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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
- Wildfire
- Earthquake

The list of *critical facilities* includes:

- Municipal facilities;
- Communication facilities;
- Fire stations 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 New Hampshire Homeland Security and Emergency Management (NH HSEM) and the Federal Emergency Management Agency (FEMA). This Document was approved by both agencies prior its adoption at the local level.

## CHAPTER I. INTRODUCTION

### Background

The New Hampshire Homeland Security Emergency Management (NH HSEM) has a goal for all communities within the State of New Hampshire to establish local hazard mitigation plans as a means to reduce and mitigate future losses from natural hazard events. The NH HSEM outlined a process whereby communities throughout the State may be eligible for grants and other assistance upon completion of a local hazard mitigation plan. A handbook entitled *Hazard Mitigation Planning for New Hampshire Communities* was created by NH HSEM to assist communities in developing local plans. The State's Regional Planning Commissions are charged with providing assistance to selected communities to develop local plans.

The *North Hampton Hazard Mitigation 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 New Hampshire Homeland Security and Emergency Management (HSEM) operating under the guidance of Section 206.405 of 44 *CFR* Chapter 1 (10-1-97 Edition). The *North Hampton Hazard Mitigation 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 and approval by the North Hampton Planning Board, it will become an official appendix to the North Hampton Master Plan.

### Methodology

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 *North Hampton Hazard Mitigation Plan*. This meeting precipitated the 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*.

#### Step 1 - Form Committee

As stated above prior to the first meeting RPC contacted the EMD of Seabrook. Members of the community were invited to join the Seabrook Hazard Mitigation Committee including the Police Chief, Fire Chief, Planning Board, Department of Public Works, and others. Public notices were posted on the Town website and two other public viewing site in Town to inform residents about the planning process, to participate, and allow the possibility to be a member of the planning process. The initial meeting was held on September 7, 2010 to introduce the Mitigation Planning Process to the possible committee.

#### 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 using Pictometry™ software 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. This process involved reviewing the Town's Masterplan, Capitol Improvements Program (CIP), Zoning Ordinance, Subdivision Regulations, Site Plan Review Regulations, and participation in the (National Flood Insurance Program) NFIP. This allowed to committee to identify portions of the Town's existing mitigation strategies. The Committee could see how natural hazards were dealt with in the context of the Master Plan which outlines the vision for the Town and how capitol expenditures were planned to increase the Town's preparedness for Natural Disasters.

### **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.

### **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.

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

RPC staff compiled the results of Steps 1 to 8 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 RPC 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 meeting was held by the North Hampton Board of Selectmen on \_\_\_\_\_. The meeting allowed the community and neighboring towns to provide comments and suggestions for the *Plan* in person, prior to the document being finalized. 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 by the Board of Selectman.

## **Hazard Mitigation Goals and Objectives of the State of New Hampshire**

The *State of New Hampshire Natural Hazards Mitigation Plan*, which was prepared and is maintained by the New Hampshire Homeland Security and Emergency Management (NH HSEM), sets forth the following related to overall hazard mitigation goals and objectives for the State of New Hampshire:

1. To improve upon the protection of the general population, the citizens of the State and guests, from all natural and man-made hazards.
2. To reduce the potential impact of natural and man-made disasters on the State's Critical Support Services.
3. To reduce the potential impact of natural and man-made disasters on Critical Facilities in the State.
4. To reduce the potential impact of natural and man-made disasters on the State's infrastructure.
5. To improve Emergency Preparedness.
6. Improve the State's Disaster Response and Recovery Capability.
7. To reduce the potential impact of natural and man-made disasters on private property.
8. To reduce the potential impact of natural and man-made disasters on the State's economy.
9. To reduce the potential impact of natural and man-made disasters on the State's natural environment.
10. To reduce the State's liability with respect to natural and man-made hazards generally.
11. To reduce the potential impact of natural and man-made disasters on the State's specific historic treasures and interests as well as other tangible and intangible characteristics which add to the quality of life of the citizens and guests of the State.
12. To identify, introduce and implement cost effective Hazard Mitigation measures so as to accomplish the State's Goals and Objectives and to raise the awareness of, and acceptance of Hazard Mitigation generally.

*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 Pardue, Town Administrator  
Brian Page, Police Chief  
Thomas Lambert, Fire Chief  
Richard Mabey, Building Inspector  
Robert Strout, Road Agent  
Corey Landry, Health Officer  
Krystina Arrain, Planning and Zoning Administrator

### Hazard Mitigation Participants for 2010/11 Update

Stephen Fournier, Town Administrator  
Brian Page, Police Chief  
Dennis Cote, Fire Chief and Health Inspector  
Richard Mabey, Building Inspector/Code Enforcement  
John Hubbard, Director of Public Works  
Wendy Chase, Planning and Zoning Administrator

The North Hampton Board of Selectmen offers thanks to the **New Hampshire Homeland Security and Emergency Management** ([www.nhHSEM.state.nh.us](http://www.nhHSEM.state.nh.us)), 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.

## CHAPTER II. COMMUNITY PROFILE

### Natural Features

The Town of North Hampton is located in New Hampshire within the Rockingham County. North Hampton is bordered by the New Hampshire municipalities of Greenland, Rye, Stratham, and Hampton, as seen below in Figure 1. The town was incorporated in 1742 and had a recorded population of 4,259 during the 2000 US Census<sup>1</sup>. From 1990 to 2000, North Hampton's population grew by 18.46 percent and from 2000 to 2010 grew only 1%. According to the 2010 census the population was estimated at 4,301. The 2009 American Community Survey (ACS) shows the median age to be 42.6 years, with 29% of the population 19 years and younger and 14% age 65 and older. As of 2009, there were 1,953 total housing units according to the NH office of Energy and Planning and a population density of 321.7 persons per square mile of land area in 2009.

