Multi-Hazard Mitigation Plan Update 2018

Town of Newmarket, NH

Adopted 2006
Updated February 1, 2013
Updated May 4, 2018

Submitted to the New Hampshire Homeland Security & Emergency Management

By the

Town of Newmarket, NH
with Strafford Regional Planning Commission

This project was funded from the fiscal year 2016 Pre-Disaster Mitigation (PDM) Grant Program, which was awarded to the Department of Safety, Division of Homeland Security and Emergency Management (HSEM) from the Federal Emergency Management Agency (FEMA).

Acknowledgements

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The 2006 and 2013 Newmarket Multi-Hazard Mitigation Committee
New Hampshire Homeland Security Emergency Management (HSEM)
Town of Newmarket

The 2018 Town of Newmarket Multi-Hazard Mitigation Planning Committee

6 people have attended meetings and/or been instrumental in completing this plan:

- Steve Fournier — Town Administrator/EMD, Town of Newmarket
- Kyle True — Police Chief, Town of Newmarket
- Richard Beaudet — Police Lieutenant, Town of Newmarket
- Gregory Marles — Director of Facilities, Town of Newmarket
- Rick Malasky — Fire Chief/Public Works Director, Town of Newmarket
- Diane Hardy — Town Planner, Town of Newmarket

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Date of Adoption by Town: 4/18/18
Date of Final Approval from FEMA: 5/4/18

Cover: Lamprey River/Moonlight Brook flooding on Exeter Street (the "bowl"); May 2006
Photo credit: Newmarket Fire and Rescue Department

Executive Summary

This Plan was revised and updated to meet statutory requirements and to assist the Town of Newmarket in reducing and mitigating future losses from natural and man-made hazardous events. An initial edition of this Plan was developed and presented to FEMA in 2006. The plan was revised in 2013, and was updated in 2018 to reflect the most recent information obtained through the evolution of the hazard mitigation program at the State. This update was developed by Strafford Regional Planning Commission (SRPC) and participants from the Multi-Hazard Mitigation Planning Team. This team was made up by the Town Administrator/EMD, Police Chief, Fire Chief/Public Works Director, Director of Facilities, Police Lieutenant, and Town Planner.

The Plan references historical events, as well as identifies specific vulnerabilities that are likely to impact the Town. Overall threats include:

- ∴ 2 hazards rated as having a High overall risk in Newmarket: flooding (riverine/extreme rain event) and drought
- ∴ 4 hazards rated as having a Moderate overall risk in Newmarket: sever winter storms, hurricane and tropical storms, cyber-attacks, and flooding (dam failure)
- ∴ 8 hazards rated as having a Low overall risk in Newmarket: hazardous materials, public health threats, severe thunderstorms, tornado and downbursts, extreme temperatures, earthquake and landslide, wildfire, and coastal flooding.

Each hazard was provided with a description and information on the hazard's extent, past events and impacts, potential future impacts to the community, and potential loss estimates. As part of this analysis, the planning team reviewed past and existing mitigation strategies and made updates for improvement. Lastly, the planning team developed a series of new mitigation actions to be completed over the course of this plan's five-year cycle. Each mitigation action was prioritized using the STAPLEE Method and responsibilities for implementation were identified.

This plan provides an updated list of Critical Facilities and Key Resources (CF/KR) categorized as follows: Emergency Response Facilities (ERF), Non-Emergency Response Facilities (NERF), Critical Facilities (CF), and Water Resources (WR). All critical assets were inventoried and mapped.

The revision process included reviewing other Town Hazard Plans, technical manuals, federal and state laws, the State Hazard Mitigation Plan, research data, and other available mitigation documents from multiple sources. Combining elements from these sources, the Planning Team was able to produce this integrated multi-hazards plan and recognizes that such a plan must be considered a work in progress.

The Town of Newmarket received conditional approval on March 23, 2018. A public meeting was held and the plan was adopted by the Town Council on April 18 2018. The Plan received formal approval from FEMA on May 4, 2018.

In addition to periodic reviews there are three specific situations, which require a formal review of the plan. The plan will be reviewed:

∴ Annually to assess whether the existing and suggested mitigation strategies have been successful and remain current in light of any changes in federal state and local regulations and statutes. This review will address the Plan's effectiveness, accuracy and completeness in regard to the implementation strategy. The review will address any recommended improvements to the Plan, and address any weaknesses identified that the Plan did not adequately address. This report will be filed with the Town Council.

∴ Every five years the Plan will be thoroughly reviewed, revised and updated using the same criteria outlined above. At that time it is expected to be thoroughly reviewed and updated as necessary. The public will be allowed and encouraged to participate in that five year revision process.

∴ After any declared emergency event, the EMD using the same criteria outlined above.

∴ If the Town adopts any major modifications to its land use planning documents, the jurisdiction will conduct a Plan review and make changes as applicable.

Flooding on Exeter Street, May 2016

Chapter 1: Multi-Hazard Mitigation Planning Process

Authority

Newmarket's original Multi-Hazard Mitigation Plan was prepared pursuant to Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act), herein enacted by Section 104 of the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390). This Act provides new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for State, local and tribal entities to closely coordinate mitigation planning and implementation efforts. This revised multi-hazard plan will be referred to as the "Plan". Newmarket's Plan has been prepared by the Multi-Hazard Mitigation Planning Team with the assistance and professional services of Strafford Regional Planning Commission (SRPC) under contract with New Hampshire Homeland Security Emergency Management (HSEM) operating under the guidance of Section 206.405 of 44 CFR Chapter 1 (10-1-2010 Edition). This plan is funded, in part, by HSEM through grants from FEMA (Federal Emergency Management Agency). Funds from matching funds for team member's time are also part of the funding formula.

Purpose and History

The ultimate purpose of Disaster Mitigation Act of 2000 (DMA) is to:

- *establish a national disaster hazard mitigation program –*
- *reduce the loss of life and property, human suffering, economic disruption and disaster assistance costs resulting from natural disasters; and*
- *provide a source of pre-disaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster.*

DMA 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by, among other things, adding a new section "322 – Mitigation Planning" which states:

As a condition of a receipt of an increased Federal share for hazard mitigation measures under subsection (e), a State, local, or tribal government shall develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government.

HSEM's goal is for all New Hampshire communities to complete a local multi-hazard plan as a means to reduce future losses from natural and man-made events before, during, or after they occur. HSEM has outlined a process whereby communities throughout the state may become eligible for grants and other assistance upon completion of this multi-hazard plan. The state's regional planning commissions are charged with providing assistance to selected communities to help develop local plans.

Newmarket's Multi-Hazard Mitigation Plan is a planning tool for reducing future losses from natural and man-made disasters as required by the Disaster Mitigation Act of 2000.

The DMA places new emphasis on local mitigation planning. It requires local a local jurisdiction to prepare and adopt a FEMA approved jurisdiction-wide Hazard Mitigation Plan as a condition for receiving Hazard Mitigation Assistance (HMA) project grants and other grants every five years. In addition to updating their plans every five years to continue program eligibility, local governments should review the plan yearly.

Jurisdiction and Scope of the Plan

This Plan addresses only one jurisdiction: the Town of Newmarket, NH. The Plan addresses 14 types of natural and man-made hazards that may affect the Town:

- Flooding (Riverine/Extreme Rain Event)
- Flooding (Dam Failure)
- Coastal Hazards (Storm Surge & Sea-Level Rise)
- Hurricane & Tropical Storms
- Tornado & Downburst
- Severe Winter Storms
- Severe Thunderstorms
- Wildfire
- Earthquake/Landslide
- Extreme Temperatures
- Drought
- Public Health Threats
- Hazardous Material
- Cyber Attacks

It describes each hazard and identifies past occurrences of hazard events and assesses probability of future hazard events in the Town. The Plan assesses the vulnerability of key infrastructure and critical facilities; existing residential buildings and other structures within Newmarket; and future development. The Plan also addresses the administrative, technical, and physical capacity of emergency response services and response coordination between federal, state, and local entities.

Flooding Impacts, May 2016

Multi-Hazard Mitigation Goals

The Town's multi-hazard goals are based on the State of New Hampshire Multi-Hazard Mitigation Plan (2013) goals and include:

- *Ensure the protection of the general population, citizens and guests of Newmarket New Hampshire, before during and after a hazard.*
- *Protect existing properties and structures through mitigation activities.*
- *Provide resources to residents of Newmarket, when needed, to become more resilient to hazards that impact the town's critical support services, critical facilities, infrastructure, economy, environment, historical & cultural treasures and private property.*
- *Support the Presidential Policy Directive (PPD-8) through prevention, mitigation, preparedness, and response and recovery actions.*
- *Work regionally to identify, introduce and implement cost effective hazard mitigation measures in order to accomplish the town's goals.*
- *Develop and implement programs to promote hazard mitigation to protect infrastructure throughout the town to reduce liability with respect to natural and human-caused hazards generally.*
- *To address the challenges posed by climate change as they pertain to increasing risks in the town's infrastructure and natural environment.*

Multi-Hazard Mitigation Planning Process

Overview

The Plan was developed and updated with substantial local, state, and federal coordination. The completion of this new multi-hazard plan required significant planning preparation and represents the collaborative efforts of the Town of Newmarket, an ad-hoc local Multi-Hazard Mitigation Planning Committee, and SRPC. The Committee followed an established ten step multi-hazard mitigation planning process (see box, right).

The Committee met 4 times over a 2 month period to discuss the range of hazards included in this plan as well as brainstorm mitigation needs and strategies to address these hazards and their impacts on people, business, and infrastructure in the town. All meetings were geared to accommodate brainstorming, open discussion, and an increased awareness of potential threats to the town. This process results in significant cross talk regarding all types of natural and man-made hazards.

Ten Step Multi-Hazard Mitigation Planning Process

1. Establish and Orient a Hazard Mitigation Planning Committee
2. Identify Past and Potential Hazards
3. Identify of Hazards and Critical Facilities
4. Assess Vulnerability – Estimating Potential Losses
5. Analyze Development Trends
6. Identify Existing Mitigation Strategies and Proposed Improvements
7. Develop Specific Mitigation Measures
8. Prioritize Mitigation Measures
9. Prepare Mitigation Action Plan
10. Adopt and Implement the Plan

Committee Meetings

The Plan is being developed with substantial local, state and federal coordination; completion of this new multi-hazard plan required significant planning preparation. All meetings are geared to accommodate brainstorming, open discussion and an increased awareness of potential threats to the town. Below is a brief summary of each meeting. Meeting agendas and sign-in sheets are included in the Plan's Appendix B.

Meeting #1: December 6, 2017

Members present: Steve Fournier (Town Administrator/EMD), Richard Beaudet (Police Lieutenant), Gregory Marles (Director of Facilities), Rick Malasky (Fire Chief/Public Works Director, and Diane Hardy (Town Planner)

Strafford Regional Planning Commission (SRPC) staff provided a brief overview of the update process and the federal requirements set forth in the town's grant. This included information on the five-year plan cycle, eligibility of future funding opportunities, and the town's existing plan that is set to expire on 1/31/18. SRPC staff detailed the in-kind match documentation, committee responsibilities, and steps towards successful adoption.

SRPC, and the committee, reviewed the draft community profile chapter. Committee members provided the following feedback:

1. General edits, grammar, and spelling revisions
2. Add 2017 building permit data, if information is available before submitting the plan to HSEM

SRPC, and the committee, reviewed the draft asset inventory chapter. Committee members provided the following feedback:

1. Revisions to Table 4: Emergency Response Facilities (ERF) include:
    a. Fire Station is the Emergency Operations Center (EOC)
    b. Police is the back-up EOC
    c. Remove Junior/Senior High School as emergency shelter (no generator)
    d. Remove Transfer Station for emergency fuel
    e. Add Community Center as primary emergency shelter
    f. Add Carpenter Field as potential helipad location
    g. Add Sunrise Sunset Senior Center as warming/cooling station
    h. Add Exeter High School as mass evacuation regional emergency shelter
2. Revisions to Table 5: Non-Emergency Response Facilities (NERF) include:
    a. Revisions to Wastewater Treatment Plant's location – Young's Lane
    b. Remove Water Treatment Plant
3. Revisions to Table 6: Critical Facilities (CF) include:
    a. Remove small substations
    b. Remove natural gas stations
    c. Remove critical intersections

d. Add Newmarket House on Granite Street as communication function
e. Add dispatch antennae on Zion Hill as back-up repeater
f. Add culvert on Bay Road over Lubberland Creek as vulnerable transportation asset

4. Revisions to Table 7: Vulnerable Populations to Protect (VPP) include:
    a. Change Newmarket Head Start to Community Center
    b. Change Granite Street Assisted Living to Newmarket House
    c. Add Lamprey Health Care (207 South Main Street)
    d. Add Great Bay Family Practice (60 Exeter Road)
    e. Add One Sky Futures: Learning Center (60 Exeter Road)
5. Revisions to Table 8: Water Resources (WR) include:
    a. Add the following groundwater wells:
        i. Macintosh Well
        ii. Tucker Well
    b. Add the following dry hydrants
        i. Piscassic Street
        ii. Grant Road
    c. Add the following cisterns:
        i. Cushing Road
        ii. Hayden Place

SRPC, and the committee, reviewed the all the past mitigation strategies. Committee members provided feedback on each of the twelve actions.

The next meeting was set for December 20th at 1PM at the Town Hall. SRPC staff indicated that materials would be sent out prior to the meeting date to give the committee adequate time to be prepared to discuss agenda items.

Meeting #2: December 20, 2017

Members present: Steve Fournier (Town Administrator/EMD), Richard Beaudet (Police Lieutenant), Rick Malasky (Fire Chief/Public Works Director, and Diane Hardy (Town Planner)

SRPC staff opened the meeting by reviewing the notes from the December 6th meeting with the Planning Committee; there were no additional comments. SRPC briefly went over the to-do list and asked that identified committee members submit their tasks as soon as possible for inclusion into the plan.

Next, the Planning Committee reviewed the Town's National Flood Insurance Program (NFIP) status and past floodplain management actions. Past actions included: sending out flood insurance brochures to existing residents and new homeowners located in the flood zone (handouts were also made available at the Town Hall); the 2009 FEMA Community Assistance Visit; the Moonlight Brook study; the C-RiSe vulnerability assessment; and the New Road stormwater project. The Committee added the Lubberland Creek culvert restoration project and the drainage improvements, best management practices, and educational program opportunities at the Middle/High School.

Next, the Planning Committee reviewed past presidentially declared disasters and emergency declarations. Additional input includes:

1. March 2013 Blizzard – Line of sight issues and challenges with snow removal. The Town had to use the Carpenter Property as a snow dump.
2. March 2015 Snowstorm – Line of sight issues and challenges with snow removal. The Town had to use the Carpenter Property as a snow dump.
3. August 2017 Flooding Event – There were no impacts locally.
4. November 2011 Winter Storm – Minor power outages, small amounts of debris, and school closures.
5. October 2012 Hurricane Sandy – The emergency operations center was opened; however, there were only minor impacts with rain and some wind.

The Planning Committee then discussed the descriptions of each hazard. Below is a summarized list of additional data that will be included into the Plan:

SRPC, and the committee, reviewed the draft community profile chapter. Committee members provided the following feedback:

1. Flooding
    a. There were no local ice jams
    b. The Planning Committee identified three additional flooding events of consequence, including February 2010, October 2016, and the spring of 1996. The February storm impacted parts of Route 152. The October storm impacted parts of Route 108 and Gerry Ave; however, the issues at Gerry Ave were attributed to beaver damage in a local manhole that backed up water from Moonlight Brook and has not happened since. The Committee could not recall the specifics of this storm other than it caused damage in the "bowl" area on Exeter Street. According to the Flood Insurance Study for Rockingham County (2014), this event had a recurrence interval of approximately 100 years and recorded a peak discharge of 3,060 cubic feet per second (cfs) on parts of the Exeter River in Brentwood.
2. Hurricanes and Tropical Storms
    a. Minor impacts, including periods of heavy rain, downed branches, and short-term power outages.
3. Tornado and Downburst
    a. There have been no direct impacts from tornadoes; however, the Town has experienced multiple downburst activity. In 1984, there was a microburst that tore through the mobile home park on Bay Road and destroyed 8 homes. It also took parts of the roof off the library and the Mill building.
    b. A severe wind event in late October, 2017 caused trees to come down and resulted in approximately 67% of the Town to be without power and the Halloween trick-or-treating event was postponed.
4. Severe Winter Weather

    a. Ice Storm 1998 - Local impacts included major power outages ranging from a couple of days to a week; the warming shelter was also opened.
    b. Ice Storm 2008 - Local impacts included power outages for upwards of 9 days, the opening of the warming shelter, downed trees and other debris, and road closures.
5. Severe Thunderstorms & Lightning
    a. No major impacts; some residential damage, but no fires.
6. Wildfires
    a. No major wildfires
7. Earthquakes and Landslide
    a. A minor earthquake was felt several years ago, but did not result in any damage.
8. Extreme Temperatures
    a. No significant impacts
9. Drought
    a. Newmarket operated under a stage 4 water conservation system for most of the year and only lifted the ban in the last several months
10. Public Health Threats
    a. Heroin epidemic - The Town and its partners have strengthened local advocacy through the implementation of an education and outreach campaign to help provide information on substance abuse and designating a safe station for those in need.
    b. The police department agreed to research the number of fatalities over the course of the last five years, which will be included into the plan
    c. Arsenic – Wade Farm is a location that has experienced some issues in the past
11. Hazardous Materials
    a. Routes 108 and 152 are the two roadways of biggest concern; however, the railroad is the larger concern
    b. The Planning Committee recognized at least one accident with the train and another vehicle, but it did not result in a spill of any kind. There have been other minor oil/fuel spills that have taken place in various locations in Town.
12. Coastal Hazards
    a. Due to limited development along tidal areas, to this point there have been no major flooding issues; however, future impacts of sea-level rise may result in additional risk.

The Planning Committee expressed interested in adding cyber-attacks to the list of potential hazards. SRPC agreed to work on these hazards and present them at the meeting in January.

Lastly, the Planning Committee reviewed and ranked each of the identified hazards using the hazard vulnerability assessment tool. The results are as follows:

- There were 2 hazards ranked as high, including: flooding (riverine/extreme rain event) and drought

- There were 4 hazards ranked as medium, including: sever winter storms, hurricane and tropical storms, cyber-attacks, and flooding (dam failure)
- There were 8 hazards ranked as low, including: hazardous materials, public health threats, severe thunderstorms, tornado and downbursts, extreme temperatures, earthquake and landslide, wildfire, and coastal flooding.

The next meeting was set for January 10th at 1PM at the Town Hall. SRPC staff indicated that materials would be sent out prior to the meeting date to give the committee adequate time to be prepared to discuss agenda items.

Meeting #3: January 10, 2018

Members present: Steve Fournier (Town Administrator/EMD), Richard Beaudet (Police Lieutenant), Gregory Marles (Director of Facilities), Rick Malasky (Fire Chief/Public Works Director, and Diane Hardy (Town Planner)

SRPC staff opened the meeting by reviewing the notes from the December 20th meeting with the Planning Committee; there was one comment to change the public health impact on Wade Farm from radon to arsenic.

Next, the committee reviewed the section developed by SRPC on cyber-attacks. Two additional comments were provided by the committee. The first was that we should include a sentence or two about the potential risk of an attack on the town's water and sewer electronic control system. The second was to recognize that in 2016 a single work station in the Police Department was infected with malware software; however, it did not spread and did not impact the server. Since that incident the IT department has provided outreach to officers on suspicious emails and has taken additional precautions to limit future hacking incidents.

The committee then discussed existing mitigation strategies (refer to Table 21: Existing Programs and Policies). The committee determined what the effectiveness was of each existing program and provided an update. The committee also decided to add Newmarket's participation as a community emergency response team (CERT).

Next, the committee continued to develop new mitigation actions for inclusion in the plan. Each action was discussed as a group in order to determine the following criteria: hazard type, action category, responsible party, timeframe, location, and potential funding sources. Once a complete list was developed, the Planning Committee used the STAPLEE method to organize each of the actions. SRPC would be tasked with final organization of all new strategies and existing actions that were being carried over from the 2013 Plan.

The meeting ended with next steps for conditional approval, town adoption, and final FEMA adoption.

Meeting #4: January 24, 2018 (map review)

Members present: Steve Fournier (Town Administrator/EMD), Richard Beaudet (Police Lieutenant), Gregory Marles (Director of Facilities), Rick Malasky (Fire Chief/Public Works Director, and Diane Hardy (Town Planner)

The last meeting was reserved to provide final comments on the draft update and review all the maps.

Public Involvement

Public involvement is an important part of the planning process. A local Multi-Hazard Mitigation Planning Committee (the Committee) was formed to guide and oversee the development of this Plan. Members of the Town Council, Conservation Commission, Planning Department; Police, Fire, and Public Works; and local business owners, interested organizations, and Newmarket residents were invited to participate on the Committee. Community officials were encouraged to contact as many people as they could to participate in the planning process. Members of the public and other stakeholders from neighboring communities were also informed of and encouraged to attend the Committee's meetings.

Regional Events

Town of Newmarket Hazard Mitigation Planning Committee Meeting #1

Event Date: Wed, Dec 6th, 2017 1:00:00 pm

Strafford Regional Planning Commission has begun the process to update the Town of Newmarket's Multi-Hazard Mitigation Plan. The first meeting with the Multi-Hazard Mitigation Planning Committee has been scheduled for Wednesday, December 6th, 2017 at 1:00PM at the Town Hall. At the first meeting, the Planning Committee will review the update process and requirements of the grant; go over committee responsibilities, in-kind match documentation, and the steps towards successful adoption; review a community profile; review the town's asset inventory, and discuss existing and past mitigation strategies.

All citizens, businesses, municipal officials, and interested parties from Newmarket and other neighboring communities are welcome to attend the meeting. If you are unavailable to attend, please forward any ideas or concerns to: Kyle Pimental, Principal Regional Planner, Strafford Regional Planning Commission at kpimental@strafford.org or to Steve Fournier, Newmarket Town Administrator at sfournier@newmarketnh.gov.

This update of the 2013 Plan is funded by FEMA under contract to Strafford Regional Planning Commission and is a collaborative planning process with the Town.

Date posted: Fri, Nov 17th, 2017
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To build awareness of the Plan and opportunity to be involved, an announcement about the Plan update was included on the Strafford Regional Planning Commission's website and information about the Plan was included in SRPC's news updates in order to ensure that adjacent communities were aware of Newmarket's committee meetings and had the opportunity to attend. A public notice, stressing the public nature of the process, was posted on the town's website and notices were hung at Town Hall in advance of each Committee meeting. The Committee met four times between December 6, 2017 and January 24, 2018. All feedback from participants of the planning committee was incorporated into the Plan. There was no participation from surrounding communities. There was no other public participation in the plan update process.

The public will have the opportunity for future involvement as the Plan will be periodically reviewed and the public will be invited to participate in all future reviews and updates to this plan. There will also be a public meeting before each formal review and before any change/update is sent to HSEM.

Once final approval by HSEM has been received, copies of the Plan will be distributed to the relevant town departments and personnel, HSEM, and FEMA and other state and local governmental entities; the Plan will then be distributed by these entities per requirements. Copies of the Plan will remain on file at the Strafford Regional Planning Commission (SRPC) in both digital and paper format.

