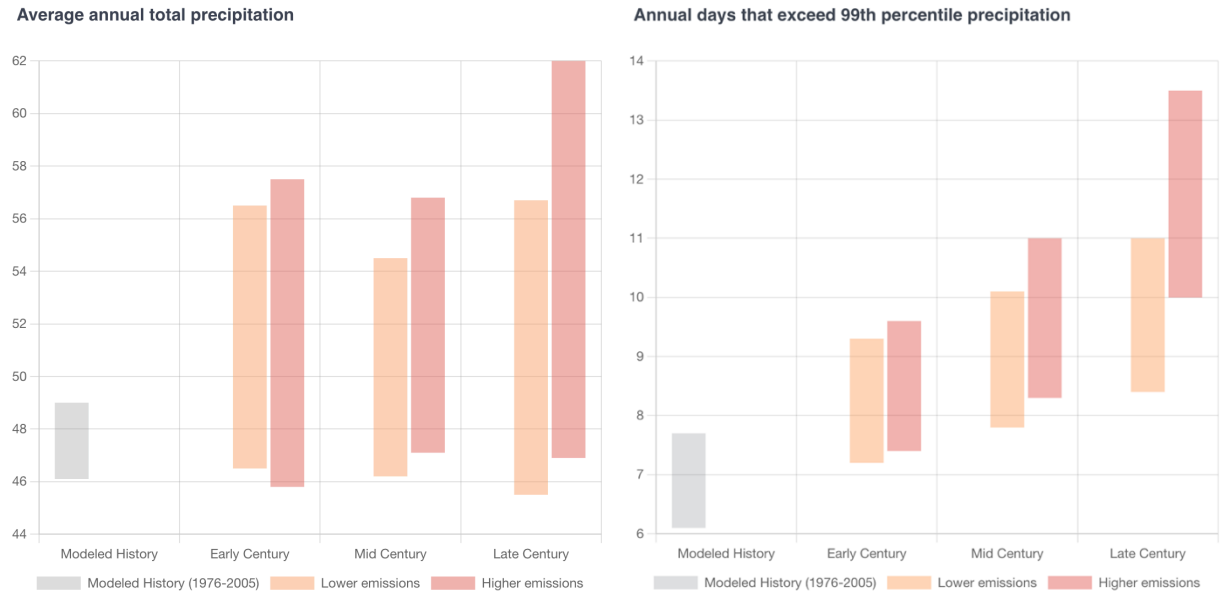
on higher or lower emissions. A higher emissions scenario would entail humans continue to produce gas trapping emissions, such as fossil fuel production, into 2100. While a lower emissions scenario indicates a future where humans reduce global emissions to zero by year 2040.[40]

Figure 3.2 Observed Change in Very Heavy Precipitation (Source: National Climate Assessment)



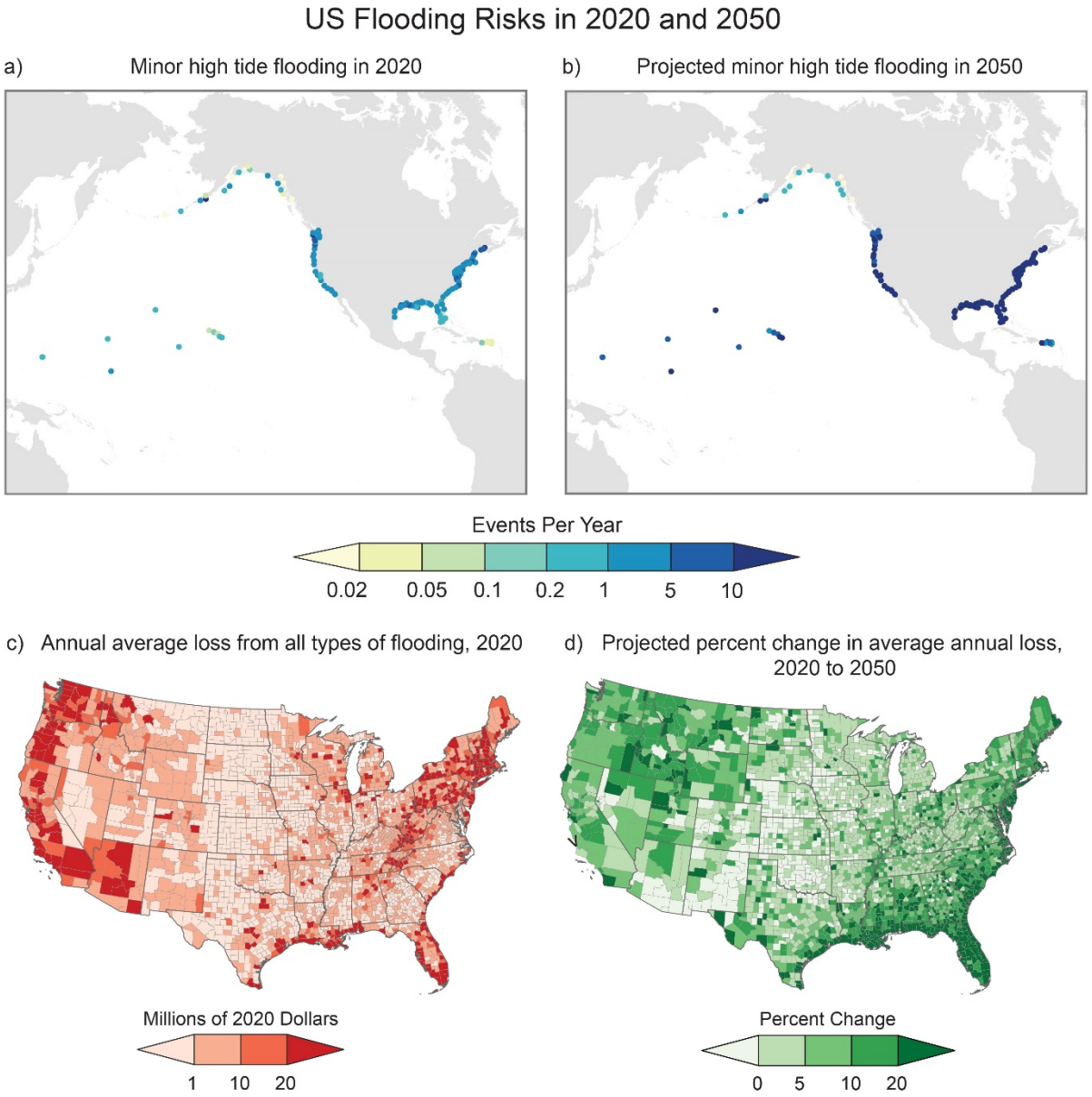
** The map shows percent increases regionally in the amount of precipitation falling in very heavy events (defined as the top 1% of all daily events) from 1958 to 2012.*

Figure 3.3 Precipitation Projections for Providence County (Source: CMRA)



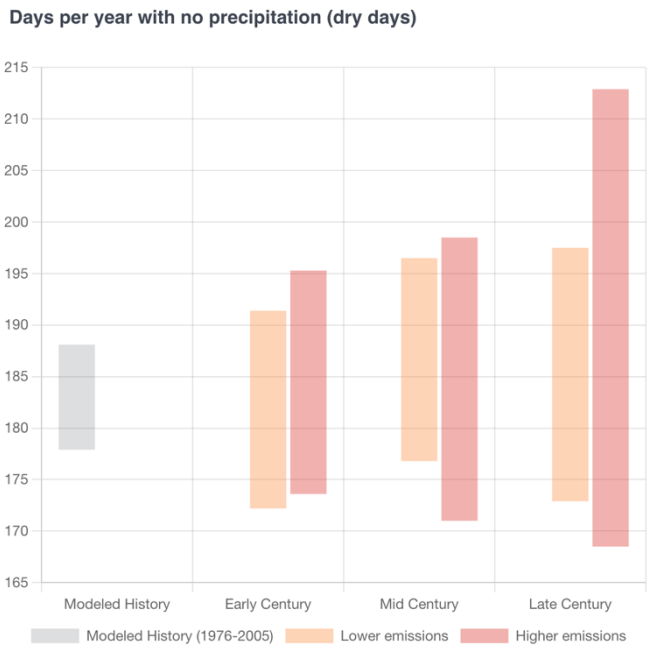
[40] Climate Mapping for Resilience and Adaptation

Figure 3.4 United States Flooding Risks in 2020 and 2050 (Source: United States Global Change Research Program, Fifth National Climate Assessment (2023)



Top row: Map shows (1) the average number of minor high tide flooding events per year in 2020 and (2) the expected number of events per year in 2050
Bottom row: Map shows (3) average annual loss (AAL) from all types of flooding in millions of dollars in 2020 and (4) the projected changes in AAL in 2050 relative to 2020.

Figure 3.5 Dry Day Projections for Providence County (Source: CMRA)



3.3.1.6 Impacts

Heavy rain and flooding can have significant impacts on the town of Glocester. During periods of heavy rainfall, water bodies, along with the Town's floodplains, can become overwhelmed, leading to road closures, damage to individual properties, and potential structural failures. Flooding also poses a risk to critical infrastructure, such as transportation routes and emergency services. Glocester's history of floods has shown that heavy rainfall can disrupt daily life and cause substantial property damage across the Town, particularly in areas with inadequate drainage systems.

With climate change, the impacts of heavy rain and flooding on Glocester are likely to become more severe. Climate models predict an increase in the frequency and intensity of extreme weather events, including heavier and more prolonged rainfall. This could lead to more frequent flooding of low-lying areas, increased pressure on aging drainage infrastructure, and a higher likelihood of structural failures. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

3.3.1.7 National Flood Insurance Program

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the

effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically. The Town of Glocester currently does not participate in FEMA's Community Rating System (CRS) Program. FEMA's CRS Program would allow residents of the Town of Glocester to gain credit points that would result in discounts on NFIP premiums.

Since the Town of Glocester entered the NFIP, the Town has had 6 flood insurance claims for a total payment of $29,000. The Town has not repetitive or severely repetitive loss structures.

3.3.2 Dam Failure/Breach

3.3.2.1 Description

A dam is a barrier across flowing water that obstructs, directs or slows down the flow, often creating a lake. The impact of a failure can often be catastrophic, usually resulting in a very large amount of water suddenly released into the area downstream. Dam breach can be caused by a number of reasons including flooding that exceeds the capacity of the dam, structural failure of the dam construction materials, movement or failure of the foundation supporting the dam, soil erosion along the embankment around dams, and inadequate maintenance.

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

While dam failures that occur during flood events compound an already tenuous situation and are certainly problematic, the dam failures that occur on dry days are the most dangerous. These "dry day" dam failures typically occur without warning, and downstream property owners and others in the vicinity are more vulnerable to being unexpectedly caught in life threatening situations than failures during predicted flood events.

3.3.2.2 Location

According to the RIDEM's Dam Safety Program, Glocester has 9 high hazard (1 with Smithfield) and 10 significant hazard dams.[41] The table below describes the ownership of high and significant dams, the State's classification, the river or stream associated with the dam and whether or not there is an emergency action plan approved on file with Rhode Island Emergency Management Agency (RIEMA).

The following high and significant hazard dams in Glocester have dam emergency action plans: Burlingame Reservoir Upper (High Hazard), Durfee Hill Wildlife Marsh #2 (Significant Hazard), and Bowdish Reservoir (High Hazard). The remaining dams listed in Table 3.5 do not have approved emergency action plans.

Table 3.5 High and Significant Dams in Glocester (Source: RIDEM)

Name (State ID)	Ownership	State Classification	River/Stream	EAP
Burlingame Reservoir Upper (018)	RIDEM Forestry	High	Brandy Brook	Yes
Keech Pond (022)	Association of Keech Pond, Inc.	High	Chepachet River	No
Waterman Lake (111)	Citizens for the Preservation of Waterman Lake, Inc.	High	Stillwater River	No
Ponaganset Reservoir (165)	Providence Water Supply Board	High	Ponaganset River	No
Lake Washington (401)	Lake Washington Neighborhood Association	High	Mary Brown Brook	No
Hawkins Pond (555)	Glocester Land Trust	High	Mary Brown Brook	No
Clarkville Pond (556)	John Morton Abbott	High	Mary Brown Brook	No
Bowdish Reservoir (566)	RIDEM Forestry	High	Mary Brown Brook	Yes
Bowdish Lower (727)	Lynda J. Schmidt	High	Mary Brown Brook	No
Cherry Valley Pond (021)	Owner unknown	Significant	Chepachet River	No

[41] 2020 Dam Safety Report, RIDEM Dam Safety Program

Name (State ID)	Ownership	State Classification	River/Stream	EAP
Smith & Sayles Reservoir (023)	Sand Dam Reservoir Association	Significant	Chepachet River	No
Mower Pond (029)	Steven Tolias	Significant	Spring Grove Brook	No
Snakeskin Pond (032)	Owner unknown	Significant	Spring Grove Brook	
Coomer Lake (354)	Providence Water Supply Board	Significant	Peeptoad Brook	No
Sucker Brook Bridge Pond (381)	Owner unknown	Significant	Sucker Brook	
Durfee Hill Wildlife Marsh #2 (499)	RIDEM Fish and Wildlife	Significant	Cady Brook	Yes
Lake Aldersgate (514)	NE Conference of the United Methodist Church	Significant	Mosquitohawk Brook - Tributary	No
Wright T. Farm Pond (587)	Clayton D. & Leslie G. Lanphear	Significant	Chepachet River - Tributary	No
David King Farm Pond (594)	Gary A King	Significant	Spring Grove Brook	No

3.3.2.3 Extent

Dams are classified by the RIDEM according to size and hazard ratings. The size classification provides a relative description of small, medium, or large, based on the storage capacity and height of the impounded water. The hazard classification relates to the probable consequences of failure or operational failure of the dam; however, it does not relate to the current condition or the likelihood of failure of the dam.

The hazard classifications are defined in the Rhode Island Dam Safety Regulations as follows:

- High Hazard – means a dam where failure or operational failure will result in a probable loss of human life.
- Significant Hazard – means a dam where failure or operational failure results in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities, or impact other concerns detrimental to the public's health, safety, or welfare. Examples of major economic loss include washout of a state or federal highway, washout of two or more municipal roads, loss of vehicular access to residences, (for example, a dead-end road whereby emergency

personnel could no longer access residences beyond the washout area), or damage to a few structures.
- Low Hazard – means a dam where failure or operational failure results in no probable loss of human life and low economic losses.

Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within 6 hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, as a result of debris jams or the accumulation of melting snow.

Two factors influence the severity of a dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream. The potential severity of a dam failure may be classified for each dam according to its "hazard potential," meaning the probable impact that would occur if the structure failed in terms of loss of human life and economic loss or environmental damage. RIDEM classifies dam based solely on the types of impacts expected if a dam were to fail; they are not related to the adequacy or structural integrity of the dams themselves.

3.3.2.4 Previous Occurrences and Probability of Future Events

109 dam incidents have been recorded in Rhode Island statewide, with majority of incidents being minor and resulting in no reported deaths, injuries, or damage to property.

According to the 2022 Annual Report to the Governor on the Activities of the Dam Safety Program, the DEM inspected the following dams in Table 3.6 and determined certain dams to be unsafe/potentially unsafe dams.

Table 3.6 Glocester Unsafe/Potentially Unsafe High and Significant Dams (Source: RIDEM)

State ID	Dam Name	Hazard	Unsafe Condition	Owner
018	Burlingame Reservoir Upper	High	Vegetation prohibited inspection, inadequate erosion protection	RIDEM
354	Coomer Lake	Significant	Vegetation prohibited inspection, inoperable low-level outlet, severe embankment erosion	Providence Water Supply Board; City of Providence

587	Wright T. Farm	Significant	Vegetation prohibited inspection and missing trash rack. Action was taken to address the unsafe conditions	Clayton D. & Leslie Lanphear III
727	Bowdish Lower	High	Vegetation prohibited inspection, debris obstructing spillway, low level outlet operability unknown	Lynda Jean Marshall, aka Lynda L. Schmidt
111	Waterman Lake	High	Vegetation/debris prohibited inspection, drainage trench clogged	Citizens for the Preservation of Waterman Lake, Inc.

In the Town of Glocester, dam breaches are likely and if they do occur, the results are certain to be catastrophic if the dam is a high or significant hazard dam, scoring a 1B in the hazard ranking, a high-risk priority.

While generally considered an infrequent occurrence, the potential for dam failure in Rhode Island is a significant concern given the large number of dams across the State and the fact that there have been dam failure events in the past. Providence County has a likely probability (10 to 100%) of dam failure occurring within the next 12 to 60 months.

3.3.2.5 Climate Change and Dam Failure/Breach

The probability of dam failure incidents may be affected by impacts from climate change, such as increased precipitation levels and flooding that heighten the chance of dam failure, especially considering that dams are typically based on historic water flows and known hydrology. Further, greater periods of drought conditions and extreme heat that could lead to ground cracking, a reduction of soil strength, erosion, and subsidence in earthen dams. A report titled *Climate Change in Rhode Island: What's Happening Now & What You Can Do*[42] indicates that bridges, roads and dams will be more susceptible to flood damage because of more severe storms and heavy rainfall.

3.3.2.6 Impacts

Dam failure in Glocester poses a significant risk to the Town's infrastructure, properties, and public safety, particularly in areas near major water bodies. A dam failure could lead to rapid and severe flooding, inundating roads,

[42] Climate Change in Rhode Island – NOAA National Ocean Service.

homes, and critical facilities, especially in low-lying areas. Key transportation routes, historic areas, and local emergency services could be particularly vulnerable to such an event, causing widespread disruption and potential loss of life and property.

With climate change, the impacts of dam failure in Glocester could become more severe, especially for the town's population, infrastructure, and emergency services. Increased frequency and intensity of heavy rainfall events could overwhelm dams, leading to more catastrophic flooding. This would threaten low-lying residential areas, potentially displacing residents and causing significant property damage. Critical infrastructure, such as roads and bridges, could be destroyed or rendered impassable, isolating parts of the town and hindering emergency response efforts. Additionally, emergency services like fire departments could be directly impacted by flooding, delaying rescue and recovery operations and exacerbating the overall damage to the community. As a result, climate change could significantly amplify the risks posed by dam failures to Glocester's safety and preparedness. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

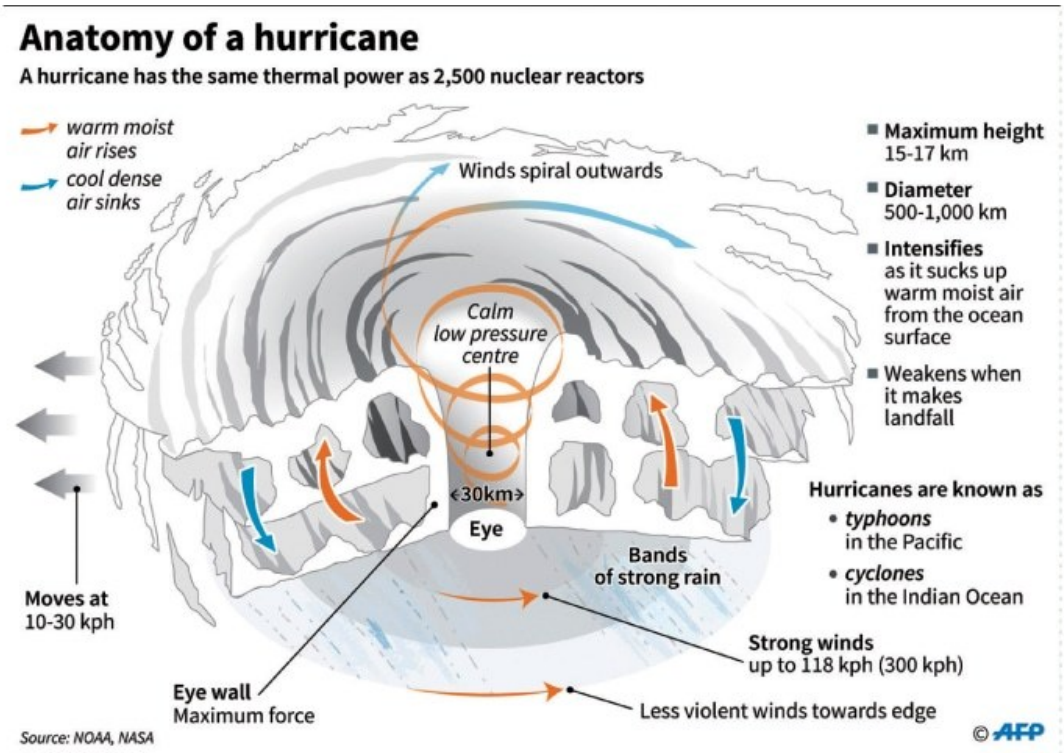
3.3.3 Hurricane

3.3.3.1 Description

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage. 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 to 73 mph.
3. Hurricane: maximum sustained surface wind speed exceeds 73 mph.

Figure 3.6 Anatomy of a Hurricane (Source: NOAA)



In the Northern Hemisphere, the most destructive section of the storm is usually in the eyewall area to the right of the eye, known as the right-front quadrant (Figure 3.6).

The "right side of the storm" is defined with respect to the storm's motion: if the hurricane is moving to the west, the right side would be to the north of the storm; if the hurricane is moving to the north, the right side would be to the east of the storm, and so on. In general, the strongest winds in a hurricane are found on the right side of the storm because the propagation of the hurricane also contributes to its winds. For example, a hurricane with 145 km/h (90 mph) winds while stationary would have winds up to 160 km per hour (100 mph) on the right side and only 130 km per hour (80 mph) on the left side if it began propagating at 16 km per hour (10 mph).

3.3.3.2 Location

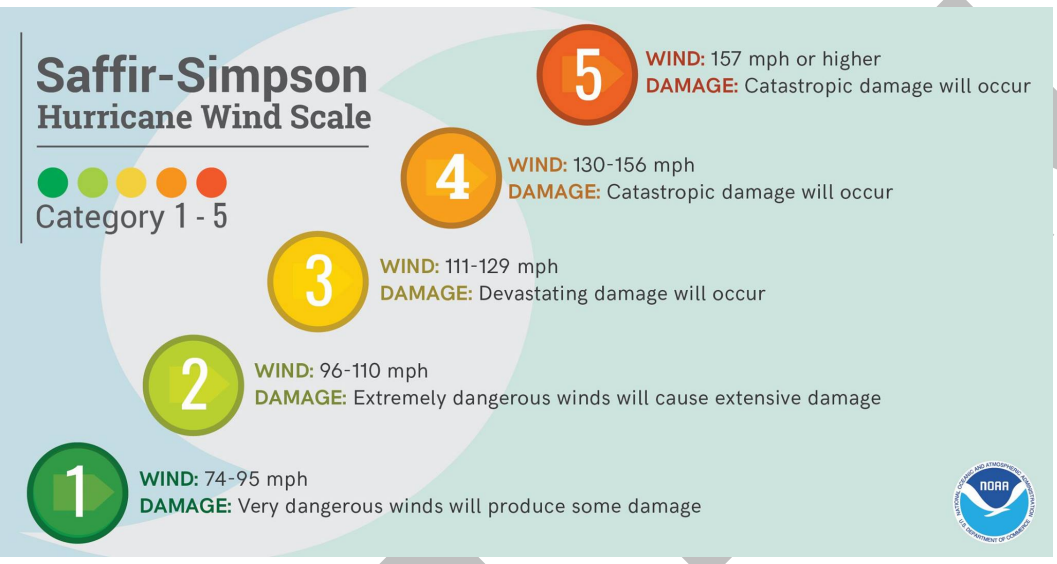
The entire State is vulnerable to hurricanes and tropical storms, depending on the storm's track. The exact location of a hurricane's impact varies from storm to storm and can be felt many miles inland from the point of impact. Therefore, all of Glocester is equally at risk from hurricanes.

3.3.3.3 Extent

Hurricanes are categorized according to the Saffir/Simpson scale (Figure 3.7) with ratings determined by wind speed and central barometric pressure.

Hurricane categories range from 1 through 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 less.