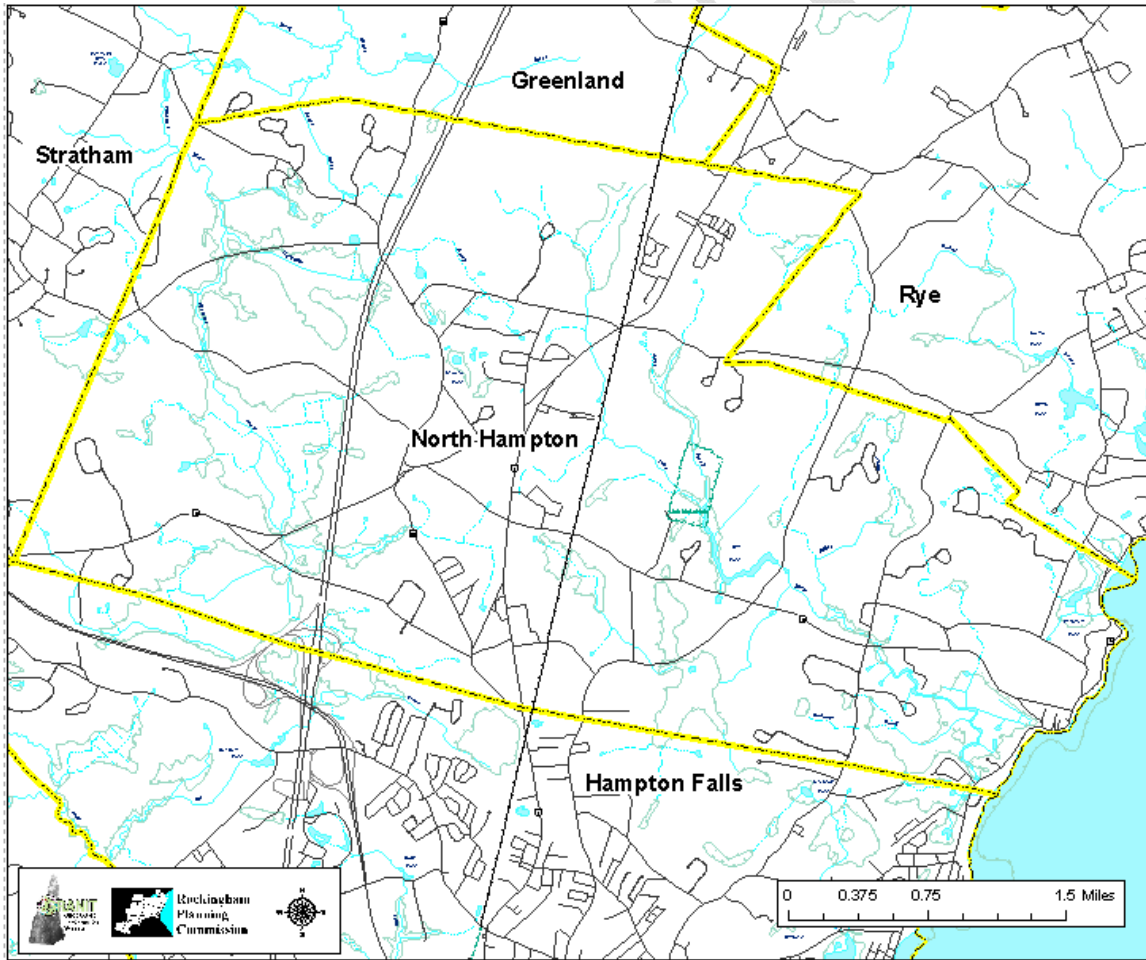
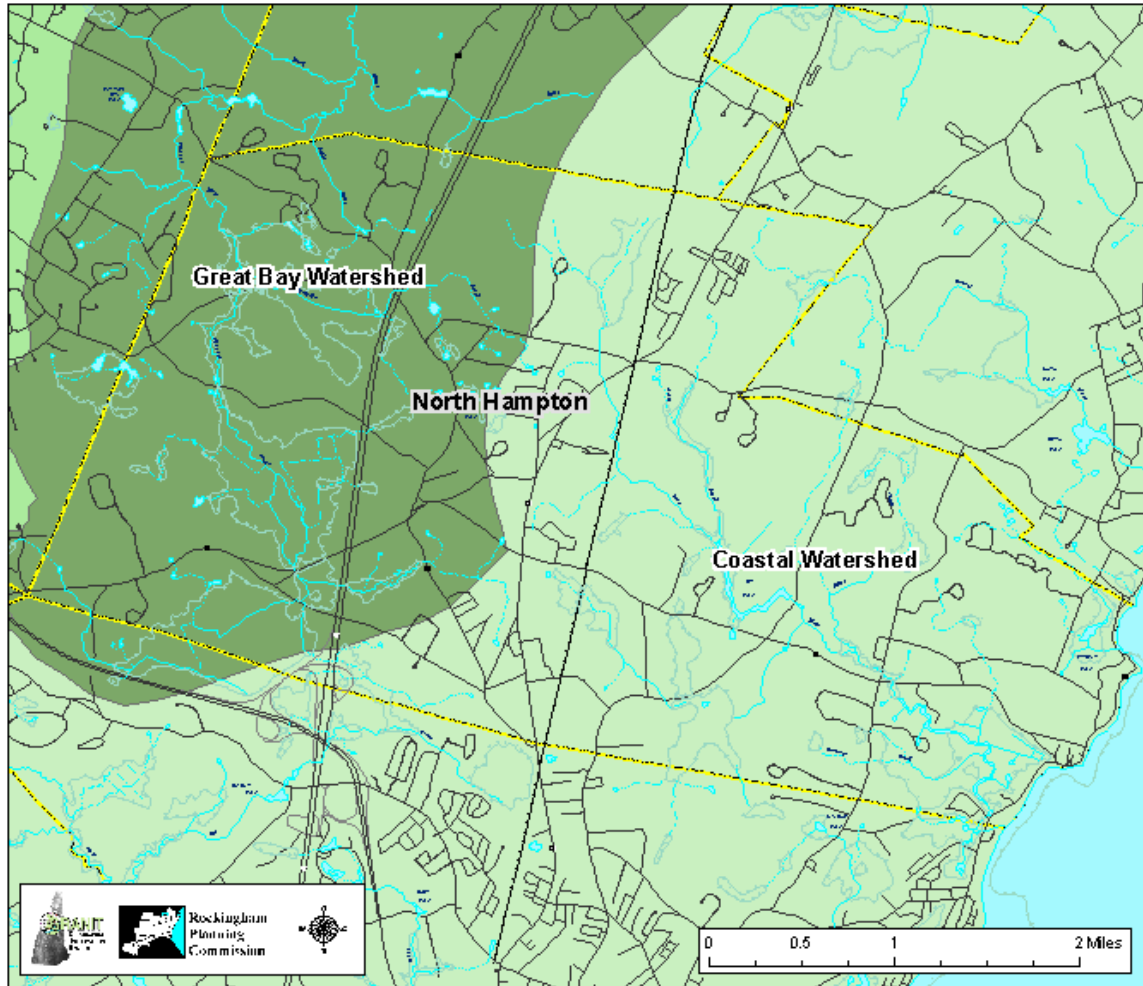


Figure 1: Location Map of North Hampton, New Hampshire

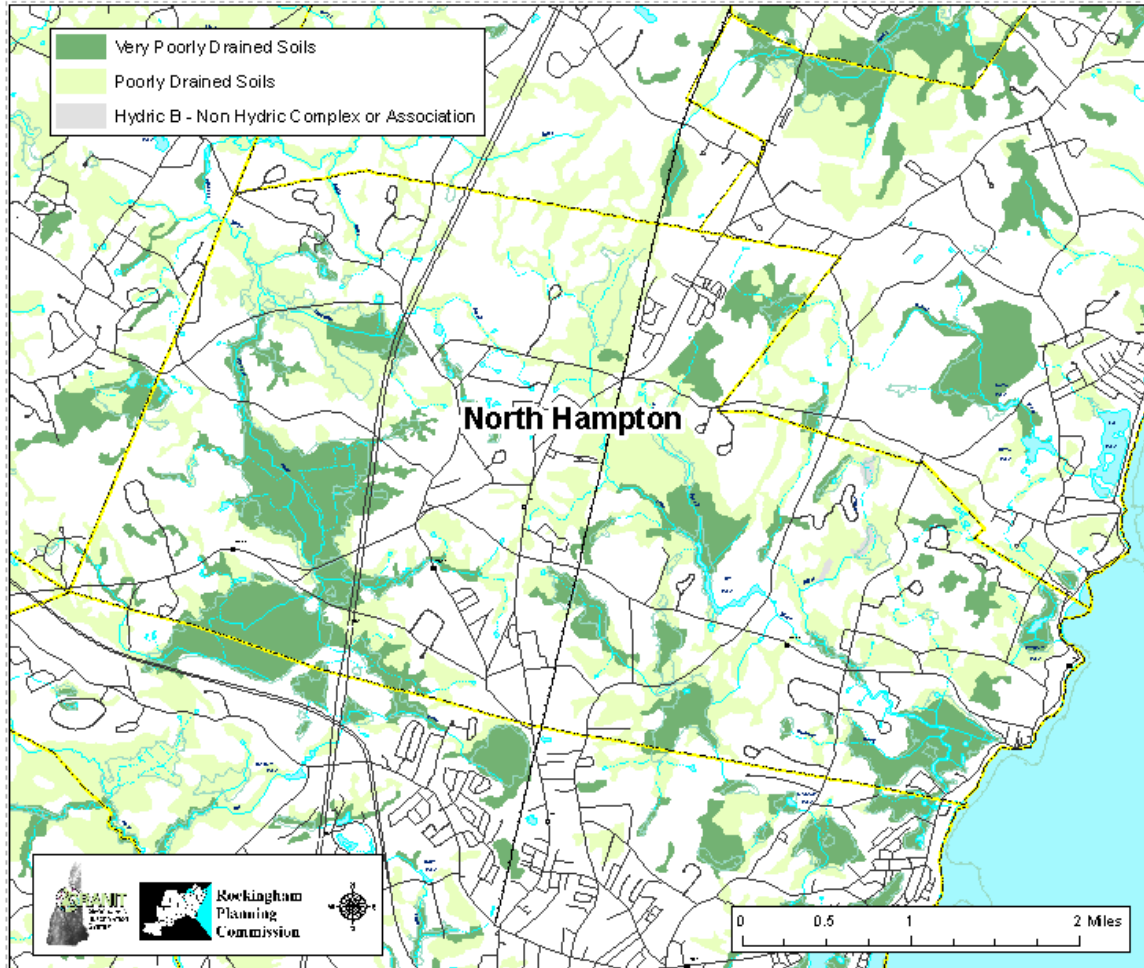
North Hampton contains 13.9 square miles of land are and 0.01 miles of inland water area. The community is characterized by a scenic coastline along the Atlantic Ocean.

<sup>1</sup> Economic & Labor Market Information Bureau, NH Employment Security



**Figure 2: Watersheds, in and near North Hampton, New Hampshire**

Wetlands are an important part of the Town of North Hampton’s surface water. Most of the Town’s wetlands occur associated with Mill Pond and tributaries. Wetland, or hydric, soils include poorly and very poorly drained soils. These soil types are often associated with marine silts and clays where the water table is at or near the surface for five to nine months of the year.



**Figure 3: Wetlands Map of North Hampton, New Hampshire. Wetland delineated as poorly and very poorly drained soils, and Wetlands from the National Wetland Inventory.**

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 below in Figure 4. North Hampton maintains participation in the National Flood Insurance Program administered by FEMA. 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 capacity 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.