Adoption and Integration

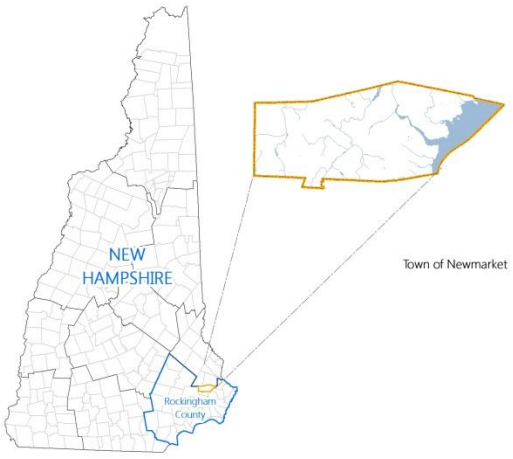
Once approved by the Planning Committee, the Plan will be forwarded to HSEM for Conditional Approval. Upon review and conditional approval by HSEM, the Town Council will hold a public meeting, to consider public comments and must promulgate a signed Resolution to Adopt the Plan.

Elements of the Plan will be incorporated into other planning processes and documents, such as the Town's Master Plan, Capital Improvement Plan, and Emergency Operations Plan. The town will refer to this Multi-Hazard Mitigation, as appropriate, in other documents.

Chapter 2: Community Profile

Overview

The Town of Newmarket is located in southeastern NH within Rockingham County. The towns bordering Newmarket are: Lee and Durham to the north, Greenland to the east, Epping to the west, and Newfields to the south. The Town also has water borders with Greenland and Newington to the east and Stratham to the southeast. With a population of 8,964 (according to the 2016 American Community Survey), Newmarket has experienced roughly a 10.5% increase in total population since 2000 (8,027). This increase is nearly double the regional demographic trend of Rockingham County, which experienced a 6.1% increase between 2000 and 2010. Newmarket's population shift more closely mimics trends in Strafford County, which experienced a 10.9% increase and represents one of the fastest growing areas in the state of New Hampshire



Map 1: Newmarket Locus Map (Source: SRPC, 2017)

The Town of Newmarket covers a total area of 14.2 square miles (9,080.3 acres), with a land area of 12.6 square miles (8,053.5 acres) and a water area of 1.6 square miles (1,026.8 acres). There are three primary watersheds within the town and include the Exeter River, Lamprey River, and Great Bay. The five major surface waterbodies are: the Piscassic River, Moonlight Brook, Lubberland Creek, the Lamprey River (tidal), and Great Bay. According to the Newmarket C-RiSe Report [2017], the inland coastal portion of Newmarket that is most susceptible to coastal flooding are those located south of the Macallen Dam on the west side of the Lamprey River near the downtown, low-lying areas around Lubberland Creek, and low-lying land south of the Lamprey River along Great Bay.

According to Newmarket's Existing Land Use Chapter [2013], the town's most recent development pattern, occurring outside the town center, has evolved into three distinct forms of land use: 1) residential open space design development; 2) land conservation; and 3) redevelopment, growth management, and infill development.

The topography of Newmarket is gently rolling with elevations ranging from sea level along tidal areas to greater than 280 feet on Bald Hill in the westernmost area of town. Great Bay and the Lamprey River are the town's most significant bodies of water.

Newmarket is positioned in the lowermost reaches of the coastal watershed, and within portions of the Lamprey River, Exeter River and the Great Bay watersheds. It contains both freshwater and tidal rivers and estuarine ecosystems. Tidal influence on the Lamprey River extends to the Macallen Dam in downtown near the NH Route 108 crossing. Tidal influence of the Great Bay extends up Lubberland Creek and the Squamscott River, as well as several unnamed tributaries in the southern areas of town.

Housing

In the period between 2011 and 2015, Newmarket experienced an overall increase of 135 total housing units (roughly 3.4%). Newmarket experienced the lowest number of total housing units in 2012, and the highest in 2015. According to housing tenure data for that same 5-year time period, the total renter-occupied unit counts increased by 7.7% while owner-occupied housing units stayed roughly the same (>1% increase). During this time period, the vacant housing units decreased by 8.6% and total occupied housing units saw a small increase of 3.9%. As of 2015, Newmarket's occupied housing units are roughly 53% owner-occupied and 47% renter occupied. Vacant housing units varied from a high of 234 in 2014 to a low of 182 in 2012. Currently, the town exhibits a 4.6% vacancy rate; this rate does not take into consideration Newmarket's limited seasonal homes. The 2010 Census estimates (not shown) that 28 homes are for seasonal, recreational, or occasional use. Unfortunately, these estimates are not available for other years, but if these numbers are substituted in 2015, a slightly more accurate vacancy rate would be 3.9%.

Table 1: Housing Data 2011 - 2015

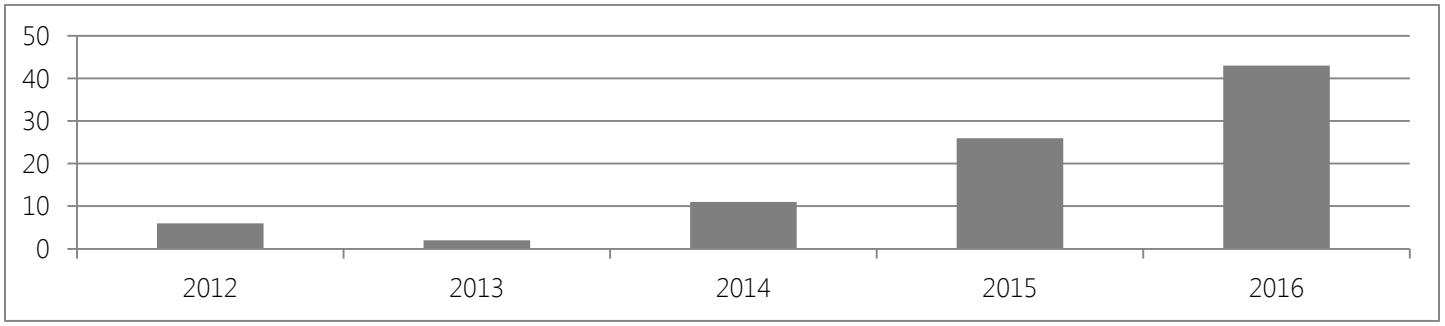
	2011	2012	2013	2014	2015	% Change 2011-2015
Total Housing Units	3,890	3,875	3,917	4,050	4,025	+3.4%
Occupied Housing Units	3,688	3,693	3,6697	3,816	3,839	+3.9%
Owner Occupied Housing Units	2,006	2,055	2,018	2,036	2,017	+0.5%
Renter Occupied Housing Units	1,682	1,638	1,697	1,780	1,822	+7.7%
Vacant Housing Units	202	182	220	234	186	-8.6%

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates

Building Permit Data

According to the data that was received from the town, a total of 88 building permits were issued from 2012 through 2016 (2017 data was not available at the time). Newmarket experienced an average of roughly 18 new structures (mostly single-unit residential, with some mixed use, manufactured, and commercial/industrial development) between 2012 and 2016. Figure 1 (below) shows Newmarket has seen a steady increase in growth over the past five years, with higher concentrations in 2015 and 2016. This data represents the best available information at the time of the preparation of the Plan; however, it should be noted that the issuance of a building permit does not always directly correlate with new development.

Figure 1: New Building Permits 2012 - 2016



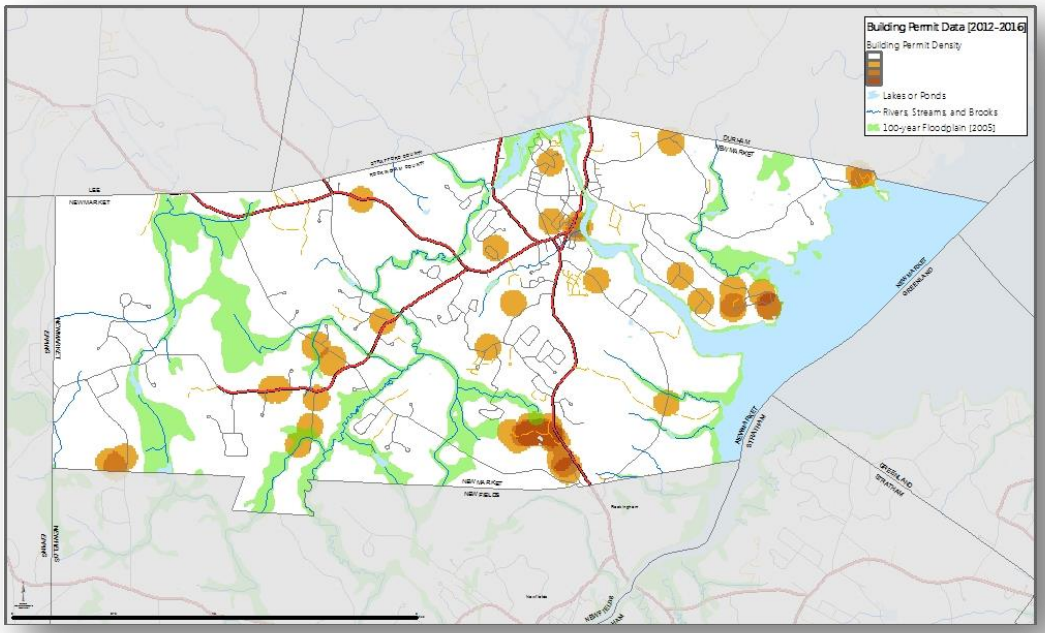
Source: Newmarket's Building Official and Planning Department

Development Trends

A GIS density analysis was completed using building permit data collected from 2012 – 2016 in order to identify and map clusters of development.

The results indicate that the predominant development type over the last several years has been residential and has been largely scattered throughout the town along existing major transportation corridors, including Grant Road, Route 152, and Route 108. Some of the higher densities are located in the following areas: Bald Hill Road, Water Street, Bay Road (Bayview Drive/Lookout Place), Cushing Road (Lubberland Drive/Eagle Drive), and north of the golf course (Honeycomb Way, Daybreak Drive, and Firefly Landing).

As mentioned above, the issuance of a building permit does not always directly correlate with new development and these maps should be used for general planning purposes only.



Map 2: Development Density Map (Source: SRPC/Newmarket, 2017)

By looking at these past development trends the town recognizes that it will continue to grow in the coming years and will continue to monitor and improve their floodplain management regulations, as needed, for all subdivision and site plan proposals in order to reduce or eliminate flood hazards and damage.

Development within the FEMA Floodplain

According to a simple GIS analysis, of all the building permits issued over the course of the last five years (2012 – 2016), there were 4 homes (two single-family; two multi-family) identified within the FEMA floodplain; however, a follow-up analysis was completed to select locations that may be within 75 to 100 feet adjacent to the FEMA floodplain. The results of that analysis indicated three homes (two single family; one multi-family) were within 75 feet of the floodplain and an additional three homes (two single family; one multi-family) were within 100 feet of the floodplain (shown on Map 3).

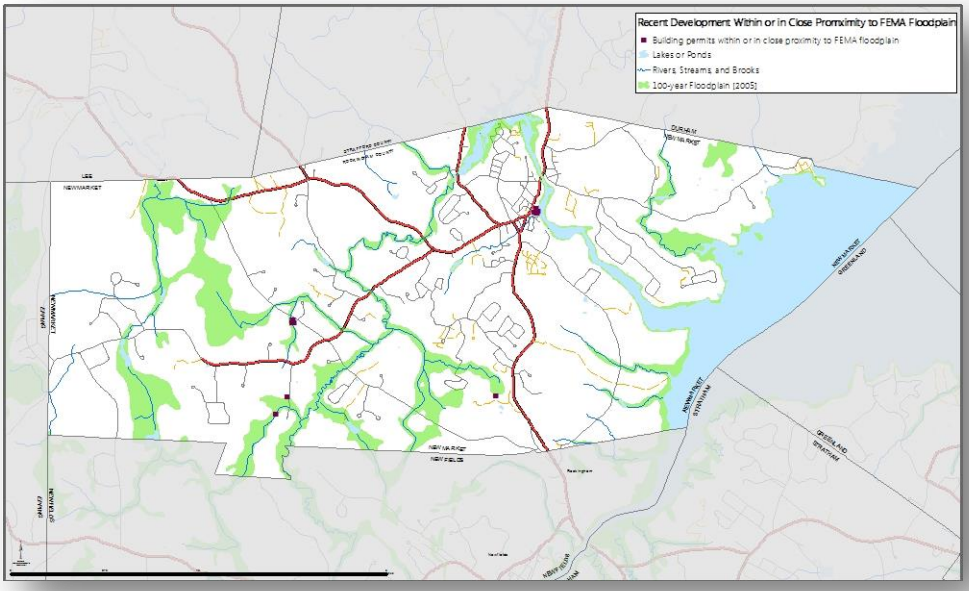
It is important to note building permit data does not always correlate directly with new construction. Due to limitations with the analysis, it is unclear as to the exact location of those structures and whether or not they are vulnerable to flooding. The locations of the 10 building permits identified as part of this analysis are provided in more detail in Table 2 below.

Table 2: Building Permits Within or Close Proximity to FEMA Floodplain [2012-2016]

Location	Year	Type	Proximity
Tuckers Way	2016	Single Family Residential	Within FEMA Floodplain
Maya's Way	2012	Single Family Residential	Within FEMA Floodplain
Water Street	2013	Multi-Family Residential	Within FEMA Floodplain
Water Street	2013	Multi-Family Residential	Within FEMA Floodplain
Honeycomb Way	2016	Single Family Residential	Within 75 feet of FEMA Floodplain
Tuckers Way	2016	Single Family Residential	Within 75 feet of FEMA Floodplain
Water Street	2013	Multi-Family Residential	Within 75 feet of FEMA Floodplain
Water Street	2013	Multi-Family Residential	Within 100 feet of FEMA Floodplain
Maya's Way	2012	Single Family Residential	Within 100 feet of FEMA Floodplain
Maya's Way	2012	Single Family Residential	Within 100 feet of FEMA Floodplain

[Source: Town of Newmarket, 2017]

As shown on Map 3, over the course of the last five years, Newmarket has, for the most part, successfully steered new developments away from existing and potential flooding dangers; however, as more extreme precipitation events occur Newmarket will need to continue to proactively plan for future flooding scenarios along with guiding development away from vulnerable areas. Therefore, the community's vulnerability has remained the same.



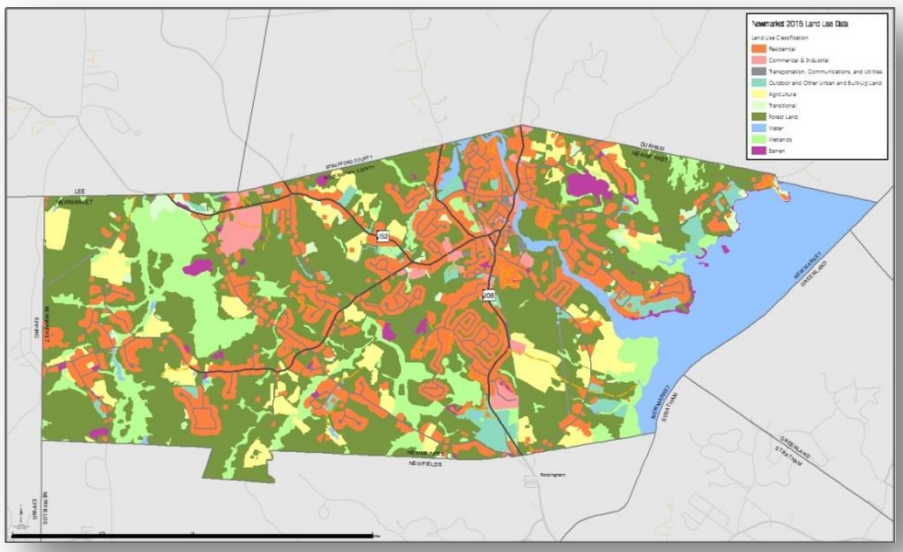
Map 3: Building Permits within or close proximity to FEMA Floodplain (Source: SRPC/OEP, 2017)

Looking ahead, the Town will use this Plan as a guide to determine where past hazards have been documented and guide potential development away from these hazard areas.

Land Use Changes

It is much easier to identify and analyze regional land use trends, compared to strictly looking at land use conversion changes at the local level; however, this data remains an important component of long-term planning efforts. As previously mentioned, Newmarket has experienced significant population increases over the course of the last decade. This has resulted in an increase in the amount of land converted to residential use over the span of the last fifteen years. See Table 3 for a more detailed analysis of land use changes of time.

According to the 2015 regional land use layer, roughly 20% (1,802 acres) of the town's total acreage is currently classified as residential, scattered throughout the town and along existing major transportation corridors. Newmarket did not experience a substantial increase in residential land use conversion in the last five years (>1%). Nor did the town see any major changes in commercial and industrial uses, agriculture, or wetlands. The town experienced roughly a 1% loss of forest land due to land conversion.



Map 4: 2015 Land Use Data (Source, GRANIT, 2017)

The town's ongoing Master Plan update process hopes to improve existing land use regulations which may include zoning amendments, as necessary, to help guide development.

Table 3: Land Use Data 2010 - 2015

Land Use Classification	Acres (2010)	% of total acreage	Acres (2015)	% of total acreage	5-year (+/-) % change
Residential	1,802.5	19.9%	1,831.9	20.2%	+0.3%
Commercial & Industrial	172.7	1.9%	173.9	1.9%	+0.0%
Agriculture	651.7	7.2%	647.8	7.1%	-0.1%
Forest Land	3,739.2	41.2%	3,641.4	40.1%	-1.1%
Wetlands	1,091.2	12.0%	1,085.8	12.0%	-0.0%
TOTAL	9,080.3	82.1%	9,080.3	81.3%	N/A

This analysis does not include: transportation, communications, and utilities; outdoor and other urban built-up land; transitional; open water; and barren lands, which together make up the remaining 17-18%.

Chapter 3: Asset Inventory

Critical Facilities and Key Resources

This chapter includes Critical Facilities and Key Resources (CF/KR) within the Town of Newmarket that were identified by the Committee during the update of this plan.

FEMA describes the term 'critical facilities' as all manmade structures or other improvements that, because of their function, size, service area, or uniqueness, have the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if they are destroyed, damaged, or if their functionality is impaired.[1] These facilities include all public and private facilities that a community considers essential for the delivery of vital services for the protection of the community, such as emergency operations centers, shelters, or utilities. [2]

"Critical facilities, and the functions they perform, are the most significant components of the system that protects the health, safety, and well-being of communities at risk."

-FEMA Critical Facility Design Considerations

Tables include a list of CF/KR, including the type of facility and building, and the address of the CF/KR, if available. Appendix D contains a correlating map set. Facilities in bold are located in other communities and are not mapped.

Table 4: Emergency Response Facilities (ERF)

ERF's are primary facilities and resources that may be needed during an emergency response

Facility	Type	Address
Town Hall	Administrative	186 Main Street
Fire Station	Emergency Operations Center (EOC)	2 Young's Lane
Police Station	Back-up EOC	70 Exeter Road
Community Center	Emergency Shelter	1 Terrace Drive
Sunrise Sunset Senior Center	Warming/cooling Station	2 Terrace Drive
Exeter High School	Regional Shelter (mass evacuation)	1 Blue Hawk Drive
Public Works Garage	Emergency Fuel	2 Young's Lane
Helipad Locations	Emergency Medical Evacuation	Leo Landroche Field Rockingham Golf Course Fire Station Carpenter Field
Evacuation Routes	Evacuation Planning	Route 108 Route 152

Table 5: Non-Emergency Response Facilities (NERF)

NERF's are facilities considered essential, that although critical, not necessary for immediate emergency response effort.

Facility	Type	Address
Wastewater Treatment Plant	Wastewater Plant	Young's Lane

[1] https://www.fema.gov/media-library-data/20130726-1557-20490-2839/fema543_chapter1.pdf
[2] Ibid

Table 6: Critical Facilities (CF)

CF are important structures that may be vulnerable during a hazardous event		
Facility	**Type**	**Address**
Pump Station(s)	Pump Station	Salmon Street Cedar Street Creighton Street Ladyslipper Drive Moody Point Bay Road Route 152 Packers Falls Road Briallia Circle Mockingbird Lane
Distribution Substation(s)	Power Substation	Nichol's Avenue
Water Tower	Water Reservoir	Great Hill Tower (Folsom Drive)
Switching Stations	Switching Stations	Gerry Avenue
Communication Tower(s)	Communication Function	Route 152 (Old DPW)
Newmarket House	Communication Function	9 Granite Street
Dispatch Antennae	Back-up Repeater	Zion Hill
Other Communications	Cell Antennae/Dispatch Service	Great Hill Water Tower
Macallen Dam	*High Hazard Dam	Lamprey River

* A High Hazard dam has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life.

Culvert (Stream Crossing)	Vulnerable Transportation Asset	Bay Road over Lubberland Creek
Bridge (096/065)	Transportation (Town Owned)	Ash Swamp Road over Piscassic River
Bridge (098/079)	Transportation (State Owned)	Grant Road over Piscassic River
Bridge (106/089)	Transportation (State Owned)	NH152 over Piscassic River
Bridge (112/098)	Transportation (State Owned)	Packers Falls Road over Piscassic River
Bridge (120/089)	Transportation (State Owned)	NH152 over PanAm Railroad
Bridge (125/054)	Transportation (State Owned)	NH108 over PanAm Railroad
Bridge (127/097)	Transportation (State Owned)	NH108 over Lamprey River

Bridges have been identified by the NHDOT Bridge Design Bureau; Dams have been identified by the NHDES, Water Division

Table 7: Vulnerable Populations to Protect (VPP)

Vulnerable populations can be defined broadly to include those who are not able to access and use the standard resources offered in disaster preparedness and planning, response, and recovery		
Facility	**Type**	**Address**
Junior/Senior High School	School	213 South Main Street
Elementary School	School	243 South Main Street
Great Bay Kids	Preschool/Daycare	3 Simons Lane
Community Center	Preschool/Daycare	1 Terrace Drive
Linked Together	Preschool/Daycare	243 South Main Street
Lamprey Health Care	Medical Facility	207 South Main Street
Great Bay Family Practice	Medical Facility	60 Exeter Road
Great Hill Terrace	Assisted Living	34 Great Hill Terrace

Newmarket House	Assisted Living	9 Granite Street
The Pines	Assisted Living	9 Grant Hill
The Willey House	Assisted Living	100 Main Street
Wadleigh Falls House LLC	Assisted Living	Route 152
One Sky Futures: Learning Center	Specialized Care	60 Exeter Road

Table 8: Water Resources

Sources of water that may be of potential use during emergencies.

Facility	Type	Address
Water Tower	Water Reservoir	Access from Folsom Drive
Groundwater Wells	Water Supply	Sewall (Route 152) Bennett (Route 152) Wade Farm Schanda Park (Schanda Drive) Moody Point Macintosh Tucker
Additional Surface Waters	Auxiliary Fire Aid	Ash Swamp Road (tributary to Piscassic River) Piscassic Street (Piscassic River) Grant Road (Crow and Eagle Falls) River Street (Lamprey River)
Dry Hydrants	Auxiliary Fire Aid	Hamel Farm Road Schanda Road Gonet Drive Ash Swamp Road Piscassic Street Grant Road
Cisterns	Auxiliary Fire Aid	Hayden Place Cushing Road

Chapter 4: Vulnerable Structures and Potential Loss

Critical Facilities/Key Resources and Other Assets

It is important to identify critical facilities and other structures that are most likely to be damaged by hazards. A GIS-based analysis was completed to determine, spatially, which critical facilities and key resources (CF/KR) within the town intersected with the FEMA floodplain, identified past and potential flooding areas from previous hazard mitigation updates, or the 6.3ft of sea-level rise with a storm surge. Table 9 lists the 14 CF/KRs located within those areas with a potential loss value estimate of **$4,526,000** at 100%.