Figure 3.7 Saffir-Simpson Hurricane Wind Scale (Source: NOAA)



3.3.3.4 Previous Occurrence and Probability of Future Events

In 2021, Hurricane Henri moved up the east coast and approached New England as a Category 1 hurricane. As it made landfall in southwest Rhode Island, Henri receded to a tropical storm. Henri brough extensive flooding and wind gusts up to 70 mph. In 2012, Superstorm Sandy swept up the east coast and caused extensive power outages throughout the Town. Although Rhode Island has not been hit by extremely intense hurricanes (Category 4 or 5) as seen in other parts of the east coast, there have been tropical depressions, tropical storms and Category 1 through 3 hurricanes that have caused extensive damage to the State. The wind and rain that precede a hurricane can cause severe damage even to those communities that are further inland, such as Glocester.

Based on historical analysis and data presented in the State of Rhode Island Hazard Identification and Risk Assessment (HIRA) it is likely (between 10 and 100% probability), to experience a hurricane in next 12 to 60 months. In the Town of Glocester, the likelihood of being struck directly by a hurricane is unlikely, but the severity is serious, scoring a 3D in the hazard ranking, a low priority.

Table 3.7 Significant Hurricanes for Rhode Island (Source: Rhode Island Almanac, 112th Annual Edition, Rhode Island Hurricanes and Tropical Storms: A Fifty-Six Year Summary, NWS, NHC Tropical Cyclone Report: Hurricane Henri (2022))

Date	Name	Category[43]	Winds at landfall	Property Damage ($ million)	Deaths
September 21, 1938	N/A	3	95 mph	100	262
September 14, 1944	N/A	3	82 mph	2	0
August 31, 1954	Carol	3	110 mph	90	19
September 11, 1954	Edna	3	40 mph	0.1	0
September 12, 1960	Donna	2	58 mph	2.4	0
September 27, 1985	Gloria	2	81 mph	19.8	1
August 19, 1991	Bob	2	100 mph	1.5	0
August 27, 2011	Irene	1	71 mph	9.6	0
October 29, 2012	Sandy	1	70 mph	31.1	0
August 21, 2021	Henri	1	70 mph	700	0

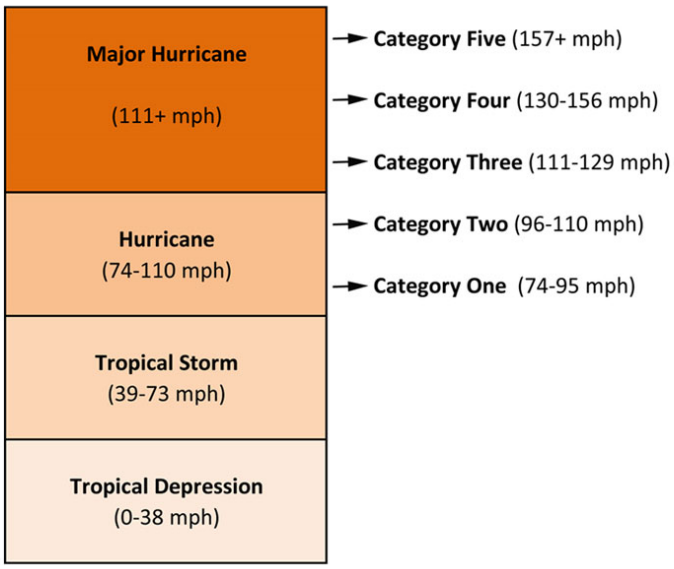
3.3.3.5 Climate Change and Hurricane

While hurricanes are a natural part of our climate system, recent research suggests that there has been an increase in intense hurricane activity in the North Atlantic since the 1970s. In the future, there may not necessarily be more hurricanes, but there will likely be more intense hurricanes that carry higher wind speeds and more precipitation as a result of global warming.

Scientists are continuing to refine our understanding of how global warming affects hurricane activity. Cutting edge research is beginning to be able to attribute individual hurricanes to global warming. For example, new research estimates that as the Earth has warmed, the probability of a storm with precipitation levels like Hurricane Harvey was higher in Texas in 2017 than it was at the end of the twentieth century. Because of climate change, such a storm evolved from a once in every 100 years event, to a once in every 16 years event over this time period (Figure 3.8).

[43] Category 1 74-95 mph winds, 4’-5’ storm surge; Category 2 96-110 mph winds, 6’-8’ storm surge; Category 3 111-130 mph winds, 9’-12’ storm surge; Category 4 131-155 mph winds, 13’-18’ storm surge; Category 5 winds greater than 155 mph, with a storm surge of greater than 18’ ; Source: Saffir-Simpson Hurricane Scale.

Figure 3.8 Observed Trends in Hurricanes (Source: Union of Concerned Scientists)



3.3.3.6 Impacts

Hurricanes can have devastating impacts on Glocester, bringing strong winds, heavy rain, and the potential for widespread flooding. The town's rural landscape, with its numerous trees and older structures, makes it vulnerable to wind damage, which can result in downed power lines, blocked roads, and damaged buildings. Flooding from excessive rainfall can overwhelm local rivers, streams, and drainage systems, leading to road closures, property damage, and disruptions to transportation and emergency services. In addition, hurricanes can cause extended power outages, isolating residents and hindering communication and emergency response efforts. Critical infrastructure, such as bridges and culverts, could also be compromised, further complicating recovery efforts and increasing the town's overall vulnerability during such events.

With climate change, the impacts of hurricanes on Glocester are expected to intensify due to more frequent and severe storms. Warmer ocean temperatures and rising sea levels are likely to increase the strength and duration of hurricanes, resulting in more destructive wind speeds and heavier rainfall. This could lead to more significant flooding, overwhelming the town's drainage systems and causing greater damage to homes, businesses, and infrastructure. Prolonged power outages and road closures could become more common, isolating parts of the town and delaying emergency services. Additionally, repeated storm damage may strain Glocester's aging infrastructure, making recovery efforts slower and more costly. With minimal projected changes in Glocester's population and

development, no significant changes in impacts due to population and development trends are anticipated.

3.3.4 Thunderstorm (including wind, lightning and hail)

3.3.4.1 Description

Thunderstorm

Thunderstorms are formed when just the right atmospheric conditions combine to provide moisture, lift, and warm and 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 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% 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 flash flooding.

Wind

The National Weather Service of NOAA defines a high wind event as sustained winds 40 mph or greater lasting 1 hour or longer, or winds of 58 mph or greater for any duration.[44] National climatic events such as tropical storms, thunderstorms, nor'easters, hurricanes, and low-pressure systems produce wind events in Rhode Island.

Lightning

Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges builds up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity - lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again. Lightning can occur between opposite charges within the thunderstorm cloud (intra-cloud lightning) or between opposite charges in the cloud and on the ground (cloud-to-ground lightning).[45]

[44] National Weather Service, National Oceanic and Atmospheric Administration, 2018.
[45] The National Severe Storms Laboratory, National Oceanic and Atmospheric Administration, 2018.

Hail
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 three-quarters-inch in diameter can do great damage to both property and crops, and some storms produce hail over 2 inches in diameter. Hail causes about $1 billion in damages annually in the U.S.

According to the National Weather Service, in order for a thunderstorm to produce dime-sized hail, its updraft speed would need to be at least 37 mph. For golf ball-sized hail, updraft speeds would need to be around 56 mph. Baseball-sized hail requires strong winds that are blowing upwards at 100 mph. When reporting observations of hail, it is important to observe its size compared to common objects. This comparison makes it easy to relay a hail storm report to forecasters and broadcast meteorologists.

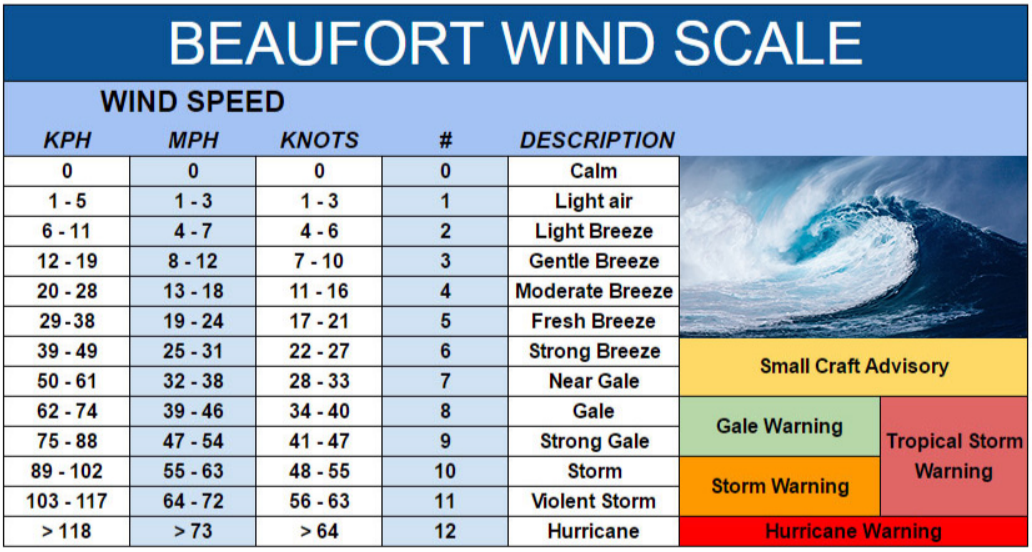
3.3.4.2 Location
When the Town of Glocester experiences significant thunderstorms, damaging wind events, lightning storms, and large hail, the effects are generally felt Town-wide.

3.3.4.3 Extent
Wind
Damages from winds events range from power outages, property damage to vehicles and buildings and fallen trees and limbs (Table 3.8). These events can occur at any time of the year but are mostly associated with other storm events. The National Weather Service issues wind advisories which vary from state to state. Generally, High Wind Advisories include winds 30 mph or greater lasting for one hour or longer, or winds 45 mph or greater for any duration. High Wind Warnings include winds 40 mph or greater lasting one hour or longer or winds 58 mph or greater for any duration, and high wind watches include winds 40 mph or greater and/or gusts 58 mph or greater.[46]

According to the Rhode Island Residential Code, Glocester's is in the 1 to 100 mph Wind Speed Zone for building standards. The Beaufort Wind Chart, as seen in Figure 3.9 below, measures wind speed magnitude.

[46]Ibid.

Figure 3.9 Beaufort Wind Chart (Source: Coast Monkey)



BEAUFORT WIND SCALE

WIND SPEED				
KPH	MPH	KNOTS	#	DESCRIPTION
0	0	0	0	Calm
1 - 5	1 - 3	1 - 3	1	Light air
6 - 11	4 - 7	4 - 6	2	Light Breeze
12 - 19	8 - 12	7 - 10	3	Gentle Breeze
20 - 28	13 - 18	11 - 16	4	Moderate Breeze
29 - 38	19 - 24	17 - 21	5	Fresh Breeze
39 - 49	25 - 31	22 - 27	6	Strong Breeze
50 - 61	32 - 38	28 - 33	7	Near Gale
62 - 74	39 - 46	34 - 40	8	Gale
75 - 88	47 - 54	41 - 47	9	Strong Gale
89 - 102	55 - 63	48 - 55	10	Storm
103 - 117	64 - 72	56 - 63	11	Violent Storm
> 118	> 73	> 64	12	Hurricane

Small Craft Advisory

Gale Warning

Tropical Storm Warning

Storm Warning

Hurricane Warning

Lightning

All thunderstorms produce lightning, and therefore all thunderstorms are dangerous. Lightning often strikes outside of areas where it is raining and may occur as far as 10 miles away from rainfall. It can strike from any part of the storm and may even strike after the storm has passed. 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 also has the potential to start both urban fires and wildfires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over $1 billion in insured losses annually nationwide.

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 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 if they are located on high ground or if they have tall protrusions, such as steeples or poles. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communications outages.

The extent of lightning can be measured using lightning density. For example, The Vaisala 2021 Annual Lightning Report showed a lightning density in Rhode Island of 2.15 cloud-to-ground strokes plus cloud pulses per square kilometer.

Hail

Rhode Island is not known for experiencing the same frequency of severe thunderstorms as the Midwest and Southeast, but the state has observed a number of very destructive hail events over the years. 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. The amount of cover obtained during a hail storm can greatly reduce the risk to human health during these events. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation. Agricultural crops and structures have significant exposure and are at risk.

The NOAA Hail Size Comparison chart (Table 3.8) measures hail sizes.

Table 3.8 Hail Size versus Object Comparison (Source: NOAA)

Hail Size (in)	Object Comparison
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.00	Hen egg
2.50	Tennis ball
2.75	Baseball
3.00	Tea cup
4.00	Softball
4.50	Grapefruit

3.3.4.4 Previous Occurrences and Probability of Future Events

Based on historical frequency of occurrence using National Climatic Data Center (NCDC) data, a reasonable determination of probability of future thunderstorms can be made. Thunderstorm events are highly likely to occur within the next 1 to 3 years. Thunderstorm events have a small range of impact, accounting for 10% or less of the jurisdictional boundaries. Hazard magnitude ranges widely and is considered to have negligible to limited

magnitude, including some injuries, no shutdown of critical facilities and infrastructure, and scattered incidental, residential, and commercial structure damages from the events.

Wind

Table 3.9 Significant Wind Events for Providence County (Source: NCEI)

Date	Magnitude	Comments
11/02/99	60 mph	Strong winds buffeted Rhode Island, as deepening low pressure moved across southern Canada. High winds in Providence and western Kent Counties resulted in several large trees, limbs, and power lines down in Coventry, Scituate, and Burrillville. In Foster, about 30 to 35 trees were downed by high winds, and some electric customers lost power for about four hours. Wind gusts were estimated to be near 60 mph, and primarily affected the higher elevations
12/12/00	60 mph	A strong cold front brought damaging wind gusts to portions of Rhode Island. Even though there were scattered reports of wind damage throughout the Ocean State, the strongest winds of nearly 60 mph were felt in the higher terrain of northwest Providence County
12/17/00	60 mph	A rapidly strengthening low pressure system west of New England brought a period of damaging southerly winds to much of the Ocean State, as lines of showers passed through southern New England. Following the passage of a strong cold front later in the day, increasing northwest winds caused damage over much of the state once again. Peak wind gusts of nearly 60 mph were common throughout Rhode Island, resulting in countless reports of downed trees, tree limbs, and power lines. About 5,700 electric customers were left without power statewide.
9/11/02	50 mph	High winds buffeted parts of northern and central Rhode Island, as a result of Hurricane Gustav passing several hundred miles southeast of New England. Although wind speeds were measured as high as 50 mph, there were numerous reports of downed trees and branches which took down power lines and disrupted service to about eighteen thousand electric customers. About four thousand electric customers lost power in Johnston and Glocester. Falling trees caused

		damage to a car and two homes in Johnston. Many trees were reported downed by the high winds in Coventry near the Scituate line.
10/15/03	45–55 mph	High winds downed trees and large limbs across northern Rhode Island, causing scattered power outages. A large limb fell onto railroad tracks in Cumberland. Although peak winds only reach 45 to 55 mph, they were strong enough to cause damage.
11/5/04	45-60 mph	Downed trees
12/23/04	50-60 mph	Downed trees and power lines
3/8/05	70+mph	Downed trees
4/2/05	58 mph	Downed trees
5/7/05	60 mph	Downed trees and power lines
9/29/05	40-60 mph	Power outages, downed trees and power lines
10/16/05	60 mph	Downed trees, and power lines, causing scattered power outages
10/25/05	60 mph	Downed trees and wires, resulting in scattered power outages
1/18/06	59 mph	Downed trees and power lines
1/21/06	n/a	Downed trees and power lines
2/17/06	n/a	Downed tree 1’ in diameter in Glocester
7/28/16	50 mph	Severe thunderstorms and strong wind brought down large tree limbs
8/2/06	69 mph	Downed trees
10/29/06	51 mph	Downed trees and large branches
12/1/06	50 mph	Downed trees and wires, resulting in scattered power outages
5/16/07	50 mph	Downed trees
6/28/07	50 mph	Downed limbs
2/10/08	67 mph	Downed trees and power lines
3/8/08	59 mph	No damage reported
7/2/08	50 mph	Downed trees and limbs
7/23/08	50 mph	Downed trees and power lines
9/9/08	50 mph	Downed trees
6/29/09	50 mph	Downed branches
1/25/10	60 mph	Downed trees and limbs
4/29/10	40-50 mph	Downed wires
12/8/11	63 mph gusts	Heavy rainfall and strong winds
12/27/11	54 mph gusts	Heavy rain, strong winds, and downed trees
7/1/12	60 mph	Downed trees and wires including trees in Bowdish Lake Campground onto recreational vehicles
7/24/12	61 mph	Severe storms with damaging wind and large hail
10/29/12	50-60 mph	Superstorm Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds to southern New England. Easterly winds

		gusted to 50 to 60 mph for interior southern New England
1/20/13	46 mph	Downed trees and wires
1/31/13	64-70 mph	Downed trees and power lines. In Glocester, a tree was downed across Snake Hill Road
11/1/13	46 mph	Downed trees
11/27/13	46 mph	Downed trees
4/4/15	37-47 mph	Downed trees
2/16/16	60 mph	Downed trees
2/25/16	n/a	Severe thunderstorm winds and high winds. A tree on Route 44 in Glocester was downed by thunderstorm winds, blocking the road
4/1/16	n/a	Heavy rain with high winds. A tree and branches were downed on Paris Iron Road in Glocester
8/12/16		Frequent lightning, wind damage and flooding. Downed trees on Lake Washington Drive and Reynolds Road
10/23/16	42 mph	Downed trees
1/24/2017	46 mph	Downed trees and wires
7/12/2017	57 mph	Downed trees
8/2/2017	57 mph	Downed trees
10/25/2017	49 mph	Downed trees
10/23/2018	60-70 mph	The tornado initially touched down in North Providence on Meadow View Blvd. around 331 PM EDT, where large branches were downed, including one on a car and a fence. In this area, wind speeds were estimated to be 60-70 mph, which is classified as EF-0 on the Enhanced Fujita Scale.
11/3/2018	49 mph	In Glocester at 207 PM EDT, a tree was down on Reservoir Road.
1/30/2019	46 mph	Downed trees
5/20/2019	57 mph	Downed trees and wires
2/7/2020	56 mph	Downed tree injuring one person
8/4/2020	59 mph	Tropical Storm Isaias moved from the coast of Virginia through New York and across southern New England causing widespread wind damage. In Providence, multiple downed trees and wires. Wind gusts reported up to 59 mph.
10/7/2020	59-60 mph	Downed trees and wires
7/27/2021	56 mph	Downed trees
8/22/2021	70 mph	Tropical Storm Henri made landfall in southwest Rhode Island and brought wind gusts up to 70 mph, flash flooding, 5 to 6 inches of rainfall, and spawned tornadoes.
11/13/2021	80 mph	Downed trees. Tornado with maximum wind speed around 80 mph.

12/11/2021	44 mph	Downed trees. In Glocester at 430 PM EST, a large tree was down on wires
7/12/2022	56 mph	Downed trees. In Glocester, a tree was down on Hunting House Road and a tree was down on Cranberry Ridge Road.
6/27/2023	56 mph	Downed trees. In Glocester, a tree was down on the 300 block of Cooper Road.
7/27/2023	56 mph	Downed trees. In Glocester, there were 3 inch diameter tree limbs broken and power poles broken.
8/18/2023	115 mph	A tornado caused significant damage along a discontinuous path in Scituate, Johnston, and North Providence, Rhode Island. This is the strongest tornado to have struck Rhode Island since the F2 tornado in Cranston and Providence on August 7, 1986. Damage was consistent with winds of around 115 mph which is classified as F2 on the Enhanced Fujita Scale.
9/13/2023	90-100 mph	An F1 with maximum winds of 100 mph began in a wooded area between Chopmist Hill Road (Route 102) and Bungy Road in the town of Glocester, RI here the tornado either snapped or uprooted an estimated 75 or more, healthy and mature trees. The tornado moved northeast and crossed Bungy Road before dissipating over an open field. Most notable, a small outbuilding, used as bus stop shelter was blown away by the tornado with remnants littered west of the original location. This damage and the tree damage along the path was consistent with wind speeds between 90 and 100 mph, resulting an F1 rating |on the Enhanced Fujita Scale.

Lightning

Vaisala's U.S. National Lightning Detection Network (NLDN) monitors total lightning activity and scientifically measures its flash density across the continental United States. The data is collected and then aggregately displayed.

The NCDC has recorded 151 significant (those causing injury, fatalities, and/or damage) lightning and hail events in Rhode Island. 11 additional injuries have been recorded since 1956 due to lightning.

Forecasters can and do forecast the likelihood of intense lightning activity. However, it is impossible to forecast individual strikes since lightning is so widespread, frequent and random. The understanding of cloud electrification processes is still incomplete. Thunderstorms always have lightning (thunder

is caused by lightning, and you cannot have a thunderstorm without thunder), but you can have lightning without a thunderstorm.[47]

Table 3.10 Significant Lightning Storms in Providence County (Source: NCEI)

Date	Comments
6/22/02	A severe thunderstorm downed large branches and wires in Scituate. In West Glocester, a lifeguard was struck by lightning as the storms moved through, and was treated for minor injuries at a local hospital.
7/19/05	Lightning strikes in the region
6/20/06	Severe thunderstorms, large hail and lightning strikes
7/18/06	Severe thunderstorms, high winds and lightning strikes
7/28/06	Severe thunderstorms, high winds, downed trees and lightning strikes
1/11/08	Winter thunderstorm and lightning strikes
7/23/08	Thunderstorm with lightning strikes
6/25/12	Thunderstorms with lightning strikes. Lightning strikes caused the most damage, hitting trees, houses, and transformers.
7/1/12	Three children in Chepachet were struck by lightning while playing outside at a Fourth of July party. Lightning struck the backyard where the children were playing. The 5 year old, 13 year old, and 14 year old were all transported to Hasbro Children's hospital for non-life threatening injuries.
6/23/15	Thunderstorms, high winds and lightning strikes
8/4/15	Thunderstorms, high winds, widespread power outages and lightning strikes
8/12/16	Thunderstorms, high winds and lightning strikes
6/13/2022	Thunderstorms with lighting strikes

Hail

Table 3.11 Significant Hailstorms for Providence County (Source: NCEI)

Date	Magnitude (size in inches)
June 20, 1995	1”
August 4, 1995	.75”
June 19, 1998	.75”
June 30, 1998	1”-2.75”
May 24, 2000	.75”-.88”
May 23, 2004	.75”
July 2, 2004	1”

[47] The National Severe Storms Laboratory, National Oceanic and Atmospheric Administration, 2018.

July 18, 2006	1”
June 24, 2008	1.25”-1.75”
July 1, 2009	.75”
July 1, 2012	.75”
May 25, 2014	1.00”
July 24, 2015	.75”
July 28, 2015	1.00”
September 30, 2017	.75”
June 29, 2019	1.75”
June 30, 2019	.75”
March 29, 2020	1”
July 17, 2021	.75”
September 28, 2021	.75”
June 2, 2023	.75”

In the Town of Glocester, thunderstorm events are highly likely to occur frequently and the effects are considered serious, scoring a 3A in the hazard ranking, a high priority (red).

3.3.4.5 Climate Change and Thunderstorm

Climate change is anticipated to alter the frequency and intensity of thunderstorms. As the planet warms, the atmosphere's ability to hold moisture increases, potentially leading to more severe thunderstorms with heavier rainfall. Warmer temperatures can also contribute to greater instability in the atmosphere, which may result in storms that are both more frequent and more intense. This could lead to an increase in related weather phenomena, including strong winds, lightning, and hail.

3.3.4.6 Impacts

Thunderstorms, including wind, lightning, and hail, can have significant impacts on Glocester, particularly due to the town’s rural and forested landscape. High winds during thunderstorms can lead to fallen trees and power lines, resulting in power outages and road closures, which can disrupt daily life and hinder emergency services. Lightning strikes pose a fire hazard. Hail can damage crops, vehicles, and buildings, adding to the economic burden on residents and the town. Additionally, severe thunderstorms can create hazardous driving conditions, further complicating travel and emergency response efforts.