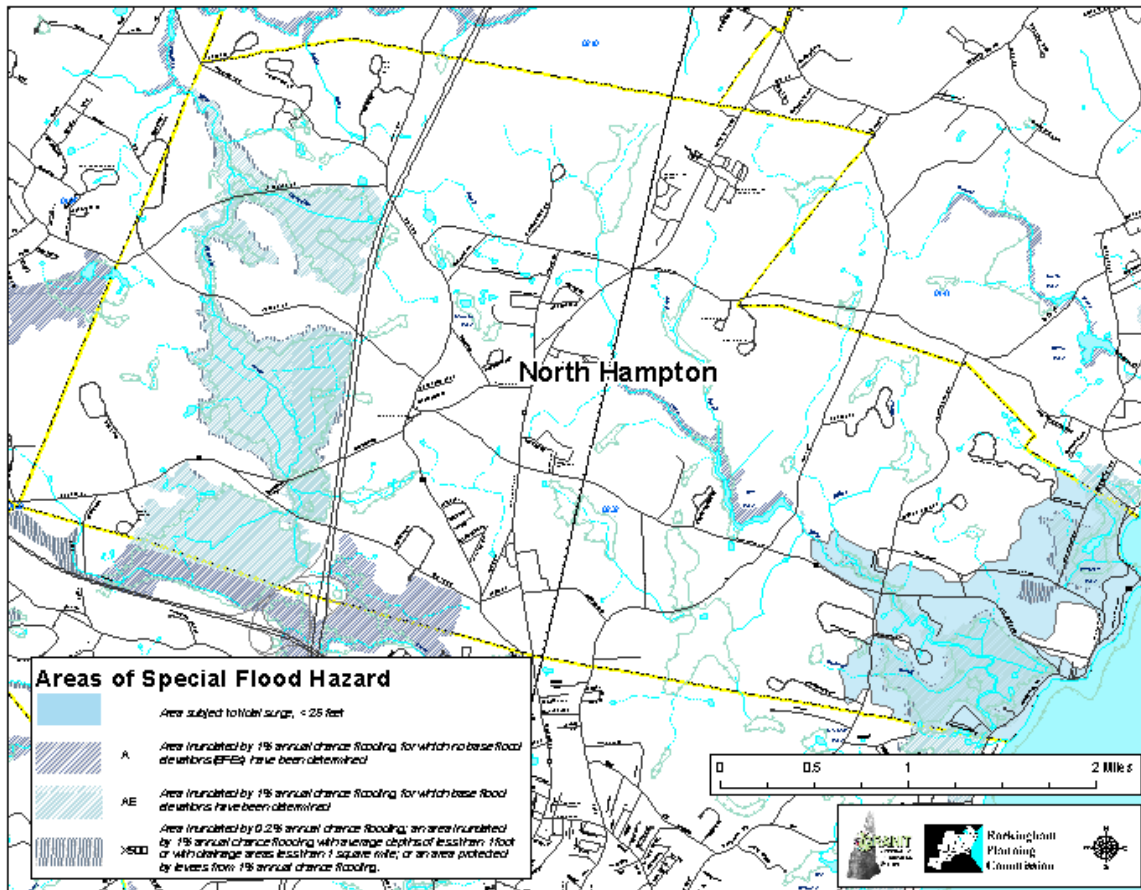


Figure 4: Floodplains of North Hampton, New Hampshire

## Current and Future Development Trends

Current 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 on Map 1. 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 5,510 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. Building department records indicate that 38 new residential building permits and 12 commercial building permits were issued between the years 2006-2011.

**INSERT MAP 1 - EXISTING LAND-USE**

DRAFT

## CHAPTER III. NATURAL HAZARDS IN THE TOWN OF NORTH HAMPTON

### 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.). The Town of North Hampton is prone to several types of natural hazards. These hazards include: flooding, hurricanes or other high-wind events, severe winter weather, wildfires and earthquakes. Other natural hazards can and do affect the Town of North Hampton, but these were the hazards prioritized by the Committee for mitigation planning. These were the hazards that were considered to occur with regularity and/or were considered to have high damage potential, and are discussed below.

Natural hazards that are included in the State's Hazard Mitigation Plan that are not included in the *Plan* include: drought, extreme heat, landslide, subsidence, radon and avalanche. Subsidence and avalanche are rated by the State as having Low and No risk in Rockingham County, respectively; due to this 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 drought, extreme heat, and radon; these hazards were not included in the *Plan*. When compared 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 drought, extreme heat, 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.

### Definitions of Natural Hazards

#### 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 can be caused by hurricanes or other coastal storms or possibly from a tsunami.

#### *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 that there is a 1% chance of a flood of that size

happening in any year. The flood hazard areas that are identified in Rye are defined as follows (according to FEMA's website: [http://www.fema.gov/fhm/fq\\_term.shtm](http://www.fema.gov/fhm/fq_term.shtm) )

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zones AE and A1-A30 are the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, Base Flood Elevations (BFEs) derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. The depth should be averaged along the cross section and then along the direction of flow to determine the extent of the zone. Average flood depths derived from the detailed hydraulic analyses are shown within this zone. In addition, alluvial fan flood hazards are shown as Zone AO on the FIRM. Mandatory flood insurance purchase requirements apply.

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone X is the flood insurance rate zones that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

#### *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 by 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.

#### *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.

#### *Coastal Storm Surge*

Storm Surge is most often associated with the landfall of a hurricane. Strong winds and low pressure combine to cause waves that can be 1 to 10 meters above normal<sup>2</sup>. Strong winds blowing toward shore cause the water to pile up at the shore, causing the storm surge. These affects are most intense on the right side of the hurricane eye where the winds are blowing on shore.

#### *Tsunami*

The National Tsunami Hazard mitigation Program (<http://www.pmel.noaa.gov/tsunami-hazard/terms.html>) defines a Tsunami as Japanese term derived from the characters "tsu" meaning harbor and "nami" meaning wave. The international scientific community describes a series of traveling waves in water produced by the displacement of the sea floor associated with submarine earthquakes, volcanic eruptions, or landslides.

#### *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.

### **Hurricane-High Wind Events**

Significantly high winds occur especially during hurricanes, tornadoes, winter storms and thunderstorms. Falling objects and downed power lines are dangerous risks associated with high winds. In addition, property damage and downed trees are common during high wind occurrences.

#### *Hurricanes*

A hurricane<sup>3</sup> 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.

#### *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

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<sup>2</sup> University of Illinois, World Weather 2010 Project <http://ww2010.atmos.uiuc.edu/>

<sup>3</sup> The Saffir/Simpson Hurricane Scale can be viewed in Appendix C

in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

The Fujita Scale<sup>4</sup> is the standard scale for rating the severity of a tornado as measured by the damage it causes. 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’re held up by winds, known as updrafts, which blow upwards in thunderstorms. The updrafts carry droplets of supercooled water – water at a 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 can grow. 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.

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<sup>4</sup> The Fujita Tornado Scale can be viewed in Appendix D.

### *Ice Storms*

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

## **Wildfire**

Wildfire is defined as an uncontrolled and rapidly spreading fire.

### *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 earth caused by the breaking and shifting of rock beneath the earth's 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<sup>5</sup> and Mercalli scale.

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

As discussed above the natural hazards that affect, or potentially could affect North Hampton, New Hampshire, that were identified for designation in this *Plan* include: flooding, hurricanes-high wind events, severe winter weather, wildfire and earthquakes. 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.

## **Flooding**

Description: Flooding events can include hurricanes, 100-year floods, 500-year floods, debris-impacted infrastructure, erosion, mudslides, rapid snow pack melt, dam breach and/or failure, coastal storm surge, and tsunamis.

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<sup>5</sup> A copy of the Richter scale is displayed in Appendix E.

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 several major flood zones: A, AE, AO, VE and X. These Zones are defined in the previous section. 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 the flood zones can be seen in Map 2: Past and Future Hazards. This area includes FIRM Zones that have been identified in North Hampton, as well as, areas of locally chronic flood problems. Map 2 also shows the potential storm surge inundation zone for categories 1 through 4. The data was developed by the National Hurricane Center and provided by the US Army Corps of Engineers.

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. From 2006 to 2010 there have been four recorded floods in the region that fall between the 100 yr - 500 yr interval. These areas are listed in Table 3.

### **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.

**Table 3: North Hampton NFIP Policy and Loss Statistics**

Policies in force	Insurance in Force	Number of Paid Losses (since 1978)	Total Losses Paid (Since 1978)
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60	\$ 12,421,700	35	\$452,721
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Source: FEMA Policy and claims database, as of April, 2011

**North Hampton NFIP Repetitive Flooding Losses**

As of April 2011, North Hampton has had 2 repetitive loss residential properties according to New Hampshire Office of Energy and Planning (NHOEP) 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**

In order to reduce flood risks, the zoning enforcement officer should be familiar with the Floodplain Ordinance and the NFIP. In addition, the Planning Board should be familiar with the NFIP policies, especially those regulations that are required to be incorporated into the Subdivision/Site Plan Review regulations. A workshop sponsored by the NH Homeland Security and Emergency Management or the NH Office of Energy and Planning would be appropriate to educate current staff and volunteers on a bi-yearly basis.