Table 9: Vulnerable Critical Facilities/Key Resources

CF/KR and Other Assets	Hazard	100% of Structure Value
Critical Facilitates		
Macallen Dam	FEMA Floodplain	The Dam Bureau at NHDES has looked into assessing values for state-owned dams with marginal success. They considered bond ratings, market value, and construction costs. They also developed a formula that calculated the cubic feet of water impounded as a monetary value. Because dams serve different purposes (recreational, hydro-power), assessed values are hard to estimate and cannot be determined.
Bay Road culvert crossing	Past Flooding & Potential Sea-Level Rise	Engineering and design costs are already complete, and it is estimated that construction costs for replacement would be an estimated $350,000.
Creighton Street Pump Station	Potential Sea-Level Rise	TBD
Ash Swamp Road over Piscassic River	FEMA Floodplain	$600,000 (25 x 24 x $1,000)
Grant Road over Piscassic River	FEMA Floodplain	$696,000 (29 x 24 x $1,000)
NH152 over Piscassic River	FEMA Floodplain	$552,000 (23 x 24 x $1,000)
Packers Falls over Piscassic River	FEMA Floodplain	$744,000 (31 x 24 x $1,000)
NH108 over Lamprey River	FEMA Floodplain	$1,584,000 (66 x 24 x $1,000)
Water Resources		
Ash Swamp Road – Fire Aid	FEMA Floodplain	N/A
Grant Road – Fire Aid	FEMA Floodplain	N/A
Piscassic Street – Fire Aid	FEMA Floodplain	N/A
River Street – Fire Aid	FEMA Floodplain	N/A
Dry hydrant on Grant Road	FEMA Floodplain	N/A

CF/KR and Other Assets	Hazard	100% of Structure Value
Dry hydrant on Piscassic Street	FEMA Floodplain	N/A
	Total	$4,526,000

Note: The approximate assessed value for the bridges was calculated by multiplying $1,000.00 per square foot of bridge. This estimate was provided by the Bridge Design Bureau at NHDOT and includes all cost (engineering, consulting and in-house design, construction, etc.) to build a new bridge.

The GIS analysis completed by Strafford Regional Planning Commission showed that no emergency or non-emergency response facilities fell within the FEMA floodplain, any past identified flooding areas, or the 6.3ft of sea-level rise + a storm surge scenario. The data did reflect significant impacts to the town's transportation infrastructure, specifically bridges – both Town and State owned. It should be noted that due to limitations with the mapping data, it was impossible to determine what the extent of the damage would be at each location; however it is safe to say that these areas are likely vulnerable to flooding under a variety of scenarios.

Other infrastructure included the Macallen Dam, the Creighton Street pump station, the Bay Road culvert, and six fire aids (drafting sites and dry hydrants). Fire aids, like those located along the Piscassic River, are intentionally located in close proximity to waterbodies to allow fire trucks to draft water during an emergency; therefore, they will inherently be vulnerable to flooding issues and do not raise big concerns for the Town.

Buildings and Utilities

It is difficult to ascertain the amount of damage that could be caused by a natural or man-made hazard because the damage will depend on the hazard's extent and severity, making each hazard event somewhat unique. The assumption used here when calculating the damage to property is equal to: 0-1%, 1-5%, or 5-10% of Newmarket's structures, depending on the nature of the hazard, whether or not the hazard is localized, and its economic impact.

The total local assessed value included in this analysis is **$529,183,000** including **$524,486,500** for buildings and **$4,696,500** for utilities. Based on this assumption, the potential loss from any of the identified hazards under a low, medium, and high damage scenario of buildings and utilities would range from **$0 to $5,291,830 (low)** or **$5,291,830 to $26,459,150 (medium)** or **$26,459,150 to $52,918,300 (high)** based on the 2016 Newmarket Town valuation. Table 10 provides more detail on these estimated economic losses.

Table 10: Economic Loss Data

Local Assessed Valuation				
	Total Assessed Value (2016)	Economic Loss		
		Low 1% Damage	Medium 5% Damage	High 10% Damage
Buildings				
Residential	$434,986,100	$4,349,861.00	$21,749,305	$43,498,610
Manufactured Housing	$7,613,200	$76,132.00	$380,660	$761,320
Commercial Industrial	$81,887,200	$818,872.00	$4,094,360	$8,188,720
Total Buildings	**$524,486,500**	**$5,244,865.00**	**$26,224,325**	**$52,448,650**
Utilities				
Public Water	$285,200	$2,852	$14,260	$28,520
Gas	-	-	-	-
Electric	$4,411,300	$44,113	$220,565	$441,130
Total Utilities	**$4,696,500**	**$46,965**	**$234,825**	**$469,650**
Net Valuation Building and Utilities	**$529,183,000**	**$5,291,830**	**$26,459,150**	**$52,918,300**

Source: NH Department of Revenue Administration. 2016 Annual Report. Assessed value does not include value of land or local exemptions. (https://www.revenue.nh.gov/mun-prop/property/equalization-2016/documents/tbc-alpha.pdf)

Human loss of life was not included in the potential loss estimates, but could be expected to occur, depending on the severity and type of the hazard.

Chapter 5: National Flood Insurance Program (NFIP)

The Office of Strategic Initiatives, (OSI) administers the National Flood Insurance Program (NFIP) in New Hampshire. The NFIP is a partnership between a community and the federal government. Communities participate by agreeing to adopt and enforce a floodplain management ordinance designed to reduce future flood risks and in return all residents in those participating communities (whether in floodplain or not) can purchase flood insurance. Currently 217 communities (92 percent) that participate in the NFIP have adopted at least the minimum standards of the NFIP.

Through FEMA's Community Assistance Program, OSI provides technical assistance to communities and the public on floodplain management and helps to promote sound land use planning techniques that will reduce flood losses. OSI conducts Community Assistance Visits to ensure that communities participating in the NFIP are meeting program goals.

Newmarket's National Flood Insurance Program Status

According to FEMA's Community Status Book Report, Newmarket has been a member of the National Flood Insurance Program (NFIP) since May 2, 1991. The Town does have significant portions of land in the 100-year floodplain; along Folletts Brook, Lubberland Creek, Piscassic River, and portions of major tributaries stemming from the Lamprey River. According to a previous GIS analysis, the Town has an estimated 326 parcels with structures that fall within the floodplain; however, this analysis was completed prior to the delineation of the new FEMA flood maps (not yet adopted) and may no longer be accurate.

FEMA issued revised preliminary map panels in Exeter and Seabrook Beach in 2016 and recently opened up the 90-day appeal period at the end of October 2018 for those revised preliminary map panels in those two towns. The other towns in the coastal mapping project area will continue to be on hold. Following the closing of the appeal period, which ends 1/16/18, FEMA will address any comments or appeals submitted during this period. The coastal mapping project will then proceed forward.

The next step would be the issuance of a Letter of Final Determination (LFD), which is a letter sent by FEMA to all communities in the project area stating when the preliminary maps will become effective, which is six months from the date of this LFD letter. Therefore, it is currently estimated that the maps will become effective for all communities in Rockingham County Coastal Project area around fall 2018.

Section 32-158 of the Town's Zoning Ordinance (as revised June 21, 2017) outlines the Town's floodplain development regulations. The purposes of the floodplain protection overlay district are to: protect floodplains from development and construction activities which would aggravate flooding; prevent development in locations which would place occupants at risk or which would likely require rescue of occupants by emergency services personnel during floods; protect the floodplains for use as habitat and for the aesthetic qualities; and ensure town compliance with the National Flood Insurance Program. The regulations shall apply to all lands designated as areas of special flood hazard by FEMA in its "Flood Insurance Study for the County of Rockingham, N.H." dated May 17, 2005,

According to information from the FEMA Community Overview (as of 5/31/2017) provided by NH OSI Assistant Planner Kellie Shamel, Newmarket has 162 total policies (33 single family homes, 14 multi-family homes, 113 other residential structures, and 2 non-residential homes) in the floodplain hazard area. There have been 30 paid loss claims totaling $838,500 with four repetitive loss[3] claims totaling $392,171.58. The four repetitive losses are all residential structures, including two apartment buildings, and two multi-family dwellings. Two of the repetitive loss properties have flood insurance; two do not have insurance. Of the 162 total policies, 114 are standard and preferred risk policies and are not required. Standard and preferred risk offers policies for buildings that are located in moderate-to-low risk areas (B, C, and X Zones).

Table 11: Newmarket's Insurance Zone Policies

Zone	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Loses	Amount of closed Paid Loses	Repetitive Loses
AE Zones	45	$16,082	$9,751,800	9	$240,057.75	1
A Zones	3	$6,923	$728,700	1	$1,032.09	0
B,C & X Zone						
Standard	80	$28,030	$20,511,600	12	$519,845.77	1
Preferred	34	$10,266	$6,571,000	8	$77,566.97	0
TOTAL	162	$61,301	$37,563,100	30	$838,500.00	2

In order to remain NFIP compliant, Newmarket has implemented a number of actions, including:

∴ The Town purchased and provided NFIP brochures to existing residents and new homeowners located in the flood zones. Brochures are available at Town Hall.

∴ In 2009, a FEMA Community Assistance Visit (CAV) was completed (the previous CAV was in April 10, 2001). The results did not find any major problems with the existing floodplain management regulations. The report provided the following recommendations: the Town's Zoning Ordinance lacked several definitions and required a few additional amendments; the Town's Subdivision and Site Plan Review Regulations should be reviewed and revised as needed; and consider filing copies of any letter of map change (LOMCs) in both the tax records and land use records to make this information more readily accessible. The Town is currently waiting for the new FEMA maps to be adopted before making additional changes to their ordinance.

∴ In 2013, Strafford Regional Planning Commission (SRPC) assisted the Town of Newmarket in preparing an update of the Town's Vision Chapter of the Master Plan. The process was prepared collaboratively by SRPC and a designated Master Plan subcommittee. SRPC organized and facilitated two visioning forums to solicit comments and ideas from residents for addressing current issues and challenges pertaining to various aspects of the community. The community was asked to consider the integration of climate adaptation measures into municipal programs, polices, and operations to reduce community risk and vulnerability.

[3] Repetitive losses are defined as residential property that is covered under an NFIP flood insurance policy and that has had at least four NFIP claim payments over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; as well as at least two separate claims payments that have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. At least two of the claims must have occurred within any ten-year period, and must be greater than 10 days apart.

∴ Throughout 2015 and 2016, the Nature Conservancy implemented Phase I of the Lubberland Creek Culvert Restoration Project. The culvert replacement will 1) restore aquatic connectivity, 2) enhance the resilience of the Lubberland Creek salt marsh and allow upstream salt marsh migration as sea levels continue to rise, and 3) remediate the flood hazard of the road-stream crossing which overtops during major flood events.

∴ In 2016, Newmarket, in partnership with the Horsely Witten Group, participated in a resiliency to flooding and climate change project in the Moonlight Brook watershed. This project was a two part effort to: 1) study flood risk associated with climate change as well as how future development and build out of the community affect these risks, and 2) design robust green infrastructure practices within the Moonlight Brook watershed to help reduce risk of flooding while reducing pollutant load into the Brook and further downstream into the Lamprey River and ultimately Great Bay.

Exeter Street Flooding [Photo credit: Rob Roseen)

∴ In 2016, the Town worked with the NHDES Coastal Program and the Nature Conservancy to complete all design and engineering for a culvert replacement at the Bay Road crossing of Lubberland Creek. This project is intended to restore fish passage, improve salt marsh migration resiliency, and remediate flood risks.

∴ In 2017, Newmarket was one of ten communities to complete a vulnerability assessment report as part of the Climate Risk in the Seacoast (C-RiSe) project. Using the latest sea-level rise projections, this report identified key assets and resources that may be affected from flooding by one or more of the sea-level rise and/or coastal storm surge scenarios. Assets included, but are not limited to: state and municipal infrastructure, municipal facilities, transportation routes and roadways, and natural resources. As part of this vulnerability assessment, UNH researchers conducted a detailed analysis of culvert flow capacity, function, and fish passage based on current and projected increases in precipitation.

∴ In 2017, the Town is in the midst of implementing a large stormwater project on New Road. The intent is to re-direct some of the stormwater flow from downtown and the "bowl" area on Route 108 to New Road to alleviate flooding in the area. The project scope is from New Road and the intersection of Route 108 down New Road about 2,200 feet to Great Cove Road and to plan a gravel wetland at the intersection of Young Drive and then install a drainage line down Young Drive (800 feet) to a new outfall out to the river on property owned by the Town. The Town recently acquired an easement at the corner of Central, Young Lane, and New Road for the gravel wetland. The road drainage is an underground drainage pipe system.

∴ The Town is improving the infiltration and drainage at the Middle/High School, as well as implementing best management practices with the hope that these efforts become part of an education program for students.

Chapter 6: Hazards & Mitigation Strategies

Overview

This section describes the location and extent of hazards that could impact the Town of Newmarket, presents past hazard events in the Town or elsewhere in New Hampshire, and discusses their rank order placement. The Multi-Hazard Mitigation Planning Committee investigated past and potential hazards using a variety of sources and techniques, including but not necessarily limited to interviewing Town historians and other citizens; researching historical records archived at the Town Library; scanning old newspapers; reading published Town histories; consulting various hazard experts; and extracting data from the NH Hazard Mitigation Plan and other state and federal databases. Past and potential hazards were mapped where spatial data was available.

Rating Probability, Severity, and Overall Risk of Future Disasters

The nature of each hazard type and the quality and availability of corresponding data made the evaluation of hazard potential difficult. The Multi-Hazard Planning Committee considered what data was at hand and used its collective experience to formulate statements of impact or potential. Each hazard type was rated using a hazard vulnerability assessment tool (refer to Table 12).

This tool estimates the probability of occurrence, severity, and overall risk of an event using a projected number system answering questions, which answer High (3), Moderate (2), and Low (1). A zero (0) score meant that there is no likelihood the hazard would impact the Town in the next 25 years. The ranges established for the average to determine severity were:

- ∴ High = >3
- ∴ Moderate = 2
- ∴ Low = 1 or below

The overall risk is a numeric indication developed by multiplying the total numbers of the probability and the severity.

Probability of Occurrence

Probability is based on a limited objective appraisal of a hazard's probability using information provided by relevant sources, observations and trends. The Planning Committee discussed and rated probability of each hazard.

- ∴ High: There is a very strong likelihood (67-100% chance) that Newmarket will experience a hazardous event within the next 25 years. Score = 3
- ∴ Moderate: There is moderate likelihood (34-66% chance) that Newmarket will experience a hazardous event within the next 25 years. Score = 2
- ∴ Low: There is little likelihood (0-33% chance) that Newmarket will experience a hazardous event within the next 25 years. Score = 1

Severity

Severity is an estimate generally based on a hazard's impact human, property and business. The Planning Committee discussed the severity of each hazard. The severity was calculated by the average of human, property and business.

- ∴ High: The total population, property, commerce, infrastructure and services of the Town are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worst case scenario there could be a disaster of major to catastrophic proportions. Score = 3
- ∴ Moderate: The total population, property, commerce, infrastructure and services of the Town are exposed to the effects of a hazard of moderate influence; or the total population, property, commerce, infrastructure and services of the community is exposed to the effects of a hazard, but not all to the same degree; or an important segment of population, property, commerce, infrastructure or service is exposed to the effects of a hazard. In a worst case scenario there could be a disaster of moderate to major, though not catastrophic, proportions. Score = 2
- ∴ Low: A limited area or segment of population, property, commerce, infrastructure or service is exposed to the effects of a hazard. In a worst case scenario there could be a disaster of minor to moderate proportions. Score = 1

Overall Risk

The risk number is one, which can help Newmarket weigh the hazards against one another to determine which hazard is most detrimental. This is calculated by multiplying the Probability of Occurrence score by the average of the Severity score (human, property, and business impacts).

- ∴ High: There is a great risk of this hazard in Newmarket. Score = 7 or greater
- ∴ Moderate: There is moderate risk of this hazard in Newmarket. Score = 4-6
- ∴ Low: There is little risk of this hazard in Newmarket. Score = 0-3

Hazards Ratings in Newmarket, NH

The Committee determined that the hazards are distributed as follows:

- ∴ 2 hazards rated as having a High overall risk in Newmarket: flooding (riverine/extreme rain event) and drought
- ∴ 4 hazards rated as having a Moderate overall risk in Newmarket: sever winter storms, hurricane and tropical storms, cyber-attacks, and flooding (dam failure)
- ∴ 8 hazards rated as having a Low overall risk in Newmarket: hazardous materials, public health threats, severe thunderstorms, tornado and downbursts, extreme temperatures, earthquake and landslide, wildfire, and coastal flooding.

Table 12 is the Town's vulnerability assessment tool, which provides more information on the multi-hazard threat analysis that was completed during a brainstorming session with the Planning Committee.

Hazard Vulnerability Table

Table 12: Hazard Vulnerability Assessment Tool – Town of Newmarket

Impact Rankings 0 – N/a 1-Low 2-Moderate 3-High	Human Impact *Probability of death or injury*	Property Impact *Physical losses and damages*	Business Impact *Interruption of service*	Severity *Average of human, property, and business impacts*	Probability *Likelihood this will occur within 25 years*	Overall Threat *Low = 0-3* *Moderate = 4-6* *High = > 7* *(Severity x probability)*
Hazard Event						
Flooding (Riverine/Extreme Rain Event)	2	3	3	2.7	3	8.0
Drought	1	3	3	2.3	3	7.0
Severe Winter Storms	1	2	3	2.0	3	6.0
Hurricane & Tropical Storms	1	2	2	1.7	3	5.0
Cyber-attacks	1	3	3	2.3	2	4.7
Flooding (Dam Failure)	2	2	2	2.0	2	4.0
Hazardous Materials	1	3	1	1.7	2	3.3
Public Health Threats	2	1	1	1.3	2	2.7
Severe Thunderstorms	1	1	1	1.0	2	2.0
Tornado & Downburst	1	1	1	1.0	1	1.0
Extreme Temperatures	1	1	1	1.0	1	1.0
Earthquake & Landslide	1	1	1	1.0	1	1.0
Wildfire	1	1	1	1.0	1	1.0
Coastal Flooding (Storm surge and sea-level rise)	1	1	1	1.0	1	1.0

Declared Disasters and Emergency Declarations

Table 13: Presidentially Declared Disasters (DR) 1990-August 2017 impacting the Town of Newmarket

Date Declared	Event	Date of Event	Source	Program	Amount (Statewide)	Remarks
September 9, 1991	Hurricane Bob	August 18-20, 1991	FEMA 917-DR	PA	$2,293,449	Severe storm and wind; no power, trees knocked down, damage at two trailer parks
October 29, 1996	Severe Storms & Flooding	Oct 20-23, 1996	FEMA 1144-DR	PA	$2,341,273	Heavy rains- 14 inches in Newmarket over a 48-hour period. Route 108 flooded near Moonlight Bridge and in the Durham border area.
January 15, 1998	Ice Storm	January 7-35, 1998	FEMA 1199-DR	PA/IA	$12,446,202	Major tree damage, electric power interrupted for many days. Schools were closed.
May 25, 2006	Severe Storm & Flooding	May 12-23, 2006	FEMA 1643-DR	PA/IA	$17,691,586	Severe storm causing; massive flooding; road closures; evacuations
April 27, 2007	Severe Storm & Flooding	April 15-23, 2007	FEMA 1695-DR	PA/IA	$26,826,780	Severe storm causing; massive flooding; road closures; evacuations
August 11, 2008	Severe Storms, Tornado, & Flooding	July 24, 2008	FEMA 1782-DR	PA	$3,673,097	Severe storms and wind damage
January 2, 2009	Severe Winter Storm	December 11-23, 2008	FEMA 1812-DR	DFA/PA	$14,898,663	Carbon monoxide issues. Power outages for six days. Dispatch received 135 calls for trees down.
March 29, 2010	Severe Winter Storm	February 23-March 3, 2010	FEMA 1892-DR	PA	$6,841,093	Severe winter storm; minor power outages; no major damage

Date Declared	Event	Date of Event	Source	Program	Amount (Statewide)	Remarks
September 3, 2011	Tropical Storm Irene	August 26 – Sept 6, 2011	FEMA 4026-DR	PA	$17,684,244	Minor damage. 1-day of power outage. School was cancelled.
March 19, 2013	Severe Snow and Blizzard	February 9-11, 2013	FEMA 4105-DR	PA	$6,153,471	Line of sight issues and challenges with snow removal. The Town had to use the Carpenter Property as a snow dump.
March 25, 2015	Severe Snow & Snowstorm	January 26-29, 2015	FEMA 4209-DR	PA	$4,939,214	Line of sight issues and challenges with snow removal. The Town had to use the Carpenter Property as a snow dump.
August 9, 2017	Severe Storms and Flooding	July 1-2, 2017	FEMA 4329-DR	PA	$6,218,291	There were no impacts locally.
12 declarations totaling approximately $122,007,363						
Program Key: PA: Public Assistance, IA: Individual Assistance, DFA: Direct Federal Assistance						

Table 14: Emergency Declaration (EM) 1990-August 2017 impacting the Town of Newmarket

Date Declared	Event	Date of Event	Source	Program	Amount (Statewide)	Remarks
March 16, 1993	Heavy Snow	March 13-17, 1993	FEMA 3101-EM	PA	$832,396	Snow removal; high winds.
March 28, 2001	Snow Emergency	March 5-7, 2001	FEMA 3166-EM	PA	$3,433,252	Snow removal
March 11, 2003	Snow Emergency	February 17-18, 2003	FEMA 3177-EM	PA	$2,288,671	Snow removal
March 30, 2005	Snow Emergency	January 22-23, 2005	FEMA 3207-EM	PA	$3,611,491	Snow removal
December 13, 2008	Severe Winter Storm	December 11-23, 2008	FEMA 3297-EM	DFA/PA	$900,000	Winter storm; snow and ice removal
November 1, 2011	Severe Winter Storm	October 29-30, 2011	FEMA 3344-EM	PA	Data not available	Minor power outages, small amounts of debris, and school closures.
October 30, 2012	Hurricane Sandy	October 26-31, 2012	FEMA 3360-EM	PA	$643,660	The emergency operations center was opened; however, there were only minor impacts with rain and some wind.
7 emergency declarations totaling approximately $11,709,470						
Program Key: PA: Public Assistance, DFA: Direct Federal Assistance						

Flooding

Overview	
Hazard Type	Flooding
Location/Extent	Lamprey River and the Piscassic River. The Lubberland Creek, Follett Brook and Tuttle Swamp area, as well as along the tributaries to the Great Bay have extensive floodplain areas.
Vulnerability	
Severity	2.7
Probability	3
Overall Threat	8.0 (high)

Description of the Hazard

Riverine flooding is the most common natural disaster to impact New Hampshire. Riverine flooding occurs when surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow. As a result, water overflows the river banks and spills out into adjacent low lying areas.[4] Floods are most likely to occur in the spring due to the increase in rainfall and the melting of snow; however, floods can occur at any time of the year because of heavy rains, hurricane, or a Nor'easter.