With climate change, the impacts of thunderstorms in Glocester are likely to become more intense and frequent. Rising temperatures increase the amount of moisture in the atmosphere, leading to more severe

thunderstorms with stronger winds, heavier rainfall, and larger hailstones. This could result in more widespread damage to homes, infrastructure, and agricultural areas. Increased storm intensity also raises the likelihood of prolonged power outages, blocked roads, and damage to communication networks, making it more difficult for emergency services to respond effectively. Additionally, more frequent hailstorms could cause recurring damage to crops and property, straining local resources and economic stability. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

3.3.5 Snow and Ice Storm (including nor'easter)

3.3.5.1 Description

A heavy snow is generally defined as having more than 8 inches of accumulation in less than 24 hours. A winter storm warning is issued when snowfall is expected to accumulate more than 4 inches in 12 hours and/or a quarter inch or more of freezing rain accumulation.

Heavy snow can bring a community to a standstill by inhibiting transportation, knocking down trees and utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant and surpass annual municipal salt supply and can surpass annual snow removal budgets, often before the end of the season. When utilities are affected and heaters do not work, water and sewer pipes can freeze and even rupture and roofs collapse under the heavy weight of snow.

The term "ice storm" is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Ice storms result from the accumulation of freezing rain, which is rain that becomes super-cooled and freezes upon impact with cold surfaces. 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.

Ice storms can be the most devastating of 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.

Nor'easters are storms that move along the North American east coast. The name "nor'easter" refers to the strong winds that blow from the northeast ahead of the storm over coastal waters. These storms can develop any time

of the year but most frequently form with peak intensity between September and April.

These storms usually take a north or northeastward track following their development, intensifying along the away due to the temperature difference between the cold Arctic air transported across the United States by the polar jet and the warm air moving northward from the Gulf of Mexico and Atlantic Ocean. The counterclockwise flow around this low-pressure system bring the warm moist oceanic air over land.

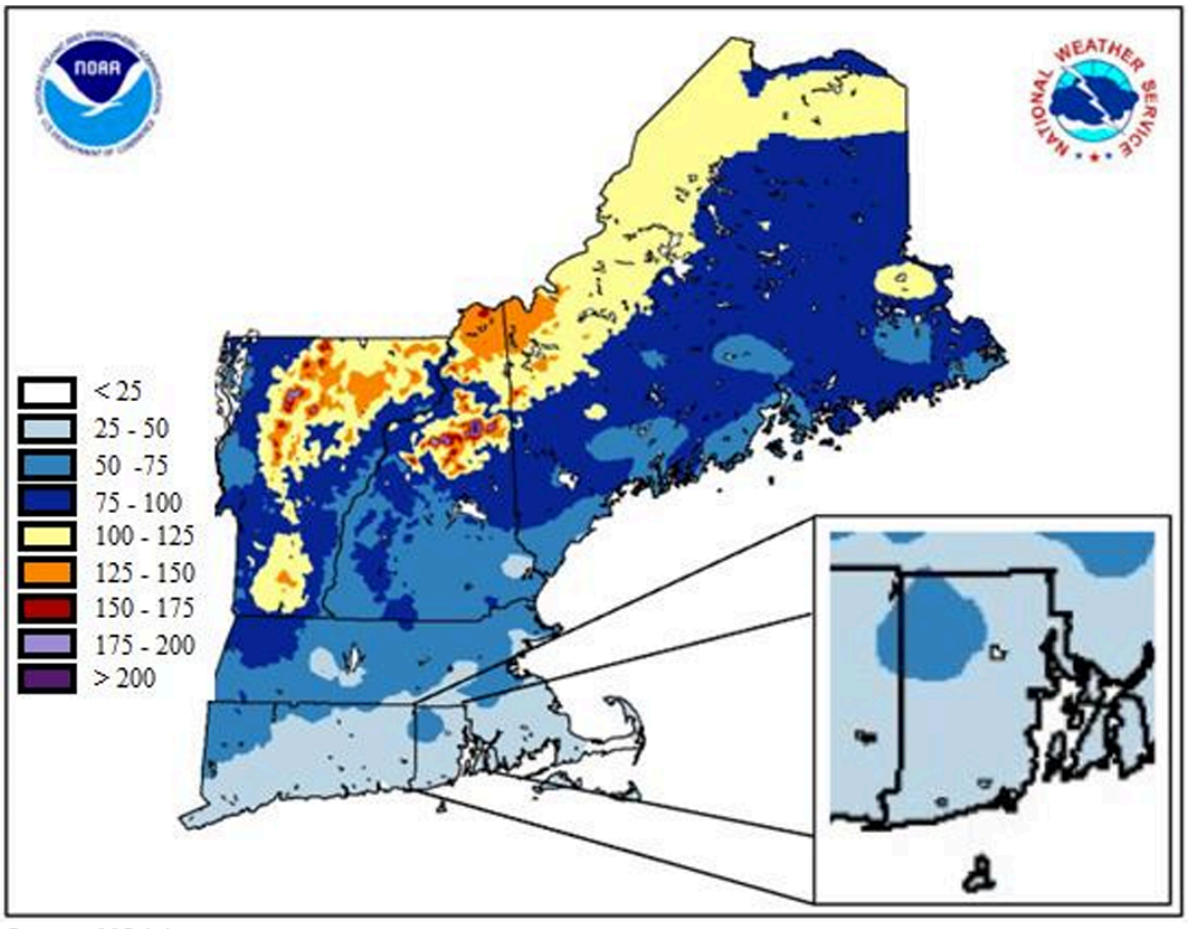
This air collides with the cold air carried southward by the trough of the jet stream. The intensifying low spirals the different air masses toward each other at a faster rate due to the enhanced pressure gradient. The greater the temperature differences between the two air masses, the greater the turbulence and instability can become, leading to the production of stronger, more severe coastal storms, that eventually impact inland areas of Rhode Island.

3.3.5.2 Location

The entire Town of Glocester experiences a variety of winter conditions including snow and ice storms. When the Town of Glocester experiences a snowstorm or nor'easter, effects are generally felt Town-wide. Average annual snowfall based on 1991 to 2020 normals is shown below in Figure 3.10 below. Although somewhat more variable in terms of distribution, northwest portions of Providence and Kent counties see these heavy snowfall events with greater frequency compared to Bristol, Newport, and Washington counties. Most of the significant snow events result in hazardous road conditions, power outages, school/business closings and transportation disruptions.

Providence County will likely see annual snowfall totals over 50 inches, with the greatest impacts and vulnerability in western Glocester and northern Foster communities. Burrillville and Scituate also have an elevated risk and associated damages. Heavy snow can affect the entire State, but the highest amounts occur in the northern and northwestern areas of the State (Figure 3.10)

Figure 3.10 Average Annual Snowfall (Source: NOAA)



3.3.5.3 Extent

Even though there is no universally accepted scale to measure a snowstorm, the Northeast Snowfall Impact Scale (NESIS), developed by Paul Kocin and Louis Uccellini of the National Weather Service (NWS), characterizes and ranks high-impact Northeast snowstorms. The 5 categories of NESIS are: Extreme, Crippling, Major, Significant, and Notable shown in Table 3.12. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts. For example, the Blizzard of 1978 scored a 6.25 on the scale and was classified as Crippling based on its widespread impact and extreme conditions.

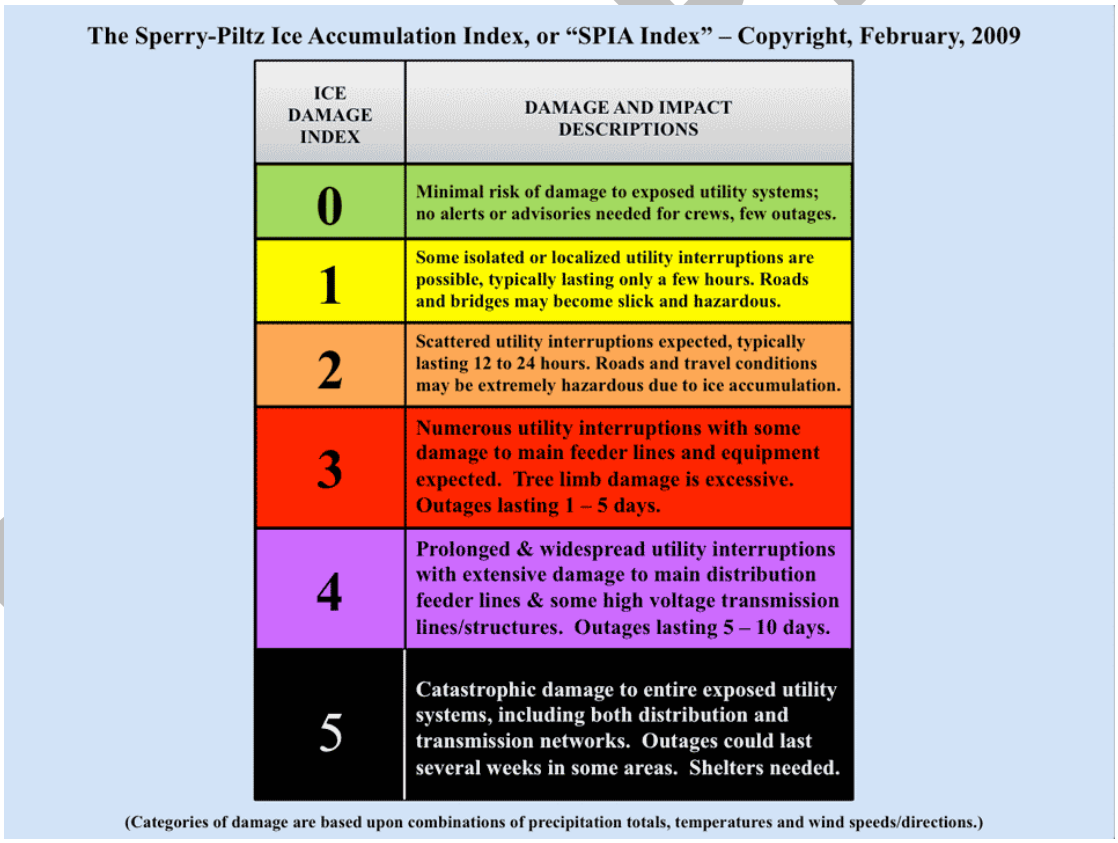
The geographical location of Glocester in the northwest corner of the state and overall higher elevation increases the likelihood of snowstorms over other areas of the state. Glocester generally has more snow events than most other communities in the state.

Table 3.12 NESIS Scale (Source: NOAA)

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

The Sperry–Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems. Sid Sperry of the Oklahoma Association of Electric Cooperatives and Steven Piltz from the National Weather Service office in Tulsa, Oklahoma, developed the index together. 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), as shown below in Figure 3.11.

Figure 3.11 Sperry-Piltz Ice Accumulation Index (Source: SPIA Index)



Historically, nor'easters have resulted in hazardous road conditions, power outages, the closing of schools/businesses, minor accidents and highway travel disruptions. The National Weather Service issues Winter Storm

Warnings (snow, sleet, or ice expected – take action), Winter Storm Watches (snow, sleet, or ice possible – be prepared), and winter weather advisories (wintery weather expected – exercise caution).[48]

During any severe natural events, like nor'easters, the police may have some weak communications on the 800 MHz Riscon system, particularly around Main Street in Chepachet Village, in West Glocester near the Connecticut state line, and along Route 94 at Babbits Corner.

3.3.5.4 Previous Occurrences and Probability of Future Events

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. In Rhode Island, there is no single database or repository of consistent, detailed descriptions of the types of ongoing "normal" winter hazards that occur. Detailed information only exists for the unusual events that cause an exceptional amount of hardship (i.e., snow and ice removal), threats to public safety, and major damage to public and private property, such as the Blizzard of 1978, the 1991 Halloween Storm, the 2003 President's Day Storm, and the 2005 Blizzard.

Table 3.13 Significant Winter Weather/Heavy Snow for Providence County (Source: NCEI)

Date	Snowfall (inches)	Comments
3/16/04	4"-8"	No major damage reported
11/12/04	4"-8"	No major damage reported
12/26/04	6"-10"	Dozens of minor accidents due to poor visibility and slippery roads
1/5/05	5"-7"	No major damage reported
1/22/05	15"-25"	Winds gusting as high as 60 mph created near blizzard conditions making travel impossible during the height of the storm
3/1/05	4"-8"	No major damage reported
3/12/05	3"-9"	No major damage reported
3/23/05	4"-8"	Minor traffic disruptions
2/12/06	9"-14"	No major damage reported
3/16/07	4"-7"	No major damage reported
1/14/08	n/a	Heavy snow, downing trees and power lines
12/19/08	10"-12"	No major damage reported
12/31/08	5"-7"	No major damage reported
1/18/09	6"-7"	No major damage reported
3/2/09	7"-12"	Numerous flight cancellations in Boston and many car accidents.

[48] National Weather Service, National Oceanic and Atmospheric Administration, 2017.

12/19/09	18"-21"	Numerous flight cancellations out of T.F. Green Airport in Providence, school closings, and a struggle by plows to keep the roads clear
3/26/10	12"-24"	Heavy snow, transportation disruptions
12/26/10	8”-15”	No major damage reported
1/12/11	10”-22”	Transportation disruptions
1/21/11	6”-7.5”	No major damage reported
1/26/11	12”-17”	No major damage reported
2/1/11	6”-8”	Heavy snow with upwards of a tenth of an inch of ice accumulation
12/29/12	8”-13”	No major damage reported
2/8/13	21”-28”	An historic winter storm deposited tremendous amounts of snow over all of southern New England. Isolated thunderstorms and strong winds were common across the entire region during the height of the storm. Snow fell at 2 to 3 inch per hour throughout the region. The Providence Journal reported that almost 170 people sought treatment for storm-related injuries. A major disaster declaration (DR-4107) was declared on March 22, 2013.
3/7/2013	5”-12”	No major damage reported
12/14/13	4”-8”	No major damage reported
1/02/14	7”-8”	Bitter cold temperatures and strong winds reported
1/21/14	10”-12”	No major damage reported
2/5/14	5”-10”	No major damage reported
2/13/14	5”-10”	No major damage reported
12/9/14	n/a	An eighth of an inch of ice accumulated on exposed surfaces in the western part of Glocester. Numerous accidents were reported.
1/24/15	4”-7”	No major damage reported
1/26/14	24”-36”	An historic winter storm brought heavy snow to southern New England with blizzard conditions to much of Rhode Island. The Governor declared a state-wide travel ban beginning at midnight on January 27th and continuing through 8 pm. The few cars/drivers who did not obey the travel ban became stuck. Several fatalities occurred as a result of the storm. President Obama issued a federal disaster declaration for the state of Rhode Island for this storm, allowing federal assistance for emergency work and repairs to facilities damaged by the storm.
2/2/15	3”-13”	No major damage reported
2/8/15	6”-16”	No major damage reported
2/14/15	8”-13”	No major damage reported
1/23/16	5”-8”	No major damage reported
2/5/16	5”-12”	Storm resulted in downed trees and power lines
2/8/16	6”-9”	No major damage reported

4/4/16	4”-7”	No major damage reported
12/17/2016	3.5”-5”	No major damage reported
1/8/2017	8”-11”	No major damage reported
2/9/2017	10”-15”	No major damage reported
3/14/2017	7”-13”	A major winter storm moved rapidly northeast across southern Rhode Island. Snowfall along the coast was about 2 t 6 inches while around a foot fell in northwest Providence County. Strong winds ranged from 45 to 60 mph across the state. No major damage reported
12/10/2017	4”-6”	No major damage reported
12/23/2017	n/a	Ice accumulation in Northwest Providence County was up to one-quarter inch.
1/4/2018	8”-14”	No major damage reported
1/30/2018	5”-7”	No major damage reported
2/14/2018	n/a	At 714 AM EST in Foster and Scituate, several multiple vehicle accidents were reported due to icing.
2/18/2018	5”-6”	No major damage reported
3/8/2018	6”-13”	No major damage reported
3/13/2018	13”-25”	No major damage reported
11/15/2018	9”	An early season Nor’easter resulted in heavy snow accumulation in Rhode Island. Snowfall amounted up to 9 inches in northwest Rhode Island.
11/16/2018	7.5”	No major damage reported
1/19/2019	3”-5”	Three to five inches of snow fell on Northwest Providence County. A member of the General Public in Burrillville reported ice accumulation of one-quarter inch.
3/4/2019	10”-15”	No major damage reported
12/16/2020	8.4”-14”	No major damage reported
2/1/2021	8”-12”	Snowfall amounts ranged from 8 to 12 inches with wind gusts between 35 to 45 mph. No major damage reported.
2/7/2021	6”-11”	No major damage reported
1/7/2022	5”-12”	No major damage reported
1/28/2022		Strong winter storm with blizzard conditions hit southern New England. Snowfall generally ranged from 13 to 19 inches. The highest amount reported was 19.1 inches in Harrisville. Winds gusted 30 to 40 mph. The Smithfield Airport ASOS (KSFZ) reported blizzard criteria from 806 AM EST to 827 AM EST and from 853 AM EST to 956 AM EST but then all wind data were lost and thus a blizzard was unable to be determined.
2/27/2023	5.5”-7”	Snowfall in northwest Providence County generally ranged from 5.5 to 7.0 inches, with the highest amounts in the higher terrain. Some specific amounts included: 7.0 inches in Foster; 6.3 inches in Glocester; 6.0 inches in Burrillville; and 5.5 inches in Smithfield.

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

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

A major disaster declaration (DR-4653) was declared on May 12, 2022, due to severe winter storms and snowstorms during the period of January 28 to January 29, 2022. Snowfall ranged from 13 to 24 inches with wind gusts to hurricane force along the coast and 50 to 60 mph inland.[49] Bristol, Kent, Newport, Providence, and Washington Counties, including the Narragansett Indian Tribe were affected by adverse disaster conditions.

Severe winter weather events have a large range of impact, accounting for 40 to 100% of the jurisdictional boundaries. The probable hazard magnitude for severe winter weather ranges from negligible magnitude, with no shutdown of critical infrastructure and facilities, to limited magnitude, including some injuries and less than 10% of residential and commercial structures damaged from the events.

Historically, significant storms for Glocester have resulted in the canceling of schools, the closure of businesses, power outages, fallen tree limbs, downed telephone/power wires, poor road conditions and the collapse of several roofs. The 2 major threats from these hazards are loss of power due to ice on electrical lines and then no potable water supply, and snow loading on rooftops.

[49] National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Storms Events Database, Providence County, 2023

The severity of winter weather events in Rhode Island is difficult to accurately determine. Days of frigid, arctic air and below freezing temperatures may be followed by days of mild temperatures in the 40s or 50s. Snowfall and rainfall vary; however, Rhode Island residents can expect to experience several nor'easters, which usually bring a possibility for blizzard conditions or heavy rainstorms dependent on the temperature.

Based on history and climatic conditions, there is a high likely probability that winter hazards will continue to occur and impact Rhode Island, including the Town of Glocester, with the probability of a winter storm event occurring within the next 12 to 60 months near 10%.

With each winter, there is a strong likelihood that at least one heavy snowstorm and/or nor'easter will hit Rhode Island. The Town of Glocester experiences a nor'easter or major snowstorm frequently and the severity is serious, scoring a 3A in the hazard ranking, a high priority (red).

3.3.5.5 Climate Change and Snow and Ice Storm (including nor'easter)

According to the National Centers for Environmental Information, years with heavy seasonal snow and extreme snowstorms continue to occur with great frequency as the climate has changed. The frequency of extreme snowstorms in the eastern two-thirds of the contiguous United States has increased over the past century. Approximately twice as many extreme United States snowstorms occurred in the latter half of the 20th century than the first.

Conditions that influence the severity of eastern United States snowstorms include warmer-than-average ocean surface temperatures in the Atlantic. These can lead to exceptionally high amounts of moisture flowing into a storm and contribute to greater intensification of the storm. Natural variability can affect ocean surface temperatures, but as global surface temperatures increase, the temperature at any time is higher than it would have been without climate change. Overall, global ocean surface temperatures have increased at a rate of +0.18°F per decade since 1950.

In addition, studies have shown that natural variability associated with the presence of El Niño conditions has a strong influence on the incidence of severe snowstorms in the eastern United States. Based on an analysis of the top 100 snowstorms in six regions east of the Rocky Mountains, scientists found that severe snowstorms are approximately twice as likely to occur in the Northeast and Southeast regions during years when a moderate to strong El Niño is present as compared to years when neutral conditions exist.

3.3.5.6 Impacts

Snow and ice storms, including nor'easters, can have significant impacts on Glocester, causing disruptions to daily life, infrastructure, and emergency services. Heavy snowfall can result in road closures and dangerous travel conditions, isolating residents and hindering access to critical services. Accumulated snow and ice can lead to widespread power outages due to downed trees and power lines, leaving homes and businesses without electricity for extended periods. Ice accumulation on roads, bridges, and sidewalks creates hazardous conditions for drivers and pedestrians alike, increasing the risk of accidents. Additionally, the weight of snow and ice on roofs and structures can cause structural damage, while freezing temperatures during these storms can threaten vulnerable populations, including the elderly and those with limited heating options.

With climate change, the impacts of snow and ice storms, including nor'easters, on Glocester are expected to evolve. Heavier snowfall events could exacerbate the risks of road closures, power outages, and structural damage. Additionally, as winter temperatures fluctuate more frequently above and below freezing, ice storms may become more common, increasing the danger of slippery roads, hazardous travel, and infrastructure damage from ice-laden power lines and trees. The unpredictability of storms, combined with more frequent freeze-thaw cycles, could strain emergency services and response efforts, making the town more vulnerable to the compounded effects of snow, ice, and cold temperatures during these events. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

3.3.6 Extreme Temperatures

3.3.6.1 Description

Extreme cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions.

The definition of an excessively cold temperature varies according to the normal climate of a region. In Rhode Island, extreme cold usually involves temperatures below zero degrees Fahrenheit. Extreme cold events are typically part of winter storm events and can occur during anytime of the year with devastating effects on agricultural production.[50] 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

[50] Ibid

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 5 degrees below 0, even though the actual temperature could be much higher. The NWS issues a wind chill advisory when wind chill temperatures are potentially hazardous and a wind chill warning when the situation can be life-threatening[51].

The 2024 Rhode Island State Hazard Mitigation Plan defines extreme heat as temperatures that hover 10 degrees or more above the average high temperature for the region and lasts for several weeks.[52] Relative humidity and ambient air temperature are additional components of heat conditions. Humid or muggy conditions can add to the discomfort of high temperatures and occur when an area of high atmospheric pressure traps moisture laden air near the ground.

3.3.6.2 Location

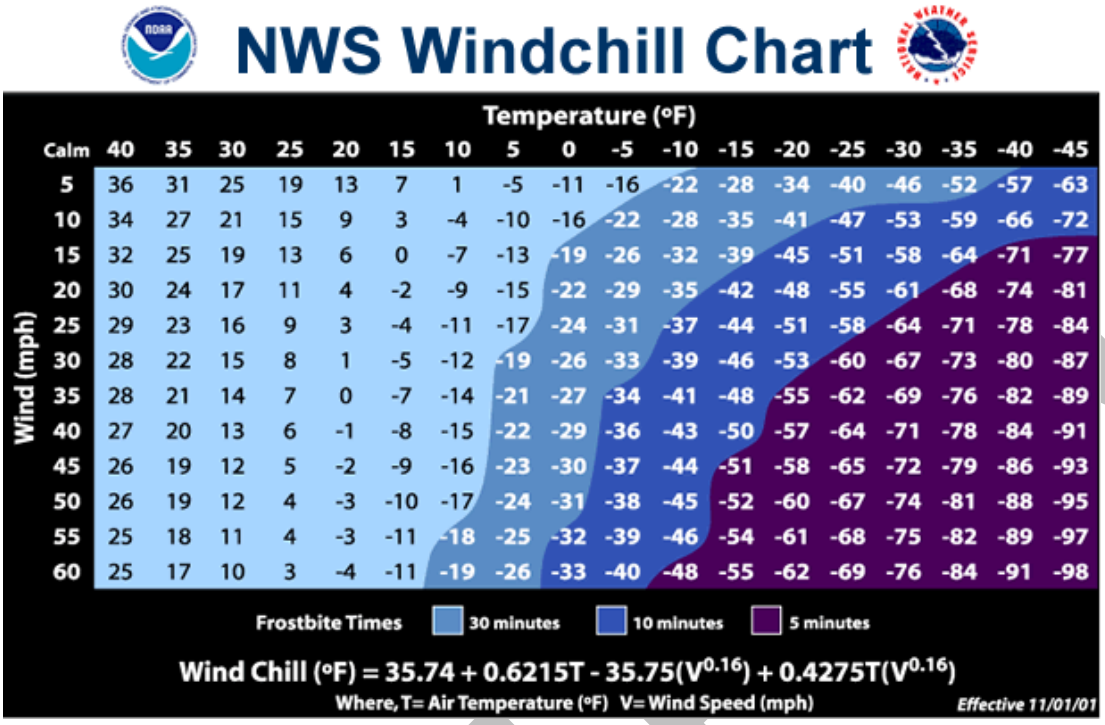
An extreme cold or heat event would be a regional issue affecting Glocester and significant portions of Southern New England. Extreme temperatures could have a serious impact on private and public structures, as well as the general population throughout Glocester. Those most at risk to extreme temperatures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

3.3.6.3 Extent

The National Weather Service will issue a wind chill advisory when wind chill temperatures are potentially hazardous and a wind chill warning when the situation can be life-threatening (Figure 3.12). The National Weather Service also issues heat advisories and excessive heat warnings when unusual periods of hot weather are expected (Figure 3.13).

