



# **North Hampton, NH Hazard Mitigation Plan Update 2018**

**Approved by the**

**North Hampton Board of Selectmen**

On \_\_\_\_\_, 2\_\_\_\_

And adopted as an official appendix to the North Hampton Emergency Operations Plan

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**NH Homeland Security and Emergency Management**

DRAFT



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## Executive Summary

The North Hampton Hazard Mitigation Plan (herein also referred to as the Plan) was compiled to assist the Town of North Hampton in reducing and mitigating future losses from natural hazard events. The Plan was developed by the Rockingham Planning Commission and participants from the Town of North Hampton Natural Hazard Mitigation Committee and contains the tools necessary to identify specific hazards, and aspects of existing and future mitigation efforts.

The following *natural* hazards are addressed:

- Flooding
- Hurricane-High Wind Event
- Severe Winter Weather, including snow squalls
- Wildfire
- Earthquake
- Drought
- Extreme Temperatures
- Extreme Weather, including microbursts and heavy precipitation events

The list of *critical facilities* includes:

- Municipal facilities;
- Communication facilities;
- Fire station and law enforcement facilities;
- Schools;
- Shelters;
- Evacuation routes; and
- Vulnerable Populations

The *North Hampton Hazard Mitigation Plan* is considered a work in progress and should be revisited frequently to assess whether the existing and suggested mitigation strategies are successful. Copies have been distributed to the Town Hall and the Emergency Operations Center. A copy of the *Plan* is also on file at The Rockingham Planning Commission, the office of New Hampshire Homeland Security and Emergency Management (NHHSEM) and the Federal Emergency Management Agency (FEMA). This Document was approved by both agencies prior its adoption at the local level.

## Introduction

### Background

The New Hampshire Homeland Security and Emergency Management (NHHSEM) has a goal for all communities within the State to establish local hazard mitigation plans as a means to reduce and mitigate future losses from natural hazard events. The NHHSEM outlined a process whereby communities throughout the State may be eligible for grants and other assistance upon completion of a local hazard mitigation plan. FEMA's *2013 Hazard Mitigation Planning Handbook* was consulted throughout the Plan update process by staff from both the Rockingham Planning Commission (RPC) and the Town of North Hampton to stimulate conversation about how the Town can become more resilient to natural hazards. The State's Regional Planning Commissions are charged with providing assistance to selected communities to develop local plans

The *North Hampton Hazard Mitigation Plan (Plan)* was prepared by participants from the Town of North Hampton Hazard Mitigation Team with the assistance and professional services of the Rockingham Planning Commission (RPC) (under contract with the NHHSEM) operating under the guidance of Section 44 CFR 201.6. The *Plan* serves as a strategic planning tool for use by the Town of North Hampton in its efforts to identify and mitigate the future impacts of natural and/or man-made hazard events. Upon adoption of the *Plan* by the North Hampton Board of Selectmen the Plan will become an official appendix to the North Hampton Emergency Operations Plan.

### Methodology

On October 13, 2016, the Rockingham Planning Commission (RPC) organized the first meeting with emergency management officials from the Town of North Hampton to begin the initial planning stages of the *Plan Update (primarily step 1)*. This meeting precipitated the solicitation of participants and development of the *Natural Hazards Mitigation Committee* (herein after, the *Committee*). RPC and participants from the Town developed the content of the *Plan* using the ten-step process set forth in the *Hazard Mitigation Planning for New Hampshire Communities*. The following is a summary of the ten-step process conducted to compile the *Plan*. Meetings were also held on November 10, 2016, January 12, 2017, February 16, 2017, February 23, 2017, March 16, 2017 and October 5, 2017.

The Committee solicited information for the Plan from local officials and residents throughout the Plan development process, including requesting information on impacts from natural hazards and Town response to the hazards. The Plan Update process was also discussed by Committee representatives at Selectmen meetings, Planning Board meetings, Conservation Commission meetings, Heritage Commission meetings, Little Boars Head Village District Commissioner meetings, town staff meetings, and information was shared with residents via the Town's website and weekly e-newsletter. RPC staff kept communities in the region informed of the Plan Update process and requested feedback at monthly Commissioner meetings which involve members of Planning Boards, Boards of Selectmen, and Conservation Commissions in surrounding towns. Information about the Plan update was also posted on the RPC's website.

The Town's 2012 Plan served as a starting point for discussions on hazards impacting the community, as well as discussions on mitigation strategies. The 2012 Plan has served as a reference for local land use regulations and policies, development of the Town's Capital Improvement Plan and department budgets, and has been referenced in the RPC's 2015 Regional Master Plan.

### **Step 1- Form the Committee**

In September 2016, the North Hampton Emergency Management Director, North Hampton Town Administrator, and Rockingham Planning Commission staff identified boards, staff and groups within North Hampton to solicit input from on the Plan and seek representation on the Committee. (See solicitation letter in Appendix K). A Committee comprised of the Emergency Management Director/ Fire Chief, Town Administrator, Police Chief, Deputy Police Chief, Deputy Fire Chief, Public Works Director, Planning and Zoning Administrator, Building Inspector/ Code Enforcement Officer, Planning Board representative, Conservation Commission representative, Agriculture Committee representative and Heritage Committee representative was established to work with staff from the Rockingham Planning Commission to update the Plan. Committee members included the following North Hampton town staff and elected officials:

#### North Hampton Town Staff

- Michael Tully, Emergency Management Director/ Fire Chief
- Steve Jarvin, Deputy Fire Chief
- Kevin Kelly, Inspector/Code Enforcement
- John Hubbard Public Works Director
- Michael Maddox, Police Chief
- Paul Apple, Town Administrator
- Rick Milner, Planning & Zoning Administrator
- 

#### North Hampton Town Officials (elected North Hampton residents)

- Jim Maggoire, Select Board
- Nancy Monahan, Heritage Commission
- Dan Derby, Planning Board
- Brian Goode, Little Boars Head Village District
- Jeff Hillier, Heritage Commission
- Chris Ganotis, Conservation Commission

RPC staff informed local officials of surrounding communities of the plan update at monthly meetings of RPC Commissioners. Participation was sought from the NH Homeland Security and Emergency Management. and staff from the Division reviewed and commented on the Plan.

### **Step 2 – Map the Hazards**

Participants in the *Committee* identified areas where damage from historic natural disasters have occurred and areas where critical man-made facilities and other features may be at risk in the future for loss of life, property damage, environmental pollution and other risk factors. RPC generated a set of base maps with GIS (Geographic Information Systems) that were used in the process of identifying past and future hazards.

### **Step 3 – Identify Critical Facilities and Areas of Concern**

Participants in the Committee then identified facilities and areas that were considered to be important to the Town for emergency management purposes, for provision of utilities and community services, evacuation routes, and for recreational and social value. Using a Global Positioning System, RPC plotted the exact location of these sites on a map. Digital images were collected for each Critical Facility and images of the Town of North Hampton.

### **Step 4 – Identify Existing Mitigation Strategies**

After collecting detailed information on each critical facility in North Hampton, the Committee and RPC staff identified existing Town mitigation strategies relative to flooding, wind, fire, ice and snow events and earthquakes.

### **Step 5 – Identify the Gaps in Existing Mitigation Strategies**

The existing strategies were then reviewed by the RPC and the Committee for coverage and effectiveness, as well as the need for improvement.

### **Step 6 – Identify Potential Mitigation Strategies**

A list was developed of additional hazard mitigation actions and strategies for the Town of North Hampton. Natural Hazard Mitigation Plans for other communities in the region were utilized to identify new mitigation strategies as well as FEMA recommended hazard mitigation examples. The Master Plan, Emergency Operation Plan, and Capital Improvements Plan were also reviewed to generate ideas.

### **Step 7 – Prioritize and Develop the Action Plan**

The proposed hazard mitigation actions and strategies were reviewed and each strategy was rated (good, average, or poor) for its effectiveness according to several factors (*e.g.*, technical and administrative applicability, political and social acceptability, legal authority, environmental impact, financial feasibility). Each factor was then scored and all scores were totaled for each strategy. Strategies were ranked by overall score for preliminary prioritization then reviewed again under Step 7.

### **Step 8 - Determine Priorities**

The preliminary prioritization list was reviewed in order to make changes and determine a final prioritization for new hazard mitigation actions and existing protection strategy improvements identified in previous steps. RPC also presented recommendations to be reviewed and prioritized by emergency management officials.

### **Step 9 - Develop Implementation Strategy**

Using the chart provided under Step 9 in the handbook, an implementation strategy was created which included person(s) responsible for implementation (who), a timeline for completion (when), and a funding source and/or technical assistance source (how) for each identified hazard mitigation actions. Also, when the Master Plan or the North Hampton Capital Improvement Plan (CIP) is updated the *North Hampton Hazard Mitigation Plan* shall be consulted to determine if strategies or actions suggested in the *Plan* can be incorporated into the Town's Master Plan recommendations and or capital expenditures.

### **Step 10 - Adopt and Monitor the Plan**

RPC staff compiled the results of Steps 1 to 9 in a draft document. This draft *Plan* was reviewed by members of the Committee and by staff members at the RPC. RPC staff compiled the results of Steps 1 to 9 in a draft document. This draft *Plan* was reviewed by members of the Committee and by staff members at the RPC. The draft *Plan* was also placed on the Town of North Hampton website for review by the public, neighboring communities, agencies, businesses, and other interested parties to review and make comments via email. A duly noticed public meetings were held on October 13, 2016, November 10, 2016, February 16, 2017, February 23, 2017, March 16, 2017, and October 5, 2017. The meeting allowed the community and neighboring towns to provide comments and suggestions for the *Plan* in person, prior to the document being finalized. This also allowed board and committee members to review other planning documents in Town such as the Master Plan and CIP to consider and incorporate pertinent information that may be included within the Hazard Mitigation Plan. The draft was revised to incorporate comment from the Selectmen, Planning Board and general public; then submitted to the NH HSEM and FEMA Region I for their review and comments. Any changes required by NH HSEM and FEMA were made and a revised draft document was then submitted to the North Hampton Board of Selectmen for their final review. A public hearing was then held by the North Hampton Board of Selectmen on \_\_\_\_\_. At this public hearing the *Plan* was approved and adopted by the Board of Selectman.

Hazard Mitigation Goals and Objectives of the Town of North Hampton, New Hampshire

The Town of North Hampton sets forth the following hazard mitigation goals and objectives:

- 1. Reduce or avoid long-term vulnerabilities posed by natural hazards impacting North Hampton, including the impacts from flooding, hurricanes and high wind events, severe winter weather, wildfire, earthquakes, extreme temperatures, drought, and extreme weather, including increased precipitation events and sea – level rise.**
- 2. Improve upon the protection of the Town of North Hampton’s general population, the citizens of the State and guests, from all natural and man-made hazards.**
- 3. Reduce the potential impact of natural and man-made disasters on North Hampton and the State’s Critical Support Services.**
- 4. Reduce the potential impact of natural and man-made disasters on North Hampton’s Critical Facilities in the State.**
- 5. Reduce the potential impact of natural and man-made disaster on North Hampton’s and the State’s infrastructure.**
- 6. Improve North Hampton’s Emergency Preparedness.**
- 7. Improve North Hampton’s Disaster Response and Recovery Capability.**
- 8. Reduce the potential impact of natural and man-made disasters on private property in North Hampton.**
- 9. Reduce the potential impact of natural and man-made disasters on North Hampton’s and the State’s economy.**
- 10. Reduce the potential impact of natural and man-made disasters on North Hampton’s and the State’s natural environment.**
- 11. Reduce North Hampton’s and the State’s liability with respect to natural and man-made hazards generally.**
- 12. Reduce the potential impact of natural and man-made disasters on North Hampton’s and the State’s specific historic treasures and interests as well as other tangible and intangible characteristics that add to the quality of life to the citizens and guests of the State and the Town.**
- 13. Identify, introduce and implement cost effective Hazard Mitigation measures so as to accomplish North Hampton’s and the States’ goals and objectives in order to raise the awareness and acceptance of hazard mitigation planning.**

Through the adoption of this Plan the Town of North Hampton concurs and adopts these goals and objectives.

## Acknowledgements

The North Hampton Board of Selectmen extends special thanks to those that assisted in the development of this *Plan* by serving as member of Natural Hazards Mitigation Committee:

- Michael Tully, Emergency Management Director/ Fire Chief
- Steve Jarvin, Deputy Fire Chief
- Kevin Kelly, Inspector/Code Enforcement
- John Hubbard Public Works Director
- Michael Maddox, Police Chief
- Paul Apple, Town Administrator
- Rick Milner, Planning & Zoning Administrator
- Jim Maggoire, Select Board
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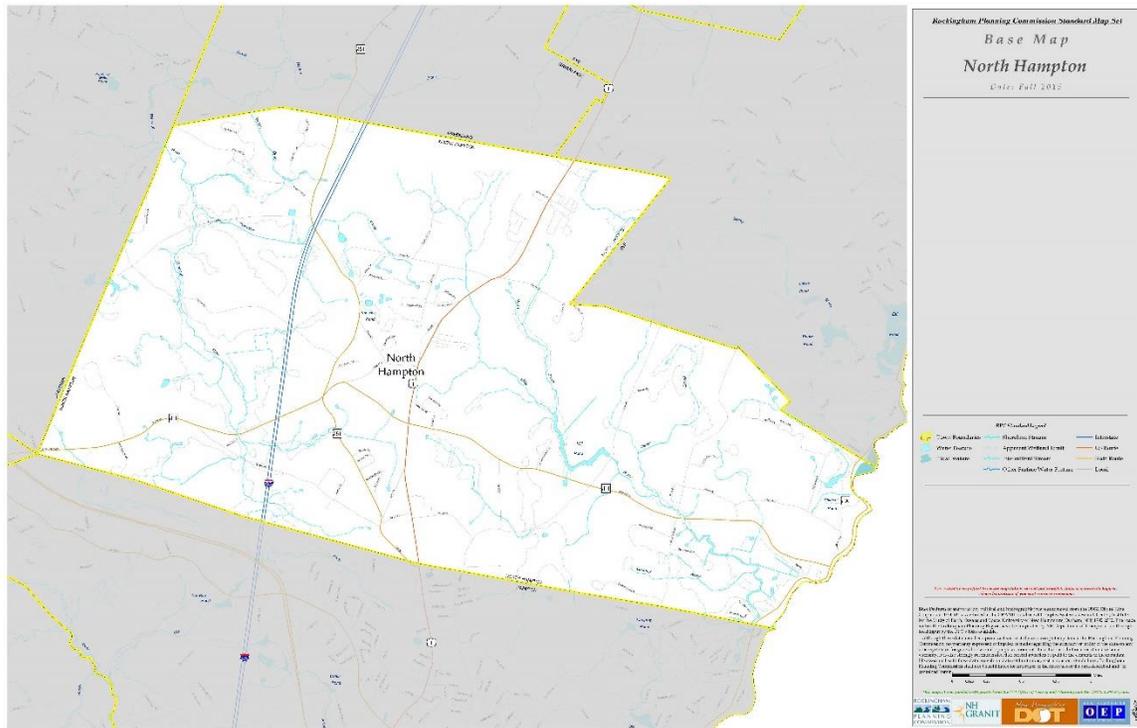
The North Hampton Board of Selectmen offers thanks to the NHHSEM (<http://www.nh.gov/safety/divisions/hsem/index.html>) which provided the model and funding for this *Plan*.

In addition, thanks are extended to the staff of the Rockingham Planning Commission for professional services, process facilitation and preparation of this document.

## Community Profile

The Town of North Hampton is located in New Hampshire in Rockingham County. North Hampton is bordered by the New Hampshire towns of Rye, Exeter, Stratham, and Greenland, as seen below in Figure 1. The town was incorporated in 1742 and had a population of 4,301 recorded during the 2010 US Census and an estimated population of 4,514 in 2016 based on NH Office of Strategic Initiatives

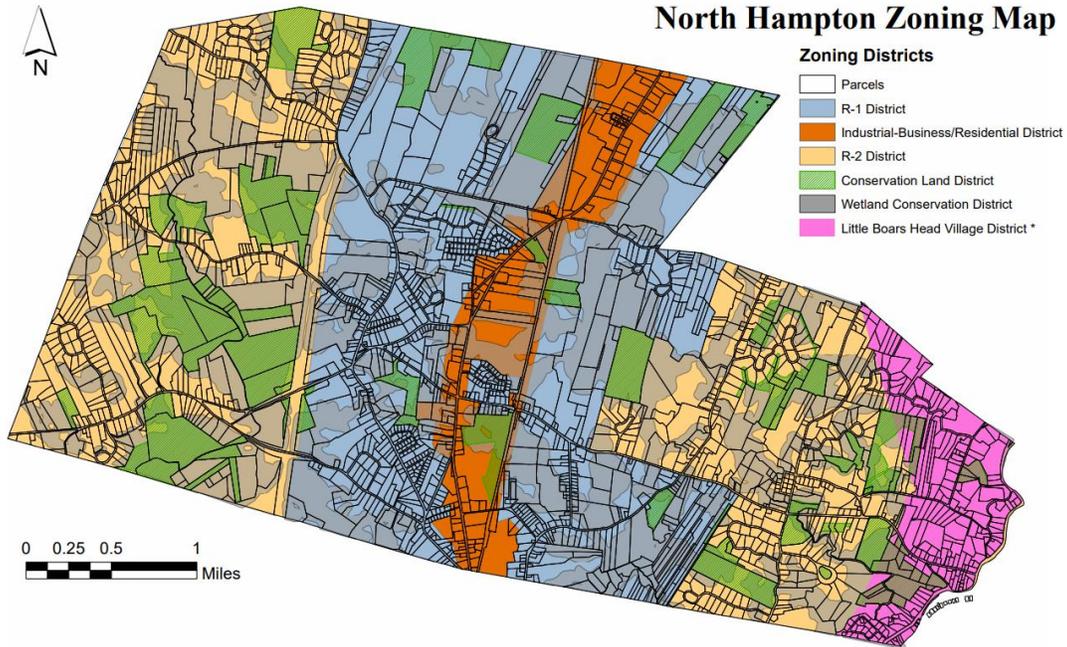
**FIGURE 1: LOCATION MAP OF NORTH HAMPTON, NEW HAMPSHIRE**



North Hampton is 14.4 square miles characterized by forested areas, wetlands, coastal marshes and rocky shores. Surface water in the Town of North Hampton is dominated by the Winnicut River watershed draining to the northwest, Little River and coastal drainage draining to the east, and the Atlantic Ocean (Figure 2). North Hampton has a scattering of small ponds, one large impounded at the Mill Road Dam along the Little River, and multiples tidally influenced creeks and ponds along the coastline.

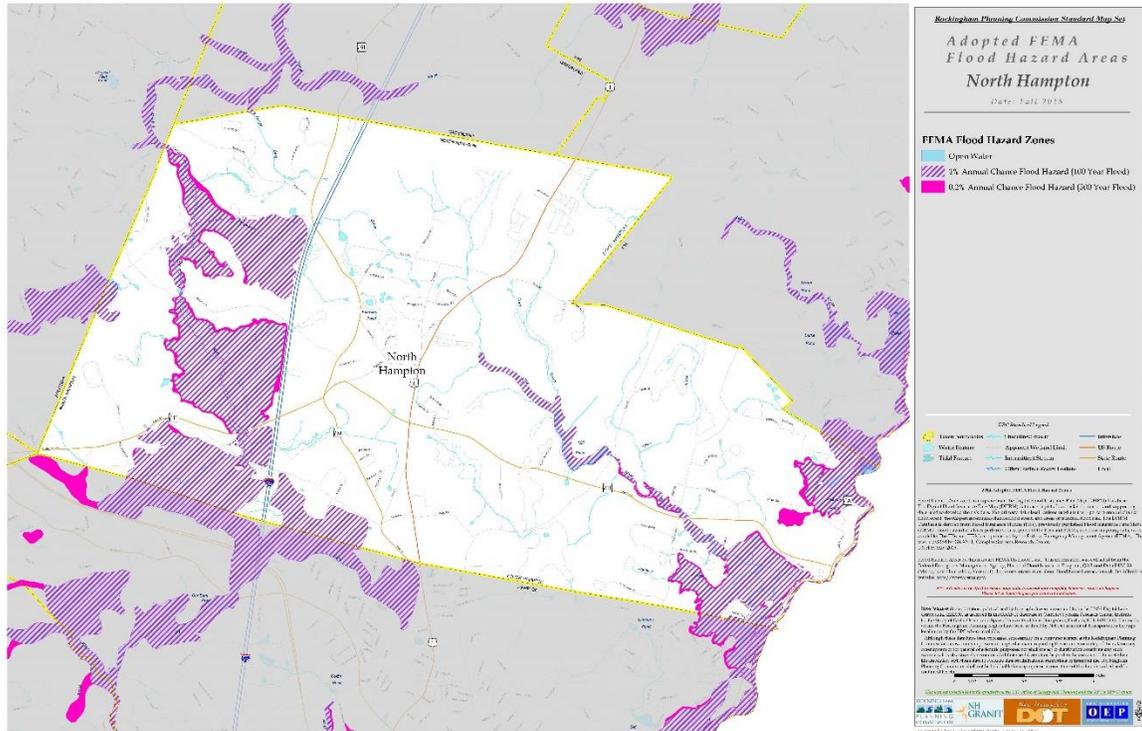


Floodplains for this *Plan* are defined as the 100-year and 500-year flood hazard zones, as depicted on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). Floodplains in the Town of North Hampton are shown in Figure 4. North Hampton **FIGURE 3 - NORTH HAMPTON ZONING DISTRICTS; LITTLE BOARS HEAD VILLAGE DISTRICT (PINK).**



\* Parcels located within the Little Boars Head Village District are subject to the Village District's adopted zoning ordinances and not the Town of North Hampton's zoning ordinances.

maintains participation in the National Flood Insurance Program (NFIP) administered by FEMA. (In 2017, the Little Boars Head Village District (as shown in Figure 3) became a participant in the NFIP as an independent political entity for zoning authority from the town; the Village District maintains.) Development should be located away from wetlands and floodplains whenever possible. The filling of wetlands for building construction not only destroys wetlands and their numerous benefits, but may also lead to groundwater contamination. Building within a flood zone may also reduce the floodplain's ability to absorb and retain water during periods of excessive precipitation and runoff. Moreover, in regard to building within floodplains, contamination may result from flood damage to septic systems.