New Hampshire's climate ranges from moderate coastal to severe continental, with annual precipitation ranging from about 35 inches in the Connecticut and Merrimack River valleys, to about 90 inches on top of Mount Washington. Localized street flooding occasionally results from severe thundershowers, or over larger areas, from more general rain such as tropical cyclones and coastal "nor'easters." More general and disastrous floods are rare, but some occur in the spring from large rainfall quantities combined with warm, humid winds that rapidly release water from the snowpack. Causes of flooding that could potentially affect Newmarket include:

The "100-year flood" Term:

The "100-year flood" is a term often used to describe a flood that has a 1% chance of occurring in any year. But the phrase is misleading, and often causes people to believe these floods happen every 100 years on average. The truth is, these floods can happen quite close together, or not for long stretches of time, but the risk of such a flood remains constant from year to year. The 100-year-flood term was originated to delineate areas on a map to determine what properties are subject to the National Flood Insurance Program. Properties within the 100-year-floodplain, as defined by the Federal Emergency Management Agency, have special requirements and mortgage holders will require owners to carry flood insurance on these properties.

[Source: The Nurture Nature Center: Focus on Floods]

- ∴ 100-year rainstorm event
- ∴ Severe tropical storm (hurricane or tropical storm) that can bring torrential rainfall in excess of that from a 500-year storm.
- ∴ Rapid snow pack melt in spring can be a significant potential flooding source, given the northern, relatively cold location and climate of Newmarket
- ∴ River ice jams, which could occur, although the Army Corps of Engineers Ice Jam Database contains no record of ice jams in Newmarket. The Planning Committee confirmed there have been no records of any ice jams in any of the major rivers in town.
- ∴ Dam breach or failure.

[4] FEMA Training Chapter 2 Types of Floods and Floodplains (https://training.fema.gov/hiedu/docs/fmc/chapter%202%20-%20types%20of%20floods%20and%20floodplains.pdf)

Extent of the Hazard

Flooding can occur in any area of the Town but is more likely to occur within the 100-year floodplain, downstream of dams, along river and stream banks, near wetlands and road crossings, and other low-lying areas. Newmarket has approximately 24.0% (2,183.4 acres) of its area in 100-yr. floodplain (see Map 5). It should be noted that this estimation is likely overstated due to the fact that the FEMA floodplain contains open water. If the tidal portions along the Lamprey River and Great Bay were removed the approximate acreage may be more accurately depicted as 12.6% (1,144.1 acres).

Based on extent of the floodplain, the Town has flooding potential along the Lamprey River and the Piscassic River. The Lubberland Creek, Follett Brook and Tuttle Swamp area, as well as along the tributaries to the Great Bay, also have a fairly expansive floodplain area.

Although flooding of the full extent of this floodplain by definition would require a 100-year storm, smaller storms with a higher annual probability of occurrence could still flood significant portions of that floodplain. Structures that could be impacted by a 100-year storm could also be affected by smaller, more frequent flooding. There are a large number of structures within this floodplain. It is likely that the 100-year floodplain will change in area when flood maps are continually updated to reflect changes in development patterns and better mapping technology and current precipitation data.

Flooding on the Lamprey River south of the dam, 2006

According to the C-RiSe assessment report, the inland coastal portion of Newmarket that is most susceptible to coastal flooding are those areas located south of the Macallen Dam on the west side of the Lamprey River near the downtown, low-lying areas around Lubberland Creek, and low-lying land south of the Lamprey River along Great Bay.

Past Events and Impacts

Although the storm could not be classified, a 1936 event was described at the time as causing "the greatest damage in New Hampshire's history" (Fahey 1936). Two other consequential flooding events took place in 2006 and 2007, both of which were considered 100-year events.

May 2006 Mother's Day Flood Event

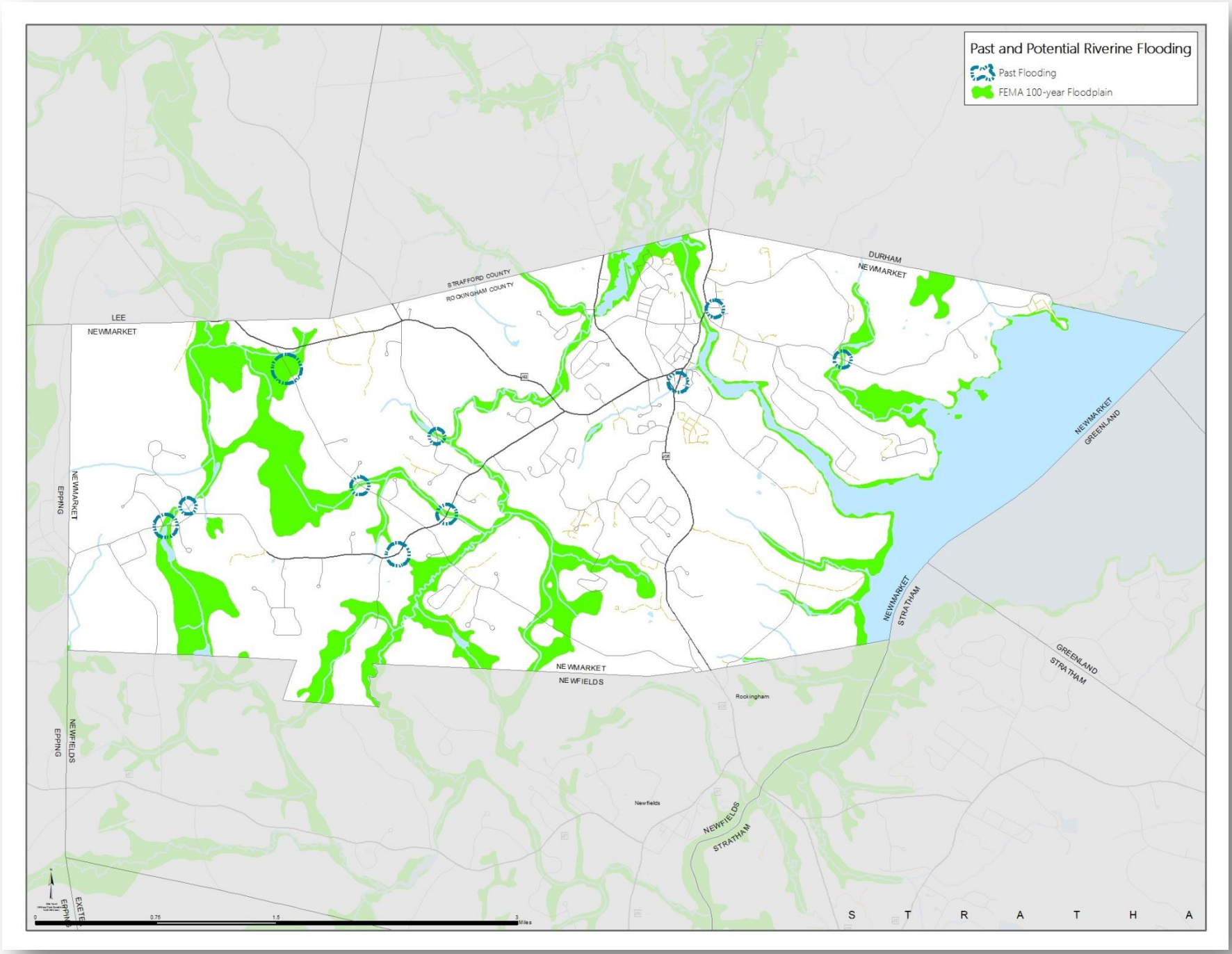
From May 11-15 2006, central and southern New Hampshire experienced severe flooding caused by as much as 14 inches of rainfall. In addition to the precipitation volume being exceptional, the month of May 2006 was the second wettest May in New Hampshire on record (based on NOAA data). The U.S. Geologic Survey Lamprey River gauging station located near Packers Falls Road Bridge measured the highest flow ever recorded of approximately 8,970 cubic feet per second (CFS) on May 16. This flood level was estimated to be a flood event with a recurrence interval between 100 and 500 years. The Piscassic River rose to a level that exceeded its normal drainage basin, entered Moonlight Brook, and was impounded behind the PanAm culvert at intersection of Gerry Avenue and Exeter Street. The earthen embankment at the railroad arch culvert subsequently failed and storm flows flooded Route 108, in the "Exeter Street Bowl." During this flood event, floodwaters in Exeter Street were approximately four feet deep, vehicles were submerged, oil tanks and dumpsters displaced and silt from eroded roadways and foundations was discharged into the Lamprey River . As a result of the flood damage, a presidential disaster declaration was made on May 25, 2006 for seven New Hampshire counties, including Rockingham County.

Patriot's Day 2007 Flood Event

On April 15 and 16, 2007 nearly seven inches of rain fell in Newmarket. The U.S. Geologic Survey Lamprey River gauging station located near the Packers Falls Road Bridge measured a peak flow of approximately 8.450 cubic feet per second on April 18, 2007, the second highest flow. This flood level was estimated to have a recurrence interval of just below 100 years. Normal flows for this date would be 654 cubic feet per second. While there was flooding in the "Exeter Street Bowl" again, the damage was not as severe as occurred with the 2006 flood. Flooding in the New Road area extending to Exeter Street was significant necessitating temporary road closures.

Both floods resulted in significant damage to public and personal property in Newmarket. Roads were impassable for days and severely damaged, and residential areas were evacuated due to high water levels and inundation of homes by floodwaters.

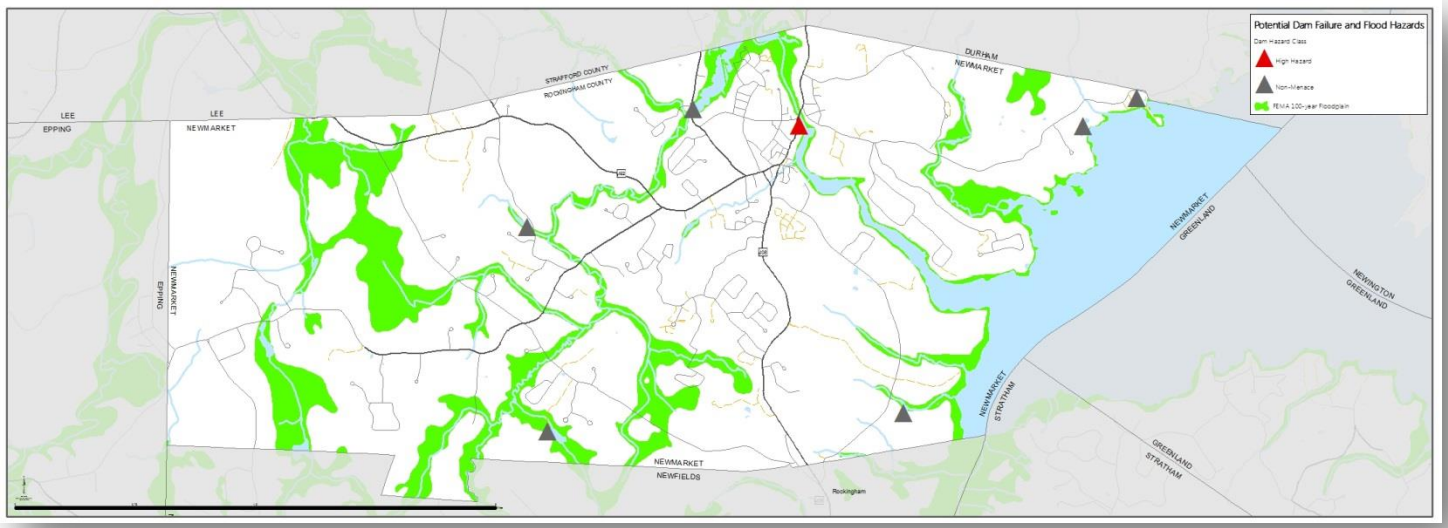
The Planning Committee identified three additional flooding events of consequence, including February 2010, October 2016, and the spring of 1996. The February storm impacted parts of Route 152. The October storm impacted parts of Route 108 and Gerry Ave; however, the issues at Gerry Ave were attributed to beaver damage in a local manhole that backed up water from Moonlight Brook and has not happened since. The Committee could not recall the specifics of this storm other than it caused damage in the "bowl" area on Exeter Street. According to the Flood Insurance Study for Rockingham County (2014), this event had a recurrence interval of approximately 100 years and recorded a peak discharge of 3,060 cubic feet per second (cfs) on parts of the Exeter River in Brentwood.



Map 5: Past and Potential Hazards (Source: FEMA, GRANIT, and the Town of Newmarket 2017

Dam Failure

Dam failures are comparatively rare, but can cause immense damage and loss of life when they occur. Primary causes of dam failure include: sub-standard construction, design errors, lack of maintenance, and geological instability (earthquakes). According to the NHDES 2015 database, there are a total of 7 active dams (there are an additional 11 dams that are classified as ruins, removed, breached, not built, pending, or exempt). There is one high hazard dam (Macallen Dam). There are six non-menacing dams (Piscassic River Dam, Miller Dam, Recreation Pond Dam, Fire Pond Dam, Conservation Pond Dam, and Wildlife Pond Dam). There have been no past occurrences of dam failure in Newmarket, and given that the only high hazard dam is currently being rehabbed and state inspection schedules – the probability of future failure is relative low.



Map 6: Dam Inundation Zones (Source: NHDES, 2015)

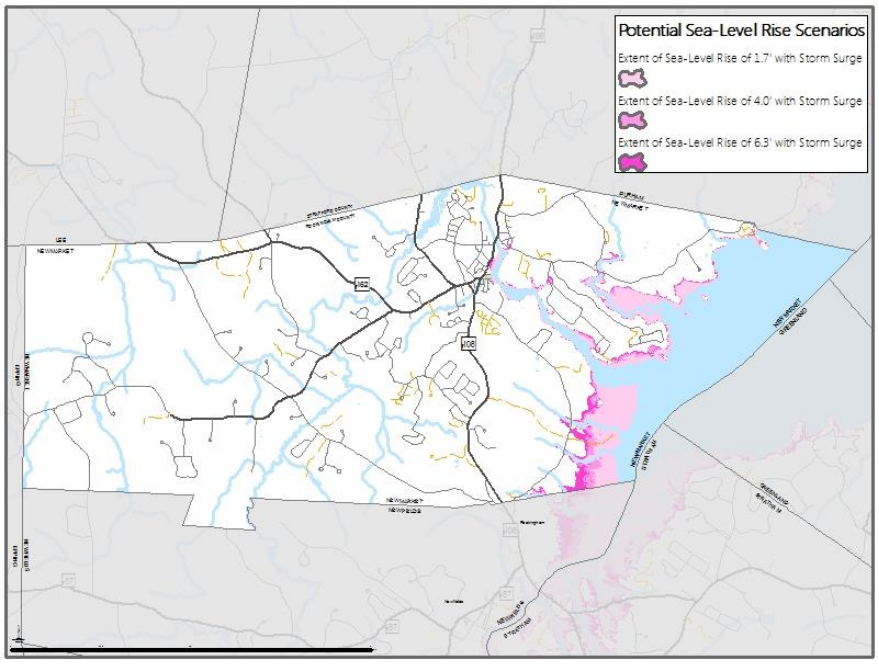
The Strafford Regional Planning Commission did not have any delineated dam inundation zone data available for the Town of Newmarket. The NHDES Dam Bureau may have additional GIS data. A more comprehensive list of dams, their associated classifications, and inspection schedules in Newmarket are located in Table 15.

Table 15: Active Dams in Newmarket

Dam Classification	Classification Definition	Number of Dams in Newmarket	Inspection Interval (Years)
High	Dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life.	1	2
Significant	Dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no probable loss of lives but major economic loss to structures or property.	0	4
Low	Dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no possible loss of life and low economic loss to structures/property.	0	6
Non-Menace	Dam that is not a menace because it is in a location and of a size that failure of misoperation of the dam would not result in probable loss of life or loss to property.	6	6

Coastal Flooding and Sea-Level Rise

According to the C-RiSe vulnerability assessment, Newmarket can expect to see impacts from sea-level rise in several areas of town. The regions of the town that are most susceptible to coastal flooding are those located south of the Macallen Dam on the west side of the Lamprey River near the downtown, low-lying areas around Lubberland Creek, and low-lying land south of the Lamprey River along Great Bay. In addition, small sections of 10 different roads in the Town are vulnerable to low, moderate, and high sea-level rise scenarios (with and without storm surge).



Map 7: Future Sea-Level Rise + Storm Surge Scenarios

Key findings for Newmarket are based on evaluation of the 1.7 feet (intermediate-low), 4.0 feet (intermediate), and 6.3 feet (highest) sea-level rise projections at the year 2100 and these sea-level rise projections with the 100-year storm surge. Map 7 provides the spatial extend of the three different sea-level rise scenarios. Groundwater rise and salt water intrusion associated with sea level rise will also likely affect the Town in various ways, including impacts to public and private drinking water supplies and existing septic systems in low-lying areas.

Potential Future Impacts on the Community

Overall, flooding potential in Newmarket is high and flood conditions will continue to affect the Town. Both seasonal flooding and flooding due to extreme weather events have the potential to occur during all seasons. Future sea-level rise may impact certain low-lying, tidal areas.

Estimated Potential Losses

Based on the high hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$52,918,300** in estimated potential losses from flooding.

Hurricane and Tropical Storms

Overview	
Hazard Type	Hurricane and Tropical Storms
Location/Extent	Town-wide
Severity	1.7
Probability	3
Overall Threat	5.0 (moderate)

Description of the Hazard

A hurricane is the term used for tropical cyclones that occur in the Northern Hemisphere east of the International Dateline to the Greenwich Meridian. Tropical cyclones originate over tropical or subtropical waters and are characterized by organized deep convection and a closed surface wind circulation about a well-defined center. These events are called typhoons if they occur west of the International Dateline. Hurricane season in the Atlantic runs from June 1 to November 30.

According to the State Hazard Mitigation Plan (2013) tropical cyclones with maximum sustained winds of less than 39 mph are called tropical depressions. Once the tropical cyclone reaches winds of at least 39 mph, they are typically called a tropical storm and assigned a name. If the winds reach 74 mph or greater, they are upgraded and called a hurricane.

Extent of the Hazard

Hurricanes may impact all areas of the Town. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating system based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.

Scale Number (Category)	Sustained Winds (MPH)	Damage	Storm Surge
1	74-95	**Minimal:** Unanchored mobile homes, vegetation and signs.	4-5 feet
2	96-110	**Moderate:** All mobile homes, roofs, small crafts, flooding.	6-8 feet
3	111-130	**Extensive:** Small buildings, low-lying roads cut off.	9-12 feet
4	131-155	**Extreme:** Roofs destroyed, trees down, roads cut off, mobile homes destroyed. Beach homes flooded.	13-18 feet
5	More than 155	**Catastrophic:** Most buildings destroyed. Vegetation destroyed. Major roads cut off. Homes flooded.	Greater than 18 feet

Past Impacts and Events

These severe tropical storms may occur anytime from early spring to late fall, and in general are less common than other storms, e.g. nor'easters. As wind events, historically hurricanes have caused damage in Newmarket, most notably in 1938 and 1954 (Hurricane Carol).

The NOAA National Climatic Data Center's Storm Events database (NCDC 2017) does not list any Hurricanes as directly affecting Rockingham County from January 1, 2007 to August 31, 2017; however, Rockingham County did experience impacts from Hurricane Sandy. Hurricane Sandy was the last hurricane to hit the region during the period of October 26 to November 8, 2012. Local impacts included periods of heavy rain and short-term power outages. The database does report one tropical storm event, which is detailed as follows:

Tropical Storm Irene (August 28, 2011) - brought a prolonged period of strong and gusty winds and heavy rain to the state. The high winds snapped or uprooted numerous trees throughout the state causing more than 160,000 customers to lose electrical and/or communication services. The heavy rains caused rivers and streams throughout the state to flood causing damage to bridges, roads, and property. The strongest winds across the state began Sunday morning in southern areas and spread northward during the day. Winds continued to be gusty overnight as the storm moved away from the area. Observed maximum wind gusts included 63 mph at Portsmouth, 52 mph at Concord, and 51 mph at Manchester. On the top of Mt. Washington, winds gusted to 104 mph as the storm approached and 120 mph as it moved away. The combination of wet soil and the prolonged

period of strong and gusty winds brought down numerous trees throughout the state. One person was killed and three people were injured across the state due to falling trees or branches. Rainfall amounts across the state ranged from 1.5 to 3 inches across southeastern New Hampshire. Local impacts included periods of heavy rain, downed branches, and short-term power outages.

Potential Future Impacts on Community

Based on historical data and statistical predictors, the Atlantic Basin averages approximately 12 total named storms per year. Six of those storms will become hurricanes with three becoming a category three or higher. With variability in sea-level pressure and sea-surface temperatures in the Atlantic Ocean, it is difficult to predict with certainty the number of storms in any given year. It is even more difficult to determine which of those storms will make landfall. Because Newmarket is located in closer proximity to the New Hampshire coast, wind speeds may still hold their coastal strength; however, significant impacts would be dependent on the exact track of these concentrated storms.

Newmarket remains vulnerable to hurricane hazards, including: high winds, heavy rainfall, and inland flooding; therefore the recurrence potential of hurricane and tropical storm hazards is moderate. Given that the 2017 Atlantic hurricane season was hyperactive, which featured 17 named storms (tying it with 1936 as the fifth-most active season since reliable records began in 1851) and three that were major hurricanes (Harvey, Irma, and Maria), it is likely that the region will be impacted by a significant storm of tropical origin within the foreseeable future.

Estimated Loss Potential

Based on the moderate hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$26,459,150** in estimated potential losses from impacts associated from hurricanes and tropical storms.

Tornado & Downburst

Overview	
Hazard Type	Tornado & Downburst
Location/Extent	Town-wide – dependent upon tornado track
Severity	1.0
Probability	1
Overall Threat	1.0 (low)

Description of the Hazard

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud with winds in excess of 200 mph, often accompanied by violent lightening, peripheral high winds, severe hail, and severe rain. Tornadoes develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity, and the convergence of warm, moist air at low levels with cooler, drier air aloft. Most tornadoes remain suspended in the atmosphere, but if they touch down they become a force of destruction.

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage. A tornado is usually accompanied by thunder, lightning, heavy rain, and a loud "freight train" noise. In comparison to a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

A downburst is a severe localized wind blasting down from a thunderstorm. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris. Downbursts fall into two categories: microburst, which covers an area less than 2.5 miles in diameter and macroburst, which covers an area at least 2.5 miles in diameter.

Extent of the Hazard

The Enhanced Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. The scale measures wind speeds of 65 to greater than 200 miles per hour. The damage path of a tornado can be in excess of one mile wide and 50 miles long, whereas a downburst is typically less than 2.5 miles. Downbursts can have wind speeds of 150 miles per hour.

Enhanced Fujita Scale	
EF–0	65–85 mph winds
EF–1	86–110 mph
EF–2	111–135 mph
EF–3	136–165 mph
EF–4	166–200 mph
EF–5	>200 mph

Past Impacts and Events

Tornadoes are rare in New Hampshire. The NCDC Storm Events database (NCDC 2017) lists only 10 tornadoes that have impacted Rockingham County since 1950. Two were an EF-0 event (65-85 mph); two were an EF1 event (73-112 mph); five were EF2 events (111-135 mph); and one was an F3 event (136-165 mph). Over the course of the past six decades, there has been one fatality, 11 injuries, and approximately $1.2 million in property damages associated with tornados. The majority of property damage was sustained during an event that took place in 2008, which was the most recent touchdown. There have been no direct impacts in Newmarket.