[51] Ibid
[52] Ibid

Figure 3.12 Windchill Chart (Source: NOAA)



NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

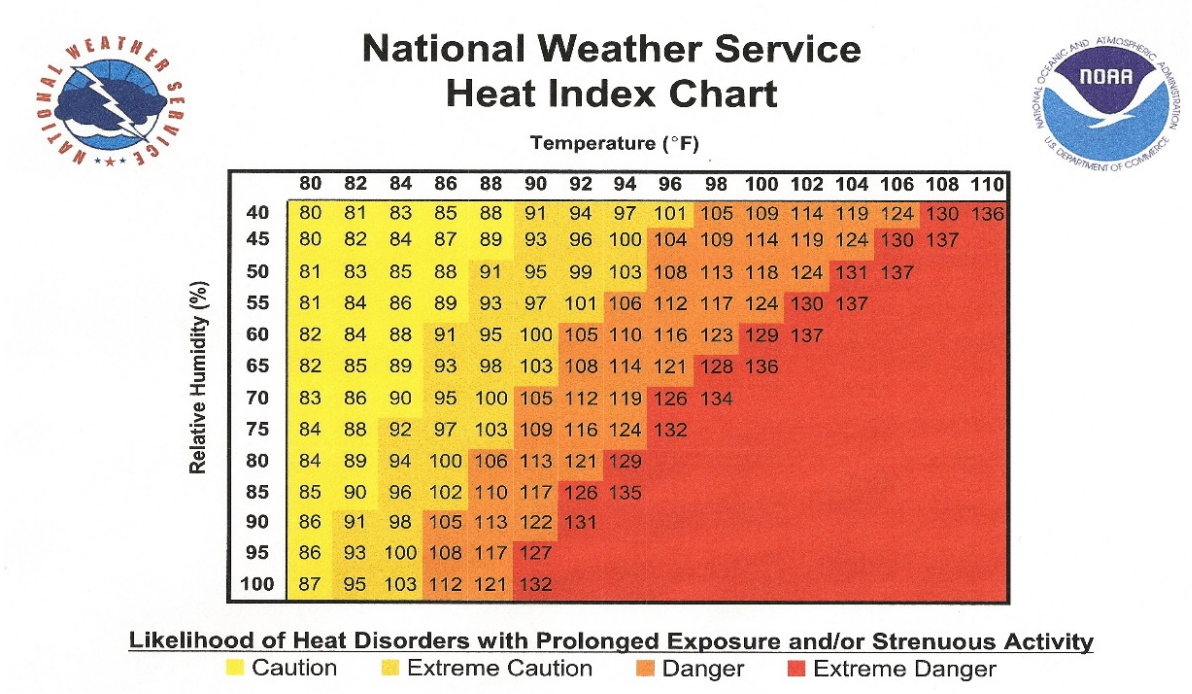
Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Figure 3.13 Heat Index Chart (Source: NOAA)



National Weather Service Heat Index Chart

Relative Humidity (%) \ Temperature (°F)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

3.3.6.4 Previous Occurrences and Probability of Future Events

Previous occurrences of extreme temperatures have been few in the past records. According to the NCDC, 2 extreme cold/wind chill events have occurred in Providence County since 1950:

- On February 16, 2015 in Providence County, low pressure off the Delmarva peninsula intensified rapidly as it moved northeastward. Its path just southeast of Nantucket brought heavy snow to all of southern New England and blizzard conditions and coastal flooding to coastal areas. A 56 year old female custodian was injured when she fell through a skylight while clearing the snow from the roof of Smithfield High School on February 18th. The Automated Weather Observing Station at North Central State Airport (KSFZ -Smithfield, RI) recorded wind chills as low as 30 below zero during this six hour time frame.
- On February 14, 2016 in Providence County, arctic high pressure brought strong northwest winds and extremely cold wind chills to southern New England. Many locations reported wind chills between 25 and 35 degrees below zero.

At the other extreme, the NCDC reported extreme heat in Providence County on July 22, 2011. A strong upper level ridge brought very hot temperatures to Southern New England. A moist southwest low level flow increased humidity levels such that heat index values rose above 105 degrees for a period of a few hours.

Given the effects of climate change (detailed below), the probability of future extreme temperatures is highly likely. The Glocester NHMC ranked extreme temperatures as 3B, likely and serious.

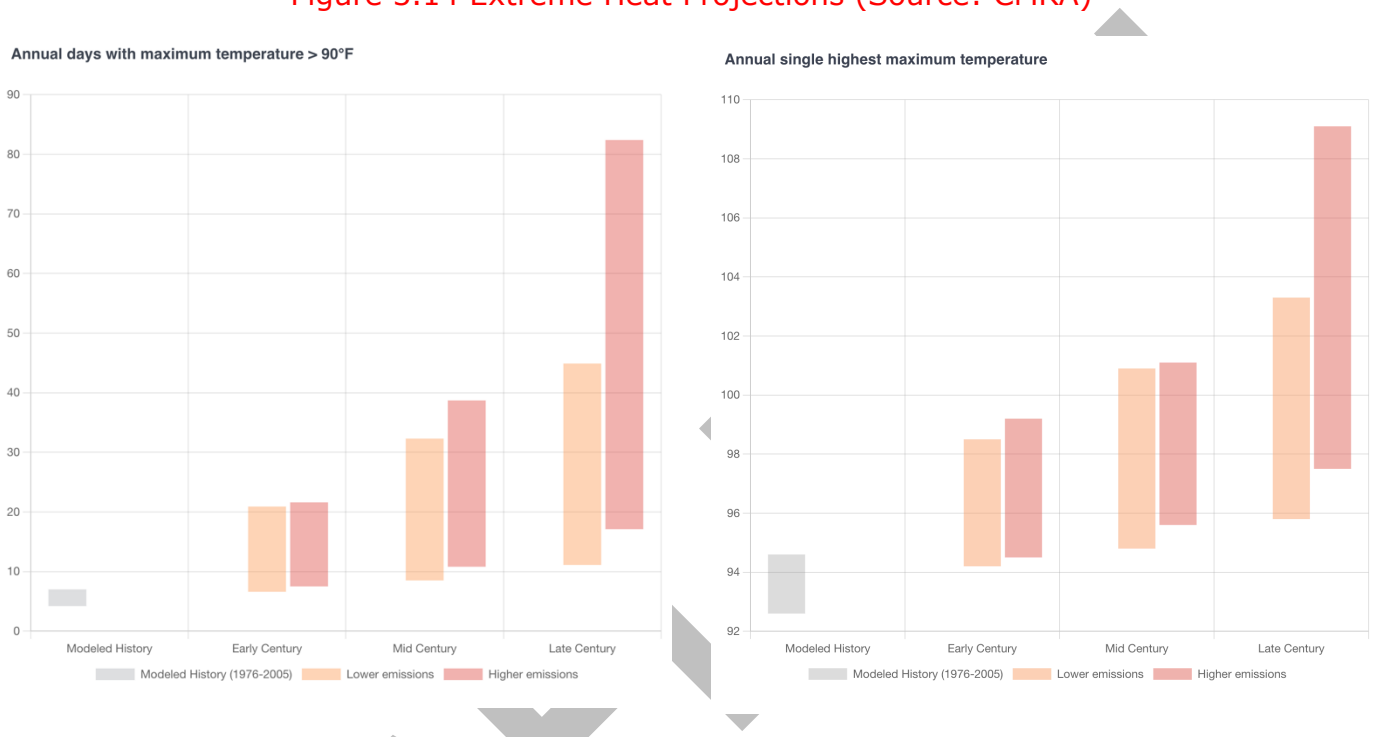
3.3.6.5 Climate Change and Extreme Temperature

Many extreme temperature conditions are becoming more common. Since the 1970s, unusually hot summer days (highs) have become more common over the last few decades in the United States. Unusually hot summer nights (lows) have become more common at an even faster rate. This trend indicates less "cooling off" at night. Although the United States has experienced many winters with unusually low temperatures, unusually cold winter temperatures have become less common—particularly very cold nights (lows). Record-setting daily high temperatures have become more common than record lows. The decade from 2000 to 2009 had twice as many record highs as record lows.

According to data projected from Climate Mapping for Resilience and Adaptation (CMRA), Providence County is expected to face an increase of extreme heat days. The magnitude of increase in the number of extreme

heat days is dependent on high or low emissions produced by human made emissions, but regardless of emissions scenario, projections show an increase in the number of annual days with maximum temperature > 90°F and in the annual single highest maximum temperature[53].

Figure 3.14 Extreme Heat Projections (Source: CMRA)



3.3.6.6 Impacts

Extreme temperatures, both heat waves and cold snaps, can have serious consequences for Glocester's population, infrastructure, and natural environment. During heat waves, vulnerable populations such as the elderly and those with pre-existing health conditions are at higher risk of heat-related illnesses, including heat exhaustion and heat stroke. Prolonged high temperatures can also strain the town's energy grid due to increased demand for cooling, potentially causing power outages. Additionally, extreme heat can damage roadways, degrade building materials, and increase the risk of wildfires in the town's rural and forested areas. In contrast, extreme cold can lead to burst pipes, frozen infrastructure, and hazardous road conditions, impacting transportation and emergency services. Prolonged exposure to cold can also endanger vulnerable populations, particularly if power outages disrupt heating sources during winter months.

[53] Climate Mapping for Resilience and Adaptation

Climate change is expected to intensify the impacts of extreme temperatures on Glocester. Heat waves are likely to become more frequent, longer, and more intense, placing greater stress on vulnerable populations and increasing the risk of heat-related illnesses and deaths. Higher temperatures will also lead to increased energy consumption, which could strain the town's power infrastructure and result in more frequent outages. On the other hand, while cold snaps may become less frequent, when they do occur, they could be more severe due to the growing unpredictability of weather patterns. These fluctuations in temperature could lead to greater stress on infrastructure, with roads and buildings more susceptible to damage from rapid freeze-thaw cycles. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

3.3.7 Mosquito Borne Disease

3.3.7.1 Description

Mosquito borne diseases are among the world's leading causes of illness and death with the World Health Organization estimating that more than 300 million clinical cases each ear are attributed to mosquito borne illnesses.[54] Mosquito borne diseases are spread by the bite of an infected mosquito. Mosquitos infected with a virus may bite people, horses, and other mammals. Diseases that are spread to people by mosquitoes include Zika Virus, West Nile Virus, Chikungunya virus, malaria, and dengue. Mosquitoes pose an increasing risk to illness and diseases, including West Nile Virus (WNV), Eastern Equine Encephalitis (EEE), and Zika Virus. The species of mosquitos that carry WNV and EEE can be found in Rhode Island while the species that carry Zika Virus are not known to be present in Rhode Island.[55]

West Nile Virus (WNV) is the leading cause of mosquito-borne disease in the United States today. Currently, there are no vaccines to prevent or medications to treat individuals affected by WNV. Most people infected with WNV do not feel sick. About 1 out of 150 infected individuals develop serious and sometimes fatal symptoms.[56] In the United States, Eastern Equine Encephalitis (EEE) is considered as one of the most serious mosquito borne diseases. Although rare, EEE is very serious and does not have any treatment or vaccines available. About 30% of individuals infected with EEE die while survivors are likely to have lasting neurologic problems.[57] The best measures to prevent WNV or EEE is to use insect repellent, wear long

[54] Environmental Protection Agency, Joint Statement on Mosquito Control in the United States, 2012
[55] Rhode Island Department of Health, Mosquitos
[56] Rhode Island Department of Health, West Nile Virus
[57] Rhode Island Department of Health, EEE

sleeved shirts and pants, and to limit mosquito breeding grounds indoors and outdoors.

As changes to temperature and precipitation are predicted to affect Rhode Island, individuals should take actions to protect themselves from mosquito bites. Mosquitos who carry WNV or EEE tend to be most active at sunrise and sundown. Individuals may protect themselves by limiting outside activity, wearing long sleeves and pants, utilizing EPA-approved bug spray with at least 20% DEET (not on infants), utilizing screens on doors and windows, and utilizing mosquito netting over baby carriages and playpens.[58] Additionally, removing mosquito breeding grounds such as minimizing areas around residences that collect water, cleaning gutters regularly, and cleaning and changing birdbath water at least once a week can limit breeding grounds.

Horses are susceptible to WNV and EEE virus. It is advised to vaccinate animals early in the season to prevent contraction of mosquito-based diseases.

3.3.7.2 Location

The Department of Environmental Management (DEM) and Rhode Island Department of Health (RIDOH) document cases of WNV and EEE identified in mosquito trapping as well as animal and human cases by county. Mosquito Borne Disease is a Town-wide hazard for Glocester.

3.3.7.3 Extent

The Environmental Protection Agency (EPA) coordinates with state and local governments to ensure mosquito control departments have access to effective tools.[59] EPA encourages nonchemical mosquito prevention efforts; namely to remove standing water which provide breeding sites. State and local governments serve on the front line by providing public information, managing mosquito control programs, and providing public education. The Mosquito Abatement Coordination (MAC) office under the Rhode Island Department of Environmental Management conducts surveillance of mosquito borne diseases as an early warning system for Rhode Island residents. Adult mosquitos are trapped statewide weekly from June through September.[60] Responses to suppress disease carrying mosquito populations are formed on the results of sample testing by RIDOH. The Department of Environmental Management and Department of Health provide public advisories reporting the status of WNV or EEE found in the state. In 2023, at

[58] Rhode Island Department of Health, Mosquitos
[59] Environmental Protection Agency, Joint Statement on Mosquito Control in the United States, 2012
[60] Rhode Island Department of Environmental Management

least 18 reports were published between June and September to notify the public of the status, if any of identified mosquito borne diseases.

3.3.7.4 Previous Occurrences and Probability of Future Events

RIDOH traps and tests mosquitos weekly from June to October. In order to test mosquitoes for infectious diseases, RIDOH traps groups of mosquitoes from various locations throughout each county in Rhode Island. These groups are separated into "pools" according to species and tested for the presence of a virus. Since 2012 RIDOH estimates that 105 mosquito pools have tested positive for an infectious disease in Rhode Island. Of the 105 mosquito pools, 24 of the mosquito pools that tested positive for a virus were found in Providence County.[61] According to the CDC, in 2023, only one individual in Rhode Island was reported to have contracted West Nile Virus.[62] While 25 individuals were reported to have WNV in Rhode Island from 1999-2022.[63] From 2003-2022, 4 individuals in Rhode Island were reported to have been infected with EEE.[64] While, no individuals were reported to be infected with EEE in Rhode Island in 2023.

In the Town of Glocester, mosquito borne disease incidents are highly likely to occur frequently and the effects are considered serious, scoring a 3A in the hazard ranking, a high priority (red).

3.3.7.5 Climate Change and Mosquito Borne Disease

RIDOH reports that climate change is expected to influence mosquitoes and the viruses they carry. Changes in precipitation and temperature may impact mosquito habitat and range, in turn impacting the spread and survival of viruses transmitted to humans.[65] Additionally, increased humidity and water accumulation create ideal breeding sites, further boosting mosquito populations and the likelihood of disease transmission.

3.3.7.6 Impacts

Mosquito-borne diseases, such as West Nile Virus and Eastern Equine Encephalitis (EEE), pose a public health risk to Glocester, particularly during warmer months when mosquito populations thrive. These diseases can spread to humans through mosquito bites, causing serious illnesses and, in some cases, fatalities. The presence of wetlands, ponds, and forests in Glocester provides suitable breeding grounds for mosquitoes, increasing the risk of disease transmission. Outbreaks of mosquito-borne diseases can lead

[61] Rhode Island Department of Health, Arboviral Surveillance
[62] Center for Disease Control and Prevention, West Nile Virus, Current Year Data (2023)
[63] Center for Disease Control and Prevention, West Nile Virus, Historic Data (1999-2022)
[64] Center for Disease Control and Prevention, Eastern Equine Encephalitis Virus, Historic Data (2003-2022)
[65] Rhode Island Department of Health, Climate Change and Mosquitoes

to public health emergencies, requiring widespread mosquito control measures, increased healthcare demand, and public advisories. In addition, recreational activities and outdoor work could be disrupted as residents avoid mosquito-prone areas.

Climate change is not expected to worsen the impacts of mosquito-borne diseases in Glocester, but will make the impacts more frequent by creating more favorable conditions for mosquito populations. With minimal projected changes in Glocester's population and development, no significant changes in impacts due to population and development trends are anticipated.

3.4 Vulnerability to Natural Hazards

Vulnerability is defined in hazard mitigation planning as the characteristic of a community asset that is most susceptible to exposure to loss from a natural hazard. The following discussion characterizes the vulnerabilities in the Town's community assets to natural hazards and an overview of Glocester's vulnerable at-risk populations.

3.4.1 Demographics

The Town of Glocester has seen a slight decline in population since the 2000 United States Census. The estimated population for the Town in 2020 is 9,820, a decrease in population from the 2000 United States Census of 9,948. The Town's population projections indicate a much slower rate of growth for the coming decades. The Town population in 2022 was 10,039 with the median age at 47.9.[66] The 2022 median household income is $106,350 and the largest age population group (13.9%) was individuals aged between 55 to 59 years old.

The median age of Glocester residents will continue to rise as the "boomers" age. This increase in the percentage of elderly residents will increase local demand for services related to aging, such as medical care, elder-care, and particularly the senior center. In terms of disaster response and preparedness, the elderly and special needs populations are considered to have unique vulnerabilities and may be less able to respond and recover during and after a disaster. The NHMC identified at risk populations such as: elderly, mobile home residents, access and functional needs, child-care facilities, and campers at private and state campgrounds.

3.4.2 Population Density

Glocester contains 141.990 square kilometers of land area (54.822 square miles) and 5.223 square kilometers of water area (2.017 square miles). The total area is 147.213 square kilometers or 56.839 square miles. Of the

[66] American Community Survey, DP05 ACS Demographic and Housing Estimates, 2022

36,469 acres of area that comprise the Town, 8,882 acres are listed as undeveloped, more than 24% of the Town's entire area. 1,700 acres, or over 4% is classified as water bodies.

Of all the parcels of land containing development, over 17,000 acres, or almost 47%, is in residential use. Some of this residential development is considered high density, particularly around several of the lakes and ponds, comprising about 2.1% of the Town's area. Approximately 2,190 acres are in commercial, industrial and institutional uses, or about 6% of the Town's area. While this development pattern helps to define Glocester's rural character, it also makes the creation of neighborhood planning districts impractical; therefore, in terms of development, the Town is treated as one planning area with no geographic or neighborhood planning districts.

3.4.3 Population Growing Trends

According to a recent land capacity analysis for the Comprehensive Plan Update, Glocester can expect to experience modest demand of land consumption into the future. Without drastic changes in policy and infrastructure, the demand for land will be predominantly for residential housing. Much of the remaining undeveloped land area is characterized by natural resources that prevent development.

Limited expansion of existing commercial areas has been identified in the Town. For those locations for commercial or residential expansion, the Town will propose rezoning those areas to an existing zoning district. For those locations with a future protected open space designation, the Town will propose the creation of a new zoning district with uses consistent with protected open space such as passive recreation and conservation.

3.4.4 Visitors

The NHMC defined visiting populations for Glocester as annual visitors to Glocester's campgrounds and historic areas. Visiting populations may be less familiar with the local environment and hazards, and less prepared to protect themselves against natural hazards. The typical tourist season runs from Memorial Day through Labor Day and continues moderately into the fall. The natural hazard profiles that effect seasonal populations are: hurricanes and thunderstorms (including wind, lightning and hail).

3.4.5 Mobile Homes

Manufactured homes designed and installed according to the 1994 United States Department of Housing and Urban Development (HUD) standards perform much better than older manufactured housing, particularly in areas with higher design wind speeds. However, even new manufactured homes are often damaged by high-wind events.

Damage to mobile homes can be grouped into 2 categories: direct damage to the home itself and damage that results from failures in the home's anchorage system. Although manufactured homes and site-built homes may have similar vulnerabilities to direct damage, some of the vulnerabilities to anchorage failures are unique to manufactured homes.[67]

Tax assessor records obtained for 2018, indicate there are 127 mobile homes in Glocester located mobile home parks (Table 3.14). There are 86 mobile homes built before 1994 and 41 built after the 1994 HUD standards.

Table 3.14 Glocester Mobile Homes and Parks (Source: Town of Glocester)

Name of Mobile Home Park	Location	Number of Units
Davis Mobile Home Park	Tourtellot Hill Road at Davis Drive	39
The Village on Chopmist Hill	Chopmist Hill Road	78
Sunset Cove	Pole 550 Putnam Pike	10
Total		127

3.4.6 Access and Functional Needs

The access and functional needs population (group homes) and elderly living in Glocester Housing Authority managed property are cared for during emergencies by the Glocester Emergency Management Agency (GEMA) and the Glocester Police Department. GEMA utilizes the Rhode Island Department of Health (HEALTH) Special Needs Registry, and the local police and ambulance to prioritize support services (oxygen delivery and accessible transportation) for this population well in advance of a natural disaster.

Data received from the Glocester Police Department, states that Glocester is home to 1 group home. The total population for all the group homes is estimated to be around 12 clients. This group home is located in Harmony.

The elderly housing in Chepachet has 62 beds. This population is located within the impact area of such natural hazards like: heavy rains and riverine flooding, hurricanes, snow, ice, high winds, and thunderstorms (wind, lightning and hail).

[67] FEMA, Understanding and Improving Performance of New Manufactured Homes During High-Wind Events HSFEHQ-07-J-0007, April 2007

3.4.7 Child-Care Facilities

The information on Glocester's child-care facilities listed below (Table 3.15) was compiled in 2023 from the Homeland Infrastructure Foundation Level Database (HIFLD). The maximum capacity total refers to the total amount of children allowed at all the facilities according to occupancy rates. All child-care facilities are susceptible heavy rains and riverine flooding, hurricanes, snow, ice, high winds, and thunderstorms (hail and lightning).

Table 3.15 Glocester Child Care Facilities (Source: HIFLD)

Name of Preschool Facility	Address	Capacity
Glocester Child Care Facility	965 Putnam Pike	43
Harmony Child Care & Learning Center	185 Putnam Pike	110
The Learning Place	21 Terry Lane	40
Maximum Capacity Total		193

3.4.8 Campgrounds - RIDEM and Private

The RI DEM Parks and Recreation Division campground reported the following number of overnight visitors in 2016 and 2017 (Table 3.16). Additionally, private camping in Glocester at Bowdish Lake, Oak Leaf and Holiday Acres campgrounds have a licensed capacity of over 750 private campsites.

Campground visitors typically camp from June through late August. This schedule coincides with the Atlantic Ocean hurricane season, June 1 to November 30th. Natural disasters that could negatively affect the campground include: heavy rains and flooding, hurricanes, high winds, and thunderstorms (hail and lightning). Depending on the threat and the severity of the event, this population may be at risk and require assistance such as shelter, potable water and food.