**FIGURE 4: FLOODPLAINS OF NORTH HAMPTON, NEW HAMPSHIRE**

## Land Use and Development

A land use map was prepared for this Plan using data from the New Hampshire GIS data repository, GRANIT (The New Hampshire Geographically Referenced Analysis and Information Transfer System). The land use data was created by Rockingham Planning Commission from 2010 aerial photos. The data was developed by interpreting one-foot resolution color photos at a scale of 1:12,000, followed by field checking as needed. For more information on this data layer please visit <http://granit.sr.unh.edu>. This data is presented in Map 1: North Hampton Current Land Use.

Development is predicated on the Town of North Hampton Zoning Ordinance. The Town is divided into three zoning districts in which development is permitted, as seen in Figure 3 above. These three zones are: High Density Residential, Medium Density Residential and Industrial-Business/Residential. For more information on these specific zones see the North Hampton Zoning Ordinance.

The population growth for the Town is expected not to exceed 4,733 in 2025. The commercial growth is expected to be concentrated along Route 1 and to include the renovation and replacement of some of the businesses by others that involve more intense utilization of the real estate. Figure 5 below illustrates the land use change North Hampton has experienced from 2010 to 2015, with the main changes being an increase in residential land use and industrial/commercial uses, and very minimal changes to wetland areas.

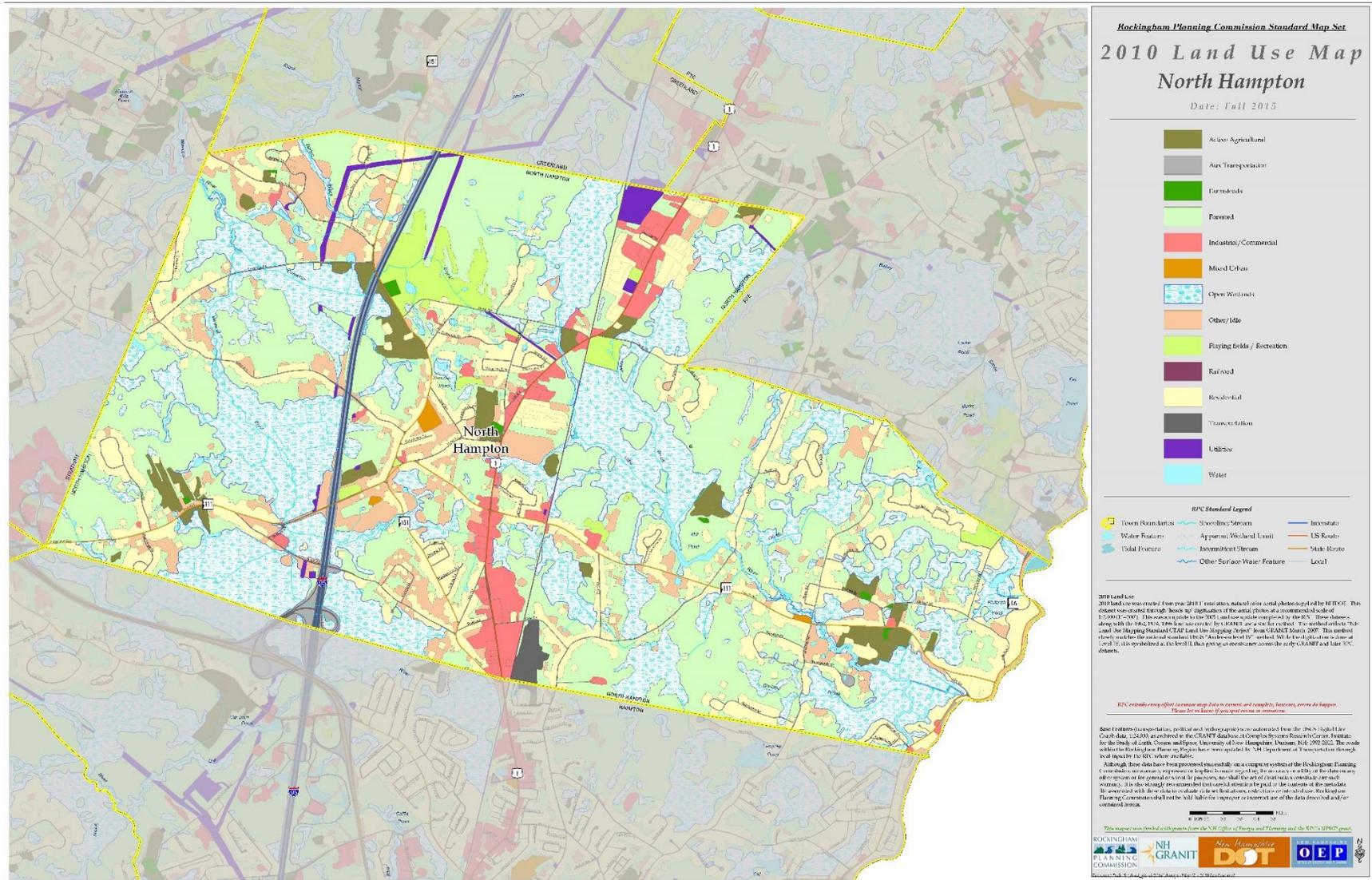
North Hampton has not seen significant changes in development since the last plan, with only a small increase in development of residential and commercial land uses. However, these changes in land use have occurred in areas that are less vulnerable to most natural hazards and the town

has land use and building restrictions (floodplain, stormwater, steep slopes, etc.) to mitigate the impact of this development. Due to this, the communities vulnerability remains the same.

**FIGURE 5 – NORTH HAMPTON LAND USE CHANGE**

North Hampton Land Use Change (Acres)				
Land use Type	2010	2015	2010 to 2015 Total Change	2010 to 2015 Percent Change
Active Agricultural	233.6	239.8	6.2	2.7%
Aux Transportation	58.6	58.0	-0.6	-1.0%
Farmsteads	12.4	8.8	-3.6	-29.0%
Forested	3,009.7	2,964.1	-45.6	-1.5%
Industrial/Commercial	281.8	289.1	7.3	2.6%
Mixed Urban	13.9	13.9	0.0	0.0%
Open Wetlands	2,486.2	2,484.6	-1.6	-0.1%
Other/Idle	646.0	619.3	-26.7	-4.1%
Playing fields / Recreation*	190.0	183.0	-7.0	-3.7%
Railroad	8.9	8.9	0.0	0.0%
Residential	1,611.8	1,666.1	54.3	3.4%
Transportation	239.8	256.7	16.9	7.0%
Utilities	74.6	74.8	0.2	0.3%
Water	55.6	55.6	0.0	0.0%
<b>Grand Total</b>		<b>8,922.7</b>		
*Many Playing Fields were changed in 2015 to ensure that those in proximity to a school were classified as Education (Industrial/Commercial).				

Map 1 – Land Use Map



## What are the Hazards?

The first step in planning for natural hazard mitigation is to identify hazards that may affect the Town. Some communities are more susceptible to certain hazards (i.e., flooding near rivers, hurricanes on the seacoast, etc.). Due to topography and location as well as the history of hazard events that have impacted North Hampton, several types of natural hazards were identified and are analyzed as part of this plan. These hazards include: flooding, hurricanes or other high-wind events, severe winter weather, wildfires, earthquakes, drought, extreme temperatures, and extreme weather, such as extreme precipitation events. Other natural hazards can and do affect the Town of North Hampton. However, the hazards listed above are those hazards prioritized by the Committee for mitigation planning. These are the hazards that are considered to occur with regularity and/or are considered to have high damage potential in North Hampton.

Natural hazards that are included in the State's Multi-Hazard Mitigation Plan Update 2013 that are not included in the *Plan* include: landslide, subsidence, radon and avalanche. Subsidence and avalanche are rated by the State as having Low and No risk in Rockingham County, respectively; accordingly, they were left out of the *Plan*. North Hampton has no record of landslides and little chance of one occurring that could possibly damage property or cause injury; so landslides were not included in this *Plan*. The State's Plan indicates that Rockingham County is at Moderate risk to radon and this hazard was not included in the *Plan*. When compared to natural hazards that could be potentially devastating to the Town (earthquakes or hurricanes) or natural hazards that occur with regularity (flooding or severe winter weather) it was not considered an effective use of the Committee time to include landslide, subsidence and radon in the *Plan* at this time. When the *Plan* is revised and updated in the future, possible inclusion of these hazards will be reevaluated.

## HAZARD DEFINITIONS

**Flooding** - Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, and/or inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage, and water supply contamination. Floods can also disrupt travel routes on roads and bridges.

Inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow; however, floods can occur at any time of the year. A sudden thaw in the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to go.

**Coastal Flooding** - Coastal flooding is defined by the National Oceanic and Atmospheric Administration (NOAA) as flooding which occurs when water is driven onto land from an adjacent body of water. This generally occurs when there are significant storms, such as tropical and extratropical cyclones.<sup>18</sup> Coastal flooding can also occur with high tides in many locations. Also described as "nuisance", "sunny-day" and "recurrent" flooding, minor high tide flooding is becoming increasingly common with little or no concurrent storm effects.<sup>19,20</sup> By definition, flooding in coastal areas caused by precipitation is considered inland (riverine) flooding; however it is important to note that the combination of heavy rain and coastal flooding can lead to compound flooding in coastal regions.<sup>21</sup> Coastal flooding not only results in the many problems identified for riverine flooding, but could also include additional issues resulting from storms

and/or recurrent flooding. These problems can include, but are not limited to—beach and shoreline erosion; loss or submergence of wetlands, other coastal ecosystems, and developed land; impacts from saltwater intrusion and high groundwater tables; loss of coastal structures (sea walls, piers, bulkheads, bridges, or buildings); overwhelmed public infrastructure; water quality impairments; and hazardous waste exposure. Loss of life and property damage can be more severe in coastal storm events due to velocity wave action and accompanying winds.

**100-year Floodplain Events** - Floodplains are usually located in lowlands near rivers, and flood on a regular basis. The term “100 year flood” does not mean that flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase “1% annual chance flood”. What this means is there is a 1% chance of a flood of a particular size happening in any year.

**Erosion and Mudslides** - Erosion is the process of wind and water wearing away soil. Typically in New Hampshire, the land along rivers is relatively heavily developed. Mudslides may be formed when a layer of soil atop a slope becomes saturated as a result of significant precipitation and slides along a more cohesive layer of soil or rock. Erosion and mudslides become significant threats to development during floods. Floods speed up the process of erosion and increase the risk of mudslides.

**Rapid Snow Pack Melt** - Warm temperatures and heavy rains cause rapid snowmelt. Quickly melting snow coupled with moderate to heavy rains are prime conditions for flooding.

**River Ice Jams** - Rising waters in early spring often breaks ice into chunks, which float downstream and often pile up, causing flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures present significant flooding threats to bridges, roads, and the surrounding lands.

**Dam Breach and Failure** - Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods are extremely dangerous and pose a significant threat to both life and property.

**Severe Storms** - Flooding associated with severe storms can inflict heavy damage to property. Heavy rains during severe storms are a common cause of inland flooding.

**High Wind Events** - Significantly high winds occur especially during hurricanes, tornadoes, winter storms and thunderstorms. Toppled trees, falling limbs and downed power lines are dangerous risks associated with high winds. In some instances, prolonged loss of power can result in additional risks to certain populations who require specialized medical equipment.

**Hurricanes** - A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. High winds are a primary cause of hurricane-inflicted loss of life and property damage. The Saffir–Simpson hurricane wind scale (SSHWS), or the Saffir–Simpson hurricane scale (SSHS) for short, classifies hurricanes (western hemisphere tropical cyclones that exceed the intensities of tropical depressions and tropical storms) into five categories distinguished by the intensities of their sustained winds. To be classified as a hurricane, a tropical cyclone must have maximum sustained winds of at least 74 mph. (Category 1). The highest classification in the scale, Category 5, is reserved for storms with winds exceeding 156 mph. The Saffir/Simpson Hurricane Scale is included in Appendix C.

**Tornadoes** - A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity and the convergence of warm, moist air at low levels with cooler, drier air aloft. Most tornadoes remain suspended in the atmosphere, but if they touch down they become a force of destruction.

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

The Enhanced Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes (see Appendix D). A tornado is usually accompanied by thunder, lightning, heavy rain, and a loud "freight train" noise. In comparison with a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

**Severe Thunderstorms** - All thunderstorms contain lightning. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, which can damage building walls and break glass.

**Lightning** - Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Lightning strikes can cause death, injury and property damage.

**Hail** - Hailstones are balls of ice that grow as they are held up by winds, known as updrafts, which blow upwards in thunderstorms. The updrafts carry droplets of supercooled water – water at/or below freezing temperature – but not yet ice. The supercooled water droplets hit the balls of ice and freeze instantly, making the hailstones grow. The faster the updraft, the bigger the stones become. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. Details of how hailstones grow are complicated, but the results are irregular balls of ice that can be as large as baseballs, sometimes even bigger. While crops are the major victims, hail is also a hazard to vehicles and windows.

**Severe Winter Weather** - Ice and snow events typically occur during the winter months and can cause loss of life, property damage and tree damage.

**Heavy Snow Storms** - A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

**Ice Storms** - An ice storm involves rain, which freezes upon impact. Ice coating at least one-quarter inch in thickness is heavy enough to damage trees, overhead wires and similar objects. Ice storms often produce widespread power outages.

**Wildfire** - Wildfire is defined as an uncontrolled fire in combustible vegetation in the wilderness or countryside.

**Forest Fires and Grass Fires** - A forest fire is an uncontrolled fire in a woody area. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. Grass fires are uncontrolled fires in grassy areas.

**Earthquakes** - Geologic events are often associated with California, but New England is considered a moderate risk earthquake zone. An earthquake is a rapid shaking of the ground caused by the breaking and shifting of tectonic plates beneath the surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale is included in Appendix E.

**Extreme Temperatures** - Extreme temperatures are typically recognized as conditions where temperatures consistently stay ten degrees or more above a region's average high temperature for a 24-72 hours (extreme heat), or stay ten degrees or more below a region's average low temperature for a 24-72 hour period (extreme cold). Fatalities can result from extreme temperatures, as they can push the human body beyond its limits. The Town is developing an extreme temperature plan utilizing the Library as a heating/cooling center.

**Drought** - Drought is a period of unusually constant dry weather that persists long enough to cause deficiencies in water supply (surface or underground). Droughts are slow-onset hazards, but, over time, they can severely affect municipal water supplies, crops, recreation resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make area more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

**Extreme Precipitation Events** - Research shows the climate of New Hampshire and the Seacoast region has changed over the past century, and predicts the future climate of the region will be affected by human activities that are warming the planet. Overall, New England has been getting warmer and wetter over the last century, and the rate of change has increased over the last four decades. The challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels could significantly alter the types and magnitudes of hazards faced by North Hampton.

## **Profile of Past and Potential Natural Hazards**

As discussed above the natural hazards that affect, or potentially could affect the Town, that were identified for designation in this *Plan* include: flooding, hurricanes-high wind events, severe winter weather, wildfire, earthquakes, drought, extreme temperatures, and extreme weather. The hazard profiles below include: a description of the events included as part of the natural hazard, the geographic location of each natural hazard (if applicable), the extent of the natural hazard (e.g. magnitude or severity), probability, past occurrences, and community vulnerability. Past occurrences of natural hazards were mapped if possible (Map 2: Past and Future Hazards). Some of the natural hazards have not occurred within the Town of North Hampton (within written

memory), for these hazards the *Plan* refers to a table of hazards that have occurred regionally and statewide (Table 3). Community vulnerability identifies the specific areas, general type of structures, specific structures, or general vulnerability of the Town of North Hampton to each natural hazard.

The **extent** of a hazard is the strength or magnitude of a hazard. For this plan extent will be described as Minimal, Moderate or Severe if there is no other appropriate scale to use or data on the extent is limited. These terms are defined as follows: Minimal – local residents can handle the hazard event without help from outside sources. Moderate - county or regional assistance is needed to survive and/or recover. Severe – state or federal assistance is necessary to survive and/or recover. **Probability** was defined as high, a roughly 66-100% chance of reoccurrence within the next 25 years; moderate, roughly a 33-66% chance of reoccurrence within the next 25 years; and low, roughly a 0-33% of reoccurrence within the next 25 years.

### **Flooding**

Description: Flooding events can include hurricanes, 100-year floods, debris-impacted infrastructure, erosion, mudslides, rapid snow pack melt, river ice jams, and dam breach and/or failure.

Location: North Hampton is vulnerable to flooding in several locations. Generally, the Town is at risk within the Flood Zones identified by FEMA on Flood Insurance Rate Maps (FIRM). As can be seen in Figure 4 in Chapter 2, North Hampton has two major flood zones: A and X. These flood zones correspond to the Special Flood Hazard Area (100-year flood zone) and the 500-year flood zone respectively. There are also several areas susceptible to flooding that are not within these flood zones, these areas are described below and displayed on Map 2: Past and Future Hazards.

Extent: The extent of flooding in North Hampton can range from minimal to severe. Minimal flooding can result in high water alongside roads and in yards; severe flooding can result in washed out roads and homes and businesses isolated by high and fast moving water. The extent of the flood zones can be seen in Map 2: Past and Future Hazards. This area includes FIRM Zones A and X, as well as, areas of locally chronic flood problems.

Probability: **High**.

**TABLE 1: PROBABILITY OF FLOODING BASED ON RETURN INTERVAL**

Flood Return Interval	Chance of Occurrence in Any Given Year
10-year	10%
50-year	2%
100-year	1%
500-year	0.2%

Past Occurrence: Flooding is a common hazard for the Town of North Hampton. Several locations were identified by the Committee as areas of chronic reoccurring flooding or high potential for future flooding. These areas are indicated on Map 2 as identified flood prone areas.

Community Vulnerability: Flooding is most likely to occur in the 100-year flood zones. These zones are located along the banks of the Little River and its tributaries, in proximity to wetlands, and in the areas listed above. Flooding events in North Hampton and southern NH have

increased and the Town should consider innovative techniques and adaptation measures to handle this increased vulnerability to storm events and climate change.

#### National Flood Insurance Program (NFIP)

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer funded disaster relief for flood victim and the increasing amount of damage caused by floods. The Federal Insurance and Mitigation Administration (FIMA) a component of the Federal Emergency Management Agency (FEMA) manages the NFIP, and oversees the floodplain management and mapping components of the program.

Communities participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce flood damage. In exchange, the NFIP makes federally subsidized flood insurance available to homeowners, renters, and business owners in these communities. Flood insurance, Federal Grants and loans, Federal disaster assistance and federal mortgage insurance is unavailable for the acquisition or construction of structures located in the floodplain shown on the NFIP maps for those communities that do not participate in the program.

To get secure financing to buy, build or improve structures in the Special Flood Hazard Areas, it is legally required by federal law to purchase flood insurance. Lending institutions that are federally regulated or federally insured must determine if the structure is located in the SFHA and must provide written notice requiring flood insurance. Flood insurance is available to any property owner located in a community participating in NFIP. Flood damage is reduced by nearly \$1 billion a year through partnerships with communities, the insurance industry, and the lending industry. Further, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance. Additionally, every \$3 paid in flood insurance claims saves \$1 in disaster assistance payments.

The NFIP is self-supporting for the average historical loss year, which means that operating expenses and flood insurance claims are not paid for by the taxpayer, but through premiums collected for flood insurance policies. The program has borrowing authority from the U.S. Treasury for times when losses are heavy; however, these loans are paid back with interest.

#### Repetitive Loss Properties

A specific target group of repetitive loss properties is identified and serviced separately from other NFIP policies by the Special Direct Facility (SDF). The target group includes every NFIP insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced four or more paid losses, two paid flood losses within a 10-year period that equal or exceed the current value of the insured property, or three or more paid losses that equal or exceed the current value of the insured property, regardless of any changes of ownership, since the buildings construction or back to 1978. Target group policies are afforded coverage, whether new or renewal, only through the SDF.