Table 16: Tornado Data for Rockingham County

Date	Magnitude	Death	Injuries	Property Damages
08/21/1951	F2	0	0	2,500
06/09/1953	F3	0	5	25,000
07/31/1954	F1	0	0	25,000
06/19/1957	F2	0	1	25,000
07/02/1961	F2	0	1	250,000
07/26/1966	F1	0	0	2,500
10/03/1970	F0	0	0	25,000
06/09/1978	F0	0	0	250
05/21/2006	F2	0	2	3,000
07/24/2008	F2	1	2	840,000
	TOTAL	1	11	1,198,000

Between 1991 and 2010, the average annual number of tornadoes in New Hampshire was one.[5] Though the frequency of tornado events in New Hampshire is not great, the state has experienced large tornados throughout its history. An early example is the tornado that stuck the state in September 1821. This tornado was reported to have tracked from the Connecticut River, near Cornish, and terminating near Boscawen. When the skies cleared, 6 people were dead, hundreds injured and thousands homeless.

In 1998 an F2 tornado in Antrim, N.H. blew down a 45-foot by 12-foot section of the Great Brook Middle School. Witnesses reported seeing a funnel cloud, and the weather service, after an inspection, confirmed it was a tornado. According to the June 2, 1998 edition of the Eagle Tribune, John Jensenius from the National Weather Service in Gray, Maine estimated that the twister cut a path half a mile long, up to 100 yards wide, and was on the ground for several minutes.

In July 2008, an F2 tornado and high winds created a path of destruction through five New Hampshire counties that destroyed homes, displaced families, downed trees and forest lands and closed major state roadways. The impact to residents was extensive, with over 100 homes rendered uninhabitable. Phone and electric service was cut off to over 12,500 customers. One fatality is attributed to a building collapse, and local hospitals reported numerous physical injuries associated with this severe storm.[6] Since the July 2008 tornado, the NCDC Storm Events database reports that nine tornados have hit New Hampshire; however, none have hit Rockingham County. The most recent event occurred in July 2016 in Pittsburg.

Downburst activity is very prevalent throughout the State. However, the majority downburst activity is mostly unrecognized unless a large amount of damage has occurred. Several of the more significant and recent events are highlighted below:

- ∴ Central, NH – July 6, 1999 – Damages: Two roofs blown off structures, downed trees, widespread power outages, and damaged utility poles and wires; two fatalities.
- ∴ Stratham, NH – August 18, 1991 – Damages: $2,498,974 worth of damages; five fatalities.
- ∴ Moultonborough, NH – July 26, 1994 – Damages: Downed trees, utility poles and wires. Approximately 1,800 homes without power and 50-60 homes damages.
- ∴ Bow, NH – September, 6, 2011 – Damages: City Auto in Bow had 15 campers damaged and estimated $200,000 in damage.

The Town has experienced multiple downburst activity. In 1984, there was a microburst that tore through the mobile home park on Bay Road and destroyed 8 homes. It also took parts of the roof off the library and the Mill building.

In October, 2017 a wind storm that was accompanied with heavy rain produced sustained winds of 60 mph that resulted in wide-spread power outages caused by downed trees and power lines. Approximately 67% of the Town was without power and the Halloween trick-or-treating event was postponed.

[5] NOAA. U.S. Tornado Climatology (https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology)
[6] New Hampshire Department of Safety. State of NH Natural Hazard Mitigation Plan 2013. Homeland Security and Emergency Management.

While tornados are not common, they would cause significant impacts in the Town. The probability of reoccurrence of a downburst may be higher. A tornado or downburst can impact the entire jurisdiction and may cause greater damage in the community center.

Potential Future Impacts on Community

There have been 10 reported tornadoes over the course of 67 years in Rockingham County; the average annual probability of recurrence, therefore, is 14.9% (10/67 x 100). The probability may be slightly higher if local reports of tornadoes were considered; however, this 14.9% probability is for all of Rockingham County – not just Newmarket. The actual probability for Newmarket should be much lower, considering the great dependence of impact upon the actual track of any tornado. The NCDC identified two tornadoes that touched down relatively close (Northwood and Hampton Falls) to the Town, which would suggest the average annual probably of recurrence to be less than 5%. The tornado recurrence probability for Newmarket, therefore, is relatively low.

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$5,291,830** in estimated potential losses from impacts associated from tornadoes and downbursts.

Severe Winter Weather

Overview	
Hazard Type	Severe Winter Weather
Location/Extent	Town-wide
Severity	2.0
Probability	3
Overall Threat	6.0 (moderate)

Description of the Hazard

Winter snow and ice events are common in New Hampshire. The National Climatic Data Center (NCDC 2017) Storm Events database reports 64 severe winter weather events, which include: 4 blizzards, 45 heavy snow events, 4 ice storm, and 11 winter storms (nor'easters) that have impacted Rockingham County from January, 1 2007 to August 31, 2017.

Heavy snow typically brings significant snow removal costs along with delays in transportation schedules. Wet snow can result in major infrastructure damage from heavy snow loads and has been the cause of human harm during long periods of shoveling, including back injuries and in some cases heart attacks to older individuals. The most severe damage, though, often comes from ice storms and winter nor'easters.

Ice Storm, 2008

The State's Multi-Hazard Mitigation Plan Update 2013 identifies four types of winter storms:

- ∴ *Heavy snowstorms*: A storm that deposits four or more inches of snow (or 10 cm) in a twelve-hour period
- ∴ *Blizzards*: A violent snowstorm with winds blowing at a minimum speed of 35 miles (56 kilometers) per hour and visibility of less than one-quarter mile (400 meters) for three hours
- ∴ *Nor'easter*: A large weather system traveling from south to north, passing along the coast. As the storm's intensity increases, the resulting counterclockwise winds which impact the coast and inland areas in a Northeasterly direction. Winds from a Nor'easter can meet or exceed hurricane force winds.
- ∴ *Ice Storms*: An event that occurs when a mass of warm, moist air collides with a mass of cold, arctic air. The less dense warm air will rise and the moisture may precipitate out in the form of rain. When this rain falls through the colder, denser air and comes in contact with cold surfaces, ice will form and may continue to form until the ice is as thick as several inches.

Extent of the Hazard

Snow and ice storms are a Town-wide hazard.

Sperry-Piltz Ice Accumulation Index

The Sperry–Piltz Ice Accumulation Index, or SPIA Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness.

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

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	< 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

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

Past Events and Impacts

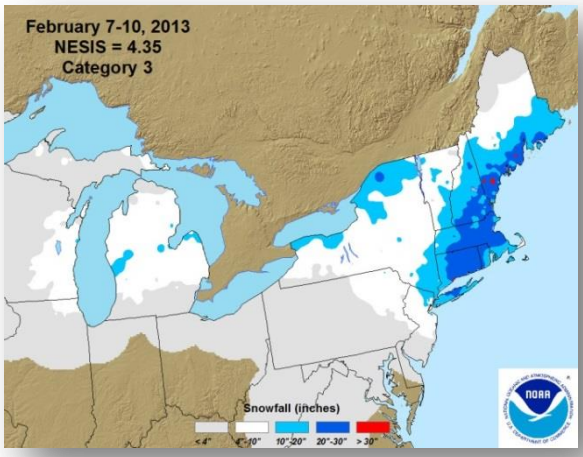
Four events of those listed in the NCDC database are of particular note for their severity:

The Ice Storm of 1998: (January 7th – 9th) was a severe ice storm that is recognized as the worst event in recent memory. Ice accreted several inches thick on trees, power lines, and other exposed surfaces causing many people in those areas to lose electrical service. Statewide, the storm knocked out power to about 55,000 customers, an estimated 125,000 people. Those impacted had to contend with snow, additional freezing rain, rain, slippery roads, falling ice and other debris, sub-zero temperatures, strong winds, and dangerous wind chills. Local impacts included major power outages ranging from a couple of days to a week; the warming shelter was also opened.

The Ice Storm of 2008 (December 11th – 12th) was a major winter storm that brought a mixture of snow, sleet, and freezing rain. The greatest impact in the state was in southern and central New Hampshire where a significant ice storm occurred. Following the ice storm, recovery and restoration efforts were negatively impacted by additional

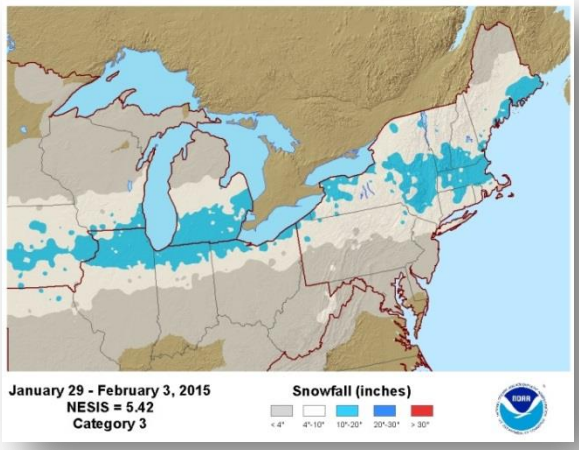
winter weather events that passed through the state. The freezing rain and sleet ranged from 1 to 3 inches, ice accretion to trees and wires in these areas generally ranged from about a half inch to about an inch. The weight of the ice caused branches to snap, and trees to either snap or uproot, and brought down power lines and poles across the region. About 400,000 utility customers lost power during the event, with some customers without power for two weeks. Property damage across northern, central and southeastern NH was estimated at over $5 million. Local impacts included power outages for upwards of 9 days, the opening of the warming shelter, downed trees and other debris, and road closures.

The Blizzard of 2013 – NEMO (February 8th-9th) was an area of low pressure developed rapidly off the Carolina coast late on the 7th and early on the 8th. The storm moved very slowly northeast during the 8th and 9th as it continued to intensify. By the morning of the 10th, the storm was located just to the east of Nova Scotia. The storm brought heavy snow, high winds, and blizzard conditions to the southeastern part of the state. Snowfall amounts were generally 18 inches or more in the southeast where blizzard conditions caused considerable blowing and drifting snow. In western and northern sections, snowfall amounts were in the 4 to 18 inch range. Southeastern New Hampshire had blizzard conditions for about 3 to 10 hours.



The NCDC Regional Snowfall Index for the stations near Newmarket reported between 18 and 24 inches of snow (Rochester and Nottingham) and 12 to 18 inches (between Epson and Northwood) from February 8-February 10, 2013. According to the NH Union Leader, wind gusts of over 30-miles-per hour were expected to occur with the storm; however, the NH Electric Co-op reported only minor power outages.[7] No other major local impacts.

The Blizzard of 2015 – JUNO (January 26th – 28th) was area of low pressure developed off the Delmarva peninsula on Monday, January 26th, and intensified rapidly as it moved slowly northward through the 27th. Snow spread northward across the region Monday night and became heavy on Tuesday, the 27th. Winds became strong during the day Tuesday leading to blizzard conditions at times along and inland from the coast. The snow persisted into Tuesday night in many areas with blowing and drifting snow. Snowfall amounts ranged from 10 to more than 30 inches across much of the southeastern part of the state.



[7] New Hampshire Union Leader. February 9, 2013.
http://www.unionleader.com/apps/pbcs.dll/article?AID=/20130209/NEWS1101/130209041/0/OPINION02

Juno was ranked on the NESIS as a 'major' event based on the area affected, the amount of snow, and the number of people living in the path of the storm. The Regional Snowfall Index for the station near Newmarket reported between 18 and 24 inches from January 25-January 28th, 2015[8]. Similar to the storm in 2013, this snow storm brought heavy bands of snow and wind, causing blizzard-like conditions. No other major local impacts.

Other, less recent events were also damaging. The nor'easter of December 7, 1996 was especially damaging to power systems and is described in the NCDC database as "the most extensive and costliest weather related power outage in the state's history," at least until 1996 when that database entry was made. The 1998 ice storm probably surpassed this storm in power systems impact. This storm is thought to have been of the same magnitude as the one that occurred in the region in 1929, indicating a return period of approximately 70 years (CRREL 1998).

Extended Power Failures

When discussing extended power failure in this plan, it is referring to power failure that can last for a period of days or weeks. Many things can cause power failure: downed power lines (due to storm, wind, accident, etc.); failure of public utilities to operate or failure of the national grid. Extended power failure can present not only lighting difficulties but also heating, water supply and emergency services. In Newmarket, there have been extended power outages on occasion; the worst in recent years was the ice storm of 2008 where power was out for over a week in some places. Additional events to add are the Halloween Snow Event (2011), which produced heavy, wet snow and leaf-on conditions that resulted in downed trees and caused major power outages throughout the Town, and the Thanksgiving Day snow event in late November (2014), which also produced heavy, wet snow that resulted in sporadic power outages and disrupted travel plans for the holiday weekend, including major delays at airports and hazardous travel. Remote areas, such as Bay, Grant, and New Road are likely to be restored last.

Potential Future Impacts on Community

Newmarket will continue regularly to receive impacts from severe, regional winter weather events.

Estimated Loss Potential

Based on the moderate hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$26,459,150** in estimated potential losses from impacts associated from severe winter weather.

Severe Thunderstorms & Lightning

Overview	
Hazard Type	Severe Thunderstorm and Lightning
Location/Extent	Town-wide (sporadic)
Severity	1.0
Probability	2
Overall Threat	2.0 (low)

[8] http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=rsi&theme=rsi

Description of the Hazard

As defined by NOAA, a thunderstorm is a rain shower during which thunder is heard. Because thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is the result of convection, which is the upward atmospheric motion that transports whatever is in the air (such as moisture) with it. A thunderstorm is classified as severe if it has hail one inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado. Thunderstorm-related hazards that could impact Newmarket include: high winds and downburst, lightning, hail, and, torrential rainfall. Thunderstorms and severe thunderstorms are a Town-wide hazard. They are most likely to occur in spring and summer.

Lightning can cause significant, sometimes severe, damage. Lightning strikes can cause direct damage to structures and serious injury or death to people and animals. Extensive damage also commonly results from secondary effects of lightning, such as electrical power surges, wildfire, and shockwave. According to lightning fatality data collected by the National Oceanic and Atmospheric Administration (NOAA) over the last decade, lightning kills an average of 32 people each year in the United States. There were 320 fatalities (254 were men; 66 were women) in the United States from 2007 to 2017.

Extent of the Hazard

Lightning heats air to a temperature of 50,000 degrees Fahrenheit and causes the air to expand and contract rapidly, which causes thunder. A lightning strike occurs very quickly but can occur multiple times during a storm.

Table 17: Lightning Activity Scale

Lightning Activity Level (LAL)	Conditions
LAL1	No thunderstorms activity
LAL2	Isolated thunderstorms
LAL3	Widely scattered thunderstorms
LAL4	Scattered thunderstorms
LAL5	Numerous thunderstorms
LAL6	Widely scattered, scattered, or numerous DRY thunderstorms

Past Events and Impacts

Thunderstorms are common in New Hampshire but can be considered generally less severe than in other areas of the country, such as the Great Plains states. Severe thunderstorms do occur in New Hampshire, though. The NCDC database lists 32 reported events of severe thunderstorm winds in Rockingham County from January 1, 2007 to August 31, 2017. One event took place in in Newmarket. On July 23, 2016 a severe thunderstorm produced strong winds (estimated 50 knots) that downed trees blocking the Amtrak track.

There were no reported lightning strike related deaths in New Hampshire. The NCDC database lists seven reported lightning events in Rockingham Country from January 1, 2007 to August 31, 2017; none of which occurred in Newmarket (closest was in Newfields on 7/16/2010). Local impacts included some residential damage, but no fires.

Finally, hail is a fairly common part of thunderstorms in New Hampshire, but damaging hail is apparently not. The damage that can result from hail is mostly to cars and windows. The NCDC Storm Events database lists 34 reported hailstorms in Rockingham County from January 1, 2007 to August 31, 2017. One of these events took place in Newmarket. On August 22, 2009 a severe thunderstorm produced 0.88 inch hail throughout Town.

Potential Future Impacts on Community

The annual recurrence probability of thunderstorms in general is effectively 100%. Newmarket will continue to experience thunderstorms and should expect to sustain significant damage periodically.

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$5,291,830** in estimated potential losses from impacts associated from severe thunderstorms and lightning.

Wildfire

Overview	
Hazard Type	Wildfire
Location/Extent	Town-wide (Unfragmented, wooded areas)
Severity	1.0
Probability	1
Overall Threat	1.0 (low)

Description of the Hazard

Wildfire is defined as an uncontrolled and rapidly spreading fire. A forest fire is an uncontrolled fire in a woody area. Forest fires occur during drought and when woody debris on the forest floor is readily available to fuel the fire. Grass fires are uncontrolled fires in grassland areas. Newmarket has an urban core with a surrounding forested landscape. Exposure to natural factors such as lightning that can cause wildfires is consequently high and can occur throughout the jurisdiction.

Extent of the Hazard

The National Wildfire Coordinating Group (NWCG) categorizes the size of a wildfire in six classes depending on acres burned, ranging from less than ¼ acre to greater than 5,000 acres (see box to the right). The US Forest Service's surface fire behavior fire characteristics chart illustrates primary fire behavior values including the spread rate and the intensity of the fire, which can be used to compare predicted and observed fire behavior and to describe potential fire behavior.[9]

The National Wildfire Coordinating Group (NWCG) defines the size of a wildfire as:
Class A - one-fourth acre or less;
Class B - more than one-fourth acre, but less than 10 acres;
Class C - 10 acres or more, but less than 100 acres;
Class D - 100 acres or more, but less than 300 acres;
Class E - 300 acres or more, but less than 1,000 acres;
Class F - 1,000 acres or more, but less than 5,000 acres;

[9] How to Generate and Interpret Fire Characteristics Charts for Surface and Crown Fire Behavior. (https://www.fs.fed.us/rm/pubs/rmrs_gtr253.pdf)
[11] New Hampshire Department of Safety. State of NH

Past Impacts and Events

Wildfires in New Hampshire historically have tended to run in 50-yr cycles, which can be observed starting from the 1800s. This 50-year cycle is partially based upon human activities and, therefore, may not prove to be accurate into the future.[10] The peak in wildfires in the late 1940's and early 1950's is thought to be related to the increased fuel load from trees downed in the 1938 hurricane. Here, 60 years later, New Hampshire officials are again concerned about the high fuel load created by the 1998 and 2008 ice storms that hit New Hampshire. The NCDC Storm Events database lists 0 reported wildfires in Rockingham County from January 1, 2007 to August 31, 2017.

Potential Future Impacts on Community

The probability of occurrence of wildfires in the future is effectively impossible for the Hazard Mitigation Committee to predict due to the dependence of wildfire on the occurrence of the causal hazards and the variability of numerous factors that affect the severity of a wildland fire. In general, if a wildfire occurred in one of the large, unfragmented woodland areas, the cost of the timber loss would probably be in the range of several million dollars.

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$5,291,830** in estimated potential losses from impacts associated from wildfire.

Earthquakes & Landslide

Overview	
Hazard Type	Earthquake & Landslide
Location/Extent	Town-wide and areas with steep slopes (>25%)
Severity	1.0
Probability	1
Overall Threat	1.0 (low)

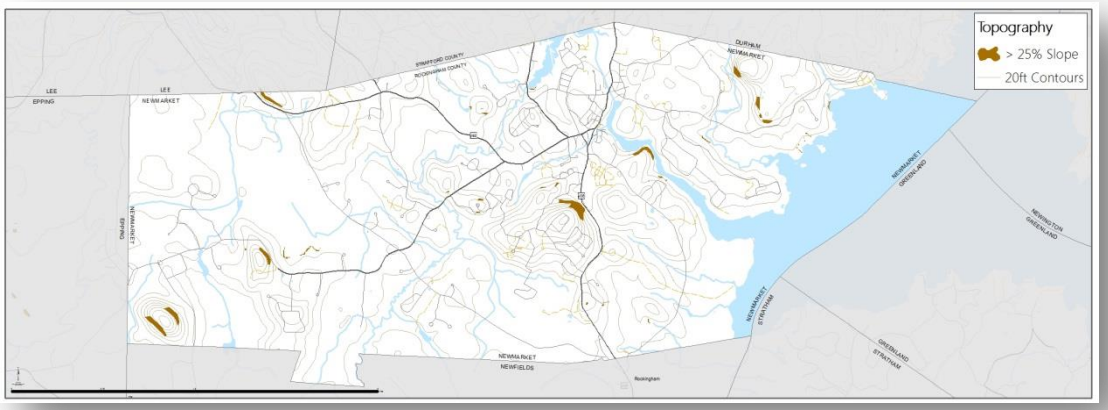
Description of the Hazard

The USGS defines an earthquake as a term used to describe both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, and are followed by vibrations of gradually diminishing force called aftershocks.[11] Earthquakes in the Northeast are not associated with specific know faults.

[10] New Hampshire Department of Safety. State of NH Natural Hazard Mitigation Plan 2013. Homeland Security and Emergency Management.
[11] The Northeast States Emergency Consortium Earthquake Hazards. http://nesec.org/earthquakes-hazards/. Viewed on 8/10/15

Due to the geology of the region, the area impacted by an earthquake in the Northeast can be up to 40 times greater than the same magnitude event occurring on the West coast. Earthquakes can occur at any time without warning. An earthquake can impact all areas of the jurisdiction. People at greatest risk from earthquakes are those who live in unreinforced masonry buildings build on filled land or unstable soil.[12]

Landslides could occur in Newmarket in areas with steep slopes, where soils and loose bedrock formations would tend to slough off and move en masse downhill under gravity. Earthquakes could readily cause landslides, as could ground saturation from extended heavy precipitation events. Given seismic or precipitation events that could initiate landslide, landslide hazard is likely quite high in steep slope areas; however, there are only approximately 35.9 acres (<1%) of steep slopes greater than 25% in Newmarket.



Map 8: Steep Slopes in Newmarket (Source: SRPC, 2015)

Extent of the Hazard

The magnitude and intensity of an earthquake is measured by the Richter scale and the Modified Mercalli Intensity (MMI) scale, respectively. The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes.

The Modified Mercalli Intensity (MMI) scale was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects actually experienced at a given place and therefore has a more meaningful measure of severity.[14]

MODIFIED MERCALLI SCALE		RICHTER SCALE	
I.	Felt by almost no one.	2.5	Generally not felt, but recorded on seismometers.
II.	Felt by very few people.		
III.	Tremor noticed by many, but they often do not realize it is an earthquake.	3.5	Felt by many people.
IV.	Felt indoors by many. Feels like a truck has struck the building.		
V.	Felt by nearly everyone; many people awakened. Swaying trees and poles may be observed.		
VI.	Felt by all; many people run outdoors. Furniture moved, slight damage occurs.	4.5	Some local damage may occur.
VII.	Everyone runs outdoors. Poorly built structures considerably damaged; slight damage elsewhere.		
VIII.	Specially designed structures damaged slightly, others collapse.	6.0	A destructive earthquake.
IX.	All buildings considerably damaged, many shift off foundations, Noticeable cracks in ground.		
X.	Many structures destroyed. Ground is badly cracked.	7.0	A major earthquake.
XI. XII.	Almost all structures fall. Very wide cracks in ground. Total destruction. Waves seen on ground surfaces, objects are tumbled and tossed.	8.0 and up	Great earthquakes.

[12] http://nesec.org/earthquakes-hazards/
[13] USGS. Earthquake Hazard Program. http://earthquake.usgs.gov/learn/glossary/?term=Richter%20scale. Viewed on 8/10/15
[14] USGS. Earthquake Hazard Program. http://pubs.usgs.gov/gip/earthq4/severitygip.html. Viewed on 8/10/15

Past Impacts and Events

Due to the state's location in an area of moderate seismic activity earthquakes are a common event in New Hampshire, but significantly damaging earthquakes are not. The Northeast States Emergency Consortium (NESEC, 2016) website presents a history of earthquake in the Northeast and documents that New Hampshire is an area of high earthquake probability. Three hundred and sixty earthquakes occurred in New Hampshire from 1638 to 2007. Approximately 40-50 earthquakes are detected in the Northeast annually.[15] However, New Hampshire has only experienced ten earthquakes of significant magnitude (Richter Magnitude 4.0 or greater) in that time period (one was located in Maine). There have been no major earthquake or landslide events. A minor earthquake was felt several years ago, but did not result in any damage.