Table 3.16 Camping Facilities in Glocester (Source: RIDEM)

Facilities	2016	2017
George Washington Campground	5,263	6,181
Bowdish Lake, Oak Leaf and Holiday Acres	750	750
Total Visitors to Campgrounds	6,013	6,931

3.4.9 Economy

The NHMC identified major employers, primary economic sectors and commercial centers in Glocester. Furthermore, the NHMC assessed the dependencies between the economic sectors and businesses and the infrastructure needed to support them. The following are specific economic

drivers that were important considerations when planning to reduce the impacts of hazards and disasters to the local economy.

In 2024, according to the RI Department of Labor and Training (DLT) State of the State, (a statistical profile of RI's cities and towns' publication) the largest sector of local employment in Glocester is Government, followed by Health Care and Social Assistance, Retail Trade, and Accommodation and Food Services[68].

FM Global is the Town's single largest tax payer. FM Global is Rhode Island's largest private company and one of the world's largest commercial and industrial property insurers. The company specializes in engineering-driven underwriting and risk management solutions and property loss prevention research. Operating in more than 130 countries, FM Global has a major presence in Rhode Island with its Johnston headquarters. The company's Glocester campus occupies about 1,500 acres of which about two thirds are in Glocester and one third in Killingly, Connecticut. It is home to FM Global's Research and Approvals Divisions.

Glocester has a limited employment base of small businesses. The Town of Glocester boasts a thriving business community of shops, restaurants, and services, with many businesses active in the Glocester Business Association. Glocester's economic base is small and concentrated on the non-basic services sector. The typically lower-paying employment opportunities available in these sectors are not adequate for persons to reside in a median-priced Glocester home, even should there be a two-income, average wage-earner household. The bulk of Glocester's civilian labor force must commute to other labor market areas to find adequate income employment opportunities. It is the regional market that provides Glocester's labor force with gainful employment opportunities and adequate income to assure economic survival.

Glocester's natural, cultural and recreational resources are the greatest economic assets the Town possesses. Its main attractions are the state and local parks, woodland scenery, open space, ponds and natural and cultural resources. Outdoor recreation is an important part of the tourism economy. Hiking, bicycling, fishing, hunting, swimming, boating, canoeing, kayaking, star gazing, photography and bird watching are all popular outdoor activities that attract people to Glocester. These need to be protected in order to encourage vacation and day visitors to visit Glocester. The state parks are susceptible to all the natural hazards profiled in Table 3.1.

[68] A statistical profile of RI cities and towns. RI Department of Labor and Training. 2024 RI State of the State.

Glocester is home to many working and cooperative farms. Glocester farmers raise chickens, sheep, hay, garden and orchard products and other popular produce that are either sold on premises, or in farmers markets or shipped to markets throughout the northeast. Refer to Glocester Comprehensive Plan (2020) – Agriculture for prime agricultural soils and protected farm land in Glocester for an Inventory of Farms in Glocester.

3.4.10 Assets/Receivables

The Town's main revenue source is from residential property taxes. According to the tax assessor, residential property types outweigh the number of commercial and industrial properties in Glocester. Residential property, single family and multi-family homes, contribute the largest percentage (85%) of property tax income for the Town. The commercial and industrial sectors contribute 5% of the total income to the infrastructure needed to support them. Motor vehicle tax and tangible personal property tax combine for the remaining 10%.

In terms of meeting a public emergency from a fiscal perspective, the Town of Glocester is in good standing from a cash perspective. Based on local statutory requirements, the Town is required to have a minimum of 12% reserves available. This is measured against the annual budget which includes the town, the school, and the regional school appropriation. The Town also sets aside a 2% appropriation for capital expenses in the annual budget. The set aside is non-operational and could be considered as a source of funds in an emergency situation. This has been looked upon favorably by the rating agencies resulting in Standard and Poor rating of AA+/stabile. Glocester has a favorable reputation with vendors providing service to the town as a result of prompt payment of bills. The town insurance company has provided quick turnaround to many communities that have experienced a disaster in the past. Based upon these factors, fiscal funding for the Town of Glocester should be better than adequate to handle an emergency.

3.4.11 Built Environment: Existing Structures

Achieving and maintaining community resilience is an ongoing effort that involves planning and will benefit from mitigation before the hazard event, followed by emergency response, restoration and long-term reconstruction after the event. This framework defines a process for developing a community plan that will inform actions before, during, and after an expected hazard event occurs.

The term resilience means the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. As related to the built environment, resilience means the ability of identified buildings and

infrastructure systems to return to full occupancy and function, as soon as they are needed, to support a well-planned and expedited recovery.

After identifying the social services to be provided and the necessary building clusters and infrastructure systems, the next step is to identify how soon each is required after a hazard event occurs. Timing will depend on both the type and intensity of the event, the age and composition of the buildings and structures, and available assistance from neighboring communities, regions, and state.

The damage to and destruction of the built environment, particularly in the critical lifeline sectors (Communications, Emergency Services, Energy, Healthcare and Public Health, Transportation, Water) represents enormous economic, social, and general functional costs to a community, while also impeding emergency response and recovery activities. For example, a nonfunctional road can have major implications for a community: general loss of productivity; disruption of physical access preventing residents from getting to work or other daily activities, prevention of emergency vehicles from reaching their destinations, with the associated health and safety implications and the potential access difficulties causing the disruption of important lifeline supplies such as food and other deliveries to the community.

3.4.12 Critical Facilities and Infrastructure Systems

Glocester's critical facilities and infrastructure systems are solid institutions prepared for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and to accelerate recovery. The NHMC developed an inventory of the location, construction standards, age and life expectancy of specific critical infrastructure systems and critical facilities. The assets (environmental, economic and critical facilities) that are most at risk from high wind events include communication towers and power lines. As mentioned previously, the entire population is affected by power outages, as residents obtain water from wells. In addition, the Town is generally one of the last municipalities to have power restored by National Grid.

One of the key infrastructure systems are septic systems, which account for 100% of the types of wastewater treatment systems in Glocester. Additionally, Glocester residents are exclusively dependent on well water. A loss of electricity also results in a loss of access to potable water.

In Table 3.17, the NHMC identified Glocester's critical facilities and infrastructure systems. The NHMC developed mitigation actions to address any structure, including critical facilities and infrastructure systems that

were identified to have risk and vulnerability to natural hazards (Section 5 Natural Hazard Mitigation Strategy). Each individual hazard section includes analysis results in the risk assessment section for the defined facilities. When hazard data was available, facilities were intersected with hazard specific data to determine the building's risk zone.

Table 3.17 Critical Facilities and Infrastructure Systems

Critical Facilities	Infrastructure Systems
Police and Fire Stations/ Emergency Operations Center Evacuation shelter Town Hall Department of Public Works Animal Shelter	Water and Wastewater (private) Power Utilities (private power company) Transportation, including Roads, Railways, Waterways (public) Communication Systems, including Telephone, Cable, Internet and Cellular Systems (private companies) Dams

3.4.13 Transportation Infrastructure

According to pavement management system data maintained by the Department of Public Works, there is a total of 147 linear miles of roadway in Town. Approximately 77 miles are Town-owned roads, 30 miles are privately-owned roads, and 38 miles are state-owned roads. There are an additional 2 miles of park-access roads. There is no rail, marine or terminal facilities located in Glocester. US 44 serves a regional commerce function as an alternative east - west route between the Providence and Hartford metropolitan market areas. Two major southern arterials, Route 94 and Route 102 are additional routes through Glocester.

Bus transportation is offered by the Rhode Island Public Transit Authority (RIPTA). Bus #9 travels between Pascoag and Kennedy Plaza Providence, with a stop in Chepachet only on weekdays. There are 5 inbound lines and 6 outbound lines. In addition, there are no pedestrian nor bicycle trails available for uses other than recreation.

Transportation is also available to elderly residents of the Town through the Statewide RIde program. In addition, the Glocester Human Services Department provides transportation for Town residents aged 60 years of age and older and the disabled.

3.4.14 Historic and Cultural Resources

The NHMC reviewed the state's natural historic registry and identified cultural assets in Glocester. Based on the Rhode Island Historical Preservation and Heritage Commission online database, Glocester has a comprehensive listing of historical and cultural assets (Appendix C).

3.4.15 Animal Shelter

The federal Pets Evacuation and Transportation Standards Act of 2006 (PETS Act) is intended to ensure that state and local emergency preparedness operational planning addresses the needs of individuals with household pets and service animals following a major disaster or emergency. The PETS Act authorizes FEMA to provide rescue, care, shelter and essential needs for individuals with household pets and service animals, and to the animals themselves following a major disaster or emergency.

The Town supports the operation of a municipal animal shelter located adjacent to the Town's transfer station, in accordance with the RIDEM Standards for Animal Health. The Office of Animal Control has 1 full- and 3 part-time Animal Control Officers. They are responsible for the care of animals in their control, encouraging their adoption, and protection of the public against stray and wild animals. In 2014, the animal control facility was completely upgraded including the offices and the cat room. While the upgraded facility and staffing is appropriate for the current and future administration of the services, the operators of the facilities hope to install a separate quarantine area for increased safety of the animals. The physical animal shelter is located Chestnut Hill Road, just off the southern junction of Routes 44 and 102. The building is located at the rear of the town's transfer station and can be affected by heavy rains and riverine flooding, hurricanes, snow, ice, high winds, and thunderstorms.

3.4.16 Limitations on Future Development

In the Glocester Comprehensive Plan, the future land use map is reflective of the Town's general existing patterns of development. The Town wishes to retain and enhance its rural character, including low density residential and agricultural development throughout much of the Town with more concentrated mixed-use development in Chepachet Village with limited expansion of existing commercial areas.

Drinking water is provided through individually owned wells. The Town relies entirely on onsite wastewater treatment system (OWTS). This reliance on private sewage disposal and private water supply limits the density and location of development. Development is generally prohibited in areas with a high-water table, because the soils do not allow on-site systems to function properly.

3.4.17 Land Use in Flood Zones

A floodplain or flood hazard area is defined as an area that has a 1% or greater chance of inundation in any given year, as delineated by FEMA pursuant to the National Flood Insurance Act of 1968, as amended (P.L. 90-448), 42 U.S.C. 4011 et seq. FEMA requires local communities to regulate development within the 100-year floodplain for homeowners to qualify for federally subsidized flood insurance. The Town has adopted a set of regulations to meet the FEMA requirements.

The Glocester Zoning Ordinance regulates development within all flood-hazard areas in the Town. The Glocester Building Official is given authority to require a development permit for construction within a flood-hazard zone. Special building code standards apply to structures erected in a flood-hazard area. Additional building standards are contained in the Rhode Island State Building Code. Approximately 2,382 acres of the Town's land area is comprised of floodplains.

The Town of Glocester has a special purpose overlay designation called the Flood Hazard Area. This district is established to govern the development and use of land subject to flood hazards, as defined as wholly or partly within Zone A and Zones A1 - A30 as identified on the Flood Insurance Rate Map as part of the Flood Insurance Study, which also includes the Flood Boundary and Floodway Map, compiled by FEMA.

3.4.18 Open Space

The Town of Glocester has a significant amount of protected open space and conservation land. There is a total of 36,469 acres of which 5,516 acres are open space. Historically, the Town's priority for open space acquisition includes the following criteria: serve as groundwater protection, support important habitats, provide opportunities for recreation, preserve farmland, have historic, cultural and scenic qualities and/or are connected to other protected parcels. The use of public bond money and/or grants, as well as conservation easements, may be expanded to apply to areas that are vulnerable and that should not be built on or rebuilt on.

3.4.19 Natural Environment

Natural resource depletion and resource degradation are key aspects of environmental vulnerability. Glocester's ecotourism economy is dependent on a healthy forests, ponds and wetlands to attract summer tourists to camping and to continue to provide clean water supply. Wetlands are sensitive to increasing pollution from stormwater runoff containing road salts and oils, fertilizers and pesticides, bacteria and nutrients and sediments.

Many protected natural areas including floodplains and wetlands reduce the risk of flooding and in Glocester. Continued protection of the environment is paramount to preserving wetlands that serve to absorb floodwater, infiltrate and treat stormwater and provide a natural buffer to the negative impacts of natural disasters on the built environment. Better watershed management upstream will reduce flood related problems for Glocester residents.

The forest, reservoirs, and ponds of Glocester are vital economic, environmental, and cultural resources. A healthy wetland complex provides protection against the effects of storm flooding. The forested environment provides habitat for terrestrial organisms and is home to species of indigenous and endemic Rhode Island plants. Ecotourism is an important economic driver of tourism in Glocester and for Rhode Island.

Environmental assets and natural resources are important to Glocester. These assets support the quality of life and the economy through agriculture, tourism, recreation, and a variety of other ecosystem services, such as clean air and water. The natural environment also provides protective functions that reduce hazard impacts and increase resiliency. The Town has identified and protected critical habitat areas through local, state and federal legislation and ordinances.

With the exception of a few small areas in the villages, most of the floodplains are sparsely developed. Public agencies also own large areas of forested land, including George Washington Management Area, Durfee Hill Wildlife Management Area, and Pulaksi State Park and Recreational Area. Bowdish Lake Camping Area is privately owned. The village of Chepachet generally is outside the flood hazard areas. There have been no major subdivisions or land development projects proposed. Some land has been restricted from development.

Of the 36,469 acres of area that comprise the Town of Glocester, 1,700 acres are surface water and 2,405 acres are wetlands, accounting for 6.6% of the Town's total area. Flood storage capacity areas or flood plains, which constitute 2,382 acres and 6.5% of the Town are another important local water resource. The proper functioning of these resources is critical to the environmental health of the community and safety of its citizens. 10,631 acres, or 29% of the Town lies within the Scituate Reservoir watershed.

The Providence Water Supply Board is the owner and operator of the Scituate Reservoir water supply and distribution system. In addition to these surface water resources are the subsurface or groundwater resources. The Town does not provide a public water supply or distribution network. All potable water in Glocester is obtained from groundwater, captured and

distributed by private individuals or firms. Water quality preservation and enhancement including groundwater protection are of paramount importance to the well-being of Glocester's citizens and the nearly 60 percent of the State's population supplied water from the Scituate Reservoir.

Wetlands and riparian areas help absorb flood waters, while soils and landscaping contribute to stormwater management and natural undisturbed vegetation provides erosion control and reduces runoff. Conservation of environmental assets may present opportunities to meet mitigation and other community objectives, such as protecting sensitive habitat, developing parks and trails, and contributing to the economy.

Watersheds are areas serving as the exclusive drainage basins for a particular surface water body. For example, the Scituate Reservoir watershed is a drainage basin where all precipitation that falls in that area is collected and eventually drained into the Scituate Reservoir. Thus, it is important to understand that the watershed area forms the geographic basis for land use and pollution-prevention policies and programs. In Glocester, there are eight watersheds, two of which (Barden Reservoir-Ponaganset River and Moswansicut Pont-Huntinghouse Brook) contribute to the larger Scituate Reservoir.

Within the watershed area is a dynamic natural water resource system comprised of rivers, streams, creeks, ponds, lakes, wetlands and floodplains. A stream, creek, pond or lake is an important part of the hydrological cycle. That is a process where precipitation from the atmosphere falls onto the earth; percolates into groundwater preserves; runs off or leaches from the ground water reserves into surface water bodies or wetlands; and is evaporated by the sun or transpired by plants back into the atmosphere. Surface water bodies, streams, creeks and wetlands serve two parts of this cycle. First, they serve to drain the surface of the land and, second, they are interconnected with groundwater movement.

Streams, creeks, ponds and lakes are prevalent throughout Glocester due to the natural and altered environment. In the Town's early history, waterways were important sources of power for manufacturing mills. Several of the Town's large waterbodies, such as Keech and Spring Grove Ponds, Waterman, Pascoag, Smith & Sayles, Burlingame, Bowdish and Ponaganset Reservoirs, were originally created for this purpose. Later, many of these same waterbodies, along with other natural waterbodies, were used as sources of outdoor recreation activities. Swimming, fishing, boating and the scenic views were sought out by many seasonal visitors to the Town.

The Town data in Table 3.18 below identifies the most valuable areas of Glocester along with the protective function the resource provides to reduce the magnitude of hazard events such as heavy rains, riverine flooding, hurricane, high winds, and thunderstorms.

Table 3.18 Glocester's Natural Areas

Natural Areas	Function
Forested Lands	Stormwater attenuation
Wetlands	Absorb flood waters
Freshwater streams and floodplains	Absorb flood waters
Farmland	Stormwater attenuation

3.5 Risk Analysis and Assessment Matrix

3.5.1 Methodology and Vulnerability Summary

Vulnerability indicates what is likely to be damaged by the identified hazards and how severe that damage could be. After identifying types and areas of risk, a vulnerability analysis can help to determine the gaps in the community. This section examines the vulnerability of the built environment, such as structures, utilities, roads, and bridges, as well as social and environmental vulnerability. A vulnerability analysis also estimates the number of people exposed to hazards, including elderly populations and other populations. This also includes such things as whether the shelter capacity is sufficient for the affected population, and whether businesses are likely to face temporary closure due to natural disasters. Historical damages are often good indicators for current exposure and potential damage.

A vulnerability chart was developed based on the identification and profile of the natural hazards that have occurred throughout Glocester over time. The Vulnerability Matrix in Table 3.19 describes the expected frequency of occurrence, and the potential severity of the damage resulting from each individual hazard evaluated. Coordination with the 2024 Rhode Island State Hazard Mitigation Plan was also a consideration in the development of the Vulnerability Matrix.

Table 3.19 Vulnerability Matrix

Hazard	Frequency	Severity
Flood-Related Hazard	Likely	Catastrophic/Serious
Wind-Related	Highly Likely	Serious
Winter Related Hazard	Highly Likely	Serious
Additional Hazards	Likely	Serious

Additionally, through a preliminary community vulnerability assessment to update the Comprehensive Plan, researchers found that the Town of

Glocester is most susceptible to the same natural hazards and long-term climate change effects found in this plan. Those hazards are: heavy rains and riverine flooding, dam breaches, hurricanes, thunderstorms (including wind, lightning, and hail), snow and ice storms (including nor'easters), extreme temperatures, and mosquito borne diseases.

The Town of Glocester's Natural Hazard Mitigation Committee identified and ranked 5 vulnerable areas: population (including historical properties), local dams, critical infrastructure and public utilities, local roadways subject to flooding (including bridges) and tree damage. Below is a description of these vulnerable areas.

3.5.2 Risk Area #1: Population (including historical properties)

3.5.2.1 Vulnerability Description

The severity of a disaster depends on both the physical nature of the extreme event and the social nature of the human populations affected by the event. Some important human factors that tend to influence disaster severity. A core point here is that different people, even within the same region, have different vulnerability to natural hazards.

- Wealth. Wealth is one of the most important human factors in vulnerability. Wealth affects vulnerability in several ways. The poor are less able to afford housing and other infrastructure that can withstand extreme events. They are less able to purchase resources needed for disaster response and are less likely to have insurance policies that can contribute. They are also less likely to have access to medical care. Because of these and other factors, when disaster strikes, the poor are far more likely than the rich to be injured or killed.
- Education is another important factor in hazard impacts. With education, we can learn how to avoid or reduce many impacts. When populations include professionals trained in hazards, then these people can help the populations with their hazards preparations and responses.

3.5.2.2 Natural Hazard

Glocester residents and historical properties are subject to heavy rains and riverine flooding, dam breach, hurricanes, thunderstorms (including wind, lightning and hail), snow and ice storms (including nor'easters), extreme temperatures, and mosquito borne diseases.

3.5.2.3 Primary Problems

Vulnerability is based in large part on building construction and standards. Other factors, such as location and condition of the building, and even maintenance of trees in the immediate area play a significant role in

determining vulnerability. The location and construction of facilities plays a role in how they are affected by natural hazards. Mobile homes constructed before 1993 may not withstand hurricane force winds and may sustain extreme damage from a significant wind related disaster. Displacement of residents could cause economic and social hardships, injury and/or loss of life, disrupt local and regional economy or be an inconvenience to residents.

3.5.2.4 Risk Assessment

Residential homes, historical properties and mobile homes are located throughout Glocester and are exposed to natural hazards.

3.5.2.5 Mitigation Benefits

Mitigating the effects of natural hazards could protect life and property, continue local and regional economic growth, prevent and/or minimize economic and social hardship and improve overall public safety.

3.5.3 Risk Area #2: Local Dams

3.5.3.1 Vulnerability Description

The Town of Glocester has 19 high and significant hazard dams located throughout Town. Many of these dams were developed during the 1800's in order to harness water power for the mill complexes in the area. Today, these dams are owned by public and private owners.

3.5.3.2 Natural Hazard

The dams are subject to structural failure that will possibly create flooding hazards downstream. Structural failure of a dam can be caused by intense wind events and/or heavy rains. Dam failures can occur on dry days and are the most dangerous type of failure because they typically occur without warning.

3.5.3.3 Primary Problems

There is a general lack of knowledge, understanding, and awareness of dams and their risks, leaving those most affected by dams unprepared to deal with the impacts of their failures. Dams are owned and operated by individuals, private and public organizations, and various levels of government (federal, state, and local). The responsibility for operating and maintaining a safe dam rests with the owner. Common law holds that the storage of water is a hazardous activity. Maintaining a safe dam is a key element in preventing failure and limiting the liability that an owner could face. The extent of an owner's liability varies from state to state and depends on statutes and case law precedents. Owners can be fiscally and criminally liable for any failure of a dam and all damages resulting from its failure. Any uncontrolled release of a reservoir, whether the result of an intentional release or dam failure, can have devastating effects on persons, property, and the environment (FEMA,

2016a). Structural failure of any one of the dams could cause injury and/or loss of life, damage and/or loss of public infrastructure, environmental damage to the waterbody and downstream of the dam, damage and/or loss to private property downstream of the dams.

3.5.3.4 Risk Assessment

The Rhode Island Department of Environmental Management (RIDEM) administers and enforces the statewide Rhode Island Dam Safety Program. The objective of the program is to inspect all dams within the state to determine their conditions, to review and approve plans for construction or substantial alteration of a dam, to order the owner to make repairs or to take other necessary action to make a dam safe. RIEMA is responsible for reviewing and approving dam emergency action plans for high and significant dams statewide. Each plan identifies threats and impacts and establishes activation thresholds and appropriate officials to contact in case of a dam failure.

3.5.3.5 Mitigation Benefits

Mitigating the effects of natural hazards on a dam and the surrounding area will decrease the potential for dam failures, reduce the liability from damage to public and private property and improve overall public safety.

3.5.4 Risk Area #3: Critical Infrastructure & Public Utilities

3.5.4.1 Vulnerability Description

When the Town of Glocester experiences extended power loss, all residents and business are negatively impacted. Electrical utilities and communications are vulnerable to all natural hazards that disrupt electricity. Damage to power lines or communication towers have the potential to cause power and communication outages for residents, businesses and critical facilities. In addition to lost revenues, downed power lines present a threat to personal safety.

3.5.4.2 Natural Hazard

Critical infrastructure and public utilities are subject to high wind events, nor'easters, hurricanes, snow/ice storms and heavy rains.

3.5.4.3 Primary Problems

Communications and power supplies may be compromised during thunderstorms, and some critical facilities might not be equipped with a backup power source. Damage to public utilities infrastructure could result in injury and/or loss of life, damage and/or loss to private property, environmental damage, hazardous waste contamination, decrease in public safety or inconvenience to residents. The cascading effect of loss of

electricity from natural disaster impacts can lead to evacuation, loss of wastewater treatment and/or loss of potable water supply.

3.5.4.4 Risk Assessment
Critical infrastructure and public utilities are located throughout town and is exposed to a wide variety of natural hazards.

3.5.4.5 Mitigation Benefits
Mitigating the effects of natural hazards on critical infrastructure and existing public utilities will protect life and property, decrease the potential for hazardous waste contamination, decrease clean-up costs, reduce the liability from damage to public and private property and improve overall public safety.

3.5.5 Risk Area #4: Local Roadways Subject to Flooding (including Bridges)
3.5.5.1 Vulnerability Description
The committee decided that because of aging roadway conditions, it is best to be proactive about including local roadways in the natural hazard mitigation action plan. The Rhode Island Department of Transportation (RIDOT) administers and enforces a statewide bridge monitoring program.