The FEMA Regional Office provides information about repetitive loss properties to State and local floodplain management officials. The FEMA Regional Office may also offer property owners building inspection and financial incentives for undertaking measures to mitigate future flood losses. These measures include elevating buildings from the flood area, and in some cases drainage improvement projects. If the property owners agree to mitigation measures, their property may be removed from the target list and would no longer be serviced by the SDF.

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#### **Table 2: North Hampton NFIP Policy and Loss Statistics**

Policies in force	Insurance in Force	Number of Paid Losses (since 1986)	Total Losses Paid (Since 1982)
58	\$13,052,100	36	\$470,421
Source: FEMA Policy and claims database, as of November 2017			

#### North Hampton NFIP Repetitive Flooding Losses

North Hampton joined the Regular Program of the NFIP on June 3, 1986. North Hampton is part of the Rockingham County DFIRMs and FIS, which are both dated May 17, 2005. North Hampton has had 2 repetitive loss residential properties according to New Hampshire Office of Strategic Initiatives(NHOSI) records. This is determined by any repetitive damage claims on those properties that hold flood insurance through the NFIP.

#### Floodplain Management Goals/Reducing Flood Risks

A major objective to floodplain management is to continue participation in the NFIP. Communities that agree to manage Special Flood hazard Areas shown on NFIP maps participate in the NFIP by adopting minimum standards. The minimum requirements are the adoption of the floodplain Ordinances and Subdivision/Site Plan Review requirements for land designated as Special Flood hazard Areas. Under Federal Law, any structure located in the floodplain is required to have flood insurance. Federally subsidized flood insurance is available to any property owner located in a community participating in the NFIP. Communities that fail to comply with the NFIP will be put on probation and/or suspended. Probation is a first warning where all policy holders receive a letter notifying them of a \$50 increase in their insurance. In the event of suspension, the policyholders lose their NFIP insurance and are left to purchase insurance in the private sector, which is of significantly higher cost. If a community is having difficulty complying with NFIP policies, FEMA is available to meet with staff and volunteers to work through the difficulties and clear up any confusion before placing the community on probation or suspension.

#### Potential Administrative Techniques to Minimize Flood Losses in North Hampton

A potential step in mitigating flood damage is participating in NFIP. North Hampton continues to consistently enforce NFIP compliant policies in order to continue its participation in this program and has effectively worked within the provisions of NFIP. Below is a list of actions North Hampton should consider, or continue to perform, in order to comply with NFIP:

- Participate in NFIP training offered by the State and/or FEMA (or in other training) that addresses flood hazard planning and management;
- Establish Mutual Aid Agreements with neighboring communities to address administering the NFIP following a major storm event;
- Address NFIP monitoring and compliance activities;
- Revise/adopt subdivision regulations, erosion control regulations, board of health regulations to improve floodplain management in the community;
- Prepare, distribute or make available NFIP insurance and building codes explanatory pamphlets or booklets;
- Identify and become knowledgeable of non-compliant structures in the community;
- Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE), if they are in the floodplain;
- Require the use of elevation certificates;
- Enhance local officials, builders, developers, local citizens and other stakeholders' knowledge of how to read and interpret the FIRM;

- Work with elected officials, the state and FEMA to correct existing compliance issues and prevent any future NFIP compliance issues through continuous communications, training and education.

### **Coastal Flooding**

The flooding of low-lying areas on the New Hampshire coast is a natural phenomenon and has occurred for centuries. Coastal flooding in the region primarily occurs due to major rain storms and nor'easters with the added combination of full-moon tides, causing storm surge and wave effects. In some areas, human activities, particularly disruption of natural protective coastal features (e.g. dunes or wetlands) or the lowering of land as a consequence of drainage, may also have aggravated the coastal flooding hazard.

A study by John Cannon from NOAA identified 96 major coastal inundation/storm surge events between 1914 and 2007, and 37 events between 1980 and 2007 (<http://www.erh.noaa.gov/ssd/erps/ta/ta2007-03.pdf>).

This study shows several facts about the way storm surges occur on our coast:

- 1) 83% of storms happen in the colder months of October through March.
- 2) Tidal flooding, although relatively infrequent, tends to cluster with two or more events in a single year.
- 3) While most flooding occurs with high tides (above 12 ft.) many happen at lower tides due to wind, wave and tidal water "piling".
- 4) Storm surge can be very difficult to predict due to the complexities of the shape of our coast and variability in meteorological data.

Description: The flooding of low-lying areas on the New Hampshire coast is a natural phenomenon and has occurred for centuries. Coastal floods are caused by extreme sea levels, which arise as a combination of four main factors: waves, astronomical tides, storm surges, and relative mean sea level. Rainfall can exacerbate coastal flooding, leading to compounded impacts. New Hampshire experiences coastal flooding from episodic coastal inundation that result from tropical cyclones (hurricanes) and extratropical storms (Nor'easters) and occasional high tides, as well as chronic coastal inundation due to sea-level rise. Select episodic and chronic coastal inundation factors are defined below:

- **Storm surge:** Storm surge is produced by storm winds that drive ocean waters onshore, resulting in a short-term rise in sea level. The abnormal rise in sea level can cause extreme flooding in coastal areas, particularly when storm surge coincides with high tide. Storm surges can be further exacerbated by surface wave action caused by the friction between wind and water. Wave action, in particular, can cause significant damage.
- **Tidal/high-tide/nuisance flooding:** High tide flooding, also described as "nuisance", "sunnyday" and "recurrent" flooding, is flooding that leads to public inconveniences, such as road closures. It is increasingly common as coastal sea levels rise and developed areas expand and change drainage patterns in coastal areas. It is often caused by or exacerbated during astronomical spring tides when the gravitational pull of the sun is 'added' to that of the moon, causing high tides to be higher and low tides to be lower than normal. This type of minor flooding often occurs with little or no concurrent storm effects.

- **Compound flooding** (i.e., freshwater flooding + storm surge and/or high tide): Compound flooding can occur when storm surge and heavy precipitation happen concurrently. High tidal or surge water levels can impede stormwater draining into the sea, causing flooding inland. High rainfall can add yet more water to an existing tidal flood, as illustrated in the figure below. The risks of flood impacts from compound flooding in low-lying coastal areas is often much greater than from either coastal flooding or inland flooding in isolation.
- **Sea-level rise:** Global mean sea levels rose 0.7 inches per decade between 1900 and 1993. In 1993, the sea-level rise rate increased to 1.3 inches per decade. Sea levels are expected to continue rising at an accelerating rate well beyond the end of the 21st century due to natural and human-driven changes to the global climate and local landscape. The causes and best available projections for sea-level rise in New Hampshire are shown in the two figures. In 2014, the New Hampshire Coastal Risk and Hazards Commission Science and Technical Advisory Panel (STAP) published a summary of best available science on storm surge, sea-level rise, and extreme precipitation projections. The report states that, using 1992 as a baseline, coastal New Hampshire's sea levels would rise between 0.6 and 2.0 feet by 2050 and between 1.6 and 6.6 feet by 2100. North Hampton's expected sea-level rise is depicted in Map 4 – Project Sea -Level and Storm Surge.
- **Groundwater rise:** In coastal areas, groundwater flows from recharge areas to discharge areas along the shoreline. As sea-level rises, the groundwater levels near the coast also rise until a new equilibrium is established between aquifer recharge and groundwater discharge to the sea. Modeling shows that groundwater rise driven by sea-level rise may cause flooding in areas where groundwater levels are already high, not only along the coast but also at significant distances inland.

Human activities, such as disruption of natural protective coastal features (dunes, wetlands, etc.) and the lowering of land to create better drainage, have aggravated the coastal flooding hazard in some areas. Roads directly parallel to the coastline, such as New Hampshire Route 1A that run through North Hampton and the Little Boar's Head Village District, are prone to splash over when storms combined with high tide, which can compromise transportation routes. Further, roads that cross tidal marshes can be flooded under similar circumstances, creating potential impacts to egress, in the event of the need to evacuate. This problem is often exacerbated by undersized culvert infrastructure that is inadequate to adequately pass storm flows.

Location: New Hampshire has 235 miles of coastline, including 18.57 miles of shoreline exposed to the Atlantic Ocean (New Hampshire Office of Strategic Initiatives). North Hampton's entire eastern boundary is exposed to the Atlantic Ocean. The Atlantic Coast is characterized by tidal and riverine systems and landforms. The northern Atlantic Coast, of which North Hampton is part of, is marked by prominent bedrock headlands, small cove beaches, and tidal waterways that extend far inland. The primary inland riverine systems include the Taylor River and Winnicut River.

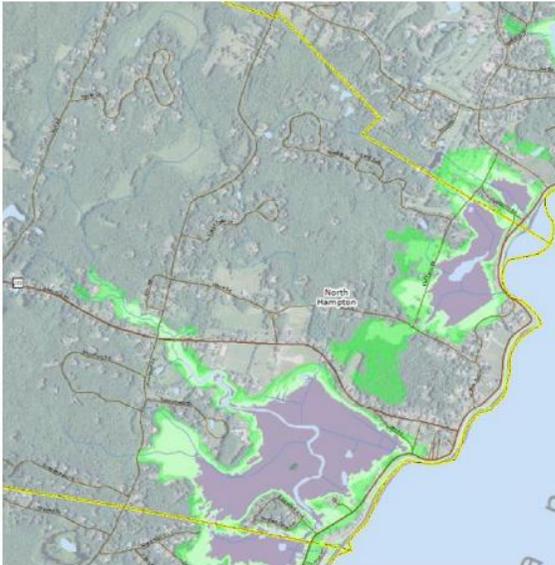
Extent: The 2015 study done by Rockingham Planning Commission, *Tides to Storm Report: Assessing Risk and Vulnerability to Sea-level rise and Storm Surge: A Vulnerability Assessment of Coastal New Hampshire* identified several areas of North Hampton near the Atlantic Coast and saltmarsh areas, particularly in the Little Boar's Head Village District, that are susceptible to storm surge and sea-level rise under various climate change scenarios.

VULNERABILITY ASSESSMENT REPORT FOR THE TOWN OF NORTH HAMPTON, NEW HAMPSHIRE

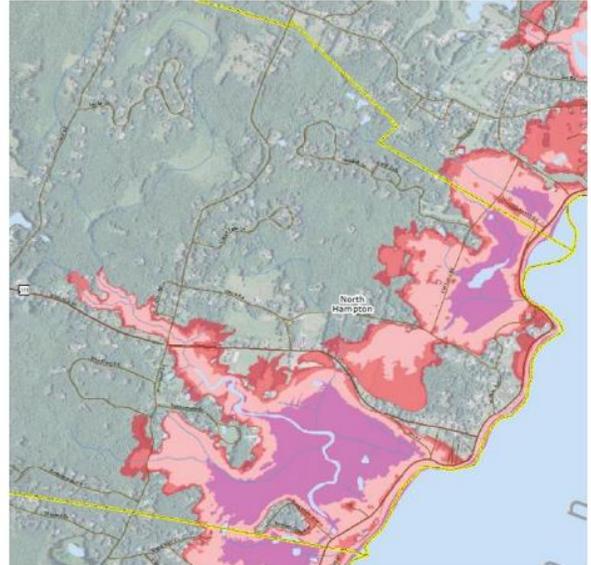
Extent of Flooding from Sea-Level Rise and Storm Surge

The green and pink color schemes are arranged from lightest to darkest with increasing flood levels and extents.

**Figure 4.**  
Sea-Level Rise Scenarios 1.7 feet, 4.0 feet and 6.3 feet



**Figure 5.**  
Sea-Level Rise Scenarios 1.7 feet, 4.0 feet and 6.3 feet plus storm surge



*Note: Storm surge is the area flooded by the 100-year/1% chance storm event.*

**MAP 4 NORTH HAMPTON VULNERABILITY ASSESSMENT EXTENDED FLOODING FROM SEA-LEVEL RISE AND STORM SURGE. (RPC, 2015)**

**Probability: High.** The State of New Hampshire’s Natural Hazards Mitigation Plan Update 2013 rates Rockingham County with high likelihood of coastal flooding.

**Past Occurrence:** According to NOAA’s Centers for Environmental Information, New Hampshire experienced 46 coastal flood events between 1950 and 2017. While no deaths due to coastal flood events were reported during that period, 37 of the events resulted in property damage. North Hampton has experienced multiple occurrences of flooding associated with tidal waters and storm surge since the 2012 Plan Update.

**Community Vulnerability:** The Committee determined that the portion of North Hampton susceptible to coastal flooding is the area depicted on Map 2 – Past and Future Hazards, with future areas of potential risk due to sea level rise high winds. The following infrastructure in North Hampton is at most risk as identified in Map 4 – North Hampton Vulnerability Assessment Extended Flooding From Sea Level Rise and Storm Surge.

Sea-Level Rise (SLR) Scenarios	SLR 1.7 feet	SLR 4.0 feet	SLR 6.3 feet	SLR 1.7 feet + storm surge	SLR 4.0 feet + storm surge	SLR 6.3 feet + storm surge
Infrastructure (# of sites)	1	7	9	10	15	16
Critical Facilities (# of sites)	1	2	2	2	4	7
Roadways (miles)	0.0	0.7	1.3	1.3	2.6	3.3
Upland (acres)	67.8	135.3	215.9	193.5	283.9	358.6
Freshwater Wetlands (acres)	32.5	49.4	71.5	61.9	84.2	95.5
Tidal Wetlands (acres)	18.1	21.3	21.9	22.1	22.1	22.2
Conserved and Public Lands (acres)	8.8	14.8	19.3	19.1	28.4	37.6
100-year floodplain (acres)	69.5	69.5	69.5	69.5	69.5	69.5
500-year floodplain (acres)	135.7	135.7	135.7	135.7	135.7	135.7

*Notes: Storm surge is the area flooded by the 100-year/1% chance storm event. Upland refers to land above mean higher high water (highest tidal extent) and excluding wetlands. 500-year floodplain impacts were calculated based on flooding beyond the extent of the 100-year floodplain impacts.*

The assessment shows that the greatest flood impacts will be to upland areas, conserved lands and freshwater and tidal wetlands. Flooding from both the sea-level rise and storm surge scenarios will impact neighborhoods along North Hampton’s entire coastline.

**Hurricane and High Wind Events**

Description: High wind events can include hurricanes, tornadoes, “Nor’-Easters,” downbursts and lightning/thunderstorm events.

Location: High wind events are more potentially damaging with increasing proximity to the coast. For the Town of North Hampton, any high wind event is likely to have downgraded significantly after making landfall, prior to reaching the town boundary. For this *Plan*, high-wind events were considered to have an equal chance of affecting any part of the Town of North Hampton.

Extent: Hurricane strength is measured using the Saffir-Simpson Scale as located in Appendix C of this plan. North Hampton is located within a Zone II hurricane-susceptible region (indicating a design wind speed of 160 mph)<sup>1</sup>. Between 1900 and 2013 2 hurricanes have made landfall in New Hampshire, a category 1 and a category 2. In Maine, 5 hurricanes have made landfall (all category 1). In Massachusetts, 6 hurricanes have made landfall (2 category 1, 2 category 2 and 2 category 3). From this information it can be extrapolated that North Hampton is a high risk to a hurricane event, with variable wind speeds between 74 – 130 mph (category 1-3).

Tornadoes are measured utilizing the Enhanced Fujita Damage Scale located in Appendix D of this plan. From 1950 to 2013 Rockingham County was subject to 9 recorded tornado events, measured using the previous Fujita Damage Scale, these included 2 type F0 (Gale Tornado, 40-72 mph), 2 type F1 (Moderate Tornado, 73-112 mph), 4 type F2 (Significant Tornado, 113-157 mph) and 1 type F3 (Severe Tornado, 158-206 mph). Type 3 tornados can cause severe damage including tearing the roofs and walls from well-constructed homes, trees can be uprooted, trains over-turned, and cars lifted off the ground and thrown.

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<sup>1</sup> “Understanding Your Risks, Identifying Hazards and Estimating Losses”, FEMA, page 3-22

**Probability: High.** The State of New Hampshire's Natural Hazards Mitigation Plan Update 2013 rates Rockingham County with high likelihood of hurricane, tornado and "Nor'-Easters" events. Also, it rates the risk of downbursts, lightning and hail events as moderate.

**Past Occurrence:** Between 1635 and 2015 14 hurricanes have impacted the State of New Hampshire. The worst of these occurred on September 21, 1938, with wind speeds of up to 186 mph in MA and 138 mph elsewhere. Thirteen of 494 people killed by this storm were residents of New Hampshire. The Storm caused \$12,337,643 in damages (1938 dollars), timber not included. Hurricanes Sandy and Irene created areas of localized flooding in North Hampton and power loss. The Town received \$7,831.69 in funds in 2012 from FEMA for Hurricane Sandy. Tornadoes have not impacted North Hampton in recently memory.

**Community Vulnerability:** The Committee determined that the high winds and heavy rain associated with hurricanes can impact every neighborhood in North Hampton before, during and after the storm, resulting in downed trees, flooding of ponds, rivers, streams, roads and basements, and damage to home, businesses and community infrastructure.

The following infrastructure in North Hampton is at most risk:

- Power lines
- Chimneys
- Trees
- Cell towers

## **Lightning**

**Description:** By definition, all thunderstorms contain lightning. Lightning is a giant spark of electricity that occurs within the atmosphere, or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of 50,000 degrees Fahrenheit, considerably hotter than the surface of the Sun. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, a shock wave that can damage building walls and break glass.

**Location:** The entire town of North Hampton is vulnerable to lightning, but specific area of open fields or saltmarsh areas. The topography of the town is relatively flat, such that taller buildings and structures are at an increased risk of lightning strikes.

**Extent:** Likelihood of damage from a lightning strike is considered minimal. The State of New Hampshire's Natural Hazards Mitigation Plan Update 2013 states that on average, much of New Hampshire has less than two cloud-to ground lightning strikes per square mile per year.

**Probability: Low.** The State of New Hampshire's Natural Hazards Mitigation Plan Update 2013 rates Rockingham County with a low high likelihood of lightning risk.

**Past Occurrence:** North Hampton specifically suffer severe damage to the Town Offices and Emergency Services when the Town Complex was struck during July 2014, resulting in a period where emergency services were without communication capabilities.

**Community Vulnerability:** The Committee determined that lightning can potentially impact all areas, resulting in fires, power outages, and damage to home, businesses and community infrastructure.

The following infrastructure in North Hampton is at most risk:

- Power lines
- Chimneys
- Trees
- Mobile homes
- Cell towers

### **Severe Winter Weather**

Description: There are three types of winter events: blizzards, ice storms and extreme cold. All of these events are a threat to the community with subzero temperatures from extreme wind chill and storms causing low visibility for commuters. Snow storms are known to collapse buildings. Ice storms disrupt power and communication services. Extreme cold affects the elderly

Location: Severe winter weather events have an equal chance of affecting any part of the Town of North Hampton.

Extent: Large snow events in Southeastern New Hampshire can produce 30 inches of snow. Portions of central New Hampshire recorded snowfalls of 98 inches during one slow moving storm February of 1969. Ice storms, which can be measured utilizing the Sperry-Piltz ice accumulation scale as found in Appendix J of this plan, occur with regularity in New England. Seven severe ice storms have been recorded that affected New Hampshire since 1929. These events caused disruption of transportation, loss of power and millions of dollars in property damage.

Probability: **High.** The State of New Hampshire's Natural Hazards Mitigation Plan rates Rockingham County with high likelihood of heavy snows and ice storms.

Past Occurrence: North Hampton has been impacted by severe winter storms in the past five years. A storm on January 2, 2009 resulted in the removal of tree debris and wind-blown debris. A storm on March 29, 2010 caused flooding that damaged roads and culverts. The "Halloween storm" on October 31, 2011 resulted in widespread power outages, fallen trees, and closed roads. Severe winter storm struck the Town on through multiple days in February 2013 and on March 19, 2013 with heavy snow fall resulting in 48 hours of snow removal. The two most recent storms include March 14-15 in 2017.

Community Vulnerability: Severe winter weather has struck North Hampton and every other community in the region on an annual basis in recent memory. The Committee determined that heavy snow, strong and gusty winds, and frigid temperatures can impact all parts of the Town equally, resulting in downed trees and power lines, extended power outages, and unsafe driving condition. Extended power outages and the resulting loss of heat in homes of elderly residents is of concern. Rapid snow melt after severe winter weather can result in flooding of rivers and streams, posing risk to roads and structures. The Committee identified the following at greatest risk from severe winter weather:

- Elderly and challenged populations
- Power lines
- Trees, including impacts roads on utility rights of way

- Cell towers

## **Wildfires**

Description: Wildfires include grass fires, forest fires and issues with isolated homes and residential areas.

Location: Previous plans identified two wooded areas of Town on the north-end of town and includes the North Hampton Town Forest on Exeter Road near the Hampton/Stratham/Exeter town boundary and the central part of Harriman Road. The Committee has identified that all areas of town are potentially vulnerable to wildfires, particularly forested areas with extensive understory brush buildup.