Earthquakes are on average an annual occurrence but significant quakes have an annual probability of occurrence (based on the 1638 to 2012 period) of about 2.7%.

Table 18: Notable Historic Earthquakes in NH 1638-2012 (Magnitude 4.0 or Greater)

Location	Date	*Intensity MMI Scale*	Magnitude *Richter Scale*
Central New Hampshire	June 11, 1638	-	6.5
Portsmouth	November 10, 1810	V	4.0
Near Hampton	July 23, 1823	IV	4.1
Ossipee	October 9, 1925	VI	4.0
Ossipee	December 20, 1940	VII	5.5
Ossipee	December 24, 1940	VII	5.5
West of Laconia	January 19, 1982	-	4.7
Northeast of Berlin	October 20, 1988	-	4.0
Southeast of Berlin	April 6, 1989	-	4.1
Hollis Center (Maine)	October 16, 2012	-	4.0

[Source: Northeast States Emergency Consortium, 2016]

Potential Future Impacts on Community

Earthquakes could readily cause landslides, as could ground saturation from extended heavy precipitation events. Given seismic or precipitation events that could initiate landslide, landslide hazard is likely quite high in steep slope areas. The Hazard Mitigation Committee did not have the expertise available to analyze the actual probability of landslide in Newmarket; however, to the best of the committee's knowledge no significant landslides have ever occurred. The USGS (1997) classifies landslide incidence regionally as very low (less than 1.5% of land area involved). The local probability in Newmarket however, will depend on specific soil/rock types and upon the probability of initiating events.

[15] http://nesec.org/earthquakes-hazards/

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$5,291,830** in estimated potential losses from impacts associated from earthquakes and landslides.

Extreme Temperatures

Overview	
Hazard Type	Extreme Temperatures
Location/Extent	Town-wide
Severity	1.0
Probability	1
Overall Threat	1.0 (low)

Description of the Hazard(s)

Extreme temperatures can be describes as heat waves and cold waves (or winter storm and extreme winter conditions.

A *heat wave* is a prolonged period of excessively hot and sometimes also humid weather relative to normal climate patterns of a certain region. Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect."[16]

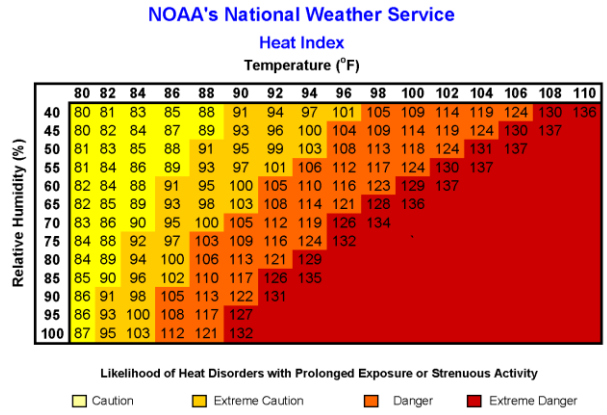
A *cold wave* can be both a prolonged period of excessively cold weather and the sudden invasion of very cold air over a large area. Along with frost it can cause damage to agriculture, infrastructure, and property. Cold waves, heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia.

[16] International Federation of Red Cross and Red Crescent Societies. Climatological hazards: extreme temperatures. http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/definition-of-hazard/extreme-temperatures/

Extent of the Hazard

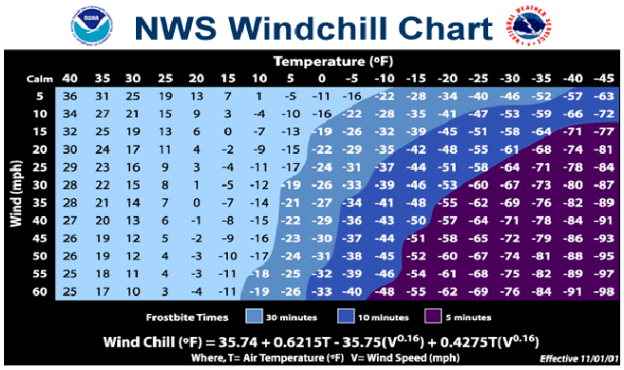
Extreme Heat

Extreme heat events can be described as periods with high temperatures of 90°F or above. The graph to the right displays the likelihood of heat disorders with prolonged exposure or strenuous activity.



Extreme Cold

What constitutes extreme cold varies by region. Characteristics of an extreme cold event in northern states include temperatures at or below zero for an extended period of time. According to the National Weather Service (NWS), extreme cold is a daily concern during the winter months for northern states. The NWS Wildchill Temperature index calculates the dangers from winter winds and freezing temperatures (Source: NWS)



The Town sends out advisory notices whenever the National Weather Service issues cold/heat index warnings in the weekly newsletter.

Past Impacts and Events

According to a 2014 study of climate change by Climate Solutions New England, Climate Change in Southern New Hampshire, from 1970 to 1999, southern New Hampshire experienced an average of seven days per year above 90°F each year. This is projected to increase to 22 days per year under a low emissions scenario to nearly 50 days per year under a high emissions scenario. Between 1980 and 2009, an average of one day per year reached 95°F in southern New Hampshire. By the end of the century, the number of days per year over 95°F is expected to increase as much as six to 22 days per year. Additionally, the average daytime maximum temperature on the hottest day is expected to increase to as much as 98°F to 102°F (depending on the emissions scenario), compared to the historical average of 93°F.[17] Between 1960 and 2012, there was an average of 8.3 days per year (or 0.8 days/decade) greater than 90°F recorded in Durham (the closest of four stations to Newmarket included in the study). During this time the hottest day of the year averaged 95.0°F.[18] There have been no significant heat-related issues for Newmarket.

Between 1960 and 2012, the average temperature of the coldest day of the year was -14.5°F in Durham (the closest of four stations to Newmarket included in the study).[19] Between 1980 and 2009, there were an average of 164 days per year under 32°F and 16 days per year under 0°F in southern New Hampshire. By the end of the century, southern New Hampshire is expected to see 20 fewer days below 32°F and only about 2 to 5 days per year under 0°F. There have been no significant cold-related issues for Newmarket.

[17] Wake, C. et al. "Climate Change in Southern New Hampshire; Past, Present, and Future." Climate Solutions of New England. 2014
[18] Ibid
[19] Ibid

Potential Future Impacts on Community

Annual average temperatures may increase on average by 3-5°F by 2050 and 4-8°F by 2100[20]

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $5,291,830 in estimated potential losses from impacts associated from extreme temperatures.

Drought

Overview	
Hazard Type	Drought
Location/Extent	Town-wide
Severity	2.3
Probability	3
Overall Threat	7.0 (high)

Description of the Hazard

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects growing or living conditions. The impacts of droughts are indicated through measurements of soil moisture, groundwater levels, and stream flow. The effect of drought on these indicators is variable during any particular event. For example, frequent minor rainstorms can replenish the soil moisture without raising groundwater levels or increasing streamflow. Low streamflow also correlates with low ground-water levels because ground water discharge to streams and rivers maintains streamflow during extended dry periods. Low streamflow and low ground-water levels commonly cause diminished water supply.

Drought is a regional hazard and can impact the entire jurisdiction. Agricultural land and residents who use dug, shallower wells may be more vulnerable to the effects of drought.

Extent of the Hazard

The National Drought Monitor classifies the duration and severity of the drought using precipitation, stream flow, and soil moisture data coupled with information provided on a weekly basis from local officials. There are five magnitudes of drought outlined in the New Hampshire State Drought Management Plan: Exceptional, Extreme, Severe, Moderate, and Abnormally Dry. At the development of this Plan, Newmarket was a year removed from an extreme drought.

Past Impacts and Events

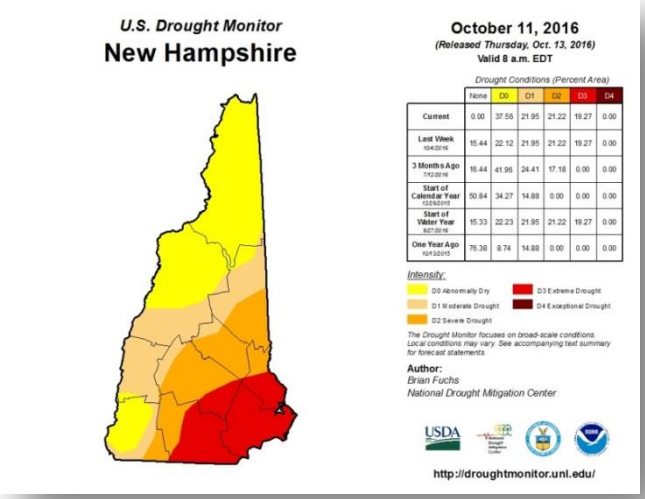
While the impacts of drought are typically not as damaging and disruptive as floods or storm events, the impacts of long term drought or near drought conditions can impact crops and the water supply.

20

Periods of drought have occurred historically in New Hampshire. Six droughts of significant extent and duration were evident in the 20th century as noted below in Table 2.5. The most severe drought recorded in New Hampshire occurred from 1960 to 1969. This drought encompassed most of the northeastern United States (1956-1966). The drought of 1929-1936 was the second worst and coincided with severe drought conditions in large areas of the central and eastern United States. The drought of 2001-2002 was the third worst on record.[21]

Table 19: Severe Drought Conditions in New Hampshire

Dates	Area Affected	Magnitude	Remarks
1929 – 1936	Statewide	-	Regional; recurrence interval 10 to > 25 years
1939 – 1944	Statewide	Severe Moderate	Severe in southeast NH and moderate elsewhere in the State. Recurrence interval 10 to > 25 years.
1947 – 1950	Statewide	Moderate	Recurrence interval 10 to >25 years
1960 – 1969	Statewide	Extreme	Longest recorded continuous spell of less than normal precipitation. Encompassed most of the northeast US. Recurrence interval >25 years.
2001 – 2002	Statewide	Severe	Recurrence interval 10 to >25 years
2015-2016	Central & Southern NH	Moderate	Recurrence interval cannot yet be determined



In more recent years, drought has again become a problem in New Hampshire. In 1999, a drought warning was issued by the Governor's Office. In March 2002, all counties in New Hampshire with the exception of Coos County were declared in Drought Emergency. This was the first time that low-water conditions had progressed beyond the Level Two, Drought Warning Stage.

Normal precipitation for the state averages 40 inches per year. During the summer of 2015, most of central and southern New Hampshire experienced its most recent drought, the first since 2001 – 2002 (was the 3rd worst on record, exceeded only by the national droughts of 1956-1966 and 1941-1942). While many communities experienced record snowfall totals this past winter (2014-2015), the lack of rainfall and higher-than-average temperatures resulted in river and groundwater levels to be lower than average. This resulted in the implementation of local water conservation plans throughout the region.

Drought conditions continued and intensified into 2016 in New Hampshire and in Southeast New Hampshire in particular. The drought was due to a combination of a below average snowpack in the spring, little precipitation to recharge the groundwater, an increase of evapotranspiration (the process by which water is transferred from the land

[21] NHDES. Drought Management Program. Publications. *NH Drought Historical Events*. Viewed on 8/10/15. http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf

to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants) in the summer, and the inability of New Hampshire watersheds to store large volumes of water due to their geology.

In October 2016, at the peak of the drought, nearly 20% of the state was categorized as being in extreme drought. One hundred and sixty community water systems had reported implementing a water restriction or ban, and 13 towns have reported implementing voluntary or mandatory outdoor use bans in the state. Newmarket operated under a stage 4 water conservation system for most of the year and only lifted the ban in the last several months.[22]

Potential Future Impacts on Community

The National Drought Mitigation Center website (NDMC 2004) emphasizes that reliable drought prediction for regions above 30°N latitude is effectively impossible. With extreme variation in environmental conditions due to climate change possibly on the rise and population increases, drought probability may grow in the future and put more of a strain on long-term water resources. Currently, drought possibility seems moderate. The large amount of water resources and relatively sparse population in New Hampshire have tended to minimize the impacts of drought events in the region, but this regional protection may be endangered in the future with increases in drought frequency or severity, especially in the State's densely populated areas along the seacoast and south-central NH.

Estimated Potential Losses

Based on the high hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $52,918,300 in estimated potential losses from drought.

Public Health Threats

Overview	
Hazard Type	Public Health Threats
Location/Extent	Town-wide
Severity	1.3
Probability	2
Overall Threat	2.7 (low)

Description of the Hazard

Epidemic

As defined by the CDC, and epidemic is "the occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time."[23] In addition to being categorized by the type of transmission (point-source or propagated), epidemics may occur as outbreaks or pandemics. As defined in the State

[22] In 2002, Newmarket implemented a Water Management Program to conserve groundwater resources during critical dry months. The program consists of a four-stage system requiring water users to limit water consumption to maintain adequate volume of the available water supply.

[23] Slate; http://www.slate.com/id/2092969/

Hazard Mitigation Plan, an outbreak is a sudden increase of disease that is a type of epidemic focused to a specific area or group of individuals. A pandemic is an epidemic that spreads worldwide, or throughout a large geographic area.

Epidemics may be caused by infectious diseases, which can be transmitted through food, water, the environment or person-to-person or animal-to-person (zoonoses), and noninfectious diseases, such as a chemical exposure that causes increased rates of illness. Infectious disease that may cause an epidemic can be broadly categorized into the following groups[24]:

- Foodborne (Salmonellosis, Ecoli)
- Water and Foodborne (Cholera, Giardiasis)
- Vaccine Preventable (Measles, Mumps)
- Sexually Transmitted (HIV, Syphilis)
- Person-to-Person (TB, Aseptic meningitis)
- Arthropodborne (Lyme, West Nile Virus)
- Zoonotic (Rabies, Psittacosis)
- Opportunistic fungal and fungal infections (Candidiasis).

An epidemic may also result from a bioterrorist event in which an infectious agent is released into a susceptible population, often through an enhanced mode of transmission, such as aerosolization (inhalation of small infectious disease particles).[25] For the purposes of this Plan, widespread drug and substance abuse may also be considered epidemics.

Lyme Disease

Lyme disease, which is spread to humans by the bite of an infected tick, is a growing threat in New Hampshire. New Hampshire has one of the highest rates of Lyme disease in the U.S.

Radon

Radon is a radioactive gas which is naturally occurring as a result of the typical decay of uranium commonly found in soil and rock (especially granite). Radon has carcinogenic properties and is a common problem in many states; New Hampshire has some isolated areas that are among the highest levels of radon in the United States according to the US Environmental Protection Agency (EPA). Whether or not a particular type of granite emanates radon is dependent on the geochemistry of that particular granite, some types are a problem and some are not. In other parts of the country, radon is associated with certain black shales, sandstones, and even limestones. The EPA has estimated that radon in indoor air is responsible for about 13,600 lung cancer deaths in this country each year (EPA document, EPA 811-R-94-001, 1994).[26]

[24] New Hampshire Department of Safety. State of NH Natural Hazard Mitigation Plan 2013. Homeland Security and Emergency Management.
[25] Ibid
[26] Ibid

Arsenic

Arsenic is a semi-metal element that is odorless and tasteless. Arsenic is a hazard because it can enter drinking water supplies, either from natural deposits in the earth or from agricultural and industrial practices.[27] Wells drilled into New Hampshire's bedrock fractures have about a 1 in 5 probability of containing naturally occurring arsenic above 10 parts per billion. In addition, wells within short distances (~50 feet) can present very different water quality because of our highly fractured bedrock. Arsenic in water has no color or odor, even when present at elevated levels. Therefore, the only way to determine the arsenic level in your well water is by testing.

Extent of the Hazard

Public health threats are events or disasters that can affect an entire community.

Past Impacts and Events

Epidemic

While not an infectious disease outbreak, New Hampshire is currently among those states in the Northeast combating a serious opioid epidemic, which according to the Union Leader has resulted in 479 expected drug overdose deaths since 2012. In Newmarket, there have been approximately 83 confirmed drug overdoses since 2015, eight of which resulted in a fatality. New Hampshire has some of the highest percentages of illicit drug use among young adults in not just the Northeast, but the entire country. Carfentanyl has emerged as an additional drug that is causing significant problems. The Town and its partners have strengthened local advocacy through the implementation of an education and outreach campaign to help provide information on substance abuse and designated a safe station for those in need.

Lyme Disease

The number of New Hampshire residents diagnosed with Lyme disease has increased over the past 10 years, with significant increases occurring since 2005.[28] In 2009, the rate of cases of Lyme disease reported in New Hampshire residents was 108 cases per 100,000 persons, which is significantly higher than the Healthy People 2010 science-based 10-year national objective for improving the health of all Americans objective of 9.7 cases per 100,000 persons.[29] From 2009 to 2013, reported cases of Lyme disease in New Hampshire increased by approximately 20% from 1416 cases per year to 1691 cases per year.[30] Rockingham, Strafford, and Hillsborough counties had the highest rates of disease in 2008-2009. In 2012, there were 172 reported cases of Lyme disease in Strafford County.[31]

[27] EPA. Arsenic in Drinking Water. (http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/index.cfm)
[28] 2011 New Hampshire State Health Profile; Improving Health, Preventing Disease, Reducing Costs for All. NH Division of Public Health Services Department of Health and Human Services. http://www.dhhs.nh.gov/dphs/documents/2011statehealthprofile.pdf
[29] HealthyPeople.gov. About Healthy People. Accessed April 2014. Available at: http://healthypeople.gov/2020/about/default.aspx
[30] NHDHHS. State of New Hampshire Tickborne Disease Prevention Plan. March 31, 2015. http://www.dhhs.state.nh.us/dphs/cdcs/lyme/documents/tbdpreventionplan.pdf)
[31] 2011 New Hampshire State Health Profile; Improving Health, Preventing Disease, Reducing Costs for All. NH Division of Public Health Services Department of Health and Human Services. http://www.dhhs.nh.gov/dphs/documents/2011statehealthprofile.pdf

Radon

Exposure is a significant hazard in New Hampshire. According to a NH Bureau of Environmental & Occupational Health (BEOH) study looking at >15,000 indoor radon test results in single-family dwellings, households in northern, eastern, and southeastern regions of New Hampshire especially tend to have nominally high concentrations of radon in air or water (BEOH 2004); however, values in excess of the US Environmental Protection Agency's 4.0 picocurie per liter (pCi/L) action guideline have been found in nearly every community in New Hampshire. Values exceeding 100 pCi/L have been recorded in at least eight of New Hampshire's ten counties. The highest indoor radon reading in New Hampshire known to NHDES is greater than 1200 pCi/L; higher values probably exist.

In Newmarket, between 30.0 – 39.9% of homes tested by homeowners from 1987 to 2008 tested at or above the radon action level of 4.0 pCi/L. The probability of significant radon exposure is fairly high.[32]

Arsenic

From 1975 until 2001, the federal maximum contaminant limit (MCL) for arsenic in water supplied by public water systems was 50 parts per billion, because the health effects of exposure to lower concentrations was not recognized. Based on an exhaustive review of the new information about arsenic's health effects, in January 2001 EPA established a goal of zero arsenic in drinking water. At the same time, EPA adopted an enforceable MCL of 10 parts per billion (ppb) based on balancing treatment costs and public health benefits. Studies have shown that chronic or repeated ingestion of water with arsenic over a person's lifetime is associated with increased risk of cancer (of the skin, bladder, lung, kidney, nasal passages, liver or prostate) and non-cancerous effects (diabetes, cardiovascular, immunological and neurological disorders). The same studies found that dermal absorption (skin exposure) of arsenic is not a significant exposure path; therefore, washing and bathing do not pose a known risk to human health.[33] Locally, Wade Farm has been a location that has experienced some arsenic issues in the past.

In 2017, NHDES offered a free water testing program (documents arsenic levels and assesses biological activity for a variety of bacteria), in which Newmarket was one of the communities chosen to participate. More information on the Targeted Arsenic and Uranium Public Health Study: A Biomonitoring New Hampshire Project can be found by visiting their website. Localized data will be available later in 2018.

Potential Future Impacts on Community

With the occurrence of worldwide pandemics such as SARS, H1N1 and Avian Flu, Newmarket could be susceptible to an epidemic and subsequent quarantine. While all individuals are potentially vulnerable to the hazard of an epidemic, epidemics often occur among a specific age group or a group of individuals with similar risk factors and exposure.[34] Lyme disease will continue to impact public health, and with changes in climate, in particular warmer winters, higher rates of Lyme disease will be an ongoing concern.

Radon, arsenic, and other potential groundwater containments will continue to need to be addressed. There have been reports by the EPA that lung cancer deaths nationwide can be attributed to radon exposure, but nothing

[32]NHDES https://www.des.nh.gov/organization/divisions/air/pehb/ehs/radon/documents/radon_by_town.pdf
[33] New Hampshire Environmental Services. Drinking Water and Groundwater Bureau. Arsenic in Drinking Water Fact Sheet.
[34] New Hampshire Department of Safety. State of NH Natural Hazard Mitigation Plan 2013. Homeland Security and Emergency Management.

inclusive has been determined at this point. With assistance from epidemiological health experts, for future plan updates the Committee may be able to use the life-table or concentration risk analysis methodologies in the EPA study (EPA 2003) together with demographic and behavioral health data to arrive at a reasonable estimate of risk. The heroin and drug epidemic remains an ongoing problem.

Estimated Potential Losses

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $5,291,830 in estimated potential losses from impacts associated from public health threats.

Hazardous Materials

Overview	
Hazard Type	Hazardous Materials
Location/Extent	Town-wide
Severity	1.7
Probability	2
Overall Threat	3.3 (low)

Description of the Hazard

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials continue to evolve as new chemical formulas are created.

Extent of the Hazard

Incidents involving hazardous materials could potentially occur at any residence or business or along any road; however, it is more likely that a spill would occur from trucks traveling from the western side of New Hampshire that pass through Newmarket en-route to the Dover/Rochester area. Routes 108 and 152 are two roadways of biggest concern. There is also a freight train that runs through the town and acts as a major line from Maine to Boston and is of much larger concern to the Town. Everyday this train carried materials for industrial uses, many of which are not publicly known. The fire department does have procedures set up in case of an accident, but if there were a major spill or hazardous threat the environmental and economic impacts could be substantial. Lastly, Newmarket is within the 50-mile protective zone if the Seabrook nuclear power plant were to have a nuclear release.

Past Impacts and Events

The Planning Committee recognized at least one accident with the train and another vehicle, but it did not result in a spill of any kind. There have been other minor oil/fuel spills that have taken place in various locations in Town.

Potential Future Impacts on Community

The Pan-Am rail line, because of the sheer quantity, is one of the largest future threats to the Town. As the rail line travels through Newmarket, it crosses important natural resource features including waterbodies (Moonlight Brook and Lamprey River), wetlands, and forested land; industrial complexes; and passes through the economic core of the downtown (over Route 108 (Exeter Street); and under S. Main Street and Elm Street). Any derailment would have significant impacts for the Town.

There is also the Newington Sea-3 expansion project, which is an important hazardous materials threat. This import/export project includes three 90,000-gallon tanks and associated chilling and pumping equipment in order to refrigerate and bulk store pressurized propane that is being railed in.