An essential step in mitigating flood damage is participating in NFIP. North Hampton should work to consistently enforce NFIP compliant policies to continue its participation in this program. North Hampton has effectively worked within the provisions of NFIP.

### **Hurricanes-High Wind Events**

Description: High wind events can include hurricanes, tornadoes, "Nor'-Easters," downbursts and lightning/thunderstorm events.

Location: Hurricane events are more potentially damaging with increasing proximity to the coast. North Hampton's Atlantic coastline makes the community vulnerable to hurricanes. For this *Plan*, high-wind events were considered to have an equal chance of affecting any part of the Town of North Hampton.

Extent: North Hampton is located within Zone II hurricane-susceptible region (indicating a design wind speed of 160 mph)<sup>6</sup>. From 1950 to 1995 Rockingham County was subject to 9 tornado events, 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)<sup>7</sup>. Type 3 tornados can cause severe damage including tearing the roofs and walls from well-constructed homes, trees can be

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<sup>6</sup> "Understanding Your Risks, Identifying Hazards and Estimating Losses", FEMA

<sup>7</sup> The tornado project .com

uprooted, trains over-turned, and cars lifted off the ground and thrown<sup>8</sup>. Between 1900 and 2010 2 hurricanes have made landfall in New Hampshire, a category 1 and a category 2. There was also a tropical storm in 1999. In Maine, 5 hurricanes have made landfall (all category 1). In Massachusetts, 7 hurricanes have made landfall (2 category 1, 3 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 wind speeds variable between 74 - 130 mph (category 1-3).

Probability & Severity. Although frequency is moderate, the severity of a storm event is high. Most coastal municipalities face more critical damage when introduced to a storm event due low elevation and location. As a result, coastal municipalities are faced with storm surges and coastal flooding.

Storm Event	Frequency	Severity
<b>Tornado/Downburst</b>	Moderate	Moderate
<b>Hurricane</b>	Moderate	High
<b>Lightning</b>	Moderate	Low

Past Occurrence:

Between 1635 and 2010, 9 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 138mph 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.

Rockingham tornado history is as follows: Category F0 tornados occurred on Oct. 03, 1970 and June 09, 1978. Category F1 tornados occurred on July 31, 1954 and July 26, 1966. Category F2 tornados occurred on Aug. 21, 1951, June 19, 1957, July 02, 1961, June 09, 1963, May 21, 2006, and July 24, 2008. The category F3 tornado occurred on June 09, 1953.

Community Vulnerability:

- Power lines,
- Shingled roofs,
- Chimneys, and
- Trees

**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. None of these storms affect one area of town more than another.

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<sup>8</sup> "Understanding Your Risks, Identifying Hazards and Estimating Losses", FEMA

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" during one slow moving storm February of 1969. Ice storms 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 damage. On December 12, 2008 a severe ice storm hit New England that caused major damage to private and public utilities. PSNH's cost of restoration effort estimated at \$75 million for NH alone.

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: A list of past winter storm events is displayed below, in Table 3.

Community Vulnerability:

- Power lines,
- Trees, and
- Elderly Populations

## Wildfires

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

Location: The Committee did not identify any particular areas of Town at-risk for wildfires.

Extent: A wildfire in the Town of North Hampton is unlikely, but if a crown fire were to occur it could be very damaging to several small sections of with higher density residential development.

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:

- Structures located near large open vegetated areas prone to lightning strike

## 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: 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. 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 Natural Hazard Mitigation Plan ranks all of the Counties in the State with at moderate risk to earthquakes. The Town of North Hampton's Peak Ground Acceleration (PGA) values range between 6.1 and 21.0<sup>9</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. A list of earthquakes that have affected the region is displayed in Table 3.

Community Vulnerability:

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

### Coastal Storms

Description: The State's Atlantic seacoast and estuaries are vulnerable to extremes of storm water runoff and storm surge from coastal storms and hurricanes. A storm surge,

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<sup>9</sup> <http://geohazards.cr.usgs.gov/eq/pubmaps/us.pga.050.map.gif>

especially when coupled with astronomical high tides, presents a threat to all land areas adjacent to the marine environment<sup>10</sup>.

Location: The possible location (inundation) of a storm surge is depicted on the Map 2: Past and Future Hazards. The 25-foot contour above sea level was chosen as the furthest inland extent of a possible storm surge. The potential size of a storm surge is variable and sources also differ on the potential maximum size of a storm surge in the area of North Hampton, NH. NOAA's website states a Storm Surge could affect an area up to 15 feet above the normal tide level<sup>11</sup>. A University of Illinois website states that a storm surge could be as high as 25 feet<sup>12</sup>. Because of the wide range of possible impacts, the worst case scenario was chosen to represent the maximum possible impact of a storm surge event.

Extent: Coastal storms could affect much of North Hampton, due to the Town's low elevation. Assuming that the Town is vulnerable to category 3 hurricanes, the potential storm surge related to such a wind event could reach several feet above normal sea level<sup>13</sup>. A storm surge would affect many of the homes, businesses and habitats located near and adjacent to the waterline. Impacts from storm surge coupled with global data signifying mean sea level rise could cause significantly more damage than current SLOSH (Sea, Lake and Overland Surges from Hurricanes) or LIDAR (Light Detection and Ranging) models may show. SLOSH and LIDAR models incorporating future sea level rise scenarios should be used for defining the potential maximum surge for some of these at risk locations.

Probability: **High.** The State of New Hampshire's Natural Hazards Mitigation Plan rates Rockingham County with high likelihood of storm surge and hurricane events. The probability of this maximum storm surge event (25 feet high) is **Very Low**. Figure 3 below show the chance of a "named storm" affecting the areas as a percentage per year. From this map it can be interpolated that New Hampshire has between 18% and 24% of being affected by a named storm each year.

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<sup>10</sup> NH State Natural Hazards Mitigation Plan October 2010 Edition

<sup>11</sup> [www.nhc.noaa.gov/HAW2/english/storm\\_surge.shtml](http://www.nhc.noaa.gov/HAW2/english/storm_surge.shtml)

<sup>12</sup> [http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/hurr/damg/surg.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/damg/surg.rxml)

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

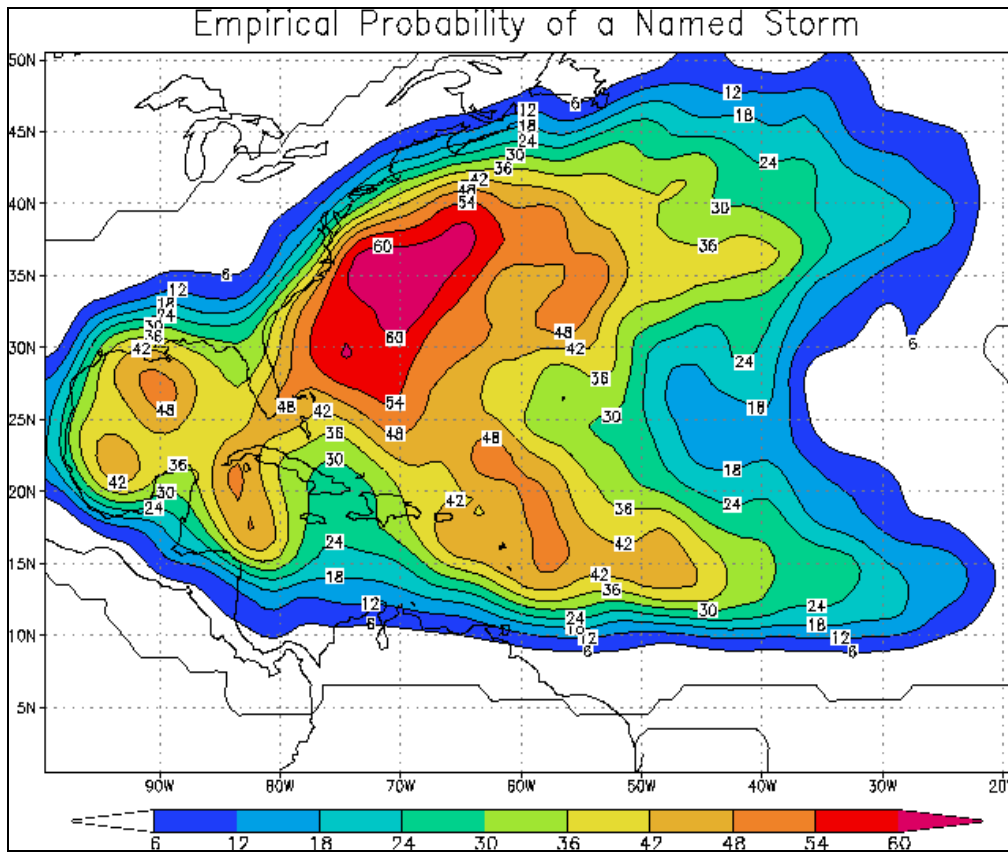


Figure 5: Coastal Storm Probability, per year. Source <http://www.prh.noaa.gov/cphc/pages/FAQ/Climatology.php>

Past Occurrence: A list of hurricanes and Nor'easters that have affected the region are displayed below in Table 4.