Extent: A wildfire is defined as a fire in wooded, potentially remote areas that may endanger lives. Wildfire can be measured utilizing the NWCG Classification of fire size<sup>2</sup>. New Hampshire has about 500 wildfires each year; most of these burn less than half an acre. A wildfire in the Town of North Hampton is unlikely, but if a crown fire were to occur it could be very damaging. The Wildland-Urban Interface Scale, a tool to quantify the expected severity of wildfire events in developed areas, is included in Appendix K.

Probability: **Moderate**. The State of New Hampshire's Natural Hazards Mitigation Plan rates Rockingham County with moderate risk to wildfires.

Past Occurrence: The majority of wildfires in North Hampton are minor brush fires. No large fires have occurred within recent memory.

Community Vulnerability: The Committee determined that all forested and open areas in town are prone to wildfires, and the greatest wildfire threat in North Hampton is the result of extended drought that create wildfires. The Committee summarized the threat as follows:

- Structures located near large open vegetated areas prone to lightning strike
- Vulnerability increases during drought events
- Tree debris created by high wind and winter storm events

## **Earthquakes**

Description: including landslides and other geologic hazards related to seismic activity.

Location: An earthquake has an equal chance of affecting all areas in the Town of North Hampton.

Extent: Earthquakes are measured utilizing the Richter Magnitude Scale as detailed in Appendix E of this plan. New England is particularly vulnerable to the injury of its inhabitants and structural damage because of our built environment. Few New England States currently include seismic design in their building codes. Massachusetts introduced earthquake design requirements into their building code in 1975 and Connecticut very recently did so. However, these specifications are for new buildings, or very significantly modified existing buildings only.

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<sup>2</sup> [http://www.nwcg.gov/pms/stds/standards/fire-size-class\\_v1-0.htm#definition](http://www.nwcg.gov/pms/stds/standards/fire-size-class_v1-0.htm#definition)

Existing buildings, bridges, water supply lines, electrical power lines and facilities, etc. have rarely been designed for earthquake forces (New Hampshire has no such code specifications).

**Probability: Moderate.** The State of New Hampshire’s Multi-Hazard Mitigation Plan Update 2013 ranks all of the Counties in the State as being at moderate risk to earthquakes. The Town of North Hampton’s Peak Ground Acceleration (PGA) values range between 6.1 and 21.0<sup>3</sup>. These numbers are associated with how much an earthquake is felt and how much damage it may cause (Table 2).

**TABLE 2: PEAK GROUND ACCELERATION (PGA) VALUES FOR NORTH HAMPTON (INFORMATION FROM STATE AND LOCAL MITIGATION PLANNING, FEMA).**

PGA	Chance of being exceeded in the next 50 years	Perceived Shaking	Potential Damage
6.1	10%	Moderate	Very Light
10.6	5%	Strong	Light
21.0	2%	Very Strong	Moderate

**Past Occurrence:** Large earthquakes have not affected the Town of North Hampton within recent memory.

**Community Vulnerability:** The Committee determined that earthquakes do not pose a frequent threat to North Hampton, but if one were to occur that the most vulnerable structures include:

- Dams,
- Bridges,
- Brick Structures,
- Infrastructure,
- Water and Gas lines, and
- Secondary hazards such as fire, power outages, or hazardous material leak or spill.

### **Extreme Temperatures**

**Description:** Extreme temperatures are typically recognized as conditions where temperatures consistently stay ten degrees or more above a region’s average high temperature for a 24-72 hours (extreme heat), or stay ten degrees or more below a region’s average low temperature for a 24-72 hour period (extreme cold). Fatalities can result from extreme temperatures, as they can push the human body beyond its limits.

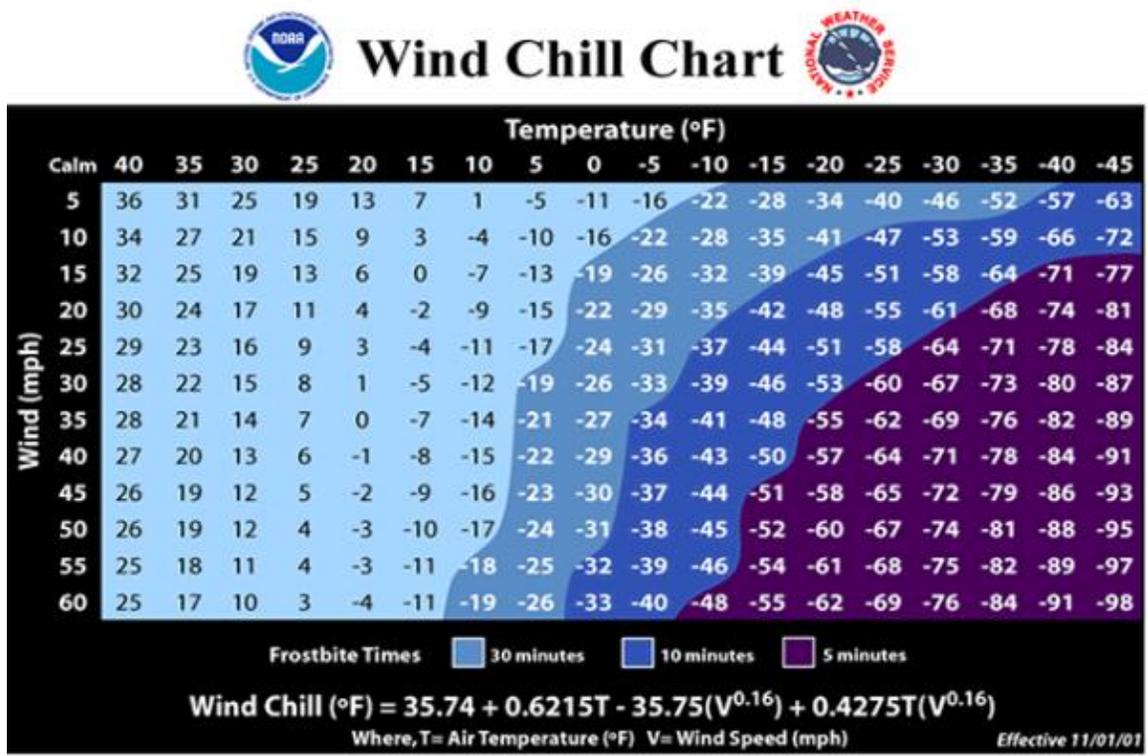
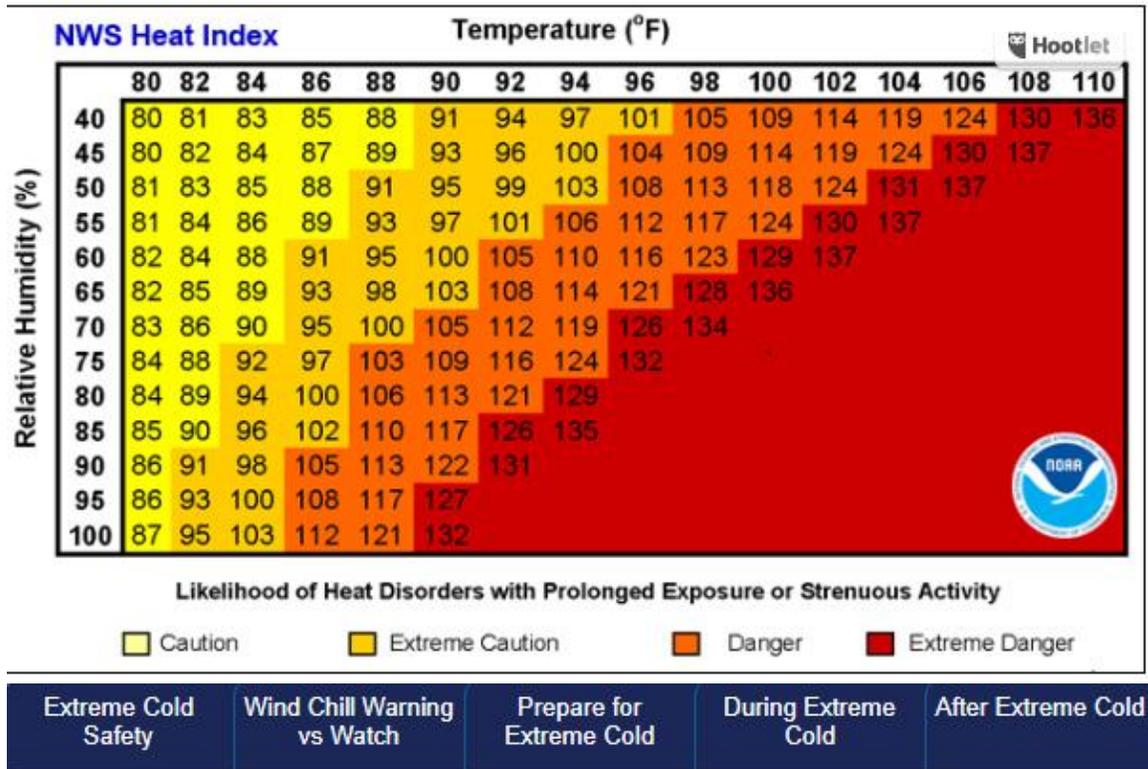
**Location:** Extreme temperatures can affect all areas of North Hampton.

**Extent:** Extreme heat events impact North Hampton for 2-3 days each summer, and extreme cold events impact the Town 5-7 days each winter. NOAA’s Heat Index (available at: <https://www.weather.gov/safety/heat-index>) measures a number in degrees Farenheit that tells how hot it feels when relative humidity is added to the air temperature. NOAA’s Wind Chill Temperature (WCT) Index (<https://www.weather.gov/safety/cold-wind-chill-chart>) uses

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<sup>3</sup> <http://geohazards.cr.usgs.gov/eq/pubmaps/us.pga.050.map.gif>

advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.



Probability: **HIGH**

Past Occurrence: Annually

Community Vulnerability: The Committee determined that all parts of North Hampton are at risk of impacts associated with extreme temperatures. The young, elderly and challenged populations are especially vulnerable to heat stroke. The Emergency Management Director maintains a list of these populations, including addresses for homes, day care centers, and congregate care facilities. These are also listed on Map 3.

## **Drought**

Description: Drought is a period of unusually constant dry weather that persists long enough to cause deficiencies in water supply (surface or underground). Droughts are slow-onset hazards, but, over time, they can severely affect municipal water supplies, crops, recreation resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make area more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

Location: The Committee determined that drought poses risks to water supply throughout North Hampton. Risks of wildfire associated with drought conditions are greatest in the north side of Town, in lower density residential neighborhoods.

Extent: Although New Hampshire is typically thought of as a water-rich state, there are times the demand for water can be difficult to meet. A combination of increased population and extended periods of low precipitation can cause reduced water supplies. Drought can impact North Hampton after extended periods with limited rain and snowfall, often for several months. The NOAA Drought Monitoring Scale is available at:

<https://www.ncdc.noaa.gov/monitoring-references/dyk/drought-legend>

## **U.S. Drought Monitor Scale**

### *Intensity:*

-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

The U.S. Drought Monitor established a drought scale much like those that rate hurricanes and tornadoes. The "D-scale" speaks to the "unusualness" of a drought episode. Over the long run, D1 conditions are expected to occur about 10 to 20 percent of the time. D4 is much rarer, expected less than 2 percent of the time. For more detailed information about drought definitions, please visit the [U.S. Drought Monitor](#).

Probability: **LOW**

Past Occurrence: The State of New Hampshire Multi-Hazard Mitigation Plan Update 2013 rates the Seacoast Region at low risk for drought. However, drought conditions persisted across

southern New Hampshire for much of 2016, including North Hampton. In 2016, some isolated private wells did go dry.

Community Vulnerability: The Committee determined that homes and businesses served by wells are the most vulnerable to drought.

### **Extreme Weather Events – Microbursts, Extreme Precipitation**

Description: Research shows the climate of New Hampshire has changed over the past century, and predicts the future climate of the region will be affected by human activities that are warming the planet. Overall, New England has been getting warmer and wetter over the last century, and the rate of change has increased over the last four decades. In addition, sea-levels are rising, resulting in coastal flooding.

Location: The challenges posed by climate change, such as microbursts and more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher could significantly alter the types and magnitudes of hazards faced by North Hampton. Intense precipitation events and extreme heat can impact all parts of the Town

Extent: Extreme weather events are already impacting North Hampton in the form of increased precipitation and flooding events and coastal flooding. Areas vulnerable to coastal flooding and storm surge due to climate change and rising sea levels are available in Map 4.

Past Occurrence: Hazards associated with extreme weather and a changing climate are occurring annually in North Hampton, including flooding from extreme precipitation events and storm surge from coastal storms.

Community Vulnerability: The Committee determined that climate change impacts North Hampton in the by creating flooding and storm surge of roadways, including evacuation routes.

Table 4: State of New Hampshire  
 Presidentially Declared Disasters (DR) and Emergency Declarations (EM) 1982-2017  
 Source: State of NH Multi-Hazard Mitigation Plan, 2013 Update and 2018 Update DRAFT

All declarations are available at: <https://www.fema.gov/disasters/>

Date Declared	Event	FEMA DR	Program	Amount	Counties Declared
08/27/86	Severe storms/flooding	FEMA-771-DR	PA	\$1,005,000	Cheshire and Hillsborough
04/16/87	Severe storms/flooding	FEMA-789-DR	PA/IA	\$4,888,889	Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, and Sullivan
08/29/90	Severe storms/winds	FEMA-876-DR	PA	\$2,297,777	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, and Sullivan
09/09/91	Hurricane	FEMA-917-DR	PA	\$2,293,449	Statewide
11/13/91	Coastal storm/flooding	FEMA-923-DR	PA/IA	\$1,500,000	Rockingham
03/16/93	Heavy snow	FEMA-3101-DR	PA	\$832,396	Statewide
01/03/96	Storms/floods	FEMA-1077-DR	PA	\$2,220,384	Carroll, Cheshire, Coos, Grafton, Merrimack, and Sullivan
10/29/96	Severe storms/flooding	FEMA-1144-DR	PA	\$2,341,273	Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
01/15/98	Ice storm	FEMA-1199-DR	PA/IA	\$12,446,202	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Strafford, and Sullivan
07/02/98	Severe storms	FEMA-1231-DR	PA/IA	\$3,420,120	Belknap, Carroll, Grafton, Merrimack, Rockingham, and Sullivan
10/18/99	Hurricane/tropical storm Floyd	FEMA-1305-DR	PA	\$750,133	Belknap, Cheshire, and Grafton
March 2001	Snow emergency	FEMA-3166-EM	PA	\$4,500,000	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford
2/17/03 - 2/18/03	Snow emergency	FEMA-3177-EM	PA	\$3,000,000	Cheshire, Hillsborough, Merrimack, Rockingham, and Strafford
09/12/03	Severe storms/flooding	FEMA-1489-DR	PA	\$1,300,000	Cheshire and Sullivan
03/11/03	Snow emergency	FEMA-3177-EM	PA	\$3,000,000	Cheshire, Hillsborough, Merrimack, Rockingham, and Strafford

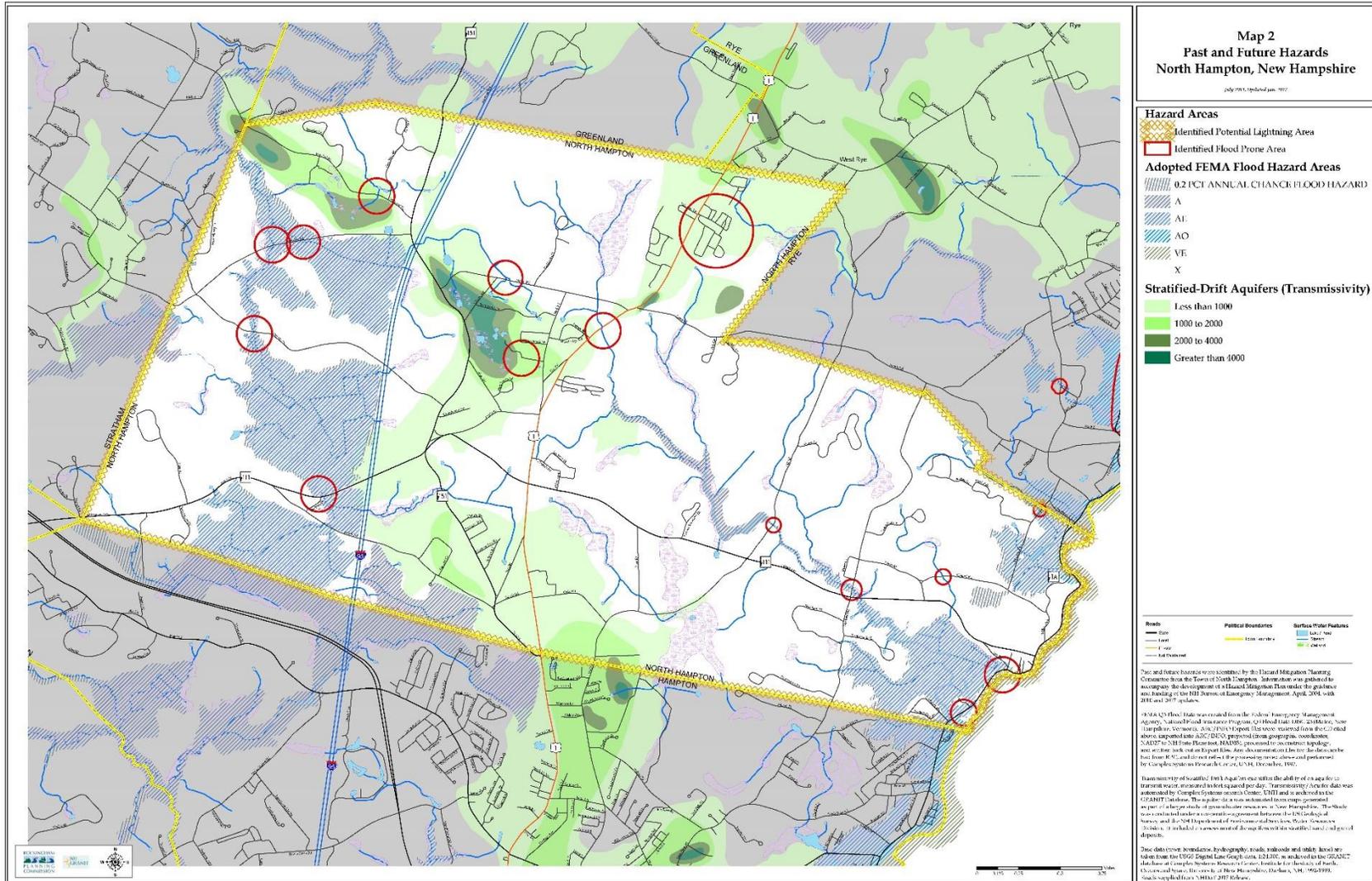
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01/15/04	Snow emergency	FEMA-3193-EM	PA	\$3,200,000	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, and Sullivan
03/30/05	Snow emergency	FEMA-3207-EM	PA	\$4,654,738	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
03/30/05	Snow emergency	FEMA-3208-EM	PA	\$1,417,129	Carroll, Cheshire, Coos, Grafton, and Sullivan
04/28/05	Snow emergency	FEMA-3211-EM	PA	\$2,677,536	Carroll, Cheshire, Hillsborough, Rockingham, and Sullivan
10/26/05	Severe storm/flooding	FEMA-1610-DR	PA/IA	\$14,996,626	Belknap, Cheshire, Grafton, Hillsborough, Merrimack, and Sullivan
05/31/06	Severe storm/flooding	FEMA-1643-DR	PA/IA	\$17,691,586	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford
4/15/07 - 4/23/07	Severe storm/flooding	FEMA-1695-DR	PA/IA	\$27,000,000	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
08/11/08	Severe storms/tornado/flooding	FEMA-1782-DR	PA	\$1,691,240	Belknap, Carroll, Merrimack, Rockingham, and Strafford
09/05/08	Severe storms/flooding	FEMA-1787-DR	PA	\$4,967,595	Belknap, Coos, and Grafton
10/03/08	Severe storms/flooding	FEMA-1799-DR	PA	\$1,050,147	Hillsborough and Merrimack
12/11/08	Severe winter storm	FEMA-3297-EM	DF A/P A	\$900,000	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
01/02/09	Severe winter storm	FEMA-1812-DR	DF A/P A	\$19,789,657	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
03/29/10	Severe winter storm	FEMA-1892-DR	PA	\$9,103,138	Merrimack, Rockingham, Strafford, and Sullivan
05/12/10	Severe winter storm	FEMA-1913-DR	PA	\$3,057,473	Hillsborough and Rockingham
07/22/11	Severe storms/flooding	FEMA-4006-DR	PA	\$1,664,140	Coos and Grafton