Estimated Potential Losses

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$5,291,830** in estimated potential losses from hazardous materials impacts.

Coastal Hazards

Overview	
Hazard Type	Coastal Hazards
Location/Extent	West side of the Lamprey River near the downtown, low-lying areas around Lubberland Creek, and low-lying land south of the Lamprey River along Great Bay.
Severity	1.0
Probability	1
Overall Threat	1.0 (low)

Description of the Hazard

Coastal flooding is often associated with storm surge, extreme precipitation events, and sea-level rise, and can be devastating to human health and safety, public and private structures and facilities, and the economies of coastal and inland coastal communities.

King Tide Event at Schanda Park, November 2017 (Source: SRPC)

Extent of the Hazard

Newmarket is an inland coastal community, one of seventeen communities in the New Hampshire Coastal Zone, but has limited risk and vulnerability in regard to flooding caused by wave action. However storm surges brought on by large storm events like hurricanes and nor'easters, accompanied by high tides and potential sea level rise are valid concerns around the west side of the Lamprey River near the downtown, low-lying areas around Lubberland Creek, and low-lying land south of the Lamprey River along Great Bay.

Past Impacts and Events

Due to limited development along tidal areas, to this point there have been no major coastal flooding issues; however, future impacts of sea-level rise may result in additional risk.

Potential Future Impacts on Community

In 2014, the Coastal Risk and Hazards Commission (CRHC) released their Sea-Level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends report that provides the best available and relevant scientific information to inform decision-makers. The report projects that New Hampshire's coast could see a range of 0.6ft to 2.0ft of sea level rise by the year 2050. By 2100, that range could be from 1.6ft all the way to 6.6ft depending on different emission scenarios.

In 2017, NOAA released a report titled Global and Regional Sea Level Rise Scenario for the US that indicates global sea-level projections may be in the range of 6.6ft to 8.9ft of rise by 2100 under the highest scenario. These results take into consideration the instability of the Antarctic ice-sheet and indicate that these higher outcomes may be more likely than previously thought. While these projections are based on models and there is always a high level of uncertainty, the trend continues to go up – not down.

King Tide Event at Schanda Park, November 2017 (Source: SRPC)

According to the CRHC report annual precipitation (not extreme events) is expected to increase by as much as 20% with most increases occurring during winter and spring during this century. Extreme precipitation events are expected to increase in frequency and in the mount of precipitation produced; however it is unclear as to how much those events will increase.

Estimated Potential Losses

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $5,291,830 in estimated potential losses from coastal hazard impacts.

Cyber-Attacks

Overview	
Hazard Type	Cyber Attacks
Location/Extent	Town-wide
Severity	2.3
Probability	2
Overall Threat	4.7 (moderate)

Description of the Hazard

The field of cyber security is primarily concerned with protecting against damage and disruption to or theft of hardware, software, or information. Due to the variety of services they provide, local government organizations collect, store, and work with large amounts of personal data and other sensitive information. While the security of this information has always been important, increasing use of digital networks to store and transmit that information makes the security of those networks a priority. Furthermore, local governments provide critical services such as police, fire, utilities, and other services, and disruption to these services could be devastating for residents. Types of cyber threat include:[35]

- Malware: Malicious software that can damage computer systems, including monitoring system activity, transferring information, or even taking control of computers or accounts. This includes a wide variety of viruses, Trojans, ransomware, and other programs that are usually installed by clicking on infected links, files, or email attachments.
- Phishing: These attacks come in the form of emails, often disguised as a trusted or legitimate source, that attempt to extract personal data.
- Denial of Service: This is a large-scale attack designed to disrupt network service by overloading the system with connection requests. These attacks are more likely to impact large, high-profile organizations, but such attacks can occasionally have residual impacts on other organizations in the same network.
- Man in the Middle: By imitating an end user (e.g. an online bank), an attacker can extract information from a user. The attacker can then input that information to the end user to access additional information, including sensitive data such as personal or account information.
- Drive-by Downloads: Malware installed on a legitimate website causes a system to download a program simply by visiting that website. This program then downloads malware or other files directly to the user's system.
- Malvertising: This attack type downloads malware or other files to your computer when you click on an infected advertisement.

[35] Sullivan, Megan. 8 Types of Cyber Attacks Your Business Needs to Avoid (http://quickbooks.intuit.com/r/technology-and-security/8-types-of-cyber-attacks-your-business-needs-to-avoid/)

- Rogue Software: Attackers use pop-up windows to mimic legitimate anti-virus or other security software in order to trick users into clicking on links to download malware or other files.
- Sponsored Attacks: These threats, which could be perpetrated by state or non-state actors, include specific attacks to damage or disrupt infrastructure such as utilities or wastewater facilities.

Extent of the Hazard

Cyber threats are a Town-wide hazard that have the potential to impact any location if critical services are disrupted, or any resident, business, contractor, or employee whose information is stored in town records in the event of a data breach. The severity of any impact depends upon the type of incident – targeted phishing attacks may be focused upon a single employee or account, while malware attacks could impact an entire department or gain access to an entire database of personal information.

Past Impacts and Events

A global ransomware attack began on May 12, 2017 that impacted more than 100,000 organizations in 150 countries.[36] Ransomware is a type of malware that encrypts a user's files, making them inaccessible, and demands a ransom to return access. While ransomware has existed for years, it is becoming more prevalent. An IBM study of the impacts of ransomware found that nearly 40% of all spam emails contain a ransomware attachment, up from 0.6% in 2015.[37] The FBI estimates that over $1 billion in ransoms were paid by businesses and consumers in 2016 compared to $24 million in 2015.[38]

The Durham Police Department was the victim of a ransomware attack in June 2014. The attack originated from a phishing attack that linked to a Dropbox account containing malware. The malware locked access to files in a shared directory, effectively preventing the department from filing or accessing reports, sending and receiving emails, or researching the record management system. In this case, damage was limited by the fact that the officer who opened the file did not have local administrative rights to make changes to the computer or system. The Durham IT department was able to restore service by isolating and identifying infected computers and drives before reimaging computers and replacing system files with external backups. These preventative measures of limiting administrative rights and backing up data regularly to external servers meant that the biggest impact was the network downtime necessary to restore the computers and servers, and recovery was relatively quick. In total, it took the Town three days to restore full service (police servers were unavailable for two days) at a cost of $3,500.

In 2016 a single work station in the Police Department was infected with malware software; however, it did not spread and did not impact the server. Since that incident the IT department has provided outreach to officers on suspicious emails and has taken additional precautions to limit future hacking incidents.

[36] http://www.npr.org/sections/thetwo-way/2017/05/14/528355526/repercussions-continue-from-global-ransomware-attack
[37] IBM X-Force. Ransomware: How consumers and businesses value their data. 2016
[38] http://www.nbcnews.com/tech/security/ransomware-now-billion-dollar-year-crime-growing-n704646

Potential Future Impacts on Community

Newmarket is most likely to be at risk from malware, phishing, and other methods of acquiring personal information. These threats may be targeted, as in the case of phishing emails sent to employee accounts, or threats that individuals encounter during their regular computer usage. Cyber threats are also constantly evolving in order to find new weaknesses in anti-virus software and other network defenses. As noted above, ransomware has become an increasingly prevalent form of malware in recent years, and is likely to continue to be a threat in years to come.

Another potential concern the planning committee discussed was the risk of an attack on the town's water and sewer electronic control system. This is an important utility system that would have major implications if hacked.

Estimated Potential Losses

Based on the medium hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $26,459,150 in estimated potential losses from cyber-attacks.

Hazards Not Included in this Plan

The State of New Hampshire identifies avalanches as a hazard in the State Multi-Hazard Mitigation Plan Update of 2013. Avalanches are not included in this Plan for the Town of Newmarket. Avalanches were not identified by the present or past Planning Committee as a local hazard due to the fact that there are no significant mountains or topographical features, where avalanches would be likely to or have occurred in the past. The Town will re-evaluate the need to include additional hazards to this Plan during subsequent updates of the Plan.

Chapter 7: Action Plan

Past Mitigation Strategies

During past updates the Planning Committee developed a list of strategies to implement over the course of the Plan's life-cycle. Table 20 summarizes those strategies, and provides updated information as to if the strategy was accomplished or not.

Table 20: Accomplishments Since Last Plan Adoption

Proposed Mitigation Action	Update 2018
1. Construct two towers with sirens and voice communication to be used for town and public communications.	Removed Action. This action is no longer viewed as a priority and should be removed.
2. Install reverse 911 location system and train users on alert system.	Completed Action. This action has been completed.
3. Develop the early stages of a stormwater management plan that would stem from the culvert evaluations that have recently been completed. First steps would be to organize the assessment report and prioritize which culverts are in the most need of repair and replacement.	Deferred Action. The Town hasn't starting working on developing a stormwater plan yet. As a first step, the Town needs to map its system, which needs to be updated by July 2020 according to the MS4 permit. At the time of this chapter update, the Seacoast Stormwater Group has released an RFP out to assist communities in the seacoast with mapping their impaired watersheds and outfalls.
4. Continue to move forward with the Macallen Dam Feasibility Study.	Completed Action. In 2010, Gomez and Sullivan completed the feasibility study, which when released, resulted in a shift in public opinion. Instead of removal, the Town is currently working with NHDES on making the necessary repairs. Hydrologic modeling has been completed and, in 2016, the Town hired GZA to complete all engineering, stability, and concept designs. Construction is set to be completed in the fall of 2019.
5. Public education and outreach on the recently completed fluvial erosion hazard assessments. The Town will develop maps, outreach materials, and planning techniques to implement in order to protect citizens and their property, while contributing to the health and stability of the rivers.	Removed Action. The NH Geological Survey did not conduct any fluvial erosion studies on waterbodies within the Town of Newmarket. As such, this action should be removed.
6. Purchase and install a back-up generator at the Middle/High School	Deferred Action. This action has not been completed and should be rolled into the 2018 update.

Proposed Mitigation Action	Update 2018
7. Set aside funds in order to purchase equipment cots, pillows, blankets, etc. for emergency shelter.	Deferred Action. This action has not been completed and should be rolled into the 2018 update.
8. Make all documents relating to the Hazard Mitigation Update available at the Town Library and Town Hall.	Completed Action. Hard copies of the plan were sent to the Town Hall and Library. The Town website will create a new emergency preparedness tab and house all electronic copies of the plan moving forward.
9. Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	Completed Action. Brochures were purchased and are available at the Town Hall.
10. Continue to provide outreach assistance to elderly, special needs, and community at risk populations by organizing staff and coordinating within Town departments.	Completed Action. In 2017, the Police Department along with the High School Superintendent formed a committee to conduct an emergency planning meeting. These meetings are conducted regularly to review emergency plans and best practices as a way to provide continued assistance for our vulnerable populations. The Police Department conducts regular meetings with the Sunrise Sunset Senior Center to talk about current safety concerns in the community, along with meetings throughout the year with the Newmarket Housing Authority. These meetings reach out to the elderly and section 8 housing. The Police Department also offers a "Good Morning Program" where the elderly can check in every morning.
11. Design outreach materials (i.e. magnets, brochures, flyers) with emergency procedures and contact information to be mailed out to current and future residents in town.	Completed Action. Important emergency information is sent out and posted in the Town's weekly newsletter and on the website.
12. Establish a partnership with local businesses and services as a planning community assistance strategy. Partner with businesses to offer food, coffee, and water, etc. to Town Departments during an emergency or extreme weather event.	Completed Action. The Town has a partnership with a number of businesses in the downtown, including but not limited to: Jeremy's Pizzeria, Panzanella's, and Riverworks Tavern that all offer supplies to municipal departments during emergencies.

Status Update:

Completed Action – This program continues to be an implemented mitigation action item since the last updated plan was developed

Deferred Action – At the time of developing this plan, more time is required for completion

Removed Action – This existing program is no longer a priority to the Town

Ongoing Action – This program will occur throughout the life of the plan

Existing Mitigation Strategies

During the update the Planning Committee developed a list of existing programs and strategies that were ongoing planning mechanisms to help reduce impacts from future hazards. Table 21 summarizes those programs, and provides information on the effectiveness, any changes in priority, and a list of recommendations to improve them during the next life-cycle of this plan.

Table 21: Existing Programs and Policies

Existing Program	Description	Effectiveness	2018 Update
Building Codes	Establishes regulations for the design and installation of building systems	Good	The Town is currently using the 2009 IBC and is waiting for the state to adopt the new codes. At the time of this plan update, the state building code review board was trying to get legislation passed to adopt the 2015 codes.
Local Emergency Operations Plan (LEOP)	Defined notification procedures and actions that should be taken in different emergency situations	Good	This was last updated in 2011. The Town is currently seeking funds to update this plan in 2018.
Storm Drain Maintenance	Responsible for catch basins, culverts cleaning, ditch maintenance, structure upkeep and maintenance	Good/ Average	The Town has been active in storm drainage improvements including catch basin cleaning.
Tree Maintenance	Utility companies and NHDOT have tree maintenance programs to clear trees and limbs from power lines and roadways.	Good	Eversource has undertaken an aggressive pruning effort over the last several years. The town's public works department handles additional tree maintenance as necessary. The town has a line item in their budget for contracting services for taller more complicated tree cutting projects.
Evacuation and Notification	Evacuation and notification procedures	Good	During an emergency the Town uses local media (channel 9), road signage, and door-to-door notifications given by Fire, Police, and EMD. Website and radio post alerts and call numbers. The town uses the code red system to send alerts through calls, texts, and email; Twitter, Facebook, and WebEOC are also used.
Emergency Back-Up Power and Shelters	Offers temporary shelter during extended periods without power	Average	The Fire Station, Public Works, and the Police Station all have backup generators. A portable generator is now located at the Community Center. The Community Center acts as the primary emergency shelter, the Senior Center is used as a warming/cooling station, and the Exeter High School acts as the regional shelter for any mass evacuations. Full service generators are needed at the Community Center and Town Hall.

Existing Program	Description	Effectiveness	2018 Update
Hazardous Materials Response Team	Newmarket is a member of the START Hazardous Materials Emergency Response Team, a regional effort to combine resources to mitigate hazardous materials incidents. On-going training, education and acquisition of resources are important.	Excellent	The Town has local capabilities and also partners up with Seacoast START (Regional HazMat Team). The yearly cost is roughly $2,500 and helps to provide additional training for Fire and EMS personnel.
Community Emergency Response Team (CERT)	Provides the knowledge and skills citizen volunteers need to effectively serve their community	Excellent	As of 2017, there were two current operators that have received training and the town has received new vests.
Floodplain Management Ordinance	Local ordinance to regulate development in the floodplain.	Good	Newmarket last updated their floodplain ordinance in 2010. The Town will once again review their floodplain ordinance when the new FEMA maps are adopted. It is currently estimated that the maps will become effective for all communities in Rockingham County Coastal Project area around fall 2018.
Shoreline Water Quality Protection Act	Establishes minimum standards for the subdivision, use and development of the shorelands along the state's larger waterbodies	Good	State requirements are on portions of the Lamprey River, Upper Narrows, Piscassic River, as well as the impoundment behind Macallen Dam and Great Bay. These waterbodies are referenced in the Town's zoning as an overlay district. Local regulations, which are more stringent, will be continually monitored for revisions as needed.
Master Plan	A guiding document used to manage Newmarket's growth and development through local land use regulations.	Excellent	Over the course of the last several years, the Town has updated a series of master plan chapters, including vision, existing and future land use, and housing and demographics. The community facilities and transportation sections are next.
Capital Improvements Program (CIP)	A program that helps to address improvement projects over a period of time.	Excellent	This six year program links infrastructure spending to the goals and values outlined in the Town's Master Plan. The Town Administrator approved the CIP for fiscal years 2019-2024 in late 2017.

Effectiveness:

Excellent – The existing program works as intended and is exceeding its goals

Good – The existing program works as intended and meets its goals

Average – The existing program does not work as intended and/or does not meet its goals

Poor – The existing program is negatively impacting the community

2017 Update: Recommendations for improvement

The Planning Committee's Understanding of Multi-Hazard Mitigation Strategies

The Planning Committee determined that any strategy designed to reduce personal injury or damage to property that could be done prior to an actual disaster would be listed as a potential mitigation strategy.

This decision was made even though not all projects listed in Tables 22 (New Mitigation Actions) and 23 (Implementation Plan) are fundable under FEMA HMA grant programs. The Planning Committee determined that this Plan was in large part a management document designed to assist the Town Council and other Town officials in all aspects of managing and tracking potential emergency planning strategies. For instance, the Planning Committee was aware that some of these strategies are more properly identified as readiness issues. The Planning Committee did not want to "lose" any of the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

The Planning Committee identified six new strategies to implement during the life of this Plan and carried over three additional actions from the 2013 plan. These strategies are intended to supplement existing programs and the ongoing and not yet completed mitigation strategies identified in previous plan updates. When identifying new strategies, the Planning Committee balanced a number of factors including capacity to implement strategies, priority projects, existing strategies, policies, and programs, the hazard ranking, and whether a strategy will reduce risk associated with multiple hazards.

Future Mitigation Strategies

The Committee identified several new mitigation strategies to reduce vulnerability to hazards. The Committee focused on identifying the best appropriate strategies for the community and the hazards it is most vulnerable based on the vulnerability assessment. Some of the mitigation strategies are strategies for multiple hazards. The goal of each proposed mitigation strategy is reduction or prevention of damage from a multi-hazard event.

New mitigation strategies are listed in Table 22, which also includes a feasibility assessment and prioritization of each hazard.

Feasibility & Prioritization

A technique known as a STAPLEE evaluation, which was developed by FEMA, was used to evaluate new mitigation strategies based on a set of criteria (see below). The STAPLEE method is commonly used by public administration officials and planners.

S	Social:	Is the proposed strategy socially acceptable to the community? Is there an equity issue involved that would result in one segment of the community being treated unfairly?
T	Technical:	Will the proposed strategy work? Will it create more problems than it solves?
A	Administrative:	Can the community implement the strategy? Is there someone to coordinate and lead the effort?
P	Political:	Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
L	Legal:	Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
E	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?
E	Environmental:	How will the strategy impact the environment? Will it need environmental regulatory approvals?

The Committee evaluated each mitigation strategy using the STAPLEE and ranked each of the criteria as poor, average, or good. These rankings were assigned the following scores: *Poor=1; Average=2; Good=3.*

The following questions were used to guide further prioritization and action:

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Can the action be implemented quickly?

The prioritization exercise helped the committee evaluate the new hazard mitigation strategies that they had brainstormed throughout the multi-hazard mitigation planning process. While all actions would help improve the Town's multi-hazard and responsiveness capability, funding availability will be a driving factor in determining what and when new mitigation strategies are implemented.

Table 22: Future Mitigation Actions & STAPLEE

New Mitigation Project	S	T	A	P	L	E	E	Total
Purchase two fully operational generators to be installed at the Community Center and Town Hall. The Community Center currently acts as the emergency shelter and needs backup power. The Town Hall needs backup power to function and provide town administrative services.	3	3	3	2	3	2	3	19
				There may be a lack of public support to fund		Costs should not be too excessive as the facilities are both small		
Alleviate flooding in reoccurring areas by redirecting stormwater flow away from downtown and the "bowl" area on Route 108 and New Road. This project will install a gravel wetland and improve existing drainage infrastructure.	3	3	3	3	3	1	3	20
						There are significant costs to this project		
Construct culvert replaced at the Bay Road crossing of Lubberland Creek to remediate existing flood risk, restore fish passage, and improve salt marsh migration resiliency. All design and engineering is complete.	3	3	3	3	1	2	2	17
					Land ownership challenges	If no grants are available will have a large cost to town	Will need state permits	
Review the updated floodplain model ordinance from Office of Strategic Initiatives and update the town's floodplain ordinance, once 2018 FEMA maps are approved and adopted.	3	3	3	3	3	3	3	21
Complete upgrades and modifications to the Macallen Dam in order to address that state's letter of deficiency and to ensure that the dam will be stable enough to withstand 100-year design flows.	3	3	2	3	2	2	2	17
			Coordination with multiple partners		Land ownership challenges	High cost, but easier to pass bond due to state mandate	Will need state permits	

New Mitigation Project	S	T	A	P	L	E	E	Total
Implement a town-wide stormwater education and climate resiliency campaign.	3	3	3	3	3	3	3	21
*Develop the early stages of a stormwater management plan that would stem from the culvert evaluations that have recently been completed. First steps would be to organize the assessment report and prioritize which culverts are in the most need of repair and replacement.	3	3	3	3	2	1	3	18
					Potential land ownership challenges	High cost associated with this project		
*Purchase and install a back-up generator at the Middle/High School.	3	3	3	2	3	2	3	19
				There may be a lack of public support to fund		Costs may be slightly higher at this building is larger		
*Set aside funds in order to purchase equipment cots, pillows, blankets, etc. for emergency shelter.	3	3	3	3	3	2	3	20
						Small cost to implement		

*Ongoing and deferred actions from the 2013 Plan. Previous STAPLEE scores were reaffirmed.

Implementation Schedule for Prioritized Strategies

After reviewing the finalized STAPLEE numerical ratings, the Team prepared to develop the Implementation Plan (Table 23). To do this, the Team developed an implementation plan that outlined the following:

- ∴ Type of hazard
- ∴ Affected location
- ∴ Type of Activity
- ∴ Responsibility
- ∴ Funding
- ∴ Cost Effectiveness; and
- ∴ Timeframe

The following questions were asked in order 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?

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

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

In addition to the prioritized mitigation projects, Table 23, Implementation Plan, includes the responsible party (WHO), how the project will be supported (HOW), and what the timeframe is for implementation of the project (WHEN).

Table 23: Implementation Plan

New Mitigation Project	Type of Hazard	Affected Location	Type of Activity	Responsibility	Funding	Cost Effectiveness *Low = < $5,000* *Medium = $5,000 - $10,000* *High = > $10,000*	Timeframe *Ongoing/Continuous* *6 months - 1 year* *1 - 2 years* *2 - 5 years*
Purchase two fully operational generators to be installed at the Community Center and Town Hall. The Community Center currently acts as the emergency shelter and needs backup power. The Town Hall needs backup power to function and provide town administrative services.	Multi-hazard	Community Center & Town Hall	Structure & Infrastructure Project	Facilities Director	EMPG funding & operating budget	High = >$10,000	2-5 years
Alleviate flooding in reoccurring areas by redirecting stormwater flow away from downtown and the "bowl" area on Route 108 and New Road. This project will install a gravel wetland and improve existing drainage infrastructure.	Flooding	New Road area	Structure & Infrastructure Project	Public Works Director	Grants and operating budget	High = >$10,000	2-5 years
Construct culvert replaced at the Bay Road crossing of Lubberland Creek to remediate existing flood risk, restore fish passage, and improve salt marsh migration resiliency. All design and engineering is complete.	Flooding	Bay Road (Lubberland Creek)	Structure & Infrastructure Project	Public Works Director	Grants and operating budget	High = >$10,000	2-5 years

Review the updated floodplain model ordinance from Office of Strategic Initiatives and update the town's floodplain ordinance, once 2018 FEMA maps are approved and adopted.	Flooding	FEMA floodplain areas	Planning	Planning Department	Operating budget	Medium = $5,000 - $10,000	2-5 years
Complete upgrades and modifications to the Macallen Dam in order to address that state's letter of deficiency and to ensure that the dam will be stable enough to withstand 100-year design flows.	Dam Failure	Macallen Dam	Structure & Infrastructure Project	Facilities Director	Operating budget	High = >$10,000	2-5 years
Implement a town-wide stormwater education and climate resiliency campaign.	Mutli-hazard	Town-wide	Education and Outreach	Planning Department	Operating budget	Medium = $5,000 - $10,000	2-5 years
*Develop the early stages of a stormwater management plan that would stem from the culvert evaluations that have recently been completed. First steps would be to organize the assessment report and prioritize which culverts are in the most need of repair and replacement.	Flooding	Town-wide	Planning	Hired consultant & Public Works Department	Operating budget	High = >$10,000	2-5 years
*Purchase and install a back-up generator at the Middle/High School.	Multi-hazard	Middle/High School	Structure & Infrastructure Project	EMD & Facilities Manager	EMPG funding & operating budget	High = >$10,000	2-5 years
*Set aside funds in order to purchase equipment cots, pillows, blankets, etc. for emergency shelter.	Multi-hazard	Town-wide	Planning	EMD	Operating budget, donations, and grants	Low = < $5,000	1-2 years
*Ongoing and deferred actions from the 2013. Previous implementation notes were reaffirmed.							