Community Vulnerability:

- Structures near the shoreline
- Boats and docks
- Shoreline erosion
- Utilities near the shoreline

**Table 3: Past Hazard Events in North Hampton and Rockingham County**

Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Flood	March 11-21, 1936	Statewide	\$133,000,000 in damage throughout New England, 77,000 homeless.	Double Flood; snowmelt/heavy rain.
Flood	September 21, 1938	Statewide	Unknown	Hurricane; stream stage similar to March 1936
Flood	July 1986 – August 10, 1986	Statewide	Unknown	<b>FEMA DR-771-NH:</b> Severe storms; heavy rain, tornadoes, flash flood, severe wind

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Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Flood	August 7-11 1990	Statewide	Road Network	<b>FEMA DR-876-NH:</b> A series of storms with moderate to heavy rains; widespread flooding.
Flood	August 19, 1991	Statewide, Primarily Rockingham and Strafford Counties	Road Network	<b>FEMA DR-917-NH:</b> Hurricane Bob; effects felt statewide; counties to east hardest hit.
Flood	October 28, 1996	Rockingham County	Unknown - Typically structures and infrastructure in the floodplain	North and west regions; severe storms.
Flood	June – July 1998	Rockingham County	Heavy damage to secondary roads occurred	<b>FEMA DR-1231-NH:</b> A series of rainfall events
Flood	May 12, 2006	Central and Southern Regions	100 yr – 500 yr	<b>FEMA-1643-DR:</b> Severe storms and flooding. Counties Declared: Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford
Flood	April 15 - 23, 2007	Statewide	100 yr – 500 yr	<b>FEMA-1695-DR:</b> Severe storms and flooding associated with a Nor'easter. Counties Declared: Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan.
Flood	July 24 2008	Central and Southern Regions	100 yr – 500 yr	<b>FEMA-1782-DR</b> Severe storms, tornado and flooding. Counties Declared: Belknap, Carroll, Merrimack, Rockingham, and Strafford
Flood	March 14 – 31, 2010	Southeastern Region	100 yr – 500 yr	<b>FEMA-1913-DR</b> Severe storms and flooding. Counties Declared: Hillsborough and Rockingham County
Hurricane	October 18,19 1778	Portions of State	Unknown	40-75 mph winds
Hurricane	1804	Portions of State	Unknown	
Hurricane	September 8, 1869	Portions of State	Unknown	> 50 mph winds

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Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Great Hurricane Of 1938	September 21, 1938	All of Southern New England	2 billion board feet of timber destroyed; electric and telephone disrupted, structures damaged, flooding; statewide 1,363 families received assistance.	Max. wind speed of 186 mph in MA and 138mph max. elsewhere 13 of 494 dead in NH; \$12,337,643 total storm losses (1938 dollars), timber not included.
Hurricane Carol	August 31, 1954	Southern New England	Extensive tree and crop damage in state.	SAFFIR/SIMPSON HURRICANE SCALE <sup>14</sup> - Category 3, winds 111-130 mph
Hurricane Donna	September 12, 1960	Southern and Central NH	Unknown	Category 3 Heavy Flooding
Hurricane Belle	August 10, 1976	Southern New England	Unknown	Category 1, winds 74-95 mph Rain and flooding in NH
Hurricane Gloria	September 27, 1985	Southern New England	Unknown	Category 2, winds 96-110 mph >70 mph winds; minor wind damage and
Tropical Storm Floyd	September 16-18 1999	Statewide	Unknown	
Ice Jam	Feb 29, 2000	Brentwood, NH Exeter River	Unknown	Discharge 570 cfs
Ice Jam	Mar 29, 1993	Epping, NH Lamprey River	Road flooding	
Tornado	May 21, 1814	Rockingham County	Unknown	F2 <sup>15</sup>
Tornado	May 16, 1890	Rockingham County	Unknown	F2
Tornado	August 21, 1951	Rockingham County	Unknown	F2
Tornado	June 9, 1953	Rockingham County	Unknown	F3
Tornado	June 19, 1957	Rockingham County	Unknown	F2
Tornado	July 2, 1961	Rockingham County	Unknown	F2
Tornado	June 9, 1963	Rockingham County	Unknown	F2

<sup>14</sup> For a complete description of the Saffir/Simpson Hurricane Scale see Appendix C.

<sup>15</sup> For a complete description of the Fujita Tornado Damage Scale see Appendix D

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Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Downburst	July 6, 1999	Stratham, NH	Five fatalities and eleven injuries. Major tree damage, power outages	Microburst \$2,498,974 in damages
Tornado	May 21, 2006	Rockingham County	Unknown	F2
Tornado	July 24, 2008	Rockingham, Merrimack, Belknap, Strafford, Carrol	Unknown	F2
Ice Storm	December 17-20 1929	NH	Telephone, telegraph and power disrupted.	
Ice Storm	December 29-30 1942	NH	Unknown- Typically damage to overhead wires and trees.	Glaze storm; severe intensity
Ice Storm	December 22 1969	Parts of NH	Power disruption	Many communities affected
Ice Storm	January 17, 1970	Parts of NH	Power disruption	Many communities affected
Ice Storm	January 8-25 1979	NH	Major disruption of Power and transportation	
Ice Storm	March 3-6 1991	Southern NH	Numerous power outages in southern NH	Numerous in Southern NH
Ice Storm	January 7, 1998	Rockingham County	Power and phone disrupted, communication tower collapsed.	\$17,000,000 in damages to PSNH equipment.
Ice Storm	December 12, 2008	New England,	Severe ice storm that caused major damage to private and public utilities.	PSNH states cost of restoration effort Estimated at \$75 million for NH alone
Snowstorm	February 4-7 1920	New England	Disrupt transportation for weeks	Boston 37-50cm of sleet , ice and snow
Snowstorm	February 15, 1940	New England	Paralyzed New England	30cm of snow with high wind.
Snowstorm	February 14-17 1958	Southern NH	Unknown	20-33" of snow
Snowstorm	March 18-21 1958	South central NH	Unknown	22-24" of snow
Snowstorm	March 2-5 1950	Southern NH	Unknown	25" of snow
Snowstorm	January 18-20 1961	Southern NH	Unknown	Blizzard Conditions; 50cm of snow
Snowstorm	February 8-10 1969	Southeastern NH	Paralyzing snow	27" of snow and high winds
Snowstorm	February 22-28 1969	Central NH	Unknown	34-98" of snow; very slow moving
Snowstorm "Blizzard of '78"	February 5-7 1978	Statewide	Trapped commuters on highways, businesses closed	Hurricane force winds; 25-33" of snow. People disregard warnings due to a series of missed forecasts
Snowstorm	April 5-7 1982	Southern NH	Unknown	Late season with thunderstorms and 18-22" of snow

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Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Snow Emergency	March 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford	Unknown	FEMA-3166-EM \$4,500,000
Snow Emergency	March 11, 2003	Cheshire, Hillsborough, Merrimack, Rockingham and Strafford	Unknown	FEMA-3177-EM \$3,000,000
Snow Emergency	March 30, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsboro, Merrimack, Rockingham, Strafford and Sullivan	Unknown	FEMA-3207-EM \$4,654,738
Snow Emergency	April 28, 2005	Carroll, Cheshire, Hillsboro, Rockingham and Sullivan	Unknown	FEMA-3211-EM \$2,677,536
Severe Winter Storm	December 11, 2008	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1812-DR \$19,789,657
Severe Winter Storm	February 23, 2010	Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1892-DR
Severe Winter Storm	March 14, 2010	Rockingham and Hillsborough	Unknown	FEMA-1913-DR
Earthquake	November 18, 1929	Grand Banks Newfoundland	No damage	Richter Magnitude Scale: 7.2 <sup>16</sup>
Earthquake	December 20, 1940	Ossipee	Ground Cracks and damage over a broad area	Richter Magnitude Scale: 5.5; Felt over 341 miles away.
Earthquake	December 24, 1940	Ossipee	Ground Cracks and damage over a broad area	Richter Magnitude Scale: 5.5; Felt over 550 KM away.
Earthquake	June 15, 1973	Quebec/NH border	Minor damage	Richter Magnitude Scale: 4.8
Earthquake	June 19, 1982	West of Laconia	Little damage	Richter Magnitude Scale: 4.5
Drought	1929-36	Statewide	Unknown	Regional
Drought	1939-44	Statewide	Unknown	Severe in southeast NH
Drought	1947-50	Statewide	Unknown	Moderate
Drought	1960-69	Statewide	Unknown	Longest recorded continuous period of below normal precipitation

<sup>16</sup> For a complete description of the Richter Magnitude Scale see Appendix E.