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09/03/11	Tropical storm Irene	FEMA-4026-DR	PA/IA	\$11,101,752	Belknap, Carroll, Coos, Grafton, Merrimack, Strafford, and Sullivan
12/07/11	October Nor'easter	FEMA-4049-DR	PA	\$4,411,457	Hillsborough and Rockingham
06/18/12	Severe storms/flooding	FEMA-4065-DR	PA	\$3,046,189	Cheshire
10/30/12	Hurricane Sandy	DR-4095 EM-3360	PA DFA	\$2,132,376	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan
2/8/13 2/10/13	- Severe storm/blizzard	DR-4105	PA	\$6,127,598	Belknap, Carroll, Cheshire, Hillsborough, Merrimack, Strafford, and Rockingham
6/26/13 7/3/13	- Severe storms/flooding	DR-4139	PA	\$6,389,705	Cheshire, Sullivan, and Grafton
1/26/15 1/29/15	- Severe winter storm/snowstorm	DR-4209	PA	\$4,607,527	Strafford, Rockingham, and Hillsborough
3/2/2018	Severe Storm and Flooding	DR-4370	PA		Rockingham
3/13-2018- 3/14-2018	Severe Winter Storm and Snowstorm	DR - 4371	PA	\$738,627.98	Strafford, Rockingham and Carroll

Map 2: Past and Future Hazards



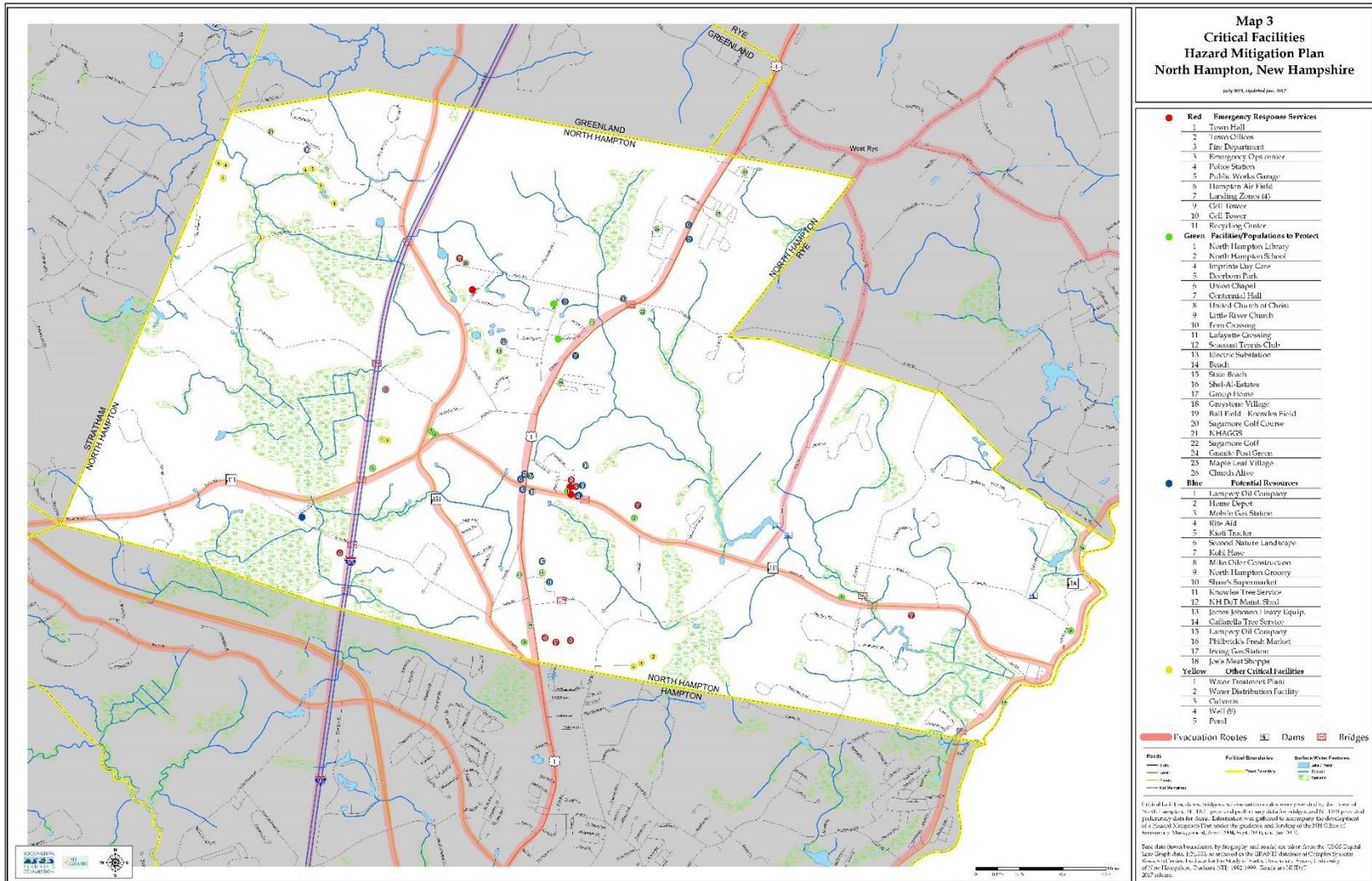
## CRITICAL FACILITIES

The Critical Facilities List for the Town of North Hampton has been identified by North Hampton's Hazard Mitigation Committee. The Critical Facilities List has been broken up into four categories. The *first category* contains facilities needed for Emergency Response in the event of a disaster. The *second category* contains Non-Emergency Response Facilities that have been identified by the committee as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of North Hampton. The *third category* contains Facilities/Populations that the committee wishes to protect in the event of a disaster. The *fourth category* contains Potential Resources, which can provide services or supplies in the event of a disaster. Map 3: Critical Facilities at the end of this Chapter identifies the location of the facilities and the evacuation routes. A detailed description of critical facilities can be found in Table 4.

**TABLE 4: CRITICAL FACILITIES**

<b>Emergency Response Services</b>	<b>Other Critical Facilities</b>	<b>Potential Resources</b>
Town Hall Town Offices Fire Department Emergency Ops center Police Station Public Works Garage Hampton Air Field Landing Zones (4) Cell Tower Cell Tower Recycling Center	Water Treatment Plant Water Distribution Facility Culverts Well (9)	Lamprey Oil Company Home Depot Mobile Gas Station Rite Aid Kioti Tractor Second Nature Landscape Kohl Hase Mike Oiler Construction North Hampton Grocery Shaw's Supermarket Knowles Tree Service
<b>Facilities/Populations to Protect</b>		
North Hampton Library North Hampton School Imprints Day Care Deerborn Park Union Chapel Centennial Hall United Church of Christ Little River Church Fern Crossing Lafayette Crossing Seacoast Tennis Club Electric Substation	Group Home Greystone Village Ball Field - Knowles Field Sagamore Golf Course NHAGGS Sagamore Golf Granite Post Green Maple Leaf Village Church Alive Beach State Beach Shel-Al-Estates	NH DoT Maint. Shed James Johnson Heavy Equip. Caffarella Tree Service Lamprey Oil Company Philbrick's Fresh Market Irving Gas Station Joe's Meat Shoppe

**MAP 3 – Critical Facilities**



## Determining How Much Will Be Affected

### Identifying Vulnerable Facilities

It is important to determine which critical facilities are the most vulnerable and to estimate their potential loss. The first step is to identify the facilities most likely to be damaged in a hazard event. To do this, the location of critical facilities illustrated on Map 3 was compared to the location of various topographical elements, floodplains, roads, and water bodies using GIS (Geographic Information Systems). Vulnerable facilities were identified by comparing their location to possible hazard events. For example, all of the structures within the 100-year and 500-year floodplains were identified and used in conducting the potential loss analysis for flooding.

#### Calculating the Potential Loss

The next step in completing the loss estimation involved assessing the level of damage from a hazard event as a percentage of the facility's structural value. The Federal Emergency Management Agency (FEMA) has developed a process in which replacement values for structures located in the 100 and 500-year floodplains can be calculated according to the amount of damage suffered<sup>4</sup>. In North Hampton, the assessed values were determined for every structure identified in the floodplain based on 2017 total assessed valuation of \$1,009,176,600. The potential loss was then calculated by multiplying the average assessed value of a structure by the percent of damage expected from a hazard event (i.e., 100-year, 4-foot flood, etc.). The following discussion summarizes the potential loss estimates to structures (residential and non-residential) due to natural hazard events.

### Flooding

Flooding is often associated with hurricanes, ice jams, rapid snow melt in the spring and heavy rains.

The average replacement value was calculated by adding up the assessed values of all structures in the 100 and 500 year floodplains. These structures were identified by overlaying digital versions of FEMA's FIRM maps on digital aerial photography of the Town of North Hampton. Because of the scale and resolution of the FIRM maps and imagery this is only an approximation of the total number of structures located within the 100 and 500 year floodplains. The Federal Emergency Management Agency (FEMA) has developed a process to calculate potential loss for structures during flood. The potential loss was calculated by multiplying the replacement value by the percent of damage expected from the hazard event. Residential and non-residential structures were combined. The costs for repairing or replacing bridges, railroads, power lines, telephone lines, and contents of structures are not included in this estimate. In addition, the figures used were based on buildings which are one or two stories high with basements. The following calculation is based on eight-foot flooding and assumes that, on average, one or two story buildings with basements receive 49% damage (Understanding Your Risks, Identifying Hazards and Estimating Losses, FEMA page 4-13):

Potential Structure Damage: 49%

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<sup>4</sup> "Understanding Your Risks, Identifying Hazards and Estimating Losses", FEMA, page 4-13.

Approximately 12 structures assessed at \$ 7,500,000= \$53,675,000 potential damage

The following calculation is based on four-foot flooding and assumes that, on average, one or two story buildings with basements receive 28% damage (Understanding Your Risks, Identifying Hazards and Estimating Losses, FEMA page 4-13):

Potential Structure Damage: 28%

Approximately 12 structures assessed at \$ 7,500,000= \$2,100,000 potential damage

The following calculation is based on two-foot flooding and assumes that, on average, one or two-story buildings with basements receive 20% damage (Understanding Your Risks, Identifying Hazards and Estimating Losses, FEMA page 4-13):

Potential Structure Damage: 20%

Approximately 12 structures assessed at \$ 7,500,000= \$2,100,000 potential damage

Several areas of North Hampton were identified as having high risk of flooding. These areas are identified on Map 2: Past and Future Hazards. Potential losses were also calculated for these at-risk areas in the same manner as those structures in the 100 and 500 year floodplains. Again these assessments are only based on the potential damages to building within the identified at-risk areas.

### **Dam Breach and Failure**

Dam breach and failure could impact North Hampton through flooding. Potential losses will depend on the extent of the breach and could include both residential and non-residential damage, including town-owned facilities. The only area identified by the Hazard Mitigation Planning Committee as at risk to flooding from dam breach is the area surrounding the Mill Pond Dam on the Little River. This dam is rated by the NH Department of Environmental Services (NHDES) as a low hazard dam meaning that the impact of dam failure is limited to area immediate downstream and is considered minimal. The probability of potential damages associated with low hazard dams per NHDES classifications are as follows:

- No possible loss of life.
- Low economic loss to structures or property.
- Structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassable or otherwise interrupt public safety services.
- The release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than two-acre-feet and is located more than 250 feet from a water body or water course.
- Reversible environmental losses to environmentally-sensitive sites.

There has been no dam breach or failure at the Mill Pond Dam since the 2012 Plan update.

### **Hurricane/ High Wind Events**

#### ***Hurricane***

Hurricanes do affect the Northeast coast periodically. Due to the inland location of the Town most hurricanes would likely degrade to tropical storms by the time they impact the Town. Even degraded hurricanes or tropical storms could still cause significant damage to the structures and infrastructure of the Town. The assessed value of all residential and commercial structures in

the Town in 2016 is \$992,241,173 (North Hampton Assessor). Assuming 1% to 5% damage, a hurricane could result in \$9,922,411 to \$49,612,058 of structure damage.

### ***Tornado***

Tornadoes are relatively uncommon natural hazards in New Hampshire. On average, about six touch down each year. Damage largely depends on where the tornado strikes. If it strikes an inhabited area, the impact could be severe. The assessed value of all residential and commercial structures in the Town in 2016 is \$992,241,173 (North Hampton Assessor). Assuming 1% to 5% damage, a hurricane could result in \$9,922,411 to \$49,612,058 of structure damage.

### ***Severe Lightning***

The amount of damage caused by lightning will vary according to the type of structure hit and the type of contents inside. In July 2014, the North Hampton Town Offices were struck by lightning causing extensive damage to equipment and resulted in loss of communications from the Town and emergency services. The probability for lightning is considered low.

### ***Severe Winter Weather***

#### ***Heavy Snowstorms***

Heavy snowstorms typically occur during January and February. New England usually experiences at least one or two heavy snow storms with varying degrees of severity each year. Power outages, extreme cold and impacts to infrastructure are all effects of winter storms that have been felt in North Hampton in the past. All of these impacts are a risk to the community, including isolation, especially of the elderly, and increased traffic accidents. Damage caused as a result of this type of hazard varies according to wind velocity, snow accumulation and duration. The assessed value of all residential and commercial structures in the Town of North Hampton, including exempt structures such as schools and churches is \$458,756,150 (North Hampton Assessor). Assuming 1% to 5% damage, a snowstorm could result in \$4,587,561 to \$22,937,807 of structure damage.

#### ***Ice Storms***

Ice storms often cause widespread power outages by downing power lines, making power lines at risk in North Hampton. They can also cause severe damage to trees. In 1998, an ice storm inflicted \$12,466,202 worth of damage to New Hampshire as a whole. Ice storms in North Hampton could be expected to cause damage ranging from a few thousand dollars to several million, depending on the severity of the storm.

### ***Wildfire***

The risk of fire is difficult to predict based on location. Forest fires are more likely to occur during years of drought. The entire town is identified as at a potential risk to wildfire. The assessed value of all residential and commercial structures in the Town in (North Hampton Assessor). Assuming 1% to 5% damage, a hurricane could result in \$9,922,411 to \$49,612,058 of structure damage.

### ***Earthquakes***

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines and are often associated with landslides and flash floods. There have been four earthquakes in New Hampshire between 1924-1989 having a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia, and one near the Quebec border. If an earthquake were to

impact the Town of North Hampton, underground lines would be susceptible. In addition, buildings that are not built to a high seismic design level would be susceptible to structural damage. The assessed value of all residential and commercial structures in the Town in 2017 is \$1,009,175,6000 (North Hampton Assessor). Assuming 1% to 5% damage, a hurricane could result in \$9,922,411 to \$49,612,058 of structure damage.

## **Severe Winter Weather**

### ***Heavy Snowstorms***

Heavy snowstorms typically occur during January and February. New England usually experiences at least one or two heavy snow storms with varying degrees of severity each year. Power outages, extreme cold and impacts to infrastructure are all effects of winter storms that have been felt in North Hampton in the past. All of these impacts are a risk to the community, including isolation, especially of the elderly, and increased traffic accidents. Damage caused as a result of this type of hazard varies according to wind velocity, snow accumulation and duration. Heavy snowstorms in North Hampton could be expected to cause damage ranging from a few thousand dollars to several million, depending on the severity of the storm.

### ***Ice Storms***

Ice storms often cause widespread power outages by downing power lines, making power lines at risk in North Hampton. They can also cause severe damage to trees. In 1998, an ice storm inflicted \$12,466,202 worth of damage across New Hampshire and in 2008 an ice storm, which mostly impacted southern NH communities, experienced over a reported \$150 million dollars worth of property damage. Ice storms in North Hampton could be expected to cause damage ranging from a few thousand dollars to several million, depending on the severity of the storm.

## **Drought**

Hazard affects posed by drought include increased risk of wildfire and deficiencies in water supply. The amount of damage can vary greatly depending on the extent of the drought. The probability of impacts from drought are dependent on the length and severity of the drought, the type of drinking water well (shallow, dug well versus deep, bedrock well), and the types of water conservation programs enacted. The majority of residents (approximately 75%) in North Hampton rely on two well fields owned by the Aquarion Water Company with the remaining population relying on small community water systems or individual onsite wells. As of 2017, Aquarion has never had to impose water restrictions in North Hampton due to the water levels within their supply wells that are located in both North Hampton and Hampton. North Hampton, like the rest of southern New Hampshire, suffered from drought during summer 2016 with some isolated wells going dry.

## **Extreme Temperatures**

Extreme heat and cold can impact all parts of North Hampton. Periods of extreme cold can result in frozen water pipes that can create damage to both infrastructure and structures. The amount of damage will vary greatly depending on the hazard event.

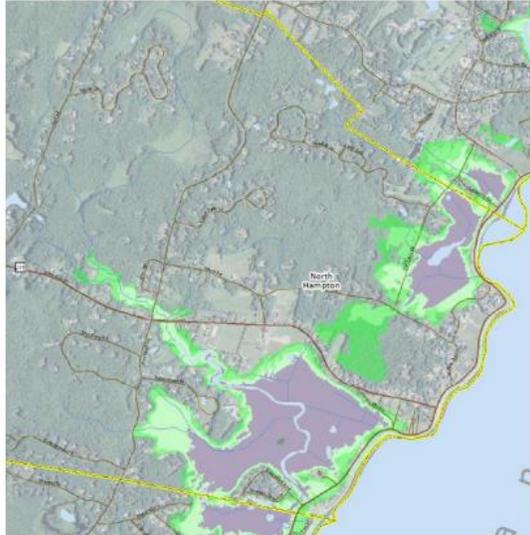
## **Extreme Weather**

The Committee categorized extreme weather events as periods of heavy, extended precipitation and microburst. North Hampton has experienced both of these types of events in recent year. Heavy precipitation events create flooding, described above.

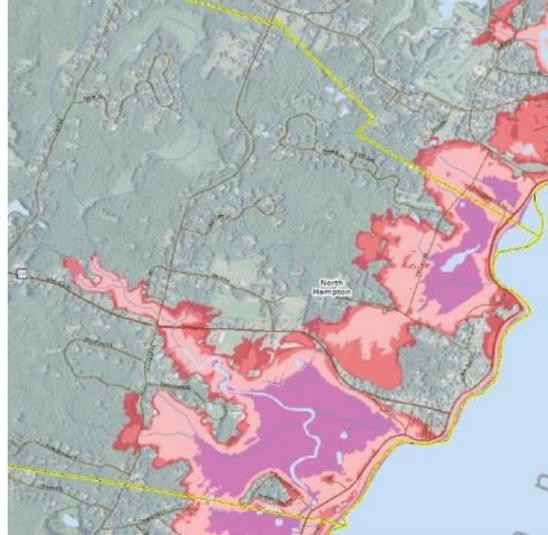
## **Climate Change and Sea-level Rise**

The impacts of climate change and sea-level rise are related to many of the hazards above, specifically to flooding through coastal storms and storm surge due to increase precipitation and rising sea-level. The extent and potential losses of these hazards is just beginning to be calculated. In 2016, Rockingham Planning Commission released *TIDES TO STORMS: Assessing Risk and Vulnerability to Sea-level rise and Storm Surge*, an assessment of vulnerable areas and infrastructure in coastal New Hampshire. Figure 4 below depicts the identified areas of concern and the extent of areas potentially threatened by sea-level rise and storm surge in North Hampton.

Sea-Level Rise Scenarios 1.7 feet, 4.0 feet and 6.3 feet



Sea-Level Rise Scenarios 1.7 feet, 4.0 feet and 6.3 feet plus storm surge



Note: Storm surge is the area flooded by the 100-year/1% chance storm event.

Sea-Level Rise (SLR) Scenarios	SLR 1.7 feet	SLR 4.0 feet	SLR 6.3 feet	SLR 1.7 feet + storm surge	SLR 4.0 feet + storm surge	SLR 6.3 feet + storm surge
Infrastructure (# of sites)	1	7	9	10	15	16
Critical Facilities (# of sites)	1	2	2	2	4	7
Roadways (miles)	0.0	0.7	1.3	1.3	2.6	3.3
Upland (acres)	67.8	135.3	215.9	193.5	283.9	358.6
Freshwater Wetlands (acres)	32.5	49.4	71.5	61.9	84.2	95.5
Tidal Wetlands (acres)	18.1	21.3	21.9	22.1	22.1	22.2
Conserved and Public Lands (acres)	8.8	14.8	19.3	19.1	28.4	37.6
100-year floodplain (acres)	69.5	69.5	69.5	69.5	69.5	69.5
500-year floodplain (acres)	135.7	135.7	135.7	135.7	135.7	135.7

Notes: Storm surge is the area flooded by the 100-year/1% chance storm event. Upland refers to land above mean higher high water (highest tidal extent) and excluding wetlands. 500-year floodplain impacts were calculated based on flooding beyond the extent of the 100-year floodplain impacts.

**FIGURE 4 - SEA-LEVEL RISE AND STORM SURGE VULNERABILITY IN NORTH HAMPTON.**

## Existing & Future Hazard Mitigation Programs & Strategies

### Existing Hazard Mitigation Programs

The next step involves identifying existing mitigation strategies for the hazards likely to affect the town and evaluate their effectiveness. And determining new strategies to mitigate specific or multiple hazard identified in prior sections. This section outlines those programs and recommends improvements and changes to these programs to ensure the highest quality emergency service possible.