3.5.5.2 Natural Hazard
The local roadways (and bridges) are subject to floods, dam breach, nor'easters, hurricanes, snow and ice storms and heavy rains.

3.5.5.3 Primary Problems
Inundation from riverine flooding can disrupt transportation infrastructure including gravel road surfaces, roadway embankment and culverts. Bridge approaches, abutments and dams can be eroded due to high velocity flow. Wind pressures and windborne debris impact traffic poles and equipment, overhead and roadside signs. If roads are inundated then it can eliminate evacuation routes. Damage to local roadways (and bridges) could cause injury and/or loss of life, damage and/or loss to private property, disrupt arterial traffic flow and evacuation routes, disrupt local and regional economy, environmental damage, decrease in public safety or inconvenience to residents.

3.5.5.4 Risk Assessment
The existing local roadways (and bridges) could be exposed to flooding caused by extreme natural hazards.

3.5.5.5 Mitigation Benefits
Mitigating the effects natural hazards could have on the existing local roadways and bridges will protect life and property, reduce the liability from

damage to private property, maintain arterial traffic flow and evacuation routes, continue local and regional economy, decrease clean-up costs and improve overall public safety.

3.5.6 Risk Area #5: Tree Damage

3.5.6.1 Vulnerability Description

Trees are located throughout the Town of Glocester. The trees in the public right of way are maintained by the town and by National Grid.

3.5.6.2 Natural Hazard

Trees are subject to floods, Nor'easters, high wind events, hurricanes, ice storms, lightning and heavy rains.

3.5.6.3 Primary Problems

Damage to trees could cause injury and/or loss of life, damage and/or loss of property, disrupt arterial traffic flow and evacuation routes, disrupt local and regional economy, environmental damage, disrupt communication, cause extensive power outages, decrease public safety or inconvenience to residents.

3.5.6.4 Risk Assessment

Trees are located throughout the Town of Glocester. These trees are owned and maintained by public and private entities are exposed to a wide variety of natural hazards.

3.5.6.5 Mitigation Benefits

A mitigation program for trees will protect lives and property, reduce the liability from damage to private property, maintain arterial traffic flow and evacuation routes, maintain communication and power, protect essential services, continue local and regional economy, decrease cleanup costs and improve overall public safety.

Section 4 Capability Assessment

4.1 Purpose

The capability assessment describes the primary mitigation programs currently in place and addresses areas for improvement in Glocester's overall natural hazard mitigation strategy. The purpose of this assessment is to improve mitigation capabilities for both existing and future risk within Glocester.

The NHMC reviewed existing town plans, studies, programs and policies that focus on or include a component of hazard mitigation. This capability assessment refers to the existing plans, programs and policies that have incorporated hazard mitigation or other proactive tools and highlights local capabilities to minimize risk. This section will also identify shortcomings in the policies, programs and regulations.

4.2 Local Government Capabilities and Program Areas

4.2.1 Introduction

Several Town departments provide services and perform activities which include a component of hazard mitigation, preparedness, response and/or recovery. The Town of Glocester implements policies and procedures to promote the safety of its residents and minimize risk to community assets. Mitigation activity is generally addressed by the Glocester Emergency Management Agency, with assistance from the Building & Zoning Official, the Public Works Department and from several other departments. These other departments include the Town Planner and GIS, Town Council, Police, Fire and Rescue, and Animal Control Department. The Town's mitigation strategy is also supported by several boards and commissions.

Glocester's Comprehensive Community Plan identifies actions that address sensitive residential development, compatible economic development, open space and recreational resource development and expansion and maintenance of public infrastructure and facilities. It outlines goals, policies and actions that provide a framework for the future development of the Town. The mitigation strategies outlined in this plan are supported by and included in the Comprehensive Plan.

The Town implements and enforces the State Building Code. However, it does not currently participate in FEMA's Community Rating System (CRS) Program. Participation in FEMA's Community Rating System Program would allow flood insurance policy holders a discount on their premiums. Since there were so few residents who participate in the flood insurance program, it was determined that participation was not cost beneficial at this time.

The Town has an approved Emergency Operations Plan (EOP). This plan addresses the response to extraordinary emergency situations associated with natural, man-made, and technological disasters. The Town's Emergency Operations Plan further addresses pre- and post-disaster strategies to effectively deal with the hazards addressed in this plan such as hurricane and flooding evacuation, public warning and sheltering during natural disasters. Mitigation actions outlined in this plan will be incorporated into the Town's Capital Improvement Program and annual budget, as appropriate.

4.2.2 Form of Government

The Town is governed by Home Rule as allowed by an amendment to the Rhode Island state constitution that grants municipalities and counties the ability to pass laws to govern themselves as they see fit as long as they obey the state and federal constitutions. The Town of Glocester has the power to enact ordinances and to make rules and regulations as necessary. Such ordinances may be made enforceable by the imposition of fines, forfeitures and penalties.

Town Council

The municipal government established by the Glocester Charter is a Town Council form of government. Town government is directed by a 5 member town council (Council) that is headed by a council president (President). The President is recognized as head of the Town government (chief executive officer) for all ceremonial purposes and by the Governor for purposes of military law (RIGL Title 30, Chapter 20-15, Section 30-15-12).[69]

During a major emergency, the Town Solicitor shall be represented at the Town Hall and provide guidance on formulating emergency policy decisions. The Town Solicitor shall assist in the writing of emergency executive orders.

To meet a public emergency affecting life, health, property or the public peace, the Council may make emergency appropriations (Such appropriations may be made by emergency Ordinance in accordance with the provisions of Article IV, § C4-10, Item 5 of the Town Charter. [70] To the extent that there are not available unappropriated revenues to meet such appropriations, the Council may, by such emergency Ordinance, authorize the issuance of emergency notes, which may be renewed from time to time, but the emergency notes and renewals thereof shall be paid not later than the last day of the fiscal year thereof next succeeding that in which the emergency appropriation was made.

---

[69] http://webserver.rilin.state.ri.us/Statutes/TITLE30/30-15/30-15-12.HTM.

[70] Town of Glocester Website eCode360 https://ecode360.com/9716523?highlight=declared,emergencies,of,of emergencies#9716523

4.2.3 Local Planning Integration and Regulatory Resources

In Glocester, as with all cities and towns in Rhode Island, land use and development decisions are made at the local level. Depending on the decision being made, applications for development are heard in public meetings before the Planning Board, Zoning Board and/or Town Council. The members of the Zoning Board and Planning Board are appointed by the Town Council. The Planning Department requires environmental reviews from RIDEM, or relevant agencies, and ensures that future development plans reflect the town's highest design and environmental protection standards. Hazard mitigation strategies are incorporated into new and existing subdivision and land use regulations.

In cooperation with state, federal and private organizations, the Town has an active land acquisition and protection program which has prevented many vulnerable areas from being developed: 5,516 acres of the 36,469 acres in the Town are protected from development as they are categorized as open space, recreational or otherwise protected.

4.2.3.1 Planning - Glocester Comprehensive Plan (2018 – 2040)

The 2020 updated Glocester Comprehensive Plan identifies the goals and policies of the municipality for its future growth and development and for the conservation of its natural and cultural resources[71]. To fulfill those goals, the Comprehensive Plan provides a framework for everyday operations within the town. Glocester has recognized that inclusion of mitigation initiatives (both pre-and post-disaster) into their Comprehensive Plan would not only benefit the community by reducing human suffering, damages and the costs of recovery, but would also help build and maintain sustainability and economic health of the community over the long term. This will also further involve the public in mitigation initiatives for the town.

One of the multiple objectives of the comprehensive plan in terms of hazard mitigation is to fund mitigation actions in the Natural Hazard Mitigation Plan. Implementing the natural hazards mitigation plan's action items through existing municipal plans and policies increases their likelihood of being supported and getting updated and maximizes Glocester's resources.

Cultural and Historical Resources

Glocester's cultural and historical resources are continually threatened by natural and manmade activities. Weather, storms, and natural disasters pose a threat to these resources. Regulations to protect and manage the cultural and historical resources of Glocester are important to assure their

[71]Glocester 2040, Comprehensive Community Plan

future existence. Private preservation efforts alone may not be sufficient to protect these resources. The Town currently has historic district zoning in Chepachet Village to regulate the alteration, repair, or destruction of its historical and cultural resources.

Addressing Climate Change in Comprehensive Plan and Natural Hazard Mitigation Plan
The Town strives to make sound energy consumption and production decisions for electricity, heating and cooling and transportation. Increasing energy efficiency reduces greenhouse gas emissions which is one way the Town can plan for climate change mitigation.

The Town has been very proactive in promoting energy efficiency within its own facilities. In 2011, the Town went out to bid on a geothermal heating/cooling system. The Town was awarded funding through the RI Energy Efficiency Block Grant Program for this project, which significantly reduces the consumption of fuel oil for heating and electricity. Through the installation of 18 wells and the installation of a ground loop geothermal heating/cooling system, the Town has saved an estimated $19,000 since its completion in 2012. In 2015, after successfully completing three winters with geothermal heat, the boilers in Town Hall were dismantled and removed from the building.

In addition, the Town purchases Energy Star certified equipment when feasible and considers energy efficiency in all capital projects and purchases. The Town's elementary schools are also about to undertake major capital improvements, many of which are related to increasing energy efficiency.

In addition to the energy efficient policies the Town employs internally, regulations to allow for alternative energy development within the Town are in place. The Town allows residential solar facilities by right and medium and large-scale solar facilities by right or special use permit in most zones in Town subject to a defined review process and performance standards outlined in the zoning ordinance. Several solar facilities have already been permitted and constructed in Town.

Planning - GIS Department
Glocester GIS also utilizes HURREVAC, a hurricane modeling tool to assist the community in tracking hurricanes to assess the potential impact on the community and plan evacuation or other activities in advance of the approaching storm.

The Town's GIS include a comprehensive mapping system that includes among other items, parcels, zoning, road centerlines, address points,

wetland, floodplains. The Town's GIS Technician is responsible for the development of maps and analysis in support of Town activities whenever needed. This includes but is not limited to abutters maps and lists, comprehensive planning, voting maps, property and site condition maps, and plans in support of grant applications. The Town is consistently working to improve the data with GIS. Some upcoming projects include GPS mapping and GIS Database Development for all Campgrounds and GPS Mapping, Inventory and GIS database development for all Storm Water structures in support of current EPA permit and the future permit, including connectivity between structures.

4.2.3.2 Zoning Ordinance

The zoning regulations set forth in the Zoning Article XII of the Glocester Home Rule Charter are adopted to be consistent with the Town of Glocester Comprehensive Plan. The regulations are enforced to encourage the most appropriate use of land, with considerations of the natural characteristics of the land and promoting safety from fire, flood and other natural or man-made disasters. The zoning ordinance supports the implementation of the goals and policies of the Town of Glocester Comprehensive Plan and the Natural Hazard Mitigation Plan. Additionally, in the zoning ordinance there is a Special Regulation, special flood hazard area and flood fringe lands (Section 350-55) overlay that restricts filling in floodways and certain floodplains. The Town of Glocester continues to enforce the special flood hazard area land use regulations outlined in the
Zoning Ordinance.

4.2.3.3 Subdivision Regulations

The subdivision of land within or adjacent to natural areas associated with natural hazards (i.e., flooding) are restricted. This applies specifically to identified floodplains in Glocester. The Town's Subdivision Regulations include many requirements that create functional and attractive development, to minimize the adverse impacts of development and to ensure that a project will be an asset to the community. These requirements include those related to landscaping, construction, street design, drainage design, erosion and sediment control, and safety and infrastructure requirements.

4.2.3.4 Building Official

The Glocester Zoning Ordinance regulates development within all flood-hazard areas in the Town. The Glocester Building Official is given authority to require a development permit for construction within a flood-hazard zone. Special building code standards apply to structures erected in a flood-hazard area. Additional building standards are contained in the RI State Building

Code. Approximately 2,382 acres of the Town's land area is comprised of floodplains.

4.2.3.5 Glocester Emergency Management Agency

The Glocester Emergency Management Agency (GEMA) is a town department that reports to the Town Council President. Glocester EMA's directive is to serve the town as described under the Town Charter. The Glocester EMA Director is tasked as the liaison with other municipal departments and with federal and state agencies, including FEMA, RIEMA, the RI Department of Health and the RI Chapter of the American Red Cross.

Community Emergency Response Team (CERT)

The Community Emergency Response Team (CERT) program educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers a consistent, nationwide approach to volunteer training and organization that professional responders can rely on during disaster situations, which allows them to focus on more complex tasks. Through CERT, the capabilities to prepare for, respond to and recover from disasters is built and enhanced.

The Glocester Community Emergency Response Team, under the direction of Glocester's EMA Director, encompasses the Emergency Shelter Team and the Medical Emergency Distribution System (MEDS) Team.

CodeRED Emergency Notification System (CodeRED)

Glocester participates in CodeRED Emergency Notification System which is an emergency alert system that sends out notifications for a variety of different situations. Town officials can notify Glocester residents and businesses by telephone, cellular phone, text message, or email about time-sensitive emergency situations or important community alerts.

CodeRED is used for significant incidents and events where the timely notification of an affected population or geographic area is essential. The CodeRED system is used during major emergencies, very large-scale utility outages, floods, local hurricane information, disasters, evacuation information, and other emergency alerts. CodeRED delivers the message through a high-speed telephone calling system to a phone number in the CodeRED database. Town staff access CodeRED via a secure portal on the web. A 'call area' will be marked identifying street addresses. Telephone numbers will be matched up electronically to these addresses through the use of Geographical Information Systems (GIS). A pre-recorded message

will be sent out via the telephone with information about the incident and possibly instructions for action to be taken.

Glocester StormReady
Glocester's StormReady program is used to implement mitigation activities and communicate hazard-related information. The National Weather Service (NWS) StormReady program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.

To be recognized as StormReady by the NWS, all 39 cities and towns across Rhode Island have completed a six-point plan to manage severe weather. Those six points include:

- Establish a 24-hour warning point and emergency operations center;
- Have more than one way to receive severe weather warnings and forecasts and to alert the public;
- Create a system that monitors weather conditions locally;
- Promote the importance of public readiness through community seminars; and
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

Glocester Emergency Operation Plan
The current Emergency Operations Plan (EOP) addresses the response to extraordinary emergency situations associated with natural, technological and man-made disasters. The EOP further addresses pre- and post-disaster strategies to deal with the hazards addressed in this plan, such as hurricane and flooding evacuation, public warning and sheltering during natural disasters. The EOP directly addresses three out of four steps in emergency management: preparedness, response and recovery from natural disasters. The Natural Hazard Mitigation plan will supplement the EOP as it specifically addresses the fourth step in emergency management. When implemented, mitigation activities may reduce risk or eliminate the need for an emergency response and greatly decrease the recovery period.

Extended Power Loss
Extended power loss during any natural disaster is a primary concern in Town as all residents depend on well water, but special needs and elderly populations are most at risk. The Police Department and Emergency Management Agency maintain a copy of the RI special needs registry, a list of residents with special needs registered with the Rhode Island Department of Health. The Police Department, EMA and/or Fire Departments call and/or visit residents on the registry prior to any major event to ensure that an

emergency plan is in place. The Departments also conduct post-disaster follow up after an extended power outage.

There are two approved mass care facilities located in Town. They are the Ponaganset High School and Fogarty Elementary School. Both are shelters inspected by the American Red Cross that can operate as mass care facilities with a total capacity of 994. Although not Red Cross approved, alternate shelters can also be made available at Ponaganset Middle School (capacity 200) and West Glocester Elementary School (capacity 200) and Town Hall (capacity 50).

4.2.3.6 Public Works Department

The Glocester Public Works Department (DPW) routinely addresses street flooding by regularly cleaning out catch basin and swales to allow unimpeded flow and to reduce ponding on the roads. Most town owned roads have been repaired and designed with adequate drainage facilities. The Town has replaced failed catch basins with new pre-cast concrete basins with sumps. These improved materials and methods collect the sand to help maintain stormwater flow. The DPW street sweeping program is initiated in the spring to collect sand and debris to prevent clogging of the catch basins. All catch basins on Town roads are inspected and cleaned during this process. The DPW also maintains retention ponds on the Town's right of way.

The primary evacuation route for Glocester is Route 44, which serves as the principal evacuation road for Glocester and adjacent communities that may need to evacuate simultaneously. The evacuation route has proper signage.

Stormwater Management Plan

Stormwater management mitigation projects or drainage improvements can reduce the frequency and severity of flooding. However, a property owner cannot propose such improvements in place of bringing a substantially damaged building into compliance. The exception is if a drainage project results in a revision of the special flood hazard area (SFHA) in which the building is located. This improvement may result in the subject building no longer in a SFHA.

Stormwater management for new subdivisions and developments is governed by Glocester subdivision regulations. Site plan review requirements include a review of the erosion and sediment control and stormwater runoff. Glocester adheres to the standards in the RIDEM Stormwater Design and Installation Manual (December 2010, amended 2015) and the RI Soil Erosion and Sediment Control Handbook (Issued 1989, Revised 2014, Updated 2016). Additionally, the Town's Stormwater Plan addresses compliance with municipal stormwater (MS4) state and federal

regulations which prioritize awareness of the concept of non-point and other stormwater pollution sources. The Town of Glocester is considered to be a small MS4, one of six municipalities in the State with a population of 1,000 to 10,000 and considered to be located within an urbanized area. In compliance with the RIPDES program general permit, the Town issues an annual report outlining steps taken in each best management practice.

Green infrastructure is a sustainable approach to natural landscape preservation and storm water management that can be used for hazard mitigation activities as well as provide additional ecosystem benefits. It provides a framework and methodology for implementing flood risk reduction and drought mitigation actions in a manner that also incorporates ecosystem benefits and helps build a community's resilience to the impacts of climate change. Green infrastructure methods use an ecosystem-based approach to replicate a site's pre-development, natural hydrologic function. Traditional "Gray infrastructure" storm water management systems seek to move excess water as quickly as possible away from homes and properties into storm drains and the storm water system. Green infrastructure seeks to do the opposite by safely capturing as much water as possible on site to facilitate storage, absorption, and infiltration. Using green infrastructure, storm water is typically channeled into a basin or ditch designed to allow the water to seep or infiltrate the ground and re-charge groundwater supplies, or to slow its passage into the storm drain during peak flow periods to avoid overwhelming the storm water system.

Green infrastructure emphasizes local, decentralized solutions that leverage the beneficial services that natural ecosystem functions can provide. Projects can be scaled to address site specific needs and conditions. Green infrastructure principles can be used in projects to mitigate flood risk to homes and property, filter pollutants from water, and capture and store water for use at a later time. The diversion, storage, and infiltration of the storm or flood water can replenish ground water supply and increase or enhance usable water supply to mitigate the effects of drought. The State's stormwater design and installation manual, to which the Town adheres, emphasizes green infrastructure.

4.3 Federal and State Grant Opportunities

The Town, across all municipal departments, considers and pursues all applicable federal, state and local grant opportunities to assist in implementing hazard mitigation programs, such as:

- Housing and Urban Development, HUD CDBG Program – a flexible program that provides communities with resources to address a wide range of unique community development needs, particularly the

Disaster Recovery Assistance Program which provides grants to help cities, counties, and States recover from Presidentially-declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.

- United States Department of Agriculture – Natural Resources Conservation Service USDA NRCS – provides Conservation Technical Assistance, Financial Assistance, and Conservation Innovation Grant programs.
- U.S. Economic Development Administration (EDA) – empowers distressed communities to revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies and generate or retain long-term, private sector jobs and investment.
- RIDEM – provide up to 50% matching funds to municipalities, land trusts and non-profit land conservation organizations to preserve valuable open space in Rhode Island.
- Hazard Mitigation Assistance (HMA) Program (HMGP, PDM, and FMA)

4.3.1.1 National Flood Insurance Program (NFIP) and Community Rating System

The NFIP was established in 1968, with the passage of the National Flood Insurance Act, to reduce the loss of life and property associated with flooding while offering property owners an opportunity to financially protect themselves. Participation in the NFIP is based on an agreement between the municipality and the Federal government. As a part of the NFIP, the government provides FIRMs to municipalities that agree to regulate development in high risk flood areas. The maps identify flood prone areas that form the basis for the federally-backed flood insurance rates. The main flood recurrence intervals used on the FIRMs are shown in Table 4.1. The 1% annual chance flood zone (or base flood) is a regulatory standard used by Federal agencies, States, and NFIP-participating communities to administer and enforce floodplain management programs.

Table 4.1 Annual Probability Based on Flood Recurrence Intervals (Source: RIEMA)

Flood Recurrence Interval	Annual Change of Occurrence
10-yr	10.0%
50-yr	2.0%
100-yr	1.0%
500-yr	0.2%

NFIP Administration & Permitting
Currently, Glocester is in good standing with NFIP and there are no outstanding compliance issues or current violations. The floodplain development regulations meet or exceed FEMA and State minimum requirements. The 2024 Rhode Island State Hazard Mitigation Plan lists that 12 properties in Glocester are insured by the NFIP with a total value of over $4.35 million. Since 1978, there were 6 losses in the community through the NFIP with $29,000 in total payments to policyholders. RIEMA records track claims since 1978 and show that the town has had no repetitive losses.

Glocester's local ordinances regarding floodplain regulations are compliant with the NFIP minimum standards. In addition to coordinating with Federal or State staff to ensure compliance, the Town will continue to participate in the program by enforcing sound floodplain management decisions, managing inquiries and updating the floodplain ordinance as necessary.

Building Department
The Town of Glocester's Building Department is charged with floodplain administration for the town. Its goal is to bring as many structures as possible into compliance with the State Building Code and the code's requirement for flood resistant construction. Glocester has an effective outreach program since it's understood that public knowledge is the first step in constructing a more resilient community.

During the construction process, as required by the State Building Code all inspections are performed with no work proceeding unless corrections are made, if any, to be in complete compliance with the code. A Certificate of Occupancy is not issued until a completed Elevation Certificate is submitted and reviewed by the Building Inspector for compliance with the Code's requirement for flood resistant construction.

4.4 Capability Needs and Challenges

Overall, the Town of Glocester has very good capability to respond to and mitigate the impacts of natural disasters. The existing mitigation program allows for the utilization of various environmental and planning policies, plans and program areas with precise execution and clear inter-departmental communication. Additional needs and challenges are described below.

Planning and GIS
A GIS capability improvement could include the establishment of a community asset management program. This program would inventory Glocester's infrastructure in the A Zone (42 facilities and structures) and AE Zone (144 facilities and structures, plus 4 in Zone AE within floodway)

including tax assessor data for baseline residential and business values (estimating dollar loss) with current condition of community assets (prior to events) to estimate potential loss in future natural disasters.

Historic properties and cultural resources are also valuable economic assets that increase property values and attract businesses and tourists. Far from being at odds with economic development, preservation of these assets is often an important catalyst for economic development (e.g., historic downtown revitalization programs leading to growth in heritage tourism.

Historic buildings and structures, artwork, monuments, family heirlooms, and historic documents are often irreplaceable and may be lost forever in a disaster if not considered in the mitigation planning process. Historic preservation planning and mitigation actions allow for the protection of historic properties and cultural resources before they are threatened with demolition or alteration. The Glocester Historical Society has seven properties or areas listed on the National Register of Historic Properties. With the use of Glocester's GIS, a mitigation program can be integrated into the planning process to ensure the protection of the historic district.

Campgrounds – Severe Weather
The campgrounds of Glocester are owned and operated by private and state agencies. However, the 2024 RI State Hazard Mitigation Plan does not provide recommendations or mitigation actions to protect these vulnerable community assets in Glocester. There is little interagency coordination between the Town and the State for campground evacuation and other natural emergency protocols. It is suggested that the State begin a dialog with Glocester to address and coordinate hazard mitigation for campgrounds as part of the next update to both the State and local hazard mitigation plans.

Dam Management District(s)
Through the creation of a dam management district for the Glocester high and significant dams, a legal quasi-governmental unit will be able to assess and collect management fees for all the residents affected by high and significant dams (see RIGL 45.62.1)[72]. The fees will be used to cover the costs of regular dam maintenance (mowing, removing growth, inspecting the gates, etc.), covering the cost for minor/major repairs that may be needed, develop and maintain Emergency Actions Plans and any costs in the administration of the dam management district.