Hazard	Date	Location	Critical Facility or Area Impacted	Remarks/Description
Drought Warning	June 6, 1999	Most of State	Unknown	Governors office declaration; Palmer Drought Survey Index indicate "moderate drought" for most of state.
Drought	2001-2002	Statewide	Unknown	Third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942

Sources: New Hampshire Homeland Security and Emergency Management, 2010; Town of North Hampton; Northeast States Emergency Consortium (NESEC) Website: <http://www.nesec.org>;

United States Geological Survey's (USGS) Earthquake Hazards Program  
[http://earthquake.usgs.gov/earthquakes/eqarchives/last\\_event/states/](http://earthquake.usgs.gov/earthquakes/eqarchives/last_event/states/)

Ice Engineering Research Group Cold Regions Research and Engineering Laboratory (CRREL)  
<https://rsgis.crrel.usace.army.mil/apex/f?p=273:2:6994523042511727>

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Map 2: Past and Future Hazards

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## CHAPTER IV. 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 through Table 7.

**Table 4: Category 1 - Emergency Response Services and Facilities:**

Critical Facility Name	Address	Comments	Hazard Vulnerability
Town Office	Atlantic Avenue	Back-up operations center	All
Police Station (Safety Complex)	Atlantic Avenue	Back-up power	All
Fire Station (Safety Complex)	Atlantic Avenue	Back-up power	All
Public Works Garage	Lafayette Road		All
Public Works Garage 2	Kimberly Drive		
Town Hall	Atlantic Avenue		All
Power Substation	Lafayette Road		All
Hampton Air Field	Lafayette Road		All
Landing Zone 1	Atlantic Avenue		All
Landing Zone 2	Exeter Rd		All
Landing Zone 3	Lafayette Road		All
Landing Zone 4	North Road		All

**Table 5: Category 2 - Non Emergency Response Facilities:**

The town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of North Hampton.

Critical Facility Name	Address	Comments	Hazard Vulnerability
Water Facility	Exeter Road		All
Water Facility	Winnicut Rd		All
Water Distribution Facility	Mill Road		All
Water Treatment Plant	Mill Road		All
Cell Tower	South Road		All
Culvert	Lovering Rd		All

**Table 6: Category 3 - Facilities/Populations to Protect:**

The third category contains people and facilities that need to be protected in event of a disaster.

Critical Facility Name	Address	Comments	Hazard Vulnerability
North Hampton School	Atlantic Avenue		All
Berry Patch Day Care	Walnut Avenue		All
Imprints Day School	Lafayette Road		All
Centennial Hall	Post Road		All
Union Chapel	Willow Avenue		All
United Church of Christ	Atlantic Avenue		All
Little River Church	Atlantic Avenue		All
First Covenant Church	Hobbs Road		All
Dearborn Park	Exeter Road		All
Fern Crossing	Lafayette Road		All
Lafayette Crossing	Lafayette Road		All
Seacoast Tennis Club	Birch Road		All
North Hampton State Beach	Ocean Boulevard	Within floodplain	All
North Hampton Library	Atlantic Avenue		All
Electric Substation	Lafayette Road		All
Artistic NSA Gymnastics-USA	Winnicut Rd		All
Greystone Village	Summer Ct		All
Sagamore Golf	North Rd		All
Recreation	Knowles Field		All
Group Home	Woodridge Rd		All
Shel-Al-Estates	Lafayette Rd		All
Sagamore Golf Course	North Road		All

**Table 7: Category 4 - Potential Resources:**

This category contains facilities that provide potential resources for services or supplies in the event of a natural disaster.

Critical Facility Name	Address	Comments	Hazard Vulnerability
Home Depot	37 Lafayette Road		All
Lamprey Oil (two sites)	227 Lafayette Road		All
Mobil Gas Station	Lafayette Road	42.97387,-70.835211	All
James Johnson Heavy Equipment	Winnicut Rd	43.001937,-70.859698	All
Sam's Landscaping	Aspen Way	42.999787,-70.81118	All
Gas/Convenient Store	Lafayette Road	42.995908,-70.816897	All
Cooperlos Tree Service	North Road		All
Knowles Tree Service	Knowles Field	42.986313,-70.837758	All
Coal Haze Electrical Contractor	Lafayette Rd		All
Rite Aid	Lafayette Rd	42.97387,-70.835211	All

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Mike Oiler Construction	Birch Rd	42.988414,-70.831434	All
Hazardous material	Atlantic Ave	42.973629,-70.828644	All
Construction Supply Resources	Lafayette	42.966035,-70.833655	All
NH DOT Maintenance Shed	South Road	42.971523,-70.860305	All

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Map 3: Critical Facilities

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## CHAPTER V. 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>17</sup>. In North Hampton, the assessed values were determined for every structure identified in the floodplain. The potential loss was then calculated by multiplying the assessed value of the 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 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 and are based on 2004 assessed values. The percentage of structural damage and contents damage that could be expected for each flood depth is shown in Table 8, along with estimates of functional downtime (how long a business/residence would be down before relocating) and displacement time (how long a business/residence would be displaced from its flooded location).

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):

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<sup>17</sup> "Understanding Your Risks, Identifying Hazards and Estimating Losses", FEMA, page 4-13.

Potential Structure Damage: 49%

Approximately 12 structures assessed at \$7,500,000 = \$3,675,000 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 = \$1,500,000 potential damage

**Table 8: Percentages of structural and content damage, based on the assessed value of a flooded parcel. Also shows the functional downtime and displacement time for each flood event.**

<b>Flood Depth</b>	<b>One-foot</b>	<b>Two-feet</b>	<b>Four-feet</b>
<b>% Structural Damage: Buildings</b>	15%	20%	28%
<b>% Structural Damage: Mobile Homes</b>	44%	63%	78%
<b>% Contents Damage: Buildings</b>	22.5%	30%	42%
<b>% Contents Damage: Mobile Homes</b>	30%	90%	90%
<b>Flood Functional Downtime: Buildings</b>	15 days	20 days	28 days
<b>Flood Functional Downtime: Mobile Homes</b>	30 days	30 days	30 days
<b>Flood Displacement Time: Buildings</b>	70 days	110 days	174 days
<b>Flood Displacement Time: Mobile Homes</b>	302 days	365 days	365 days

*~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 would be Mill Road where the Mill River crosses under the road.

## **Hurricane/ High Wind Events**

### *~Hurricane*

Hurricanes do affect the Northeast coast periodically. Since 1900, 2 hurricanes have made landfall in the State of New Hampshire. Due to the coastal location of the Town of North Hampton, hurricanes and storm surges present a real hazard to the community. Even degraded hurricanes or tropical storms could still cause significant damage to the structures and infrastructure of the Town of North Hampton. The 2004 assessed value of all residential and commercial structures in the Town of North Hampton, including exempt structures such as schools and churches, is \$885,008,700 (North Hampton Assessor). Assuming 1% to 5% damage, a hurricane could result in \$8,850,087 to \$44,250,435 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. In the State of New Hampshire, the total cost of tornadoes between 1950 and 1995 was \$9,071,389 (The Disaster Center). The assessed value of all residential and commercial structures in the Town of North Hampton including exempt structures such as schools and churches is \$885,008,700 (North Hampton Assessor). Assuming 1% to 5% damage, an earthquake could result in \$8,850,087 to \$44,250,435 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. There is now record of monetary damages inflicted in the Town of North Hampton from lightning strikes.

## **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 \$885,008,700 (North Hampton Assessor). Assuming 1% to 5% damage, an earthquake could result in \$8,850,087 to \$44,250,435 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 area identified as at risk to wildfire (Map 2: Past and Future Hazards) by the Hazard Mitigation Committee is in the northern section of Town and includes the Town Forest. The total value of all residential and commercial structures in this section of North Hampton, including exempt structures such as schools and churches, is \$885,008,700 (North Hampton Assessor). Assuming 1% to 5% damage, a wildfire could result in \$8,850,087 to \$44,250,435 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. Four earthquakes in New Hampshire between 1924-1989 had 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 North Hampton including exempt structures such as schools and churches is \$885,008,700 (North Hampton Assessor). Based on Table 9 below, an earthquake could cause a range of damage depending on the construction and materials used to build the structures. Making the assumption that all of the structures in North Hampton are single family homes built Pre-code, and wood frame construction, an earthquake could result in \$3,540,040 of damage for a 0.07 PGA earthquake to \$29,205,287 of damage for a 0.20 PGA earthquake.