Existing Protection/ Strategy	Description/ Area Covered	Responsible Party	Effectiveness	Recommended Changes	Notes
<b>Emergency Operations Plan</b>	Town wide	Emergency Management Director	Good	None	Plan updated regularly
<b>Town Master Plan</b>	Townwide-1999	Planning Board & Planning and Zoning Administrator	Good	Add Hazard Mitigation Plan to Master Plan	Planning Board reviews and/or updates annually.
<b>Town Capital Improvement Plan</b>	Town wide	Town Administrator & CIP Committee	Good	Have Departments note if a project submitted to the CIP Committee is part of the Hazard Mitigation Plan	Reviewed annually.
<b>Town Building Code</b>	Town wide	Building Inspector	Good	None	The code is in line with state and federal standards.
<b>National Flood Insurance Program Floodplain Ordinance</b>	Development restrictions in Flood Hazard Areas (100-year floodplain)	Planning Board & Building Inspector	Good	Town should coordinate with Little Boars Head Village District to ensure village zoning ordinances are in compliance with federal standards as the majority of NFIP eligible properties in North Hampton are located within the Village District.	Reviewed annually to correspond with federal guidelines and town priorities.

<b>Hazardous Materials Permitting, Zoning 220-14</b>	Town must give permit for transporting, storage, treatment or disposal of hazardous materials	Emergency Management Director	Good	None	Program is reviewed for effectiveness biennially by the Emergency Management Director
<b>Household Materials - Household Hazardous Waste Day</b>	Town-wide collection of household hazardous waste	Town Administrator	Good	Make information about where to take household hazardous waste/ HHW day more prominent on town website.	Program is effective and productive to benefit citizens of North Hampton
<b>25-year Storm Drainage Requirements</b>	25-year storm drainage required for all site plans	Planning Board & Building Inspector	Good	Planning Board should update stormwater drainage requirements to reflect increases frequency in large precipitation events in NH.	None
<b>Radiological Emergency Response Plan</b>	Town wide	Emergency Management Director, Police Chief & Fire Chief	Good	None	Town coordinates with Seabrook Station and neighboring towns for plan effectiveness. The Radiological Plan is updated every two years, with newest update completed in Spring 2017.
<b>Emergency Services</b>	Town wide	Emergency Management Director, Police Chief & Fire Chief	Good	None	Local and regional training are required for all emergency service personnel
<b>Comprehensive Emergency Management Planning for Schools</b>	School	Emergency Management Director & School Board	Good	None	The school and town coordinate emergency activities 2 to 3 times per year to maintain efficient emergency response.

<b>Storm Drainage-Culvert Maintenance Program</b>	Town wide	Road Agent	Good	None	Road Agent inspects culverts annual to ensure proper stormwater flow.
<b>Wellhead Protection</b>	Town wide	Building Inspector	Good	None	Town maintains state standards for wellhead protections and inspections regularly for violations.
<b>Aquifer Protection</b>	Town wide	Planning Board and Code Enforcement Officer	Good	Ordinance should be monitored annually to ensure latest BMPs are being utilized for development uses.	None
<b>Wetlands Protection</b>	Wetland setbacks required	Planning Board, Conservation Commission, & Code Enforcement Officer	Good	Town should coordinate with Little Boars Head Village District to ensure village zoning ordinances are effective for wetlands protection. Town increase wetland protection by requiring 25-foot vegetative buffer to surround all wetlands on undeveloped lots.	None
<b>Police and Fire Mutual Agreements - Mutual Aid</b>	Town wide	Police Chief & Fire Chief	Good	None	Regional mutual aid agreements between surrounding communities are/ continue to be effective and protective for emergency response.
<b>Hazardous Tree Program</b>	Town Roads	Road Agent	Good	None	Program has worked effectively after ice storm and large wind events for hazardous tree removal.

### Potential Mitigation Strategies

The Action Plan was developed by analyzing the existing Town programs, the proposed improvements and changes to these programs. Additional programs were also identified as potential mitigation strategies. These potential mitigation strategies were ranked in five categories according to how they accomplished each item:

- Prevention
- Property Protection
- Structural Protection
- Emergency Services
- Public Information and Involvement

The Committee discussed a list of strategies and actions that could be taken to mitigate future hazards.

Mitigation Strategy/ Action	Hazard(s) Mitigated	Activity Type	Description	Status 2011	Status/ Recommendations 2018
<b>Generator for North Hampton School (Fallout Shelter)</b>	Hazards involving power outages, or requiring shelters	Emergency Services	None	Completed	Completed
<b>Communications Tower</b>	All Hazards	Emergency Services	None	Removed - no longer a priority project	Keep: Increased cell service is critical to emergency operations during a natural hazard and town should pursue ways to increase coverage.
<b>Incident Command Vehicle</b>	All Hazards	Emergency Services	None	Completed	Completed
<b>Front End Loader</b>	Flooding, Wildfire, High Winds	Property Protection/ Structural Protection	None	Completed	New loader purchased in last two years

<b>Extend natural gas line from Lafayette Road to North Hampton School (town emergency shelter)</b>	Hazards involving power outages, or requiring shelters	Emergency Services	None	Removed - no longer a priority project	Long term priority
<b>Mobile lighting and light towers</b>	All Hazards	Emergency Services	None	Removed - no longer a priority project	Removed - no longer a priority project
<b>Rigid Bottom Water Craft</b>	Flooding	Emergency Services	None	Removed - no longer a priority project	Remove from list due to funding and no longer a priority
<b>Road Barricades - Have 50, need 100</b>	Flooding, High Winds	Property Protection	The town is in need of 100 mobile traffic barricades for emergency response services.	Deferred	Deferred
<b>All Terrain Vehicle</b>	Flooding, High Winds	Emergency Services	None	Removed	Remove
<b>Tough Book Laptop Computers (10)</b>	All Hazards	Emergency Services	None	Completed	Only 5 laptops are needed
<b>Cots, Blankets, Food Rations for Emergency Shelter at School</b>	Hazards involving power outages, or requiring shelters	Emergency Services	The town is assessing their emergency shelter and needs of bolstering supplies for sever emergency	Deferred	Low priority as regional shelters are utilized the majority of the time in an emergency event
<b>Alteration of Telephone System (hard wired line)</b>	Hazards involving power outages	Prevention	None	Completed	This would be needed in new emergency operations center was to be built.

<b>Renumbering for 911 and Mutual Aid</b>	All Hazards	Emergency Services	Continuing this action will help first responders address emergency calls efficiently	Deferred	No longer a priority due to development patters in the town. Low priority for the town
<b>Hazard Mitigation Information on Town Newsletter, Town Report and website</b>	All Hazards	Public Information and Involvement	Continuing this program and include the website allows the public to be more informed regarding hazardous events	Deferred	This strategy is ongoing and should be continued. Ongoing
<b>Local Cable Access Channel for public Outreach and Education</b>	All Hazards	Public Information and Involvement	None	Completed	Remove
<b>New Police and Fire Personnel</b>	All Hazards	Emergency Services	None	Removed - no longer a priority project	Ensure current positions are filled
<b>Marine Response Training</b>	Flooding	Prevention	None	Removed - Coast Guard is the marine respondent	Remove
<b>AM Radio Warning System</b>	All Hazards	Prevention/ Public Information	None	Removed - no longer a priority project	Remove
<b>GIS for all Town Departments</b>	All Hazards	Prevention/ Public Information / Property Protection/Structural Protection	None	Removed - no longer a priority project	Revise strategy to increase availability of geolocated town resources and infrastructure

<b>Review building codes to ensure adequate compliance for wind speed</b>	All Hazards	Prevention/ Public Information / Property Protection/S tructural Protection	None	Completed	Remove
<b>Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required</b>	Flooding, High Winds	Prevention/ Public Information / Property Protection/S tructural Protection	Planning Board continuously reviews vegetation setbacks to structures and wetlands.	Deferred	Planning Board should continue to evaluate setbacks for both developed and undeveloped lots.
<b>Update Master Plan to incorporate information from Hazard Mitigation Plan</b>	All Hazards	Prevention/ Public Information / Property Protection/S tructural Protection	Town is currently updating Master Plan and may include provision found within the Hazard Mitigation Plan	Deferred	Planning Board should continue to work to incorporate the findings and recommendations in the Hazard Mitigation Plan into the Master Plan
<b>Investigate joining the Community Rating System (CRS) Program to reduce flood insurance and potential future flood losses</b>	Flooding	Prevention/ Public Information / Property Protection/S tructural Protection	None	Removed - no longer a priority project	The Little Boars Head Village District should consider joining the CRS Program.
<b>Replace culverts at flood prone intersection and roadways, including Oak Drive, Lovering Road, North Road, Long North and</b>	Flooding	Prevention/ Public Information / Property Protection/S tructural Protection	Culverts located in these areas (depicted on the past and potential hazard maps) as flood prone areas in town are in need of repair or replacement. Storm	Deferred due to funding availability	Ongoing for 2018 - The town should keep an inventory of the condition of all culverts and replace or retrofit was funding becomes available.

<p><b>Short North Roads, Olde Locke Road, and a Route 1 Box culvert.</b></p>			<p>data suggests that large rain events (100 year storm event) are happening in at a greater frequency. If not addressed these flood prone areas could pose a serious hazard to emergency response, private property and public evacuations.</p>		
<p><b>Removal of debris, beaver obstructions and dredging of Winnicut River plane in the Lovering Road area</b></p>	<p>Flooding</p>	<p>Prevention/ Property Protection/ Structural Protection</p>	<p>By dredging this area around Lovering Road on the Winnicut River plane both flood storage and flow capacity would be ensured during heavy rain events.</p>	<p>Ongoing for 2018</p>	<p>Remove location and just add to culvert inspection/cleaning program</p>
<p><b>Coastal vulnerability assessment on areas in two that may be impacted by storm surge based on current and future sea level rise</b></p>	<p>Coastal Flooding</p>	<p>Prevention/ Property Protection/ Structural Protection</p>	<p>BY conducting a vulnerability assessment the town will be able to assess coastal areas and infrastructure that may be at risk to current and future sea level rise and the destructive impacts of storm surge.</p>	<p>Ongoing for 2018</p>	<p>Incorporate the findings and recommendations of the NH Coastal Risks and Hazards Commission's report Preparing New Hampshire for Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation into town planning documents.</p>
<p><b>Town wide dam evaluation</b></p>	<p>Flooding</p>	<p>Prevention/ Property Protection/ Structural Protection</p>	<p>There are private and public dams in town that if not effectively operating may pose a flood threat to public and private property. Evaluation of the current</p>	<p>Ongoing for 2018</p>	

			structural/functioning state of these dams will help prevent flooding impacts due to dam failure.		
<b>Locate and evaluate stormwater infrastructure</b>	Flooding	Prevention/Property Protection/Structural Protection	Locating and evaluating stormwater infrastructure in town is important to ensuring that stormwater infrastructure is working effectively during heavy rain events. This will allow the town to mitigate potential flooding events due to poorly functioning drainage systems and infrastructure.	Ongoing for 2018	Ongoing – Also requirement of EPA MS4 Stormwater Permit

## Feasibility and Prioritization of Proposed Mitigation Strategies

The goal of each strategy or action is reduction or prevention of damage from a hazard event. In order to determine their effectiveness in accomplishing this goal, a set of criteria was applied to each proposed strategy. A set of questions developed by the Committee that included the STAPLEE method was developed to rank the proposed mitigation actions. The STAPLEE method analyzes the Social, Technical, Administrative, Political, Legal, Economic and Environmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions. The following questions were asked about the proposed mitigation strategies identified in the previous section.:

1. Does it reduce disaster damage?
2. Does it contribute to other goals?
3. Does it benefit the environment?
4. Does it meet regulations?
5. Will historic structures be saved or protected?
6. Does it help achieve other community goals?
7. Could it be implemented quickly?

### STAPLEE criteria:

- Social: Is the proposed strategy socially acceptable to the community? Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Technical: Will the proposed strategy work? Will it create more problems than it solves?
- Administrative: Can the community implement the strategy? Is there someone to coordinate and lead the effort?
- Political: Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
- Legal: Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
- Economic: What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
- Environmental: How will the strategy impact the environment? Will the strategy need environmental regulatory approvals?

Each proposed mitigation strategy was evaluated using the above criteria and assigned a score (Good = 3, Average = 2, Poor = 1) based on the above criteria. An evaluation chart with total scores for each new strategy can be found in the collection of individual tables under

		Does it reduce disaster damage?	Does it contribute to other goals?	Does it benefit the environment?	Does it meet regulations?	Will historic structures be saved or protected?	Does it help achieve other community goals?	Could it be implemented quickly?	Social: Is the proposed strategy socially acceptable to	Technical: Will the proposed strategy work?	Administrative? Can the community implement the	Political: Is the strategy politically acceptable?	Legal: Is the community authorized to implement the	Economic: What are the costs and benefits of this strategy?	Environmental: How will the strategy impact the	TOTAL	
<b>New Strategies</b>	1	Investigate GIS data needs for emergency response and hazard mitigation for short and long-term planning efforts	2	3	2	1	2	2	2	3	2	2	2	3	2	2	<b>30</b>
	2	Establishment of a new safety complex to better accommodate emergency services as called for in this plan and for COOP plan.	1	1	1	1	3	3	2	2	2	2	3	2	1	<b>26</b>	
	3	Establish new town administrative facilities that are utilized during emergency operations (including all town admin buildings)	1	1	1	1	3	3	2	2	2	2	3	2	1	<b>26</b>	
	4	Continued evaluation of town's data storage back up and retrieval options.	1	2	1	1	1	2	2	3	3	3	2	3	2	1	<b>27</b>
	5	Add second hard telephone line for town administrative office and Police Department.	1	2	1	3	1	3	3	3	3	3	3	3	3	1	<b>33</b>
	6	Emergency Services personnel work with Select Board to determine public communication needs and strategies that would be needed during emergency situations. (Example: Evaluate if	2	3	2	1	2	3	2	3	3	2	2	3	3	2	<b>33</b>

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		an electronic messaging board is needed during emergencies.)															
	7	Town officials should work with NHDOT to establish protocol for traffic lights during emergency situations.	1	2	1	1	1	2	3	3	2	3	2	2	3	1	<b>27</b>
	8	Evaluate ways to better determine fuel levels of generators at town facilities	2	3	3	3	1	3	2	3	3	3	3	3	2	2	<b>36</b>
	9	Locate and evaluate stormwater infrastructure	3	3	3	3	2	3	2	3	3	3	3	3	2	3	<b>39</b>
<b>Updated Strategies</b>	10	Expand communication capabilities with new communications tower to better enable emergency personnel to communicate with the public during a hazard event.	1	3	1	2	1	3	2	3	3	3	2	2	2	1	<b>29</b>
	11	Extend natural gas line from Lafayette Road to North Hampton School to supply emergency generator.	1	3	2	3	1	3	2	3	3	3	2	2	2	1	<b>31</b>
	12	5 Toughbook laptop computers are needed for emergency personnel	1	2	1	3	1	2	3	3	3	3	3	3	3	1	<b>32</b>
	13	Cots, Blankets, Food Rations for Emergency Shelter at School	2	2	1	1	1	2	2	2	2	2	2	2	2	1	<b>27</b>
	14	Renumbering buildings for 911 and Mutual Aid locational purposes	1	2	1	3	2	2	3	2	2	2	2	2	2	1	<b>29</b>
	15	Ensure all emergency services positions are filled.	2	2	1	2	1	3	2	3	3	2	2	3	2	1	<b>36</b>
	16	Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required	3	3	3	3	2	3	2	2	2	3	2	3	2	3	<b>35</b>

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	17	Update Master Plan to incorporate information from Hazard Mitigation Plan	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>35</b>
	19	Replace culverts at flood prone intersection and roadways, including Oak Drive, Lovering Road, North Road, Long North and Short North Roads, Olde Locke Road, and a Route 1 Box culvert.	3	3	3	3	2	3	2	2	3	2	2	2	2	3	<b>34</b>
<b>Ongoing Strategies</b>	20	Emergency Operations Plan	2	2	2	3	2	3	2	3	2	3	3	3	2	2	<b>35</b>
	21	Town Master Plan	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>34</b>
	22	Town Capital Improvement Plan	2	3	2	3	2	3	2	2	2	3	2	3	3	2	<b>39</b>
	23	Town Building Code	3	3	3	3	2	3	3	2	3	3	3	3	2	3	<b>38</b>
	24	National Flood Insurance Program Floodplain Ordinance	3	3	3	3	3	3	2	2	3	3	2	3	2	3	<b>31</b>
	25	Hazardous Materials Permitting, Zoning 220-14	2	2	3	3	1	2	2	3	2	2	2	3	2	2	<b>31</b>
	26	Household Materials - Household Hazardous Waste Day	2	2	3	3	1	2	2	3	2	2	2	3	2	2	<b>29</b>
	28	Radiological Emergency Response Plan	3	2	1	2	1	2	2	3	2	2	3	3	2	1	<b>36</b>
	29	Emergency Services	3	3	2	2	2	3	2	3	3	3	3	3	2	2	<b>36</b>
	30	Comprehensive Emergency Management Planning For Schools	3	3	2	2	2	3	2	3	3	3	3	3	2	2	<b>35</b>
	31	Storm Drainage- Culvert Maintenance Program	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>35</b>
	32	Wellhead Protection	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>35</b>
	33	Aquifer Protection	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>35</b>
	34	Wetlands Protection	2	3	2	3	2	3	2	3	2	3	3	3	2	2	<b>36</b>
35	Police and Fire Mutual Agreements - Mutual Aid	3	3	2	2	2	3	2	3	3	3	3	3	2	2	<b>36</b>	
36	Hazardous Tree Program	3	3	2	2	2	3	2	3	3	3	3	3	2	2	<b>0</b>	

### Implementing Schedule for Mitigation Strategies

Additionally, an action plan that outlines who is responsible for implementing each of the prioritized strategies determined in the previous step, as well as when and how the actions will be implemented. Each strategy was evaluated and prioritized according to the STAPLEE score and level of importance within the community. Projects that might have gotten a low STAPLEE score because of criteria such as but not limited to, environmental permitting or costs associated with the project were still considered to be of high priority to the committee due to the associated risks and hazards avoided or mitigated from the action, if implemented. Priority for each strategy was grouped not only on the STAPLEE score but on a high-medium priority sliding scale. This form of prioritization was used as a basis for developing the Action Plan below:

**WHO?** Who will lead the implementation efforts? Who will put together funding requests and applications?

**HOW?** How will the community fund these projects? How will the community implement these projects? What resources will be needed to implement these projects?

**WHEN?** When will these actions be implemented, and in what order?

Table below includes the responsible party (WHO), how the project will be supported (HOW), and what the timeframe is for implementation of the project (WHEN). Also included is a cost estimate for each project if available.