[72] RIGL 45.62 Dam Management Districts

Climate Change

Rhode Island is experiencing climate change, and the impacts are placing communities, forests and aging, vulnerable infrastructure at risk. To accelerate actions and investments, Governor Raimondo signed an Executive Order on September 15, 2017 calling for the development of the State's first comprehensive climate preparedness strategy. Resilient Rhody laid the groundwork for collective action, involving state agencies, municipalities, and statewide organizations[73]. This Strategy aimed to respond to changing weather and environmental conditions in Rhode Island caused by climate change and proposed actions to better prepare the state for these impacts.

This Strategy focused the state's attention on catalytic climate resilience actions both within government and together with business, academic, and nonprofit partners. Building on the climate leadership of state government, municipalities, and organizations, it leveraged existing studies and reports to identify critical actions that move from planning to implementation.

Resilient Rhody operated with the mindset 'Action today will create a stronger and safer tomorrow'. Resilient Rhody is about actions that can be taken to protect infrastructure and natural resources, strengthen RI's economy, preserve the health of the environment, and keep Rhode Islanders safe. It's also about strengthening collaboration between state agencies, municipalities, and communities' groups throughout Rhode Island.

As of 2021, Resilient Rhody released a Three Year Impact Report detailing the progress the state has made in implementing recommendations identified in Resilient Rhody. Since 2018, 20 municipalities have participated in the Municipal Resilience Program, 38 out of 39 municipalities in Rhode Island have active Hazard Mitigation Plans, 1,424 acres of open space and natural land has been preserved, and $20 million has been dedicated to implement climate resilience projects.[74] The report details initiatives, progress, and changes made since Resilient Rhody was introduced in 2018. Including but not limited to:

- 9 Shoreline Adaptation Inventory and Design projects have been engineered;
- RIDEM has awarded about $5 million in grants to municipal and quasi-state wastewater facilities since 2020 through the Wastewater Treatment Facility Resilience Fund;

[73] Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in RI, 2018

[74] Resilient Rhody: Three Year Impact Report, 2021

- Establishment of the Stormwater Project Accelerator (SPA) which provides upfront capital to eligible entities to implement green infrastructure projects that will be funded through federal, state, and local reimbursement grants;
- RIDOH Climate Change and Health Program worked with the Newport, Olneyville, and Pawtucket Central Falls Health Equity Zones to complete community assessments focused on climate change resilience from 2018 to 2019;
- RIEMA and RIDEM have approved 16 Emergency Action Plans (EAPs) for high and significant hazard dams since 2018;
- In 2021, the Rhode Island General Assembly passed the Forest Conservation Act to establish a Forest Conservation Commission (FCC) to inventory forestland, develop stronger incentives for forest conservation, and expand urban and community forestry;[75]

Additional programs and updates on critical infrastructure and utilities, natural systems, emergency preparedness, community health and resilience, and financing climate resilience projects can be found in the Resilient Rhody Three Year Impact Report.

Tree Trimming and Public Works Department
According to the Glocester Comprehensive Plan 2018, updated 2020, the Public Works Department would like to begin a systematic tree trimming program on local roads in cooperation with the Rhode Island Department of Transportation on tree trimming on state roads. Glocester should coordinate with the National Grid 2- to 3-year rotational tree trimming municipal program if this project were to move forward.

[75] Ibid.

Section 5 Natural Hazard Mitigation Strategy

5.1 Overview

The mitigation strategy recommended by NHMC includes strengthening existing ordinances in order to achieve infrastructure resiliency. The NHMC recommends education outreach to citizens to increase awareness and to strengthen civic commitment among the public. Overall, the mitigation actions reflect a move toward protecting (hardening) critical facilities and infrastructure to be able to recover faster from a natural hazard, and to take proactive measures to protect the community assets and ultimately to reduce risk.

The goals developed by the NHMC in this Plan are to identify the following: natural hazards and risks; existing capabilities; and activities that can be undertaken to prevent loss of life and reduce property damages associated with the identified hazards. The overall strategy for mitigation was conducted by the NHMC in a three (3) step process.

The first step was to investigate natural hazards that affect Glocester in terms of location, extent, event history and probability of future events.

Next, the NHMC considered the community's assets. The NHMC defined the community's assets by the characteristics of the population (at-risk populations), the built environment (existing infrastructure), protected open space (natural resources), and the local tourism economy.

Finally, the NHMC evaluated the Town's capabilities in terms of its ability to mitigate natural hazards as they relate to the community's assets. The NHMC found that the town has relatively low risk because Glocester is a rural community with a smaller population and has fewer buildings and infrastructure to be at risk. The risk areas include population (including historical properties), local dams, public utilities (including critical communication infrastructure), local roadways subject to flooding (including bridges) and tree damage. Table 5.1 below lists events in order of priority, based on a combination of frequency, damage extent and impacts.

Table 5.1 Ranked Hazards

Hazard	Level of Concern/ Risk Priority
Dam Failure/Breach	High Risk Priority
Snow and Ice Strom (including nor'easter)	High Risk Priority
Thunderstorm (including wind, lightning, and hail)	High Risk Priority
Mosquito Borne Disease	High Risk Priority

Heavy Rain and Riverine Flooding	Medium Risk Priority
Extreme Temperatures	Medium Risk Priority
Hurricane	Low Risk Priority

The focus of the NHMC's mitigation actions is on protecting people and community assets (Section 5.3 Mitigation Actions). The mitigation actions identify plans to minimize or eliminate impacts to people, property, and natural resources from natural hazards and to implement priority hazard mitigation actions in order to protect the City's build environment, people, historic, cultural, economic and natural resources. The mitigation measures cover the following categories:

- Planning and Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services and
- Public Education and Awareness

The planning process for infrastructure resiliency is an ongoing process – one that is inherently linked to community planning, zoning and land development regulations, code development and public input. The need to regularly update and re-strategize resiliency approaches in this Plan is accomplished through the 5-year update of the hazard mitigation plan.

5.2 Mitigation Action Plan

A hazard mitigation action refers to any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazardous conditions. The NHMC has analyzed a variety of actions to reduce the impacts of hazards identified in the risk assessment. The projects that were ultimately chosen were aligned and prioritized with regards to public input, public health risks, disruption of essential services and potential economic losses to the Town. These actions, which comprehensively address the key issues, combine to create the hazard mitigation strategy to be implemented.

5.2.1 Evaluation of Selected Mitigation Actions

Mitigation actions in the previous planning cycle for the prior Glocester FEMA approved hazard mitigation plan are either completed, cancelled or carried over to be included in the 2024 mitigation actions (Table 5.2). New action items for this plan were created via research of successes in other local communities, input from town staff and constituent public outreach. Each mitigation action is briefly described below in Section 5.3 and includes implementation in terms of:

- Action Description
- Hazard(s) Addressed
- Priority Score
- Lead and Supporting Responsible Parties
- Timeframe
- Financing Options
- Cost Estimate
- Expected Mitigation Benefits Description

The actions are intended to be implemented once the plan is approved by FEMA and adopted by the Town Council. The time frame used for this strategy is as follows:

- Short Term: 0 to 6 Months
- Medium Term: 6 to 18 Months
- Long Term: 18 Months to 5 Years

The recommended actions include cost estimations and identification of responsible parties to lead the efforts. Other relevant departments/agencies that can offer support to the project are also identified, as well as funding options.

The NHMC used the following monetary ranges to estimate the cost estimate:

- Staff Time
- Minimal – less than $25,000
- Moderate – more than $25,000, but less than $100,000
- Significant – over $100,000

Table 5.2 2018 Mitigation Action Statuses

2018 Action Number	Title	Status	Notes
1	Develop an Emergency Management Website	Completed	Created a page on the Town's website and a Facebook page
2	Develop a Public Education Program for Campgrounds	Completed	Pamphlet was deemed not needed, but created good partnerships with campgrounds

2018 Action Number	Title	Status	Notes
			and program developed through Buildings and Zoning Department and GEMA
3	Emergency Water/Food Supplies	Carried Over	The Town is currently planning and will run an exercise in 2024; after the exercise, corrections will be made and an education campaign will be conducted using the Facebook page
4	Educate Businesses on How to Prepare for a Natural Disaster	Carried Over	Delayed due to disruptions from COVID-19
5	Evaluate Local Roads Subject to Flooding and Identify Projects	Carried Over, Modified	Glocester has established a new public works standard in which culverts are upsized during repaving when there is no adverse impact on the area hydrology; this action will be modified to focus on creating design ready packages for areas of flooding to be ready, if and when funding becomes available
6	Develop a Debris Management Plan	Carried Over	
7	Install Lightning Protection Devices and Methods	Carried Over	Unable to complete due to lack of funding, but remains a priority
8	Develop Emergency Action Plans for High and Significant Dams	Carried Over, Modified	The Town does not own any dams, so action needs to be modified to reflect private ownership status
9	Implement a Public Outreach Campaign for Residents/Businesses	Carried Over	Cannot be completed until all EAPs are completed; State has completed all inundation mapping
10	Initiate Study to Determine the	Carried Over, Modified	Action will be modified to only include police and libraries as the

2018 Action Number	Title	Status	Notes
	Current Storage of Vital Documents		action has been completed for Town Hall
11	Identify Alernative Storage Location for Critical Town Records	Carried Over	
12	Install Computer Surge Protection on Critical Electronic Equipment	Completed	
13	Install Transfer Swicthes on all Critical Facilities	Completed	All Town critical infrastructure has received new permanent backup generators with automatic transfer switches
14	Encourage Major Pharmacies to Install External Generator Hookup	Cancelled	This action has been deemed infeasible
15	Purchase and Install Generators in Animal Shelters	Completed	
16	Initiate a Municipal Tree Trimming Program	Cancelled	Action is no longer considered necessary as RI Energy (National Grid) has assumed responsibility for this action
17	Inspect, Repair or Replace Local and Interstate Highway Bridges	Completed	Jackson School House Road Bridge was investigated (only bridge owned by the Town)
18	Structural Retrofitting of Existing Historical Buildings	Cancelled	This action has been deemed infeasible as majority of the properties are privately owned
19	Promote Insurance Institute for Business and Home Safety FORTIFIED	Completed	Added a link to the website and received educational materials

2018 Action Number	Title	Status	Notes
20	Acquire More Open Space Properties	Carried Over	Unable to complete due to lack of funding, but remains a priority
21	Encourage Town Council to Budget for Climate Adaptation	Completed	Town completed the Community Resilience Building Program through the RI Infrastructure Bank. The Town is now a participant in the Municipal Resilience Program, which offers financial assistance in implementing the priority actions identified as part of this process.

5.2.2 Prioritization of Actions

Due to budgetary constraints and other limitations, it is often challenging to implement all mitigation of the selected actions. The NHMC selected the most cost-effective actions for implementation in order to use resources efficiently and to develop a realistic approach toward mitigation risks. The Disaster Mitigation Act 2000 (DMA) supports this principle of cost effectiveness by requiring action plans to follow a prioritization process that emphasizes benefits over costs. DMA 2000 states:
"The mitigation strategy section shall include an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs."

5.2.3 Documentation of the Process

The NHMC utilized a qualitative prioritization method (STAPLEE) and relative scores to conduct the cost benefit analysis.

STAPLEE Criteria

- Social: Is the action compatible with present and future local community needs and values?
- Technical: Is the action feasible with available local resources (or as supplement by outside resources as necessary)?
- Administrative: Does the community have the administrative capacity to implement the action?
- Political: Is there strong public support to implement and maintain the action?

- Legal: Does the community have the legal authority to implement the action?
- Economic: Is the action cost-effective?
- Environmental: Does the action impact environmental resources, and is the impact positive, negative, or neutral?

The STAPLEE Benefit-Cost Review was used to prioritize the planning recommendations and mitigation actions. Each planning recommendation and mitigation action was scored against each of the STAPLEE criteria outlined above with a numerical score. These numbers were then totaled and developed into an overall priority score. The ranking of the priority score is a guideline for what order the town should begin addressing the identified actions (Table 5.3).

Additionally, the STAPLEE Method includes a cost-benefit review as part of the mitigation actions prioritization process for potential federal disaster funding. A more detailed cost-benefit analysis will be done, at the time of application, for those proposed mitigation actions that require seeking outside funding sources, such as those available under the pre-disaster grant program and the hazard mitigation grant program offered by RIEMA.

5.3 Mitigation Actions

5.3.1 Public Education and Awareness

Action 2024-1: Emergency Water/Food Supplies

- Category: Public Education and Awareness
- Description: Educate residents in advance where to find updates on potable water distribution or other supplies after a disaster.
- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Police Department; RIEMA
- Time Frame: Short Term
- Cost Estimate: Staff Time
- Potential Funding Sources: High
- Benefits: Town Budget

Action 2024-2: Educate Businesses on How to Prepare for a Natural Disaster

- Category: Public Education and Awareness
- Description: Educate businesses on how to prepare for a natural disaster. Develop a public education and outreach plan, or a section on the website for business owners, on how to become more resilient.
- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Town Planner; Glocester Business Association; Northern RI Chamber of Commerce

- Time Frame: Medium Term
- Cost Estimate: Staff Time
- Potential Funding Sources: Medium
- Benefits: Town Budget

Action 2024-3: Public Outreach for CodeRED Alert System Enrollment

- Category: Public Education and Awareness
- Description: Launch a public outreach campaign to ensure all residents, especially vulnerable populations (elderly, disabled, non-English speakers), are enrolled in the CodeRED system.
- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Community Organizations
- Time Frame: Short Term
- Cost Estimate: Staff Time
- Potential Funding Sources: High
- Benefits: Town Budget

Action 2024-4: Create an Extreme Heat Awareness Campaign

- Category: Public Education and Awareness
- Description: Launch a campaign educating residents on recognizing and preventing heat-related illnesses, including heat stroke and dehydration, during heat waves.
- Hazard(s) Addressed: Extreme Temperatures
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Rhode Island Department of Health
- Time Frame: Short Term
- Cost Estimate: Staff Time
- Potential Funding Sources: High
- Benefits: Town Budget

5.3.2 Property Protection

Action 2024-5: Create Design Ready Packages for Mitigation Projects on Local Roads Subject to Flooding

- Category: Property Protection
- Description: Create design ready packages for projects designed to lessen the frequency or severity of flooding through the installation or modification of culverts and stormwater activities (i.e., creating retention or detention basins) in preparation for available funding and grants
- Hazard(s) Addressed: Heavy Rain and Riverine Flooding; Hurricane; Thunderstorm
- Lead Agency Assigned: Department of Public Works
- Partner Agency Assigned: Finance; Town Planner

- Time Frame: Long Term
- Cost Estimate: Significant
- Potential Funding Sources: Medium
- Benefits: Federal Grants

Action 2024-6: Develop a Debris Management Plan

- Category: Property Protection
- Description: Develop a Debris Management Plan. Follow guidance for municipalities from RIEMA on what to include and how to develop a successful plan, including building official to waive permit fees for building permits to repair storm-damaged properties.
- Hazard(s) Addressed: Hurricane; Thunderstorm; Snow and Ice Storm
- Lead Agency Assigned: Department of Public Works
- Partner Agency Assigned: GEMA; Building Official
- Time Frame: Long Term
- Cost Estimate: Moderate
- Potential Funding Sources: Low
- Benefits: Town Budget

Action 2024-7: Install Lightning Protection Devices and Methods

- Category: Property Protection
- Description: Install lightning protection devices and methods such as lightning rods and grounding on critical facilities.
- Hazard(s) Addressed: Thunderstorm
- Lead Agency Assigned: Department of Public Works
- Partner Agency Assigned: Finance
- Time Frame: Medium Term
- Cost Estimate: Minimal
- Potential Funding Sources: High
- Benefits: Federal Grants

5.3.3 Planning and Prevention

Action 2024-8: Develop Emergency Action Plans for High and Significant Dams

- Category: Planning and Prevention
- Description: Develop Emergency Action Plans (EAP's) for both High and Significant hazard dams (even privately-owned) within the Town of Glocester.
- Hazard(s) Addressed: Dam Failure/Breach
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Town Planner; USFWS; RIEMA; NRCS; RIDEM; Save the Bay
- Time Frame: Long Term
- Cost Estimate: Minimal

- Potential Funding Sources: High
- Benefits: State and Federal Grants

Action 2024-9: Implement a Public Outreach Campaign for Residents/Businesses

- Category: Planning and Prevention
- Description: Implement a Public Outreach Campaign for residents and businesses located within a dam inundation zone.
- Once EAPs have been developed for both High and Significant hazard dams, it is important to conduct a public information session for residents and businesses within the various inundation areas regarding what they should do in the event of a dam breach. This could be completed in one general session, or individual sessions for each structure and affected neighborhood.
- Hazard(s) Addressed: Dam Failure/Breach
- Lead Agency Assigned: Town Planner; GIS; GEMA; Dam Owners
- Partner Agency Assigned: CERT
- Time Frame: Medium Term
- Cost Estimate: Minimal
- Potential Funding Sources: Medium
- Benefits: Private Funds

Action 2024-10: Initiate Study to Determine the Current Storage of Vital Documents

- Category: Planning and Prevention
- Description: Initiate study to determine the current storage of vital documents in Police and Libraries.
- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: Town Clerk
- Partner Agency Assigned: GEMA
- Time Frame: Long Term
- Cost Estimate: Moderate
- Potential Funding Sources: High
- Benefits: Town Budget

Action 2024-11: Identify Alternative Storage Location for Critical Town Records

- Category: Planning and Prevention
- Description: Identify alternative storage location and/or strategy for critical Town records and documents to determine if an alternate on or off-site location, or conversion to electronic records filing is the best course for the Town to undertake.
- Hazard(s) Addressed: All Hazards

- Lead Agency Assigned: Town Clerk
- Partner Agency Assigned: GEMA
- Time Frame: Medium Term
- Cost Estimate: Staff Time
- Potential Funding Sources: High
- Benefits: Town Budget

Action 2024-12: Enhance GIS Data for Hazard Mapping
- Category: Planning and Prevention
- Description: Improve and update GIS data for hazard mapping, including flood zones, wind risk areas, evacuation routes, and critical infrastructure to enhance decision-making.
- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: GIS
- Partner Agency Assigned: Town Planner
- Time Frame: Medium Term
- Cost Estimate: Minimal
- Potential Funding Sources: Low
- Benefits: Town Budget

5.3.4 Natural Resource Protection

Action 2024-13: Acquire More Open Space Properties
- Category: Natural Resource Protection
- Description: Acquire more open space properties subject to natural hazards and land subject to flood or prone to flooding. This acquisition will principally be done by acquiring the land and then deeding it as open space. Open space acquisitions could be pursued by purchasing substantially damaged structures and demolishing them. The Town may decide to acquire the property outright as open space, and therefore prioritize areas obtained by easement.
- Hazard(s) Addressed: Heavy Rain and Riverine Flooding; Hurricane; Thunderstorm
- Lead Agency Assigned: Town Council; Planning Board; Conservation Commission
- Partner Agency Assigned: Town Planner; Land Trust
- Time Frame: Long Term
- Cost Estimate: Significant
- Potential Funding Sources: Medium
- Benefits: State and Federal Grants

Action 2024-14: Encourage Town Council to Budget for Climate Adaptation
- Category: Natural Resource Protection
- Description: Encourage Town Council to budget for climate adaptation as part of capital improvement projects.

- Hazard(s) Addressed: All Hazards
- Lead Agency Assigned: Town Planner
- Partner Agency Assigned: GIS
- Time Frame: Medium Term
- Cost Estimate: Staff Time
- Potential Funding Sources: High
- Benefits: Town Budget

Action 2024-15: Conduct Mosquito Habitat Assessments

- Category: Natural Resources Protection
- Description: Identify and map potential mosquito breeding sites, including wetlands, stagnant water, and stormwater management areas, to target prevention and treatment efforts.
- Hazard(s) Addressed: Mosquito-Borne Diseases
- Lead Agency Assigned: RIDEM
- Partner Agency Assigned: GEMA
- Time Frame: Medium Term
- Cost Estimate: Moderate
- Potential Funding Sources: Low
- Benefits: State and Federal Grants

5.3.5 Structural Projects

Action 2024-16: Identify and Retrofit Critical Infrastructure for Wind

- Category: Structural Projects
- Description: Conduct a Town-wide assessment to identify critical infrastructure vulnerable to wind damage and develop a plan to retrofit these facilities to withstand high winds.
- Hazard(s) Addressed: Hurricane; Thunderstorm; Snow and Ice Storm
- Lead Agency Assigned: Department of Public Works
- Partner Agency Assigned: Town Planner; GEMA; Building and Zoning
- Time Frame: Long Term
- Cost Estimate: Significant
- Potential Funding Sources: Low
- Benefits: State and Federal Grants

5.3.6 Emergency Services

Action 2024-17: Install and Maintain Severe Weather/Emergency Sirens
Category: Emergency Services

- Description: Install emergency sirens in key areas across the Town to alert residents of severe weather or emergencies, and schedule regular testing and maintenance of the system. This system can be used in conjunction with CodeRED and provide redundancy for areas with no cell service coverage.

- Hazard(s) Addressed: Heavy Rain and Riverine Flooding; Hurricane; Thunderstorm; Snow and Ice Storm
- Lead Agency Assigned: GEMA
- Partner Agency Assigned: Police Department
- Time Frame: Medium Term
- Cost Estimate: Moderate
- Potential Funding Sources: Medium
- Benefits: Town Budget; State and Federal Grants

Table 5.3 STAPLEE Matrix

2024 Action Number	Title	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Prioritization
2024-1	Emergency Water/Food Supplies	3	3	3	3	3	3	3	21
2024-2	Educate Businesses on How to Prepare for a Natural Disaster	2	3	2	3	2	3	3	18
2024-3	Public Outreach for CodeRED Alert System Enrollment	3	3	3	3	3	3	3	21
2024-4	Create an Extreme Heat Awareness Campaign	3	3	3	3	3	3	3	21
2024-5	Create Design Ready Packages for Mitigation Projects on Local Roads Subject to Flooding	2	3	3	3	3	2	3	19
2024-6	Develop a Debris Management Plan	2	3	2	2	3	2	3	17
2024-7	Install Lightning Protection Devices and Methods	3	3	3	3	3	3	3	21
2024-8	Develop Emergency Action Plans for High and Significant Dams	3	3	3	2	3	3	3	20
2024-9	Implement a Public Outreach Campaign for Residents/Businesses	3	3	2	2	3	3	3	19
2024-10	Initiate Study to Determine the Current Storage of Vital Documents	3	3	3	3	3	3	3	21

2024 Action Number	Title	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Prioritization
2024-11	Identify Alernative Storage Location for Critical Town Records	3	3	3	3	3	3	3	21
2024-12	Enhance GIS Data for Hazard Mapping	2	2	2	2	3	2	3	16
2024-13	Acquire More Open Space Properties	3	3	2	3	2	3	3	19
2024-14	Encourage Town Council to Budget for Climate Adaptation	3	3	3	3	3	3	3	21
2024-15	Conduct Mosquito Habitat Assessments	3	2	1	2	2	2	3	15
2024-16	Identify and Retrofit Critical Infrastructure for Wind	1	2	1	2	3	3	3	15
2024-17	Install and Maintain Severe Weather/Emergency Sirens	2	2	2	3	3	3	3	18

Section 6 Moving Toward a Safe, Resilient, and Sustainable Community

6.1 Implementing, Monitoring and Revising the Plan

6.1.1 Implementation

The NHMC has assigned a project lead and supporting role to implement each mitigation action. If major problems occur with implementation or execution of the action item(s), a special meeting can be convened to adjust the action. Each responsible department identified in the mitigation action section will be required to report annual progress to the Town Planner who will have overall coordination with each department/agency and maintain the documented progress.