### **Coastal Storm Vulnerability Area (See Potential Hazards Map)**

The Town of North Hampton possesses a large portion of land that abuts the Atlantic Ocean. Due to this the committee felt it important to highlight an area (shown as the area of potential hurricane evacuation on the past and potential hazards map) where probable flooding impact and storm surge could be felt during a large storm event (Hurricane or Nor'easter). Damages in this area could be largely reliant on the severity of a storm and tidal processes. The total value of all residential and commercial structures in this area is \$143,955,800. Assuming 1% to 5% damage in this area could result in \$1,439,558 to \$7,197,790 of structural damage.

**Table 9: Earthquake Damage and Loss of Function Table. Building Damage and Functional Loss are based on the type of Structure and the PGA (g). Two PGA (Peak Ground Acceleration) were chosen for this Table, 0.07 and 0.20 which represent a low and high example of potential earthquake in North Hampton, NH.**

		Wood Frame Construction				Reinforced Masonry				Unreinforced Masonry	
PGA (g)		High	Mod.	Low	Precode	High	Mod.	Low	Precode	Low	Precode
0.07	<b>Single Family</b>	0.1	0.2	0.3	0.4	0.1	0.2	0.4	0.5	0.6	1.0
0.20		1.3	1.7	2.8	3.3	1.3	2.5	6.1	9.0	6.5	9.4
0.07		0	0	1	1	0	1	2	7	6	12
0.20		2	3	9	15	4	16	58	106	64	114
0.07	<b>Apartment</b>	0.1	0.2	0.3	0.3	0.1	0.2	0.4	0.5	0.6	0.8
0.20		1.5	1.9	3.0	3.2	1.5	2.6	5.4	6.9	5.5	7.5
0.07		0	0	1	1	0	1	2	8	7	13
0.20		2	3	10	16	4	19	72	129	76	147
		Steel Frame (Braced)				Reinforced Masonry				Unreinforced Masonry	
		High	Mod.	Low	Precode	High	Mod.	Low	Precode	Low	Precode
0.7	<b>Retail Trade</b>	0.2	0.3	0.4	0.5	0.1	0.2	0.4	0.6	0.7	1.0
0.20		2.4	2.8	3.8	5.6	1.5	2.7	5.9	8.3	6.1	8.7
0.07		0	0	0	0	0	0	0	1	1	2
0.20		2	3	6	12	1	3	12	22	14	24
		Pre-Cast Concrete Tilt-up				Light Metal Building					
		High	Mod.	Low	Precode	High	Mod.	Low	Precode		
0.07	<b>Wholesale Trade</b>	0.2	0.4	0.5	0.6	0.4	0.7	1.0	1.6		
0.20		2.6	4.1	8.3	10.8	3.8	5.4	10.3	14.8		
0.07		0	1	1	2	1	2	3	6		
0.20		4	8	22	36	6	13	28	43		
0.07	<b>Office Building</b>	0.2	0.3	0.4	0.6	0.2	0.3	0.4	0.5		
0.20		2.0	2.9	5.6	8.1	2.5	2.9	3.7	5.2		
0.07		0	0	0	1	0	0	0	1		
0.20		1	3	11	21	2	3	5	11		
		Pre-cast Concrete Tilt-up									
		High	Mod.	Low	Precode						
0.07	<b>Light Industrial</b>	0.1	0.4	0.4	0.5						
0.20		2.6	3.9	6.0	7.4						
0.07		0	1	1	2						
0.20		4	7	21	34						

2.0	Building Damage = % of damage based on value
2	Loss of Function (# of Days)
	No Information

High, Moderate, Low and Precode refer to general seismic design level

## CHAPTER VI. EXISTING HAZARD MITIGATION PROGRAMS

The next step involves identifying existing mitigation strategies for the hazards likely to affect the town and evaluate their effectiveness. This section outlines those programs and recommends improvements and changes to these programs to ensure the highest quality emergency service possible.

**Table 10: Existing Hazard Mitigation Programs for the Town of North Hampton.**

Existing Protection	Description-Area Covered	Responsible Local Agent	Effectiveness (Poor, Avg., Good)	Recommended Changes-Actions-Comments
Emergency Operations Plan	Town-wide	Emergency Management Director	Good	None
Town Master Plan	Town-wide 1999	Zoning Administrator and Planning Board	Good	Update in progress
Town Capitol Improvement Plan	Town-wide	Zoning Administrator and Town Administrator	Good	Reviewed Annually
Town Building Code	Town-wide	Building Inspector	Good	None
NFIP Floodplain Ordinance	Development restriction in Special Flood Hazard Area (100-yr floodplain)	Building Inspector Planning Board	Good	None
Hazardous Materials Permitting, Zoning 220-14	Town must give permit for transport, storage, treatment, or disposal of hazardous materials	Emergency Management Director	Good	None
Hazardous Materials Household Waste Day	Town-wide collection of household hazardous waste	Town Administrator	Good	None
25-year Storm Drainage Requirements	25-year storm drainage required in Site Plans	Building Inspector	Good	None
Radiological Emergency Response Plan	Town-wide	Emergency Management Director	Good	None
Emergency Services	Town-wide	Emergency Management Director Police Chief Fire Chief	Good	None
CEMPS (Comprehensive Emergency Management Planning for Schools)	Schools	Emergency Management Director, School Board		None
Storm Drainage-Culvert Maintenance Program	Town-wide	Road Agent	Good	None
Wellhead Protection	Town-wide	Building Inspector	Good	None

Existing Protection	Description- Area Covered	Responsible Local Agent	Effectiveness (Poor, Avg., Good)	Recommended Changes-Actions-Comments
Aquifer Protection	Town-wide	Zoning Officer	Good	None
Wetlands Protection	Wetland Setbacks required	Conservation Commission and Planning Board	Good	None
Police and Fire Mutual Agreements Mutual Aid	Town-wide	Police Chief and Fire Chief	Good	None
Hazardous Tree Program	Town Roads	Road Agent	Good	None

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## CHAPTER VII. NEWLY IDENTIFIED MITIGATION STRATEGIES/ ACTIONS

### • 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 brainstormed a list of strategies and actions that could be taken to mitigation future hazards are compiled in Table 11

**Table 11: List of hazard mitigation strategies or actions developed by the Natural Hazard Mitigation Committee**

Mitigation Strategies or Action	Mitigation Category	Hazard(s) Mitigated	Description	Status 2011: New/Completed/Deferred/Removed
Generator for North Hampton School (Fallout Shelter)	Emergency Services	All Hazards	None	Complete
Communications Tower	Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.
Incident Command Vehicle	Emergency Services	All Hazards	None	Complete
Front End Loader	Emergency Services	All Hazards	None	Complete
Natural Gas Line from Lafayette Rd. to No. Hampton School	Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.
Mobile Lighting and Light Towers	Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.

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Mitigation Strategies or Action	Mitigation Category	Hazard(s) Mitigated	Description	Status 2011: New/Completed/Deferred/Removed
Rigid Bottom Watercraft - Jet Drive	Emergency Services	All Hazards, Hurricanes, Storm Surges	None	Removed- Due to funding and this project is no longer a hazard mitigation priority project.
Road Barricades (50), need (100)	Emergency Services	All Hazards	The town is in need of 100 mobile traffic barricades for emergency response services.	Deferred- The town has requested an additional 50 barricades and is ongoing due to financial and priority status.
All Terrain Vehicle	Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.
Tough Book Laptop Computers (10)	Emergency Services	All Hazards	None	Complete
Cots, Blankets, Food Rations for Shelter at School	Emergency Services	All Hazards	The town is assessing their emergency shelter and needs of bolstering supplies for severe emergency events.	Deferred-The town is continuing their assessment and upgrades to their emergency/warming shelter.
Alteration of Telephone System (hard wired line)	Emergency Services	All Hazards, Power Outages	None	Complete
Renumbering for 911 and Mutual Aid	Prevention, Emergency Services, Property Protection	All Hazards that require emergency response.	Continuing this action will help first responders address emergency calls efficiently	Deferred- Ongoing collaboration and education with the public is needed to complete this mitigation strategy
Hazard Mitigation Info in Town Newsletter & Town Report/Website	Prevention, Public Education, Property Protection	All Hazards	Continuing this program and including the website allows the public to be more informed regarding hazard events and situations.	Deferred- This program is ongoing as it still is pertinent to emergency preparedness.
Local Cable Access Channel for Public Outreach & Education	Prevention, Public Education	All Hazards	None	Complete
New Fire and Police Personnel	Emergency Services	All Hazards	None	Removed- Due to funding and this is longer a hazard mitigation priority project.
Marine Response Training	Emergency Services, Public Education	Hurricanes, Storm Surges, Flooding	None	Removed- US Coast Guard is the marine emergency respondent.
AM Radio Warning System	Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.