	#	Strategy/ Action	Priority (Low, Med, High)	Responsible Party	Timeframe	Funding or Technical Assistance Source	Details
New Strategies	1	Investigate GIS data needs for emergency response and hazard mitigation for short and long-term planning efforts	Low	Emergency Management Director	2022	Town	This strategies is low priority due to cost, but the information is needed.
	2	Establishment of a new safety complex to better accommodate emergency services as called for in this plan and for COOP plan.	High	Select Board	2022	Town, warrant article.	The COOP plan is currently in development. There is concern whether the existing facility would be functional during a hazard event.
	3	Establish new town administrative facilities that are utilized during emergency operations (including all town admin buildings)	High	Select Board	2022	Town, warrant article.	Along with safety complex, this is a long term goal

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	4	Continued evaluation of town's data storage back up and retrieval options.	High	Town Administrator	Ongoing	Town	
	5	Add second hard telephone line for town administrative office and Police Department.	High	Town Administrator	2017	Town	
	6	Emergency Services personnel work with Select Board to determine public communication needs and strategies that would be needed during emergency situations. (Example: Evaluate if an electronic messaging board is needed during emergencies.)	Med	Emergency Management Director and Select Board	2020	None	Includes utilizing cell phones notices, message boards, newsletter. Note: This strategy is a combination of other various outreach strategies indicated in past Plans.
	7	Town officials should work with NHDOT to establish protocol for traffic lights during emergency situations.	High	Police Chief	2017	None	Likely involves developing MOU with NHDOT.
	8	Evaluate ways to better determine fuel levels of generators at town facilities	High	Building Inspector and Fire Chief	2017	Town	
	9	Locate and evaluate stormwater infrastructure	High	Public Works Director	Ongoing	Town Engineer	Locating and evaluating stormwater infrastructure in town is important to ensuring that stormwater infrastructure is working effectively during heavy rain events. This will allow the town to mitigate potential flooding events due to poorly functioning drainage systems and infrastructure.
<b>Updated Strategies</b>	10	Expand communication capabilities with new communications tower to better enable emergency personnel to communicate with the public during a hazard event.	Med	Planning Board, Emergency Management Director	2020	Private investment needed from a telecommunications carrier.	Increased cell service is critical to emergency operations during a natural hazard and town should pursue ways to increase coverage.
	11	Extend natural gas line from Lafayette Road to North Hampton School to supply emergency generator.	Med	Town Administrator, Emergency Management Director	2022	Town must either finance the gas line extension or the utility will not extend line up Route 111	

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					until sufficient demand	
1 2	5 Toughbook laptop computers are needed for emergency personnel	High	Police Chief and Fire Chief	2018	Town	
1 3	Cots, Blankets, Food Rations for Emergency Shelter at School	Low	Emergency Management Director	2020	None	Low priority as regional shelters are utilized the majority of the time in an emergency event
1 4	Renumbering buildings for 911 and Mutual Aid locational purposes	Low	Town Assessor, Emergency Management Director	2022	Unknown	No longer a priority due to development patters in the town
1 5	Ensure all emergency services positions are filled.	High	Police Chief, Fire Chief, Town Administrator, Select Board.	Ongoing	Town	
1 6	Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required	Med	Planning Board	Ongoing	Rockingham Planning Commission can be utilized for technical assistance	
1 7	Update Master Plan to incorporate information from Hazard Mitigation Plan	Med	Planning Board	2018	Rockingham Planning Commission can be utilized for technical assistance	Planning Board should continue to work to incorporate the findings and recommendations in the Hazard Mitigation Plan into the Master Plan
1 9	Replace culverts at flood prone intersection and roadways, including Oak Drive, Lovering Road, North Road, Long North and Short North Roads, Olde Locke Road, and a Route 1 Box culvert.	Low	Public Works Director	Ongoing	Town	Culverts located in these areas (depicted on the past and potential hazard maps) as flood prone areas in town are in need of repair or replacement. Storm data suggests that large rain events (100 year storm event) are happening in at a greater frequency. If not addressed these flood prone areas could pose a serious hazard to emergency response, private property and public evacuations.
<b>Ongoing</b> 2 0	Emergency Operations Plan	High	Emergency Management Director	Ongoing	Town	

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21	Town Master Plan	Med	Planning Board & Planning and Zoning Administrator	Ongoing	Town	
22	Town Capital Improvement Plan	Med	Town Administrator & CIP Committee	Ongoing	Town	
23	Town Building Code	High	Building Inspector	Ongoing	Town	
24	National Flood Insurance Program Floodplain Ordinance	High	Planning Board & Building Inspector	Ongoing	Rockingham Planning Commission can be utilized for technical assistance	
25	Hazardous Materials Permitting, Zoning 220-14	Med	Emergency Management Director	Ongoing	Town	
26	Household Materials - Household Hazardous Waste Day	Med	Town Administrator	Annually	Funding provided in part through NHDES grant.	
28	Radiological Emergency Response Plan	High	Emergency Management Director, Police Chief & Fire Chief	Updated every 2 years	Town	Newest update completed in Spring 2017.
29	Emergency Services	High	Emergency Management Director, Police Chief & Fire Chief	Ongoing	Town	
30	Comprehensive Emergency Management Planning For Schools	High	Emergency Management Director & School Board	Conducted 2 to 3 times per year	Town	
31	Storm Drainage- Culvert Maintenance Program	Med	Road Agent	Annual	Town	
32	Wellhead Protection	Low	Building Inspector	Ongoing	Rockingham Planning Commission	

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					can be utilized for technical assistance.	
3 3	Aquifer Protection	Low	Planning Board and Code Enforcement Officer	Ongoing	Rockingham Planning Commission can be utilized for technical assistance.	
3 4	Wetlands Protection	Low	Planning Board, Conservation Commission, & Code Enforcement Officer	Ongoing	Rockingham Planning Commission can be utilized for technical assistance.	
3 5	Police and Fire Mutual Agreements - Mutual Aid	High	Police Chief & Fire Chief	Annual	Town	
3 6	Hazardous Tree Program	Med	Road Agent	As needed	Town	

## Monitoring and Updating the *Plan*

### **Incorporating the Plan into Existing Planning Mechanisms**

Upon completion and approval by FEMA and the State of New Hampshire, the Plan will be adopted as a standalone document of the Town and as an appendix of the Town's Emergency Operations Plan (EOP). An update of the EOP is continuing; future updates to the EOP will incorporate the Plan as a referenced appendix, but the two plans will always be printed as separated documents. The EOP is subject to annual review.

The Plan will continue to be consulted when the Town updates its Capital Improvement Program (CIP) and or Master Plan." The Capital Improvements Committee is responsible for updating the CIP annually, and will review the Action Plan, as it has done before, during each update. This committee in conjunction with North Hampton Emergency Management will determine what items can and should be added to the CIP based on the Town's annual budget and possible sources of other funding.

As mentioned this plan should also be reviewed prior to any Master Plan Chapter updates especially as it relates to Natural Hazards and Future Land Use. The towns Planning Board or Master plan committee is responsible for these future updates and Emergency Management will be responsible for incorporating information from this plan within those updates.

### Monitoring, Evaluating and Updating the Plan

Recognizing that many mitigation projects are continual, and that while in the implementation stage communities may suffer budget cuts, experience staff turnover, or projects may fail altogether, a good plan needs to provide for periodic monitoring and evaluation of its successes and failures and allow for updates of the Plan where necessary.

In order to track progress and update the Mitigation Strategies identified in the Action Plan (Table 8), it is recommended that the Town revisit the Plan annually, or after a hazard event. If it is not realistic or appropriate to revise the Plan every year, then the Plan will be revisited no less than every five years per FEMA requirements. The Emergency Management Director is responsible for initiating this review with members of the Town that are appropriate including members of the public. In keeping with the process of adopting the 2011 Plan Update and per NH State RSA 91-A, a public meeting to receive public comment on Plan maintenance and updating will be held during any review of the Plan. This publicly noticed meeting (via town website, and postings in the town office, library, or local newspaper) will allow for members of the community not involved in developing the Plan to provide input and comments each time the Plan is revised. The final revised Plan will be adopted by the Board of Selectmen appropriately, at a second publicly noticed meeting.

Changes should be made to the Plan to accommodate for projects that have failed or are not considered feasible after a review for their consistency with STAPLEE, the timeframe, the community's priorities, and funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, should be reviewed as well during the monitoring and update of this Plan to determine feasibility of future implementation.

## Appendix A: Summary of Hazard Mitigation Strategies

### I. RIVERINE MITIGATION

**A. PREVENTION** - Prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Future development should not increase flood damage. Building, zoning, planning, and/or code enforcement officials usually administer preventative measures.

**1. Planning and Zoning** - Land use plans are put in place to guide future development, recommending where - and where not - development should occur. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events - such as parks or wildlife refuges. A Capital Improvements Program can recommend the setting aside of funds for public acquisition of these designated lands. The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development - for example, by designating floodplain overlay, conservation, or agricultural districts.

**2. Open Space Preservation** - Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not, however, be limited to the flood plain, since other areas within the watershed may contribute to controlling the runoff that exacerbates flooding. Land Use and Capital Improvement Plans should identify areas to be preserved by acquisition and other means, such as purchasing easements. Aside from outright purchase, open space can also be protected through maintenance agreements with the landowners, or by requiring developers to dedicate land for flood flow, drainage and storage.

**3. Floodplain Development Regulations** - Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances, which either stand-alone or are contained within a zoning ordinance.

**Subdivision Regulations:** These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be shown on the plat, and that every lot has a buildable area that is above the base flood elevation.

**Building Codes:** Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.

**Floodplain Ordinances:** Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

**4. Stormwater Management** - Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development. One technique is to use wet basins as part of the

landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration - for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.

**5. Drainage System Maintenance** - Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering watercourses or storage basins; regrading and filling should also be regulated. Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading their yard without concern for runoff patterns.

**B. Property Protection** - Property protection measures are used to modify buildings subject to flood damage, rather than to keep floodwaters away. These may be less expensive to implement, as they are often carried out on a cost-sharing basis. In addition, many of these measures do not affect a building's appearance or use, which makes them particularly suitable for historical sites and landmarks.

**1. Relocation** - Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, however, so this approach will probably not be used except in extreme circumstances. Communities that have areas subject to severe storm surges, ice jams, etc. might want to consider establishing a relocation program, incorporating available assistance.

**2. Acquisition** - Acquisition by a governmental entity of land in a floodplain serves two main purposes: (1) it ensures that the problem of structures in the floodplain will be addressed; and (2) it has the potential to convert problem areas into community assets, with accompanying environmental benefits. Acquisition is more cost effective than relocation in those areas that are subject to storm surges, ice jams, or flash flooding. Acquisition, followed by demolition, is the most appropriate strategy for those buildings that are simply too expensive to move, as well as for dilapidated structures that are not worth saving or protecting. Relocation can be expensive; however, there are government grants and loans that can be applied toward such efforts.

**3. Building Elevation** - Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits. This approach is cheaper than relocation, and tends to be less disruptive to a neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain, and is commonly practiced in flood hazard areas nationwide.

**4. Floodproofing** - If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Flood proofing can be accomplished through barriers to flooding, or by treatment to the structure itself.

Barriers: Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, however, only in areas subject to shallow flooding.

Dry Flood proofing: This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings, such doors, windows, etc. are closed either permanently with removable shields or with sandbags.

Wet Flood proofing: This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range

from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

**5. Sewer Backup Protection** - Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system - whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:

- Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
- Overhead sewer - keeps water in the sewer line during a backup.
- Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

**6. Insurance** - Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.

**National Flood Insurance:** When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

**Basement Backup Insurance:** National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

**C. NATURAL RESOURCE PROTECTION** - Preserving or restoring natural areas or the natural functions of floodplain and watershed areas provide the benefits of eliminating or minimizing losses from floods, as well as improve water quality and wildlife habitats. Parks, recreation, or conservation agencies usually implement such activities. Protection can also be provided through various zoning measures that are specifically designed to protect natural resources.

**1. Wetlands Protection** Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the N.H. Wetlands Board must approve any project that impacts a wetland. And, many communities in New Hampshire also have local wetland ordinances. Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice, however, since it takes many years for a new wetland to achieve the same level of quality as an existing one.

**2. Erosion and Sedimentation Control** - Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. And, because sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters. Practices to reduce erosion and

sedimentation have two principal components: (1) minimize erosion with vegetation and; (2) capture sediment before it leaves the site. Slowing the runoff increases infiltration into the soil, thereby controlling the loss of topsoil from erosion and the resulting sedimentation. Runoff can be slowed by vegetation, terraces, contour strip farming, no-till farm practices, and impoundments (such as sediment basins, farm ponds, and wetlands).

**3. Best Management Practices** - Best Management Practices (BMPs) are measures that reduce nonpoint source pollutants that enter waterways. Nonpoint source pollutants are carried by storm water to waterways, and include such things as lawn fertilizers, pesticides, farm chemicals, and oils from street surfaces and industrial sites. BMPs can be incorporated into many aspects of new developments and ongoing land use practices. In New Hampshire, the Department of Environmental Services has developed best management practices for a range of activities, from farming to earth excavations.

**D. EMERGENCY SERVICES** - Emergency services protect people during and after a flood. Many communities in New Hampshire have emergency management programs in place, administered by an emergency management director (very often the local police or fire chief).

**1. Flood Warning** - On large rivers, the National Weather Service handles early recognition. Communities on smaller rivers must develop their own warning systems. Warnings may be disseminated in a variety of ways, such as sirens, radio, television, mobile public address systems, or door-to-door contact. It seems that multiple or redundant systems are the most effective, giving people more than one opportunity to be warned.

**2. Flood Response** - Flood response refers to actions that are designed to prevent or reduce damage or injury, once a flood threat is recognized. Such actions and the appropriate parties include:

- activating the emergency operations center (emergency director)
- sandbagging designated areas (public works department)
- closing streets and bridges (police department)
- shutting off power to threatened areas (public service)
- releasing children from school (school district)
- ordering an evacuation (selectmen/city council/emergency director)
- opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

These actions should be part of a flood response plan, which should be developed in coordination with the persons and agencies that share the responsibilities. Drills and exercises should be conducted so that the key participants know what they are supposed to do.

**3. Critical Facilities Protection** - Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Buildings or locations vital to the flood response effort:

- emergency operations centers
- police and fire stations
- hospitals
- highway garages
- selected roads and bridges
- evacuation routes
- Buildings or locations that, if flooded, would create secondary disasters
- hazardous materials facilities
- water/wastewater treatment plants
- schools

- nursing homes

All such facilities should have their own flood response plan that is coordinated with the community's plan. Nursing homes, other public health facilities, and schools will typically be required by the state to have emergency response plans in place.

**4. Health and Safety Maintenance** - The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:

- patrolling evacuated areas to prevent looting.
- providing safe drinking water.
- vaccinating residents for tetanus.
- clearing streets.
- cleaning up debris.

The plan should also identify which agencies will be responsible for carrying out the identified measures. A public information program can be helpful to educate residents on the benefits of taking health and safety precautions.

**Structural Projects** - Structural projects are used to prevent floodwaters from reaching properties. These are all man-made structures, and can be grouped into the six types of discussed below. The shortcomings of structural approaches are that:

- They can be very expensive.
- They disturb the land, disrupt natural water flows, and destroy natural habitats.
- They are built to an anticipated flood event, and may be exceeded by a greater-than-expected flood.
- They can create a false sense of security.

**Reservoirs** - Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle.

Reservoirs are suitable for protecting existing development, and they may be the only flood control measure that can protect development close to a watercourse. They are most efficient in deeper valleys or on smaller rivers where there is less water to store. Reservoirs might consist of man-made holes dug to hold the approximate amount of floodwaters, or even abandoned quarries. As with other structural projects, reservoirs:

- are expensive;
- occupy a lot of land;
- require periodic maintenance;
- may fail to prevent damage from floods that exceed their design levels; and
- may eliminate the natural and beneficial functions of the floodplain.

Reservoirs should only be used after a thorough watershed analysis that identifies the most appropriate location, and ensures that they would not cause flooding somewhere else. Because they are so expensive and usually involve more than one community, they are typically implemented with the help of state or federal agencies, such as the Army Corps of Engineers.

**Levees/Floodwalls** - Probably the best known structural flood control measure is either a levee (a barrier of earth) or a floodwall made of steel or concrete erected between the watercourse and the land. If space is a consideration, floodwalls are typically used, since levees need more space. Levees and floodwalls should be set back out of the floodway, so that they will not divert floodwater onto other properties.

**Diversions** - A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river.

Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

**Channel Modifications** - Channel modifications include making a channel wider, deeper, smoother, or straighter. These techniques will result in more water being carried away, but, as with other techniques mentioned, it is important to ensure that the modifications do not create or increase a flooding problem downstream.

**Dredging:** Dredging is often cost-prohibitive because the dredged material must be disposed of somewhere else, and the stream will usually fill back in with sediment. Dredging is usually undertaken only on larger rivers, and then only to maintain a navigation channel.

**Drainage modifications:** These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive. These approaches are usually designed to carry the runoff from smaller, more frequent storms.

**Storm Sewers** - Mitigation techniques for storm sewers include installing new sewers, enlarging small pipes, street improvements, and preventing back flow. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving body of water can absorb the increased flows without increased flooding.

In many developments, streets are used as part of the drainage system, to carry or hold water from larger, less frequent storms. The streets collect runoff and convey it to a receiving sewer, ditch, or stream. Allowing water to stand in the streets and then draining it slowly can be a more effective and less expensive measure than enlarging sewers and ditches.

**Public Information** - Public information activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property, ways to protect people and property from these hazards, and the natural and beneficial functions of a floodplain.

**1. Map Information** - Flood maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is flood-prone. These maps are available from FEMA, the NH Office of Emergency Management, the NH Office of State Planning, or your regional planning commission.

**Outreach Projects** - Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:

- Mass mailings or newsletters to all residents.
- Notices directed to floodplain residents.
- Displays in public buildings, malls, etc.
- Newspaper articles and special sections.
- Radio and TV news releases and interview shows.
- A local flood proofing video for cable TV programs and to loan to organizations.
- A detailed property owner handbook tailored for local conditions.
- Presentations at meetings of neighborhood groups.

Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.

**Real Estate Disclosure** - Disclosure of information regarding flood-prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. State laws and local real estate practice can help by making this information available to prospective buyers early in the process.

**Library** - Your local library can serve as a repository for pertinent information on flooding and flood protection. Some libraries also maintain their own public information campaigns, augmenting the activities of the various governmental agencies involved in flood mitigation.

**Technical Assistance** - Certain types of technical assistance are available from the NFIP Coordinator, FEMA, and the Natural Resources Conservation District. Community officials can also set up a service delivery program to provide one-on-one sessions with property owners. An example of technical assistance is the flood audit, in which a specialist visits a property. Following the visit, the owner is provided with a written report, detailing the past and potential flood depths, and recommending alternative protection measures.

**Environmental Education** - Education can be a great mitigating tool, if people can learn what not to do before damage occurs. And the sooner the education begins, the better. Environmental education programs for children can be taught in the schools, park and recreation departments, conservation associations, or youth organizations. An activity can be as involved as course curriculum development or as simple as an explanatory sign near a river. Education programs do not have to be limited to children. Adults can benefit from knowledge of flooding and mitigation measures. And decision-makers, armed with this knowledge, can make a difference in their communities.

## II. EARTHQUAKES

**A. PREVENTIVE** - Planning/zoning to keep critical facilities away from fault lines.  
Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction.  
Building codes to prohibit loose masonry, overhangs, etc.

B. Property Protection:

Acquire and clear hazard areas.

Retrofitting to add braces, remove overhangs.

Apply mylar to windows and glass surfaces to protect from shattering glass.

Tie down major appliances, provide flexible utility connections.

Earthquake insurance riders.

**C. EMERGENCY SERVICES** - Earthquake response plans to account for secondary problems, such as fires and hazardous materials spills.

D. Emergency Services - Slope stabilization.

III. DAM FAILURE

A. Preventive:

Dam failure inundation maps.

Planning/zoning/open space preservation to keep area clear.

Building codes with flood elevation based on dam failure.

Dam safety inspections.

Draining the reservoir when conditions appear unsafe.

**B. PROPERTY PROTECTION** - Acquisition of buildings in the path of a dam breach flood. Flood insurance.

**C. EMERGENCY SERVICES** - Dam conditioning monitoring; warning and evacuation plans based on dam failure.

**D. EMERGENCY SERVICES** - Dam improvements, spillway enlargements. Remove unsafe dams.

IV. WILDFIRES

A. Preventive:

Zoning districts to reflect fire risk zones.

Planning and zoning to restrict development in areas near fire protection and water resources.

Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads multiple accesses.

Building code standards for roof materials, spark arrestors.

Maintenance programs to clear dead and dry bush, trees.

Regulation on open fires.

B. Property Protection:

Retrofitting of roofs and adding spark arrestors.

Landscaping to keep bushes and trees away from structures.

Insurance rates based on distance from fire protection.

**C. NATURAL RESOURCE PROTECTION** - Prohibit development in high-risk areas.

D. Emergency Services - Fire Fighting

V. WINTER STORMS

**A. PREVENTIVE** - Building code standards for light frame construction, especially for wind-resistant roofs.

**B. Property Protection:**

Storm shutters and windows

Hurricane straps on roofs and overhangs

Seal outside and inside of storm windows and check seals in spring and fall.

Family and/or company severe weather action plan & drills:

include a NOAA weather radio

designate a shelter area or location

keep a disaster supply kit, including stored food and water

keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas

know how to turn off water, gas, and electricity at home or work

**C. NATURAL RESOURCE PROTECTION** - Maintenance program for trimming tree and shrubs

**D. EMERGENCY SERVICES** - Early warning systems/NOAA Weather Radio Evacuation Plans

## Appendix B: TECHNICAL AND FINANCIAL ASSISTANCE FOR HAZARD MITIGATION

Local Municipalities must have a FEMA-approved Hazard Mitigation Plan in order to be eligible for Hazard Mitigation Assistance Grants. Information on these grants may be found at:

[http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)

**HAZARD MITIGATION GRANT PROGRAM (HMGP)** - Authorized under Section 404 of the Stafford Act, the Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.

Hazard Mitigation Grant Program funding is only available in States following a Presidential disaster declaration. Eligible applicants are:

- State and local governments
- Indian tribes or other tribal organizations
- Certain private non-profit organization

Individual homeowners and businesses may not apply directly to the program; however a community may apply on their behalf. HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage.

**PRE-DISASTER MITIGATION GRANTS PROGRAM** - The [Pre-Disaster Mitigation \(PDM\) program](#) provides technical and financial assistance to States and local governments for cost-effective pre-disaster hazard mitigation activities that complement a comprehensive mitigation program, and reduce injuries, loss of life, and damage and destruction of property. FEMA provides grants to States and Federally recognized Indian tribal governments that, in turn, provide sub-grants to local governments (to include Indian Tribal governments) for mitigation activities such as planning and the implementation of projects identified through the evaluation of natural hazards.

**FLOOD MITIGATION ASSISTANCE (FMA) PROGRAM** - FEMA provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to States and communities to prepare Flood Mitigation Plans. NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project Grants. FMA Project Grants are available to States and NFIP participating communities to implement measures to reduce flood losses. Ten percent of the Project Grant is made available to States

as a Technical Assistance Grant. These funds may be used by the State to help administer the program. Communities receiving FMA Planning and Project Grants must be participating in the NFIP.

#### Emergency Management Performance Grant

**GUIDELINES** - Emergency Management Performance Grant (EMPG Program) funding is available to local communities and eligible Agencies for projects that fall in FOUR general areas of Emergency Management: Planning activities; Training activities; Drills and Exercises; and Emergency Management Administration. Contact Heather Dunkerley at NHHSEM, [heather.dunkerley@dos.nh.gov](mailto:heather.dunkerley@dos.nh.gov), 603-223-3614 for assistance.