6.1.2 Monitoring

The Glocester Emergency Management Agency, or designee, shall evaluate the effectiveness, monitor the progress and assist with the update of the Plan. The Glocester EMA director, or designee, will submit an annual progress report on action items to the Town Council. The timing of the annual review should coincide with the Town's annual budget process so any locally funded projects can be considered in the budget process. Each meeting will ensure that the Plan is still current and will track any actions submitted for the Mitigation Action Progress Form. The Mitigation Action Progress Form will be maintained by the Building Official to record the progress of each mitigation action. Presentations on the Plan's progress will be made to the Town Council and the public annually. The annual progress reports may include updates on subjects including:

- Natural hazard profiles accounting for new major disasters
- Status of mitigation action items and the identification of any implementation issues; and,
- Evaluation of the risk assessment matrix to determine if any vulnerable area should be added or deleted from the matrix.

6.1.3 Revisions

As per 44 CFR S 201.6(d)(3), the Plan will be reviewed and revised to reflect progress in local mitigation efforts and changes in priorities, and resubmitted for approval within five (5) years of the Town Council's adoption date in order to keep the plan current and maintain eligibility for mitigation project grant funding. Any updates will be reviewed and submitted to RIEMA upon local approval to ensure that local mitigation strategy remains in compliance with the State mitigation strategy.

The Glocester Emergency Management Director, or designee, shall convene the NHMC annually and after every major natural disaster to collect updated information on the action items and/or to add new mitigation actions.

Furthermore, the NHMC will begin revising the plan prior to the five (5) year expiration to ensure completion within the five (5) year update period.

The NHMC will meet after each major event to monitor and track the status of the hazard mitigation actions. Any progress will be documented on the Mitigation Action Progress Form. Each meeting will ensure that the Plan is still current and will track any actions submitted for the Mitigation Action Progress Form. The Plan will also be evaluated and updated as funding opportunities arise for the actions and projects identified in the Plan.

6.2 Continued Public Involvement

The Town of Glocester will continue public involvement in the plan maintenance process by:

- The approved/adopted Plan will be posted on the Town's website;
- Hard copies will be available at the Town Hall Clerk's Office and in the Town libraries;
- The annual meeting of the NHMC to review the implementation status of the Plan will be posted/advertised as a public meeting per Town guidelines; and
- The NHMC will include the public in the preparation of the five (5) year Plan update using public workshops, and press releases in the local newspaper.

During the five (5) year update process, a draft update will be available on the Town's website for public comment. Respondents may comment via email or by phone directly to the Town Planner. Hard copies will be available to the public at the Town Clerk's office and at the local libraries. Furthermore, additional data collection methods will be explored to gain public input, such as interviews or assessments following real world events that occur in Glocester, targeting impacted residents and businesses. In addition, the public will be invited to attend each revision meeting and their input will be included in future updates. The public education and outreach actions throughout this Plan will also provide further opportunities for the public to be involved in future mitigation activities. All updates or revisions to the Plan will be coordinated with RIEMA to ensure the most current information from the State Hazard Mitigation Plan is included.

6.3 Plan Integration

In the past, the 2018 Hazard Mitigation Plan was successfully integrated into Glocester's planning mechanisms. Departments such as Emergency Management, Planning, and Public Works held periodic discussions to address town areas impacted by weather events, enabling them to identify vulnerabilities and coordinate on future mitigation efforts. Further, the plan was integrated into the Town's Emergency Operations Plan (EOP).

Glocester will continue to ensure that the plan is not a standalone document but is actively incorporated into various existing planning mechanisms. The integration process will involve regular discussions with department heads to ensure that hazard mitigation strategies align with ongoing and future planning efforts. Specifically, the Town will hold quarterly mitigation committee meetings to review current mitigation projects and identify new opportunities for mitigation as risks evolve. These meetings will serve as a platform for the coordination of information sharing across departments, allowing for comprehensive input into the mitigation process.

This Hazard Mitigation Plan will be integrated into the following planning mechanisms:

- Glocester's Emergency Operations Plan (EOP): The Hazard Mitigation Plan will be a key component of the EOP, ensuring that mitigation strategies are in place before, during, and after emergencies.
- Town Planner's Office: Mitigation goals and objectives will be considered in long-term land use, zoning, and development decisions to ensure resilient growth.

References

American Community Survey DP05, Population Race, Ethnicity and Age, 2015.

American Community Survey DP05, ACS Demographic and Housing Estimates, 2022

Center for Disease Control and Prevention, Covid Data Tracker, United States COVID-19 Hospitalizations, Deaths, Emergency Department (ED) Visits, and Test Positivity by Geographic Area, 2024

Center for Disease Control and Prevention, Eastern Equine Encephalitis Virus, Historic Data (2003-2022), 2023

Center for Disease Control and Prevention, West Nile Virus, Current Year Data (2023), 2024

Center for Disease Control and Prevention, West Nile Virus, Historic Data (1999-2022), 2024

Climate Change in Rhode Island – NOAA National Ocean Service

Climate Mapping for Resilience and Adaptation, Providence County, RI. Retrieved from: CMRA - Climate Mapping For Resilience and Adaptation (arcgis.com)

Earthquaketrack, Biggest Earthquakes Near Rhode Island, United States, 2024

Environmental Protection Agency, Mosquito Control, Joint Statement on Mosquito Control in the United States, 2012

FEMA, 4653-DR-RI Initial Notice, 2022

FEMA Flood Insurance Study Number 44007CV001B, April 6, 2012, revised July 30, 2012

FEMA Local Mitigation Planning Handbook, March 2013.

FEMA Pocket Safety Guide for Dams and Impoundments, FEMA P-911/October 2016

FEMA, Preliminary Damage Assessment Report, Rhode Island – Severe Storms, Flooding, and Tornadoes FEMA-4753-DR, 2024

FEMA Tracks Henri Effects in the Northeast, August 2021

FEMA, Understanding and Improving Performance of New Manufactured Homes During High-Wind Events HSFEHQ-07-J-0007, April 2007

Francis Beaufort (1774-1857) Creator of the Wind Force Scale.

Glocester, The Way Up Country, compiled by the Glocester Bicentennial Commission (1976).

John H. Chafee Blackstone Valley National Heritage Corridor. Public Law 99-647, November 10, 1986.

National Centers for Environmental Information (NCEI) formerly known as National Climatic Data Center (NCDC). Retrieved from http://www.ncdc.noaa.gov/.

National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Storm Events Database, 2023

National Climate Assessment, US Global Change Research Program.

National Flood Insurance Program, US Department of Homeland Security, Federal Emergency Management Agency, 2017.

National Hurricane Center Tropical Cyclone Report, Hurricane Henri, 2022

National Weather Service, National Oceanic and Atmospheric Administration, 2017

NOAA, A River and Flash Flood Climatology of Southern New England: Results From 1994-2000.

Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in RI, 2018

Resilient Rhody: Three Year Impact Report, 2021

Rhode Island Department of Labor and Training's State of the State, A statistical profile of RI cities and towns, 2017.

Rhode Island Department of Labor and Training, Unemployment Rate/Labor Force Statistics (LAUS), 2023 Benchmark Results, 2023

Rhode Island Department of Labor and Training, Unemployment Rate/Labor Force Statistics (LAUS), Rhode Island Labor Force Statistics and Rhode Island City, Town, and Sub-State Labor Force Statistics, 2023

Rhode Island Department of Environmental Management Dam Safety Annual Report, 2016

Rhode Island Department of Environmental Management, Mosquito Control, 2023

Rhode Island Department of Health, Mosquitoes, 2023

Rhode Island Department of Health, Mosquitoes, Arboviral Surveillance, 2023

Rhode Island Department of Health, Mosquitoes, West Nile Virus

Rhode Island Department of Health, Mosquitoes, EEE (Eastern Equine Encephalitis)

Rhode Island Emergency Management Agency, State of Rhode Island Hazard Mitigation Plan, 2024

Rhode Island Local Hazard Mitigation Plan Template (RIEMA)

Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Section 104 of the Disaster Mitigation Act of 2000

State of Rhode Island Governor Dan McKee, McKee Administration Update on Exeter Fire, 2023

State of Rhode Island Governor Dan McKee, McKee Administration Update 2 on Exeter Fire, 202

State of Rhode Island Governor Dan McKee, Executive Order 20 – 100, Ninety-fifth Supplemental Emergency Declaration – Rhode Island on Pause, 2020

State of Rhode Island Hazard Identification and Risk Assessment, August 2017 (HIRA)

State of Rhode Island 2014Hazard Mitigation Plan Update.

Strategy for Reducing Risks From Natural Hazards in Glocester, Rhode Island, Adopted 2005, Revised 2011.

State of Rhode Island Hazard Mitigation Plan, 202

The Columbia Electronic Encyclopedia, 6th ed. Copyright © 2012, Columbia University Press

The Historical and Architectural Resources of Glocester, Rhode Island, prepared by the RI Historical Preservation Commission (1980)

Town of Glocester. *Glocester 2040 Comprehensive Community Plan* (United States, Town of Glocester, Planning), 2018, updated 2020.

Town of Glocester. Land Use, 2018

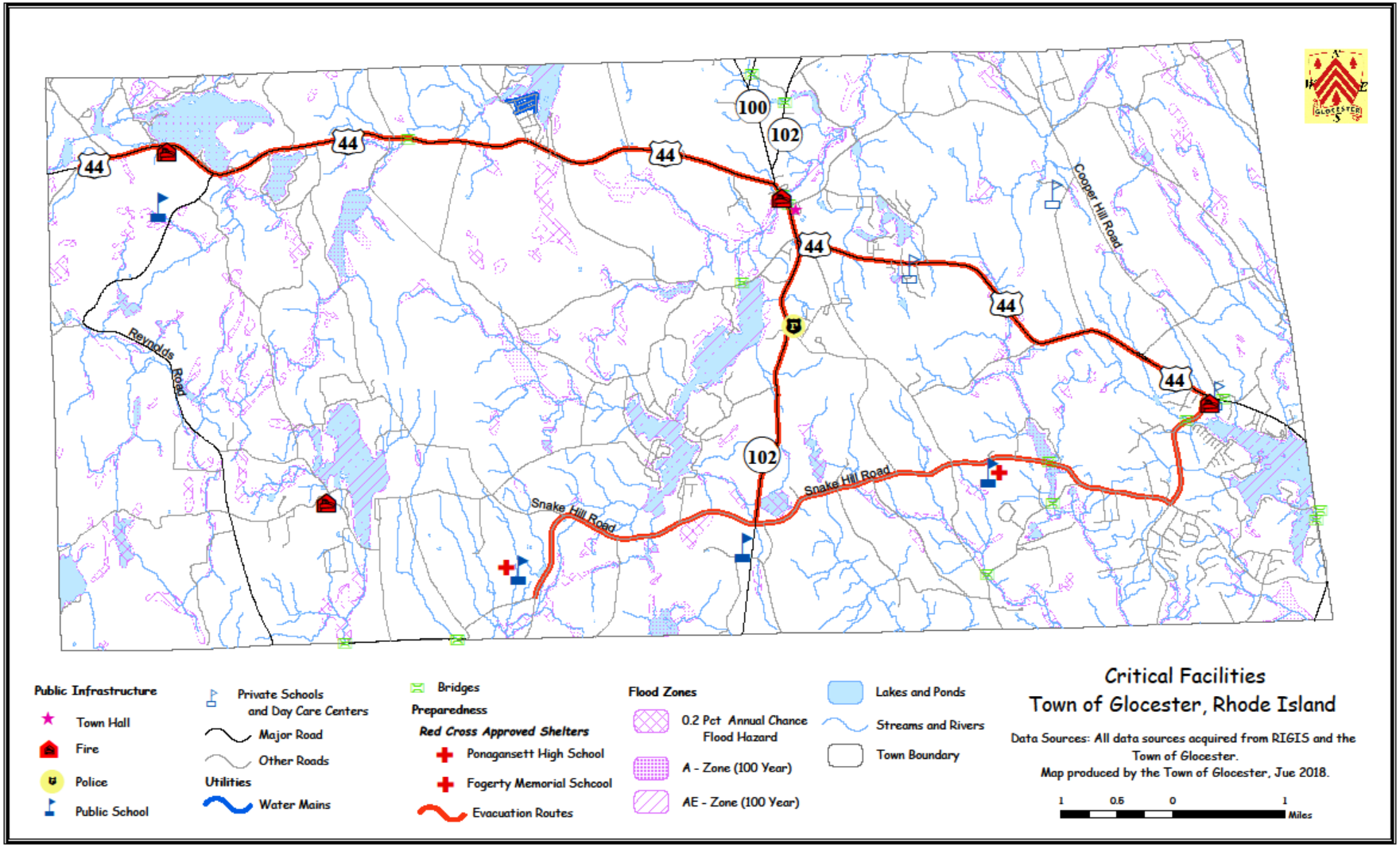
Town of Glocester. Building and Zoning Department, 2016.

US Census, American Community Survey (1960-2015), RI Population Projections, RI Statewide Planning Program, 2013 (2020-2040)

US Global Change Research Program, Fifth National Climate Assessment, 2023

Zarriello, P.J., and Bent, G.C., 2011, Elevation of the March–April 2010 flood high water in selected river reaches in Rhode Island: U.S. Geological Survey Open-File Report 2011–1029, 34 p.

Appendix A Listing of Critical Facilities



Appendix B Glocester Natural Hazard Mitigation Committee

2024 Natural Hazard Mitigation Committee

Gerald Mosca
Glocester Emergency Management
Director

Karen Scott
Glocester Planning Department
Town Planner

Joseph DelPrete
Glocester Police Department
Chief of Police

Dennis Huestis
Chepachet Fire Department
Chief/Fire Marshal/Residential Inspector

Steve Quattrini
Harmony Fire Department
Chief

Chris LaButti
West Glocester Fire Department
Chief

Dennis Begin
Glocester Building and Zoning
Building Inspector

Gary Treml
Glocester Public Works Department
Director

Jane Steere
Glocester Tax Collector
Finance Director

Appendix C Rhode Island Historical Preservation and Heritage Commission

National Registered Properties

Town	Address	Type of Historical Structure	Year Built
Glocester	N/A	Cherry Valley Archeological Site, RI-279	N/A
Glocester	N/A	Chepachet Village Historic District	N/A
Glocester	2 Chestnut Hill Road	Steere, Reuben, Double House	1860 ca
Glocester	61 Chopmist Hill Rd	Fenner-Burlingame House	N/A
Glocester	12 Dorr Drive	House	1993
Glocester	15 Dorr Drive	Slocum, Ziba, House	1850 ca
Glocester	17 Dorr Drive	Eddy, Hiram, House	1850 ca
Glocester	18 Dorr Drive	Eddy-Fitch House	1850 ca
Glocester	19 Dorr Drive	Barn/ House	1895 ca
Glocester	23 Dorr Drive	Barn/ House	N/A
Glocester	27 Dorr Drive	Smith, A., House	1850 ca
Glocester	29 Dorr Drive	House	N/A
Glocester	33 Dorr Drive	Meeting hall/ Grammar School	1838 ca
Glocester	20 Douglas Hook Road	House	1960 ca
Glocester	25 Douglas Hook Road	Rounds Cottage	1850 ca
Glocester	29 Douglas Hook Road	Irons, A., House	1850 ca
Glocester	30 Douglas Hook Road	Harrington House	1840 ca
Glocester	33 Douglas Hook Road	House	1850 ca
Glocester	37 Douglas Hook Road	House	N/A

Glocester	42 Douglas Hook Road	House	1960 ca
Glocester	43 Douglas Hook Road	House	1960 ca
Glocester	48 Douglas Hook Road	House	1960 ca
Glocester	Jack's Way	House	1870 ca
Glocester	14 Jack's Way	House	1860 ca
Glocester	14 Jack's Way	House	1870 ca
Glocester	269 Joe Sarle Rd	House	N/A
Glocester	Money Hill Road	Old Chepachet Village/ Antique and Art Center	1977 ca
Glocester	Money Hill Road	Vacant lot	N/A
Glocester	Money Hill Road	Vacant lot	N/A
Glocester	Money Hill Road	Vacant lot	N/A
Glocester	6 Money Hill Road	Holidaze Stained Glass/ Barber Shop	1963
Glocester	9 Money Hill Road	Chepachet Pharmacy	1955
Glocester	10 Money Hill Road	House and Store	1800 ca
Glocester	12 Money Hill Road	Allied Auto Parts/ Dairy Mart	1965 ca
Glocester	21 Money Hill Road	Citizens Savings Bank/ Old Stone Bank	1970
Glocester	22 Money Hill Road	Apartment House	1885 ca
Glocester	22 Money Hill Road	Double House	1885 ca
Glocester	23 Money Hill Road	The Elms/ Evans House	1790 ca
Glocester	26 Money Hill Road	Apartment House	1885 ca

Glocester	26 Money Hill Road	Double House	1885 ca
Glocester	32 Money Hill Road	Harris, Dr. George, House	1880 ca
Glocester	Oil Mill Lane	Arcade Building	1790 ca
Glocester	Oil Mill Lane	Vacant lot	N/A
Glocester	5 Oil Mill Lane	Double House	1860 ca
Glocester	11 Oil Mill Lane	Lawton, Owen, Homestead	1840 ca
Glocester	12 Oil Mill Lane	Eddy-Fiske House	1850 ca
Glocester	Old Hartford Pike	Cornell's Hotel	1831
Glocester	Pound Rd	Glocester Town Pound	N/A
Glocester	Putnam Pike	Harmony Chapel and Cemetery	1830 ca
Glocester	Putnam Pike	Hopkins Stand	N/A
Glocester	Putnam Pike	Glocester Memorial Park	1990 ca
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Vacant lot	N/A
Glocester	Putnam Pike	Barnes Barn & Acid Works Site (RI-423)	N/A
Glocester	Putnam Pike	Chepachet Bridge No. 100	N/A
Glocester	Putnam Pike	Cutler Farm and Tavern Site	c. 1860
Glocester	Putnam Pike	Juniper House Site	N/A
Glocester	479 Putnam Pike	Manton-Hunt-Farnum Farm	N/A
Glocester	1043 Putnam Pike	Mason, Reuben, House/ Acote's Hill Cemetery	1776 ca
Glocester	1096 Putnam Pike	Sheldon, Jeremiah, House/ Millmore Manor Restaurant	1833
Glocester	1105 Putnam Pike	Richmond, Deforest, House	1930 ca

Glocester	1106 Putnam Pike	House	1942 ca
Glocester	1109 Putnam Pike	Office/ DeBlois Oil Co.	1960 ca
Glocester	1116 Putnam Pike	R. I. State Police Barracks	1956
Glocester	1116 Putnam Pike	Rhode Island State Police Chepachet Barracks	N/A
Glocester	1132 Putnam Pike	Sayles, Leonard House	N/A
Glocester	1133 Putnam Pike	Sayles, Leonard B. House	1860 ca
Glocester	1136 Putnam Pike	Angell, Manning, House/ Parsonage	1820 ca
Glocester	1137 Putnam Pike	Glocester-Manton Free Library	1930
Glocester	1138 Putnam Pike	Chepachet Union Church / Congregational Church	1846
Glocester	1145 Putnam Pike	Town Hall / Grammar School	1936
Glocester	1150 Putnam Pike	Carpenter House	1840 ca
Glocester	1154 Putnam Pike	House	1930 ca
Glocester	1155 Putnam Pike	Site of Eddy House	N/A
Glocester	1155 Putnam Pike	Dino's Grocery Store / Town Center Plaza	1965
Glocester	1155 Putnam Pike	U. S. Post Office / Town Center Plaza	1967
Glocester	1158 Putnam Pike	House	1960 ca
Glocester	1159 Putnam Pike	Cooke, Cyrus, Tavern / Stagecoach Tavern	1800 ca
Glocester	1160 Putnam Pike	Office / House	1977
Glocester	1162 Putnam Pike	House and Outbuildings	1800 ca

Glocester	1163 Putnam Pike	Gas Station	N/A
Glocester	1164 Putnam Pike	House	1810 ca
Glocester	1164 Putnam Pike	Thorp Cottage	1800 ca
Glocester	1167 Putnam Pike	Lyman Mill / Red Factory / Chepachet River	1820
Glocester	1167 Putnam Pike	Masonic Hall	1802
Glocester	1169 Putnam Pike	Owen, Lawton, Mill / Stone House	1814
Glocester	1170 Putnam Pike	Fire Station	N/A
Glocester	1177 Putnam Pike	Slocum, Lydia, House	1780 ca
Glocester	1178 Putnam Pike	Hawkins, W. W., House / Store & P.O.	1860 ca
Glocester	1179 Putnam Pike	Wilmarth, Timothy, House / Brown & Hopkins Store	1800 ca
Glocester	1181 Putnam Pike	Armstrong, Job, Store / Glocester Heritage Society	1820
Glocester	1184 Putnam Pike	Christy's Liquors	N/A
Glocester	1185 Putnam Pike	Central Hotel	1800 ca
Glocester	1187 Putnam Pike	Franklin Bank Building	1800 ca
Glocester	1188 Putnam Pike	J & R Antiques / Christy's / Kitson's Liquors	N/A
Glocester	1189 Putnam Pike	Benefit Company Store	1815 ca
Glocester	1191 Putnam Pike	Store and Barn / Sheldon, Jeremiah, Tavern	1800 ca
Glocester	1192 Putnam Pike	Store / House	N/A
Glocester	1194 Putnam Pike	Owen, Thomas, House	1800 ca

Glocester	1195 Putnam Pike	Farnum Travel/ House/ Stafford Yard	1895 ca
Glocester	1200 Putnam Pike	Cumberland Farms Store / Gas Station	1937
Glocester	1201 Putnam Pike	Texaco Gas Station	1937 ca
Glocester	1201 Putnam Pike	Sunoco Gas Station/ Texaco Station Shed	1965
Glocester	1202 Putnam Pike	Kesteloot's Store	1870 ca
Glocester	1209 Putnam Pike	House	1860 ca
Glocester	1210 Putnam Pike	Kesteloot Block	1910 ca
Glocester	1210 Putnam Pike	House	1960 ca
Glocester	1213 Putnam Pike	Freewill Baptist Church	1822
Glocester	1214 Putnam Pike	House	N/A
Glocester	1218 Putnam Pike	House	1860 ca
Glocester	1230 Putnam Pike	House	1948 ca
Glocester	1237 Putnam Pike	Kimball, Asa, House	1753
Glocester	1237 Putnam Pike	House and Barn	1900 ca
Glocester	1241 Putnam Pike	Baptist Church Parsonage	1850
Glocester	1246 Putnam Pike	Taft House	1880 ca
Glocester	1251 Putnam Pike	St. Eugene's Roman Catholic Church	1957
Glocester	1251 Putnam Pike	Arnold, Warren House/ St. Eugene's Rectory	1850 ca
Glocester	1252 Putnam Pike	House	1960 ca

Glocester	3 Sherman Lane	Armstrong, Job, House / Store	1810 ca
Glocester	4 Sherman Lane	Apartments	1890 ca
Glocester	13 Sherman Lane	Stone-ender	1984 ca
Glocester	Snake Hill Rd	S. Steere House	N/A
Glocester	Snake Hill Rd	Snake Hill Road Schoolhouse Site	N/A
Glocester	449 Snake Hill Rd	House	N/A
Glocester	1198 Snake Hill Rd	House	N/A
Glocester	1435 Snake Hill Rd	Peckham Farm	1831-1851
Glocester	239 Spring Grove Rd	House	N/A
Glocester	4 Tanyard Lane	House	1860 ca
Glocester	6 Tanyard Lane	House	1838 ca
Glocester	7 Tanyard Lane	Block House/ Apartments	1870 ca
Glocester	11 Tanyard Lane	House	N/A
Glocester	15 Tanyard Lane	White Mill Office/ House	1860 ca
Glocester	16 Tanyard Lane	House	1800 ca
Glocester	Tanyard Lane (off)	Vacant lot	N/A
Glocester	Tourtellot Hill Rd	Matthewson, C.C., house	1870
Glocester	Victory Hwy	Vacant lot	N/A
Glocester	Victory Hwy	Vacant lot	N/A
Glocester	Victory Hwy	Vacant lot	N/A
Glocester	Victory Hwy	Vacant lot	N/A
Glocester	7 Victory Hwy	Hunt, Jeptha & Alice, Homestead/ Potter, Dr., House	1830 ca
Glocester	15 Victory Hwy	Keech House/ School	1800 ca

Glocester 21 Victory Hwy Hunt, Lillian M., House 1949 ca