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Mitigation Strategies or Action	Mitigation Category	Hazard(s) Mitigated	Description	Status 2011: New/Completed/Deferred/Removed
GIS for all Town Departments	Prevention, Emergency Services	All Hazards	None	Removed- No longer a hazard mitigation priority project.
Review Building Codes to insure adequate compliance for wind speed.	Prevention, Property Protection	High Wind Events	None	Complete
Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required	Prevention, Property Protection	Wildfire	The Planning Board continuously reviews vegetation setbacks to structures, wetlands etc.	Deferred- The town continuously reviews building setback requirements.
Update Master Plan to Incorporate Information from the Hazard Mitigation Plan	Prevention, Public Education	All Hazards	The town is currently updating their Master Plan and may include provisions found within the Hazard Mitigation Plan.	Deferred- The Town has begun updating their master plan.
Investigate joining the CRS program to reduce Flood insurance and potential for future flood losses.	Prevention, Public Education, Property Protection	Flooding, Coastal Storms	None	Removed- No longer a hazard mitigation priority project.
Replace culverts at flood-prone intersections and roadways that includes Oak Drive, Lovering Road, North Road, Long North and Short North Roads, Olde Locke Road and a Route 1 Box culvert	Structural	Flooding	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.	Deferred- This mitigation strategy is ongoing and is largely based on funding availability.

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Mitigation Strategies or Action	Mitigation Category	Hazard(s) Mitigated	Description	Status 2011: New/Completed/Deferred/Removed
Removal of Debris/Beaver Obstructions/Dredging on the Winnicut River plane in the Lovering Road area	Property Protection, Prevention	Flooding	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.	New
Coastal Vulnerability Assessment on areas in town that may be impacted by storm surge based on current and future sea level rise estimates	Prevention	Flooding, Coastal Storms	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.	New
Town Wide Dam Evaluation	Prevention, Property protection	Flooding	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 structural/functioning state of these dams will help prevent flooding impacts due to dam failure.	New
Locate and Evaluate Stormwater Infrastructure	Prevention	Flooding	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.	New

## CHAPTER VIII. 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 Table 11:

- 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?

### 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 strategy can be found in the collection of individual tables under Table 12a - 12x.

**Table 12a: Mitigation Action:** Road Barricades (50), need (100)

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Average	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Average	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Poor	11
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Good	3
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	1
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>36</b>

**Table 12b: Mitigation Action:** Removal of debris/beaver obstructions/dredging on the Winnicut River plane in the Lovering Road area

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Average	2
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Good	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Average	2
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Poor	1
	<b>Score</b>	<b>38</b>

**Table 12c: Mitigation Action:** Coastal Vulnerability Assessment on areas in town that may be impacted by storm surge based on current and future sea level rise estimates

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Average	2
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Average	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Poor	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Good	1
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>37</b>

**Table 12d: Mitigation Action:** Town Wide Dam Evaluation

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	1
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Good	3
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Good	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Good	1
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	2
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	1
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>35</b>

**Table 12e: Mitigation Action: Locate and Evaluate Stormwater Infrastructure**

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Good	3
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Poor	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Average	1
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>40</b>

**Table 12f: Mitigation Action: Cots, Blankets, Food for Shelter at School**

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Poor	1
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Poor	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Poor	1
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Average	2
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Average	2
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>33</b>

**Table 12g: Mitigation Action:** Renumbering for 911 and Mutual Aid

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Average	2
Does it contribute to other goals?	Average	3
Does it benefit the environment?	Poor	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Average	2
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Poor	1
<b>S:</b> Is it Socially acceptable?	Poor	1
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Average	2
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>33</b>

**Table 12h: Mitigation Action:** Hazard Mitigation Information in Town Newsletter and Town Report/Website

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Poor	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Poor	1
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Good	3
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>38</b>

**Table 12i: Mitigation Action:** Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Average	2
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Good	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Poor	1
<b>S:</b> Is it Socially acceptable?	Average	2
<b>T:</b> Is it Technically feasible and potentially successful?	Average	2
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Average	2
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Average	2
<b>E:</b> Are other Environmental approvals required?	Average	2
	<b>Score</b>	<b>34</b>

**Table 12j: Mitigation Action:** Update Master Plan to Incorporate Information from the Hazard Mitigation Plan

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Good	3
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Good	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Poor	1
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Good	3
<b>E:</b> Are other Environmental approvals required?	Good	3
	<b>Score</b>	<b>40</b>

**Table 12k: Mitigation Action:** Replace culverts at flood-prone intersections that includes Oak Drive, Lovering Road, North Road, Long North and Short North Roads, Olde Locke Road and a Route 1 Box culvert

Criteria	Evaluation Rating	Score
Does it reduce disaster damage?	Good	3
Does it contribute to other goals?	Good	3
Does it benefit the environment?	Poor	1
Does it meet regulations?	Good	3
Will historic structures be saved or protected?	Good	3
Does it help achieve other community goals?	Good	3
Could it be implemented quickly?	Poor	1
<b>S:</b> Is it Socially acceptable?	Good	3
<b>T:</b> Is it Technically feasible and potentially successful?	Good	3
<b>A:</b> Is it Administratively workable?	Good	3
<b>P:</b> Is it Politically acceptable?	Good	3
<b>L:</b> Is there Legal authority to implement?	Good	3
<b>E:</b> Is it Economically beneficial?	Average	2
<b>E:</b> Are other Environmental approvals required?	Poor	1
	<b>Score</b>	<b>35</b>

## CHAPTER IX.

### IMPLEMENTATION SCHEDULE FOR PRIORITY MITIGATION STRATEGIES

This step involves developing 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 a 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 on a 1-4 sliding scale in which strategies that received a 1 were considered high priority and those that received a score of 4, though important, were of lower priority. This form of prioritization was used as a basis for developing the Action Plan.

The following questions were asked to develop an implementation schedule for the identified priority mitigation strategies:

**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 11 is the Action Plan. In addition to the prioritized mitigation projects, Table 11 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.

**Table 13: Action Plan for proposed mitigation actions**

STAPLEE Score (Priority)	Project	Responsibility/Oversight	Funding/Support	Timeframe
40 (1)	Locate and Evaluate Stormwater Infrastructure	Public Works	Local/State and Federal Grants	1-5 years
40 (1)	Update Master Plan to Incorporate Information from the Hazard Mitigation Plan	Planning Board/Emergency Management	Local/State and Federal Grants	1-3 years
38 (1)	Removal of Debris/Beaver Obstructions/Dredging on the Winnicut River plane in the Lovering Road area	Public Works/NHDOT/NHDES	Local/State and Federal Grants	1-5 years
37 (1)	Coastal Vulnerability Assessment on areas in town that may be impacted by storm surge based on current and future sea level rise estimates	Emergency Management Director/Planning Board	Local/State and Federal Grants	1-3 years

<b>STAPLEE Score (Priority)</b>	<b>Project</b>	<b>Responsibility/Oversight</b>	<b>Funding/Support</b>	<b>Timeframe</b>
35 (1)	Town Wide Dam Evaluation	Highway Department/Public Safety	Local/Sate and Federal Grants	3 years
35 (1)	Replace culverts at flood-prone intersections and roadways that includes Oak Drive, Lovering Road, North Road, Long North and Short North Roads, Olde Locke Road and a Route 1 Box culvert	Public Works/NHDOT	Local/Sate and Federal Grants	1-5 years
36 (2)	Road Barricades (50), need (100)	Public Works/Emergency Management	Local/Sate and Federal Grants	1-3 years
33 (2)	Cots, Blankets, Food Rations for Shelter at School	Emergency Management Director	Local/Sate and Federal Grants	1-3 years
38 (3)	Hazard Mitigation Info in Town Newsletter & Town Report/Website is required	Public Safety/Town Administrator	Local	1-3 years
33 (3)	Renumbering for 911 and Mutual Aid	Fire Department	Local/Sate and Federal Grants	1-5 years
34 (4)	Review Zoning, Subdivision and Site Plan Regulations for vegetation setback and fire protection requirements and determine if more is required.	Planning Board	Local	3 years

## **CHAPTER X. MONITORING, EVALUATING 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 stand alone document of the Town and as an appendix of the Town's Emergency Operations Plan (EOP). An update of the EOP is ongoing; 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 also be consulted when the Town updates its Capitol Improvement Program (CIP). The Planning Board is responsible for updating the CIP annually, and will review the Action Plan during each update. The Planning Board 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.

### **Monitoring, Evaluating and Updating the Plan**

Recognizing that many mitigation projects are ongoing, 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, a public hearing to receive public comment on Plan maintenance and updating will be held during any review of the Plan. This publicly noticed meeting 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.