The following list of possible projects and activities is meant to guide you in selecting projects for an EMA Grant Submission. This list of suggested projects is not intended to be all-inclusive. Local communities or agencies may have other specific projects and activities that reflect local needs based on local capability assessments and local hazards.

#### Planning Activities may include:

- Develop a Hazard Mitigation Plan for your community.
- Prepare a hazard mitigation project proposal for submission to NHHSEM.
- Create, revise, or update Dam Emergency Action plans.
- Update your local Emergency Operations Plan (EOP). Consider updating a number of specific annexes each year to ensure that the entire plan is updated at least every four years.
- If applicable, develop or incorporate a regional HazMat Team Annex into your EOP.
- Develop an Anti-Terrorism Annex into your EOP.
- Develop a local/regional Debris Management Annex into your EOP.
- Develop and maintain pre-scripted requests for additional assistance (from local area public works, regional mutual aid, State resources, etc.) and local declarations of emergency.
- Develop and maintain written duties and responsibilities for EOC staff positions and agency representatives.
- Develop and maintain a list of private non-profit organizations within your local jurisdiction to ensure that these organizations are included in requests for public assistance funds.
- Prepare a submission for nomination as a "Project Impact" Community.

#### Training Activities may include:

- Staff members attend training courses at the Emergency Management Institute.
- Staff members attend a "field delivered" training course conducted by NHHSEM.
- Staff members attend other local, State, or nationally sponsored training event, which provides skills or knowledge relevant to emergency management.
- Staff members complete one or more FEMA Independent Study Courses.
- Identify and train a pre-identified local damage assessment team.

#### Drills and Exercises might include:

- Conduct multi-agency EOC Exercise (Tabletop or Functional) and forward an Exercise Evaluation Report, including after action reports, to NHHSEM (external evaluation of exercises is strongly encouraged). Drills or Exercises might involve any of the following scenarios:
  - Hurricane Exercise
  - Terrorism Exercise
  - Severe Storm Exercise
  - Communications Exercise
  - Mass Causality Exercise involving air, rail, or ship transportation accident
- Participate in multi-State or multi-Jurisdictional Exercise and forward Exercise Report to NHHSEM.
- HazMat Exercise with Regional HazMat Teams

- NHHSEM Communications Exercises
- Observe or evaluate State or local exercise outside your local jurisdiction.
- Assist local agencies and commercial enterprises (nursing homes, dams, prisons, schools, etc.) in developing, executing, and evaluating their exercise.
- Assist local hospitals in developing, executing and evaluating Mass Care, HazMat, Terrorism, and Special Events Exercises.
- Administrative Projects and Activities may include:
- Maintain an Emergency Operations Center (EOC) and alternate EOC capable of accommodating staff to respond to local emergencies.
- Establish and maintain a Call-Down List for EOC staff.
- Establish and maintain Emergency Response/Recovery Resource Lists.
- Develop or Update Emergency Management Mutual Aid Agreements with a focus on Damage Assessment, Debris Removal, and Resource Management.
- Develop and maintain written duties and responsibilities for EOC staff positions and agency representatives.
- Develop or Update Procedures for tracking of disaster-related expenses by local agencies.

**FLOOD MITIGATION ASSISTANCE (FMA) PROGRAM** - FMA was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FMA regulations can be found in 44 CFR Part 78. Funding for the program is provided through the National Flood Insurance Fund. FMA is funded at \$20 million nationally. FMA provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP).

There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to States and communities to prepare Flood Mitigation Plans. NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project Grants. FMA Project Grants are available to States and NFIP participating communities to implement measures to reduce flood losses. Ten percent of the Project Grant is made available to States as a Technical Assistance Grant. These funds may be used by the State to help administer the program. Communities receiving FMA Planning and Project Grants must be participating in the NFIP. A few examples of eligible FMA projects include: the elevation, acquisition, and relocation of NFIP-insured structures.

States are encouraged to prioritize FMA project grant applications that include repetitive loss properties. The FY 2001 FMA emphasis encourages States and communities to address target repetitive loss properties identified in the Agency's Repetitive Loss Strategy. These include structures with four or more losses, and structures with 2 or more losses where cumulative payments have exceeded the property value. State and communities are also encouraged to develop Plans that address the mitigation of these target repetitive loss properties.

## Appendix C: Saffir/simpson hurricane Scale

Courtesy of National Hurricane Center

This can be used to give an estimate of the potential property damage and flooding expected along the coast with a hurricane.

Category	Definition	Effects
One	Winds 74-95 mph	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal road flooding and minor pier damage
Two	Winds 96-110 mph	Some roofing material, door, and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of center. Small craft in unprotected anchorages break moorings.
Three	Winds 111-130 mph	Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain continuously lower than 5 feet ASL may be flooded inland 8 miles or more.
Four	Winds 131-155 mph	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach. Major damage to lower floors of structures near the shore. Terrain continuously lower than 10 feet ASL may be flooded requiring massive evacuation of residential areas inland as far as 6 miles.
Five	Winds greater than 155 mph	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Major damage to lower floors of all structures located less than 15 feet ASL and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5 to 10 miles of the shoreline may be required.

Above information can be found at: <http://www.fema.gov/hazards/hurricanes/saffir.shtm>

## Appendix D: Enhanced Fujita Tornado Damage Scale

<b>The Enhanced Fujita Scale</b>			
<b>F-Scale Number</b>	<b>Potential Damage</b>	<b>Wind Speed</b>	<b>Type of Damage</b>
F0	Light	65 – 85 mph	Little to no damage to man-made structures. Breaks branches off trees; pushes over shallow-rooted trees; damages signs
F1	Moderate	86 – 110 mph	Beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; Moderate damage.
F2	Considerable	111 – 135 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars from trains pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe	136 – 165 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted and thrown.
F4	Devastating	166 – 200 mph	Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	Incredible	Over 200 mph	Strong frame houses leveled off foundations and carried considerable distances; automobile-sized missiles fly through the air in excess of 109 yards; trees debarked; steel reinforced concrete structures badly damaged. Complete devastation.

## Appendix E: The richter Magnitude Scale

### Earthquake Severity

Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Information above found at: <http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html>

**The Richter Magnitude Scale** - Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, locations, and magnitude of an earthquake can be determined from the data recorded by seismograph stations.

The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Earthquakes with magnitude of about 2.0 or less are usually call microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater - there are several thousand such shocks annually - are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year. The Richter Scale has no upper limit. Recently, another scale called the moment magnitude scale has been devised for more precise study of great earthquakes. The Richter Scale is not used to express damage. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten wildlife. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

## Appendix F – Extreme Weather

### Extreme Weather Madness Thunderstorm Criteria

THUNDERSTORM TYPES	Rainfall Rate/hr	MAX WIND GUST	HAIL SIZE	PEAK TORNADO Possibility	LIGHTNING FREQUENCY (5 min Intervals)	Darkness Factor	STORM IMPACT
T-1 – Weak thunderstorms or Thundershowers	.03-.10	< 25 MPH	None	None	Only a few strikes during the storm.	Slightly Dark. Sunlight may be seen under the storm.	<ol style="list-style-type: none"> <li>1. No damage.</li> <li>2. Gusty winds at times.</li> </ol>
T-2 – Moderate Thunderstorms.	.10”-.25”	25-40 MPH	None	None	Occasional 1-10	Moderately Dark. Heavy downpours may cause the need for car lights.	<ol style="list-style-type: none"> <li>1. Heavy downpours.</li> <li>2. Occasional lightning.</li> <li>3. Gusty winds.</li> <li>4. Very little damage.</li> <li>5. Small tree branches may break</li> <li>6. Lawn furniture moved around</li> </ol>
T-3 – Heavy Thunderstorms 1. Singular or lines of storms.	.25”-.55”	40-57 MPH	1/4 “ to 3/4”	EF0	Occasional to Frequent 10-20	Dark. Car lights used. Visibility low in heavy rains. Cars may pull off the road.	<ol style="list-style-type: none"> <li>1. Minor Damage.</li> <li>2. Downpours that produce some flooding on streets.</li> <li>3. Frequent lightning could cause house fires.</li> <li>4. Hail occurs within the downpours.</li> <li>5. Small branches are broken.</li> <li>6. Shingles are blown off roofs.</li> </ol>
T-4 – Intense Thunderstorms 1. Weaker supercells 2. Bow Echos or lines of Storms	.55” – 1.25”	58 to 70 MPH	1” to 1.5”	EF0 to EF2	Frequent 20-30	Very Dark. Car lights used. Some street lights come on.	<ol style="list-style-type: none"> <li>1. Moderate Damage.</li> <li>2. Heavy rains can cause flooding to streams and creeks. Roadway flooding.</li> <li>3. Hail can cause dents on cars and cause crop damage.</li> <li>3. Wind damage to trees and buildings.</li> <li>4. Tornado damage.</li> <li>5. Power outages</li> </ol>
T-5 – Extreme Thunderstorms 1. Supercells with family of tornadoes. 2. Derecho Windstorms	1.25” – 4”	Over 70 Mph	Over 1.5” to 4”	EF3 to EF5	Frequent to Continuous. > 30	Pitch Black. Street Lights come on. House lights maybe used	<ol style="list-style-type: none"> <li>1. Severe Damage to Trees and Property. Damage is widespread.</li> <li>2. Flooding rains.</li> <li>3. Damaging hail.</li> <li>4. Damaging wind gusts to trees and buildings.</li> <li>5. Tornadoes F3-F5 or family of tornadoes can occur. Tornadoes can cause total devastation.</li> <li>6. Widespread power outages.</li> </ol>

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## Appendix G Lightning Risk Definitions

Lightning Risk Definitions	
Low Risk	Thunderstorms are only expected to be isolated or widely scattered in coverage (20 Percent Chance). Atmospheric conditions do not support frequent cloud-to-ground lightning strikes.
Moderate Risk	Thunderstorms are forecast to be scattered in coverage (30-50 Percent Chance). Atmospheric conditions support frequent cloud-to-ground lightning strikes.
High Risk	Thunderstorms are forecast to be numerous or widespread in coverage (60-100 Percent Chance). Atmospheric conditions support continuous and intense cloud-to-ground lightning strikes.

## Appendix H Hail Size Description Chart

Hail Size Description Chart		
Hailstone size	Measurement	
	in.	cm.
bb	< 1/4	< 0.64
pea	1/4	0.64
dime	7/10	1.8
penny	3/4	1.9
nickel	7/8	2.2
quarter	1	2.5
half dollar	1 1/4	3.2
golf ball	1 3/4	4.4
billiard ball	2 1/8	5.4
tennis ball	2 1/2	6.4
baseball	2 3/4	7.0
softball	3.8	9.7
Compact disc / DVD	4 3/4	12.1

Note: Hail size refers to the **diameter** of the hailstone.

## Appendix I Sperry-Piltz Ice Accumulation Index

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

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

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

## Appendix J Wildland Urban Interface (WUI) Exposure Zones

NIST Technical Note 1748, January 2013

Source: National Institute of Standards and Technology (NIST), US Dept. of Commerce

**Table 4: E-Scale Building Construction Classes and Attributes**

WUI scale	Building Construction Class	Ignition Vulnerabilities from Embers and Fire	Building Construction and Landscaping Attributes for Protection against Embers
E1 or F1	WUI 1	None	Normal Construction Requirements: <ul style="list-style-type: none"> <li>- Maintained Landscaping</li> <li>- Local AHJ-Approved Access for firefighting equipment</li> </ul>
E2 or F2	WUI 2	In this area, highly volatile fuels could be ignited by embers. Weathered, dry combustibles with large surface areas can become targets for ignition from embers.	Low Construction Hardening Requirements: <ul style="list-style-type: none"> <li>- Treated combustibles allowed on structure</li> <li>- Attached treated combustibles allowed</li> <li>- Treated combustibles allowed around structure</li> <li>- Low flammability plants</li> <li>- Irrigated and well maintained Landscaping</li> <li>- Local AHJ-Approved Access for firefighting equipment</li> </ul>
E3 or F3	WUI 3	Exposed combustibles are likely to ignite in this area from high ember flux or high heat flux	Intermediate Construction Hardening Requirements: <ul style="list-style-type: none"> <li>- No exposed combustibles on structure</li> <li>- Combustibles placed well away from structure</li> <li>- Low flammability plants</li> <li>- Irrigated and well maintained landscaping</li> <li>- Local AHJ-Approved Access for firefighting equipment</li> </ul>
E4 or F4	WUI 4	Ignition of combustibles from direct flame contact is likely.	High Construction Hardening Requirements: <ul style="list-style-type: none"> <li>- No exposed combustibles</li> <li>- All vents, opening must be closed</li> <li>- Windows and doors must be covered with insulated non-combustible coverings.</li> <li>- Irrigated and well maintained low flammability landscaping</li> <li>- Local AHJ-Approved Access for firefighting equipment</li> </ul>

# Appendix K Documentation of Planning Process

## Jennifer Rowden

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**Subject:** North Hampton Hazard Mitigation Plan Update - Kick off Meeting 10/13 @ 9  
**Attachments:** North Hampton 2012 Update Final-Complete.pdf

**From:** Jennifer Rowden <jrowden@rpc-nh.org>  
**Sent:** Thursday, September 22, 2016 10:25 AM  
**Subject:** North Hampton Hazard Mitigation Plan Update - Kick off Meeting 10/13 @ 9

Hello everyone,

As many of you are aware, it is once again time to update North Hampton's Hazard Mitigation Plan. We have scheduled the kick-off meeting for this update for **Thursday, October 13 from 9:00 until 10:30** in the upstairs conference room in the town offices.

Hazard mitigation plans must be updated every five years in order to maintain the town's eligibility to receive federal disaster relief funds if the town were to experience a natural disaster (severe flooding, blizzard, earthquake, etc.) and the plan is an important tool for emergency planning purposes to minimize damage. The focus of the meeting will be to give an overview of the process and to gain some initial feedback regarding areas to improve the existing plan (for example, adding Heritage Commission's historic resources inventory). **The 2012 Hazard Mitigation Plan is attached for reference.**

Input on this update is needed from a wide variety of boards and individuals. If you, or someone from your board or department, is unable to attend this meeting I will be reaching out to you to solicit input. There will also be ample opportunity for additional input and public input.

The tentative schedule for additional meetings for the plan update are November 10, January 12 and February 9 at 9 a.m. at the town offices.

If anyone has any questions regarding this planning effort or for the kickoff meeting itself, please let me know.

Regards,  
Jenn Rowden  
North Hampton Circuit Rider Planner

---

Jennifer Rowden, Senior Planner  
Rockingham Planning Commission  
156 Water Street  
Exeter, NH 03833  
Direct line: 603-658-0521  
RPC Main line: 603-778-0885  
[jrowden@rpc-nh.org](mailto:jrowden@rpc-nh.org)

## **North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**October 13, 2016  
9:00 to 10:30**

### **AGENDA**

- 1. Introductions**
- 2. Review of update process**
- 3. Review of past plan**
- 4. Next Steps**

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

Event: Kick off meeting - Municipal staff and land use boards  
 Date: October 13, 2016  
 Time: 9:00 - 10:00 , North Hampton Town Hall

1 hour

Total

Material Rate/hour	Name	Position Title/ Land Use Board	
30.56	Rick Milner	PLANNING & ZONING ADMINISTRATOR	30.56
36.28	Kevin Kelly	CODE, BUILDING, HEALTH	36.28
25.00 Volunteer	Brian Goode	LBH Zoning	25.00
56.61	Paul Apple	Town Administrator	56.61
25.00 Volunteer	DAN DERBY	PLANNING BOARD	25.00
25.00 Volunteer	Nancy Monaghan	PLANNING BOARD	25.00
25.00 Volunteer	Jim Maggiore	Select Board	25.00
49.04	Steven Janurin	Police Dept.	49.04
54.81	Michael Maddocks	Police Dept.	54.81
69.48	Michael Tully	Fire Dept.	69.48
46.76	John Hubbard	North Hampton OPW	46.76
			443.54

**North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**November 10, 2016**  
**9:00 to 10:30**

**AGENDA**

- 1. Review of Hazards and Critical Facilities**
- 2. Review of existing mapping**

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

Event: Critical facilities + hazard identification meeting  
 Date: 11/10/19  
 Time: 9:00 - 10:30 am NORTH HAMPTON

water per hour  
rate

1.5 hours

Total

25.00  
Volunteer

Name	Position Title/ Land Use Board
RICHARD MILNER	PLANNING & ZONING ADMINISTRATOR
Brian Goode	LBH
JEFF HILNER	Heritage Comm.
NANCY MONAGHAN	Planning Board
Jim Maggiore	Select Board
Cindy Jenkins	Agriculture Commission
Steven Janvin	Deputy Police Chief
Paul Apple	Town Administrator
Michael Tully	Fire Chief

45.84  
37.50  
37.50  
37.50  
37.50  
37.50  
73.56  
84.92  
104.22  

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496.04

30.50  
25.00  
Vol 25.00  
Vol 25.00  
Vol 25.00  
Vol 25.00  
49.04  
56.61  
69.48

## **North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**February 16, 2017**  
**9:00 to 10:30**

### **AGENDA**

- 1. Review current mitigation strategies**
- 2. Brainstorm potential mitigation strategies**

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

Event: Committee Meeting  
 Date: 2/16/17  
 Time: 9:00 - ~~10:30~~ 11:00 = 2 hrs

~~Chief~~  
~~Chief~~  
~~Chief~~

Name	Position Title/ Land Use Board
Michael Tully	Fire Chief
Michael Maddoxes	Police Chief
Steven Janurin	Deputy Police Chief
Dan Derby	Planning Board
RICK MILNER	PLANNING AND ZONING ADMINISTRATOR
Jim Maggioro	Select Board/ Rep to Heritage
JEFF HILNER	HERITAGE COMM.
Paul Apple	Town Administrator
Kevin Keller	C.E.O. / BUILDING / HEALTH

69.42 x 2 hrs = 138.96  
 54.71 = 109.62  
 49.04 = 98.08  
 25.00 = 50.00  
 30.56 = 61.12  
 25.00 = 50.00  
 25.00 = 50.00  
 56.61 = 113.22  
 30.28 = 60.56  


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 743.56

**North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**February 23, 2017  
9:00 to 10:30**

**AGENDA**

- 1. Continued review of mitigation strategies**

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

Event: Committee meeting 4 - New strategies  
 Date: 2/23/2017  
 Time: 9:00 - 10:30 = 1.5 hrs

Name	Position Title/ Land Use Board	
Michael Tully	Fire Chief	69.48
Steven Janvriin	Deputy Police Chief	49.04
Jim Maggiore	Select Board	25.00
Nancy Noragan	Planning Board	25.00
DAN DERBY	Planning Board	25.00
Brian Goode	Little Borne Neck	25.00
<i>[Signature]</i>	OPW	46.76
Paul L. Apple	Town Administrator	56.61
Kevin Kelley	CEO. / BUILDING / HEALTH	36.28
RICK MILNER	PLANNING AND ZONING ADMINISTRATOR	30.56
Michael Maddocks	Police Chief	54.81
Jeff Hillier	HERITAGE Comm.	25.00

x1.5 =  
 104.22  
 73.56  
 37.50  
 37.50  
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 37.50  
 70.14  
 84.92  
 54.42  
 45.84  
 82.22  
 37.50  


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 702.70

## **Appendix L Approval Letters from FEMA**

## **North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**March 16, 2017**  
**9:00 to 10:30**

### **AGENDA**

- 1. Evaluate of potential mitigation strategies**
- 2. Prioritize mitigation strategies**

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

not calculated  
into March study

Event: Review of new strategies  
Date: 8-16-17  
Time: 9:00 - 10:30

Name	Position Title/ Land Use Board
Rick MILNER	PLANNING AND ZONING ADMINISTRATOR
Michael Tully	Fire chief/EMD
Dan Derby	Planning Board
Jim Maggiore	Select Board
Jeff Hillier	HERITAGE COMM.
Kevin Keener	BUILDING DEPT
Steven Janurin	Deputy Police Chief
Michael Maddocks	Chief of Police
Ben C. Seal	LUBH

## **North Hampton Hazard Mitigation Plan 2017 Update**

North Hampton Town Offices  
233 Atlantic Avenue  
North Hampton, NH 03862

**October 5, 2017  
9:00 to 10:30**

### **AGENDA**

#### **1. Review final draft mitigation plan.**

Note: The draft plan is available for review at the North Hampton Town Offices. Public comment on the draft plan may be submitted at the meeting at the time and place above, mailed to the Town of North Hampton at the above address, or e-mailed to Jennifer Rowden at [jrownden@rpc-nh.org](mailto:jrownden@rpc-nh.org).

North Hampton Hazard Mitigation Plan 2017 Update  
Participant Sign-in

Event: Mechanics Committee  
 Date: 10/5/2017  
 Time: 9:00 - 10:00

Name	Position Title/ Land Use Board
Jim Maggiore	Select Board.
Nancy Monaghan	Planning Board
Jan Derby	" "
Rick Milner	PLANNING + ZONING ADMIN
John Hubbard	Public Works Director
Michael Tully	Fire Chief