Chapter 8: Monitoring, Evaluation, and Updating the Plan

Introduction

A good mitigation plan must allow for updates where and when necessary, particularly since communities may suffer budget cuts or experience personnel turnover during both the planning and implementation states. A good plan will incorporate periodic monitoring and evaluation mechanisms to allow for review of successes and failures or even just simple updates.

Multi-Hazard Plan Monitoring, Evaluation, and Updates

To track programs and update the mitigation strategies identified through this process, the Town will review the multi-hazard mitigation plan annually or after a hazard event. Additionally, the Plan will undergo a formal review and update at least every five years and obtain FEMA approval for this update or any other major changes done in the Plan at any time. The Emergency Management Director is responsible for initiating the review and will consult with members of the multi-hazard mitigation planning team identified in this plan. The public will be encouraged to participate in any updates and will be given the opportunity to be engaged and provide feedback through such means as periodic presentations on the plan at town functions, annual questionnaires or surveys, and posting on social media/interactive websites. Public announcements will be made through advertisements in local papers, postings on the Town website, and posters disseminated throughout the Town. A formal public meeting will be held before reviews and updates are official.

Changes will be made to the Plan to accommodate projects that have failed or are not considered feasible after a review for their consistency with STAPLEE, the timeframe, the community's priorities or funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, will be reviewed as well during the monitoring and update of the plan to determine feasibility of future implementation. In keeping with the process of adopting this multi-hazard mitigation plan, a public meeting to receive public comment on plan maintenance and updating will be held during the annual review period and before the final product is adopted by the Town Council Chapter 9 contains a representation of a draft resolution for Newmarket to use once a conditional approval is received from HSEM.

Integration with Other Plans

Both the 2006 and 2013 plans were used during periodic updates to the Newmarket's Master Plan and the C-RiSe vulnerability assessment. Input on impacts to roads and other critical infrastructure from hazards was included in relevant master plan sections. Both plans were also used during capital improvements planning updates and prioritization of municipal culverts and stream crossings for repair and replacement schedules.

This multi-hazard plan will only enhance mitigation if balanced with all other town plans. Newmarket will take the necessary steps to incorporate the mitigation strategies and other information contained in this plan with other town activities, plans and mechanisms, such as comprehensive land use planning, capital improvements planning, site plan regulations, and building codes to guide and control development in the Town of Newmarket, when appropriate. The

local government will refer to this Plan and the strategies identified when updating the Town's Master Plan, Capital Improvements Program, Zoning Ordinances and Regulations, and Emergency Action Plan. The Town Council and the Hazard Mitigation Committee will work with Town officials to incorporate elements of this Plan into other planning mechanisms, when appropriate. In addition, the Town will review and make note of instances when this has been done and include it as part of their annual review of the Plan.

Chapter 9: Plan Adoption

Conditional Approval Letter from HSEM

Good afternoon!

The Department of Safety, Division of Homeland Security & Emergency Management (HSEM) has completed its review of the Newmarket, NH Hazard Mitigation Plan and found it approvable pending adoption. Congratulations on a job well done!

With this approval, the jurisdiction meets the local mitigation planning requirements under 44 CFR 201 pending HSEM's receipt of electronic copies of the adoption documentation and the final plan.

Acceptable electronic formats include Word or PDF files and must be submitted to us via email at HazardMitigationPlanning@dos.nh.gov. Upon HSEM's receipt of these documents, notification of formal approval will be issued, along with the final Checklist and Assessment.

The approved plan will be submitted to FEMA on the same day the community receives the formal approval notification from HSEM. FEMA will then issue a Letter of Formal Approval to HSEM for dissemination that will confirm the jurisdiction's eligibility to apply for mitigation grants administered by FEMA and identify related issues affecting eligibility, if any. If the plan is not adopted within one calendar year of HSEM's Approval Pending Adoption, the jurisdiction must update the entire plan and resubmit it for HSEM review. If you have questions or wish to discuss this determination further, please contact me at Kayla.Henderson@dos.nh.gov or 603-223-3650.

Thank you for submitting the Newmarket, NH Hazard Mitigation Plan and again, congratulations on your successful community planning efforts.

Sincerely,

Kayla J. Henderson
Hazard Mitigation Planning
NH Homeland Security and Emergency Management
33 Hazen Drive
Concord, NH 03301
NEW: 603-223-3650
603-223-3609 (fax)

Signed Certificate of Adoption

CHARTERED JANUARY 1, 1991 **FOUNDED DECEMBER 15, 1727**

TOWN OF NEWMARKET, NEW HAMPSHIRE
By the Newmarket Town Council

Resolution #2017/2018 -45
A Resolution Adopting the Newmarket, NH Multi-Hazard Mitigation Plan Update 2018

WHEREAS: The Town of Newmarket authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan, and received funding from the NH Office of Homeland Security and Emergency Management under a Pre-Disaster Mitigation (PDM) grant and assistance from Strafford Regional Planning Commission in the preparation of the Newmarket, NH Multi-Hazard Mitigation Plan Update 2018; and

WHEREAS: Several public planning meetings were held between December 6, 2017 and January 24, 2018 regarding the development and review of the Newmarket, NH Multi-Hazard Mitigation Plan Update 2018; and

WHEREAS: The Newmarket, NH Multi-Hazard Mitigation Plan Update 2018 contains several potential future projects to mitigate hazard damage in the Town of Newmarket; and

WHEREAS: A duly-noticed public meeting was held by the Newmarket Town Council on April 18, 2018 to formally approve and adopt the Newmarket, NH Multi-Hazard Mitigation Plan Update 2018.

NOW, THEREFORE, BE IT RESOLVED BY THE NEWMARKET TOWN COUNCIL THAT:

That the Newmarket Town Council adopts the Newmarket, NH Multi-Hazard Mitigation Plan Update 2018.

First Reading: *April 4, 2018*

Public Hearing: *April 18, 2018*

Second Reading: *April 18, 2018*

Approval: *April 18, 2018*

Approved: _____
Dale Pike, Chair Newmarket Town Council

A True Copy Attest: _____
Terri Littlefield, Town Clerk

Final Approval Letter from FEMA

U.S. Department of Homeland Security
FEMA Region I
99 High Street, Sixth Floor
Boston, MA 02110-2132

FEMA

MAY 15 2018

Whitney Welch
State Hazard Mitigation Officer
NH Department of Safety
Homeland Security and Emergency Management
33 Hazen Drive
Concord, NH 03303

Dear Ms. Welch:

We would like to acknowledge the Town of Newmarket and the State of New Hampshire for their dedication and commitment to mitigation planning.

As outlined in the FEMA-State Agreement for FEMA-DR-4316 your office has been delegated the authority to review and approve local mitigation plans under the Program Administration by States Pilot Program. On **May 4, 2018** our Agency was notified that your office completed its review of the Newmarket NH Hazard Mitigation Plan Update 2018 and determined it meets the requirements of 44 C.F.R. Pt. 201.

With this plan approval, the Town of Newmarket is eligible to apply to New Hampshire Homeland Security and Emergency Management for mitigation grants administered by FEMA. Requests for mitigation funding will be evaluated individually according to the specific eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in your community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

Approved mitigation plans are eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Complete information regarding the CRS can be found at http://www.fema.gov/national-flood-insurance-program-community-rating-system, or through your local floodplain administrator.

The Newmarket NH Hazard Mitigation Plan Update 2018 must be reviewed, revised as appropriate, and resubmitted to New Hampshire Homeland Security and Emergency Management for approval within **five years of the plan approval date of May 4, 2018** in order to maintain eligibility for mitigation grant funding. We encourage the Town to continually update the plan's assessment of vulnerability, adhere to its maintenance schedule, and implement, when possible, the mitigation actions proposed in the plan.

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Melissa Surette at (617) 956-7559.

Sincerely,

Paul F. Ford
Acting Regional Administrator

PFF: ms

cc: Fallon Reed, Chief of Planning, New Hampshire
Kayla Henderson, Hazard Mitigation Planner, New Hampshire
Jennifer Gilbert, New Hampshire State NFIP Coordinator

Appendices

Appendix A: Bibliography

Appendix B: Planning Process Documentation

Appendix C: Summary of Possible All-Hazard Mitigation Strategies

Appendix D: Technical and Financial Assistance for All-Hazard Mitigation
- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

Appendix E: Maps

Appendix A: Bibliography

Documents

- Local Mitigation Plan Review Guide, FEMA, October 1, 2011
- Multi-Hazard Mitigation Plans
    - Town of Rollinsford, 2016
- State of New Hampshire Multi-Hazard Mitigation Plan (2013) - State Hazard Mitigation Goals
- Disaster Mitigation Act (DMA) of 2000, Section 101, b1 & b2 and Section 322a http://www.fema.gov/library/viewRecord.do?id=1935
- Economic & Labor Market Information Bureau, NH Employment Security, 2015; Census 2010 and Revenue Information
- NCDC [National Climatic Data Center, National Oceanic and Atmospheric Administration]. 2017. Storm Events

Photos

- Staff from the Newmarket Fire and Rescue Department
- Kyle Pimental, Principal Regional Planner, Strafford Regional Planning Commission

Appendix B: Planning Process Documentation

Agendas

Town of Newmarket, New Hampshire

Hazard Mitigation Committee Meeting #1

December 6, 2017
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

Agenda

1. Introductions
2. Update process and the requirements of the grant
3. Responsibilities, in-kind match documentation, and the steps towards successful adoption
4. Review Chapter 2: Community Profile (attachment)
5. Review Chapter 3: Asset Inventory (attachment)
6. Review Chapter 7: Action Plan – Past Mitigation Strategies (attachment)
7. Adjourn

Town of Newmarket, New Hampshire

Hazard Mitigation Committee Meeting #2

December 20, 2017
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

Agenda

1. Introductions

2. Old Business
    a. Review Meeting Notes (*Meeting_Notes_120617.docx*)

3. New Business
    a. Review Chapter 5: Floodplain Management (*Chapter5_Floodplain_Management.docx*)
    b. Review Chapter 6: Declared Disasters (*Chapter6_Declared_Disasters.docx*)
    c. Review Chapter 6: Hazard Descriptions (*Chapter6_Hazard_Descriptions.docx*)
    d. Review Chapter 6: Hazard Vulnerability Ranking (*Chapter6_Hazard_Vulnerability_Rankings.docx*)

4. Next meeting date

5. Adjourn

Town of Newmarket, New Hampshire

Hazard Mitigation Committee Meeting #3

January 10, 2017
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

Agenda

1. Introductions

2. Old Business
    a. Review Meeting Notes (*Meeting_Notes_122017.docx*)

3. New Business
    a. Review write-up on cyber-attacks (*Cyber_Attacks.docx*)
    b. Review existing mitigation strategies (*Existing_Actions.docx*)
    c. Brainstorm new mitigation actions and fill out implementation plan (*New_Mitigation_Actions.xls*)
        i. Go through STAPLEE Method to rank each action (*STAPLEE_Method.docx*)

4. Final meeting date

5. Adjourn

Town of Newmarket, New Hampshire

Hazard Mitigation Committee Meeting #4

January 24, 2017
12:30PM – 2:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

Agenda

1. Introductions

2. New Business
    a. Final comments to draft update
    b. Review of draft maps

3. Adjourn

Town of Newmarket, New Hampshire

Hazard Mitigation Meeting #1

December 6, 2017
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Diane Hardy	Town Planner	dhardy@newmarketnh.gov	2
Steve Fournier	Town Admin/EMD	sfournier@newmarketnh.gov	2hrs
Richard J. Bedard	Newmarket Police Dept.	RBEDARD@NEWMARKETNH.GOV	2 HRS
Gregory Marles	Town of Newmarket	gmarles@newmarketnh.gov	2 HRS
Rick Malasky	Newmarket FD	rmalasky@newmarketnh.gov	2

Town of Newmarket, New Hampshire

Hazard Mitigation Meeting #2

December 20, 2017
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Steve Fournier	Town Administrator/EMD		3
Rick Beaudet	Newmarket Police Dept.		2.5
Rick Malinsky	Newmarket Fire/DPW		3
Diane Hardy	Town Planner	DHardy@newmarketnh.gov	2

Town of Newmarket, New Hampshire

Hazard Mitigation Meeting #3

January 10, 2018
1:00PM – 3:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
GREG MARLES	DIRECTOR OF FACILITIES	gmarles@newmarketnh.gov	1
RICHARD BEAUDET	NEWMARKET POLICE LT.	RBEAUDET@NEWMARKETNH.GOV	1
STEVE FOURNIER	TA / EMD	sfournier@newmarketnh.gov	1
Diane F. Hardy	Town Planner	dhardy@newmarketnh.gov	1
Rick Malasky	DPW / Fire	rmalasky@newmarketnh.gov	1

Town of Newmarket, New Hampshire

Hazard Mitigation Meeting #4

January 24, 2018
12:30PM – 2:00PM

Newmarket Town Hall
186 Main Street
Newmarket, NH 03857

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Diane F. Hardy	Town Planner	dhardy@newmarketnh.gov	.5
Steve Fournier	Town Administrator/ESD	You know	.5
Greg Marles	Facilities Director	gmarles@newmarketnh.gov	.5
Rick Malisky	Director/ Fire Chief	rmalisky@newmarketnh.gov	.5

* Rick Beaudet was in attendance, but did not sign-in.

Appendix C: Summary of Possible All-Hazard Mitigation Strategies

I. RIVERINE MITIGATION

A. Prevention

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

1. Planning and Zoning[39] - Land use plans are put in place to guide future development, recommending where - and where not - development should occur and where it should not. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events - such as parks or wildlife refugees. A Capital Improvements Program (CIP) can recommend the setting aside of funds for public acquisition of these designated lands. The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development - for example, by designating floodplain overlay, conservation, or agricultural districts.

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

3. Floodplain Development Regulations - Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances.
    a. Subdivision Regulations: These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be shown on the plat, and that every lot has a buildable area that is above the base flood elevation.
    b. Building Codes: Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.
    c. Floodplain Ordinances: Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

[39] All zoning should be carefully reviewed on a consistent basis by municipal officials to make sure guidelines are up-to-date and towns are acting in accordance with best management practices.

4. Stormwater Management - Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development. One technique is to use wet basins as part of the landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration - for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.

5. Drainage System Maintenance - Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering water courses or storage basins; regrading and filling should also be regulated. Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading.

B. Property Protection

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

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

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

3. Building Elevation - Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits. This approach is cheaper than relocation, and tends to be less disruptive to a

neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain, and is commonly practiced in flood hazard areas nationwide.

4. Floodproofing - If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Floodproofing can be accomplished through barriers to flooding, or by treatment to the structure itself.
    a. Barriers: Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, however, only in areas subject to shallow flooding.
    b. Dry Floodproofing: This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings, such as doors, windows, etc. are closed either permanently with removable shields or with sandbags.
    c. Wet Floodproofing: This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

5. Sewer Backup Protection - Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system - whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:
    a. Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
    b. Overhead sewer - keeps water in the sewer line during a backup.
    c. Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

6. Insurance - Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.
    a. *National Flood Insurance:* When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.
    b. *Basement Backup Insurance:* National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

C. Natural Resource Protection

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

1. Wetlands Protection - Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the N.H. Wetlands Board must approve any project that impacts a wetland. Many communities in New Hampshire also have local wetland ordinances.

   Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice since it takes many years for a new wetland to achieve the same level of quality as an existing one, if it can at all.

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

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

D. Emergency Services

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

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

2. Flood Response - Flood response refers to actions that are designed to prevent or reduce damage or injury, once a flood threat is recognized. Such actions and the appropriate parties include:
    a. Activating the emergency operations center (emergency director)
    b. Sandbagging designated areas (Highway Department)
    c. Closing streets and bridges (police department)
    d. Shutting off power to threatened areas (public service)
    e. Releasing children from school (school district)
    f. Ordering an evacuation (Board of Selectmen/emergency director)
    g. Opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

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

3. Critical Facilities Protection - Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Critical facilities fall into two categories:
    a. Buildings or locations vital to the flood response effort:
        i. Emergency operations centers
        ii. Police and fire stations
        iii. Highway garages
        iv. Selected roads and bridges
        v. Evacuation routes
    b. Buildings or locations that, if flooded, would create disasters:
        i. Hazardous materials facilities
        ii. Schools

All such facilities should have their own flood response plan that is coordinated with the community's plan. Schools will typically be required by the state to have emergency response plans in place.

4. Health and Safety Maintenance - The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:
    a. Patrolling evacuated areas to prevent looting
    b. Vaccinating residents for tetanus
    c. Clearing streets
    d. Cleaning up debris

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

E. Structural Projects

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

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

1. Diversions - A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river. Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

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

3. Reservoirs - Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle. Reservoirs are suitable for protecting existing development, and they may be the only flood control measure that can protect development close to a watercourse. They are most efficient in deeper valleys or on smaller rivers where there is less water to store. Reservoirs might consist of man-made holes dug to hold the approximate amount of floodwaters, or even abandoned quarries. As with other structural projects, reservoirs:
    a. are expensive
    b. occupy a lot of land
    c. require periodic maintenance
    d. may fail to prevent damage from floods that exceed their design levels
    e. may eliminate the natural and beneficial functions of the floodplain.

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

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

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

7. Storm Sewers - Mitigation techniques for storm sewers include installing new sewers, enlarging small pipes, street improvements, and preventing back flow. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving body of water can absorb the increased flows without increased flooding. In many developments, streets are used as part of the drainage system, to carry or hold water from larger, less frequent storms. The streets collect runoff and convey it to a receiving sewer, ditch, or stream. Allowing water to stand in the streets and then draining it slowly can be a more effective and less expensive measure than enlarging sewers and ditches.

F. Public Information

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

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

2. Outreach Projects - Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:
    a. Presentations at meetings of neighborhood groups
    b. Mass mailings or newsletters to all residents
    c. Notices directed to floodplain residents
    d. Displays in public buildings, malls, etc.
    e. Newspaper articles and special sections
    f. Radio and TV news releases and interview shows
    g. A local flood proofing video for cable TV programs and to loan to organizations
    h. A detailed property owner handbook tailored for local conditions. Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.

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

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

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

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

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II. EARTHQUAKES

A. Preventive

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

B. Property Protection

1. Acquire and clear hazard areas
2. Retrofitting to add braces, remove overhangs
3. Apply Mylar to windows and glass surfaces to protect from shattering glass
4. Tie down major appliances, provide flexible utility connections
5. Earthquake insurance riders

C. Emergency Services

1. Earthquake response plans to account for secondary problems, such as fires and hazardous material spills

D. Structural Projects

1. Slope stabilization

III. DAM FAILURE

A. Preventive

1. Dam failure inundation maps
2. Planning/zoning/open space preservation to keep area clear
3. Building codes with flood elevation based on dam failure
4. Dam safety inspections
5. Draining the reservoir when conditions appear unsafe

B. Property Protection

1. Acquisition of buildings in the path of a dam breach flood
2. Flood insurance

C. Emergency Services

1. Dam condition monitoring
2. Warning and evacuation plans based on dam failure

D. Structural Projects

1. Dam improvements, spillway enlargements
2. Remove unsafe dams

IV. WILDFIRES

A. Preventive

1. Zoning districts to reflect fire risk zones
2. Planning and zoning to restrict development in areas near fire protection and water resources
3. Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads, multiple accesses
4. Building code standards for roof materials and spark arrestors
5. Maintenance programs to clear dead and dry brush, trees
6. Regulation on open fires

B. Property Protection

1. Retrofitting of roofs and adding spark arrestors
2. Landscaping to keep bushes and trees away from structures
3. Insurance rates based on distance from fire protection

C. Natural Resource Protection

1. Prohibit development in high-risk areas

D. Emergency Services

1. Fire Fighting

V. WINTER STORMS

A. Prevention

1. Building code standards for light frame construction, especially for wind-resistant roofs

B. Property Protection

1. Storm shutters and windows
2. Hurricane straps on roofs and overhangs
3. Seal outside and inside of storm windows and check seals in spring and fall
4. Family and/or company severe weather action plan & drills:
    a. include a NOAA Weather Radio
    b. designate a shelter area or location
    c. keep a disaster supply kit, including stored food and water
    d. keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas
    e. know how to turn off water, gas, and electricity at home or work

C. Natural Resource Protection

1. Maintenance program for trimming trees and shrubs

D. Emergency Services

1. Early warning systems/NOAA Weather Radio
2. Evacuation plans

Appendix D: Technical & Financial Assistance for All-Hazard Mitigation

FEMA's Hazard Mitigation Assistance (HMA) grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs[40]:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)

FEMA's HMA grants are provided to eligible Applicants (States/Tribes/Territories) that, in turn, provide sub-grants to local governments and communities. The Applicant selects and prioritizes subapplications developed and submitted to them by subapplicants. These subapplications are submitted to FEMA for consideration of funding. Prospective subapplicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website, www.fema.gov.

HMA Grant Programs

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to Natural Hazards. Brief descriptions of the HMA grant programs can be found below. For more information on the individual programs, or to see information related to a specific Fiscal Year, please click on one of the program links.

A. Hazard Mitigation Grant Program (HMGP)

HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities.

What is the Hazard Mitigation Grant Program?

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.

Who is eligible to apply?

Hazard Mitigation Grant Program funding is only available to applicants that reside within a presidentially declared disaster area. Eligible applicants are:

- State and local governments
- Indian tribes or other tribal organizations

[40] Information in Appendix E is taken from the following website and links to specific programs unless otherwise noted; http://www.fema.gov/government/grant/hma/index.shtm

- Certain non-profit organizations

Individual homeowners and businesses may not apply directly to the program; however a community may apply on their behalf.

How are potential projects selected and identified?

The State's administrative plan governs how projects are selected for funding. However, proposed projects must meet certain minimum criteria. These criteria are designed to ensure that the most cost-effective and appropriate projects are selected for funding. Both the law and the regulations require that the projects are part of an overall mitigation strategy for the disaster area.

The State prioritizes and selects project applications developed and submitted by local jurisdictions. The State forwards applications consistent with State mitigation planning objectives to FEMA for eligibility review. Funding for this grant program is limited and States and local communities must make difficult decisions as to the most effective use of grant funds.

For more information on the **Hazard Mitigation Grant Program (HMGP),** go to:
http://www.fema.gov/government/grant/hmgp/index.shtm

B. Pre-Disaster Mitigation (PDM)

PDM provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The goal of the PDM program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations.

Program Overview

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

C. Flood Mitigation Assistance (FMA)

FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program.

Program Overview

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program.

Types of FMA Grants

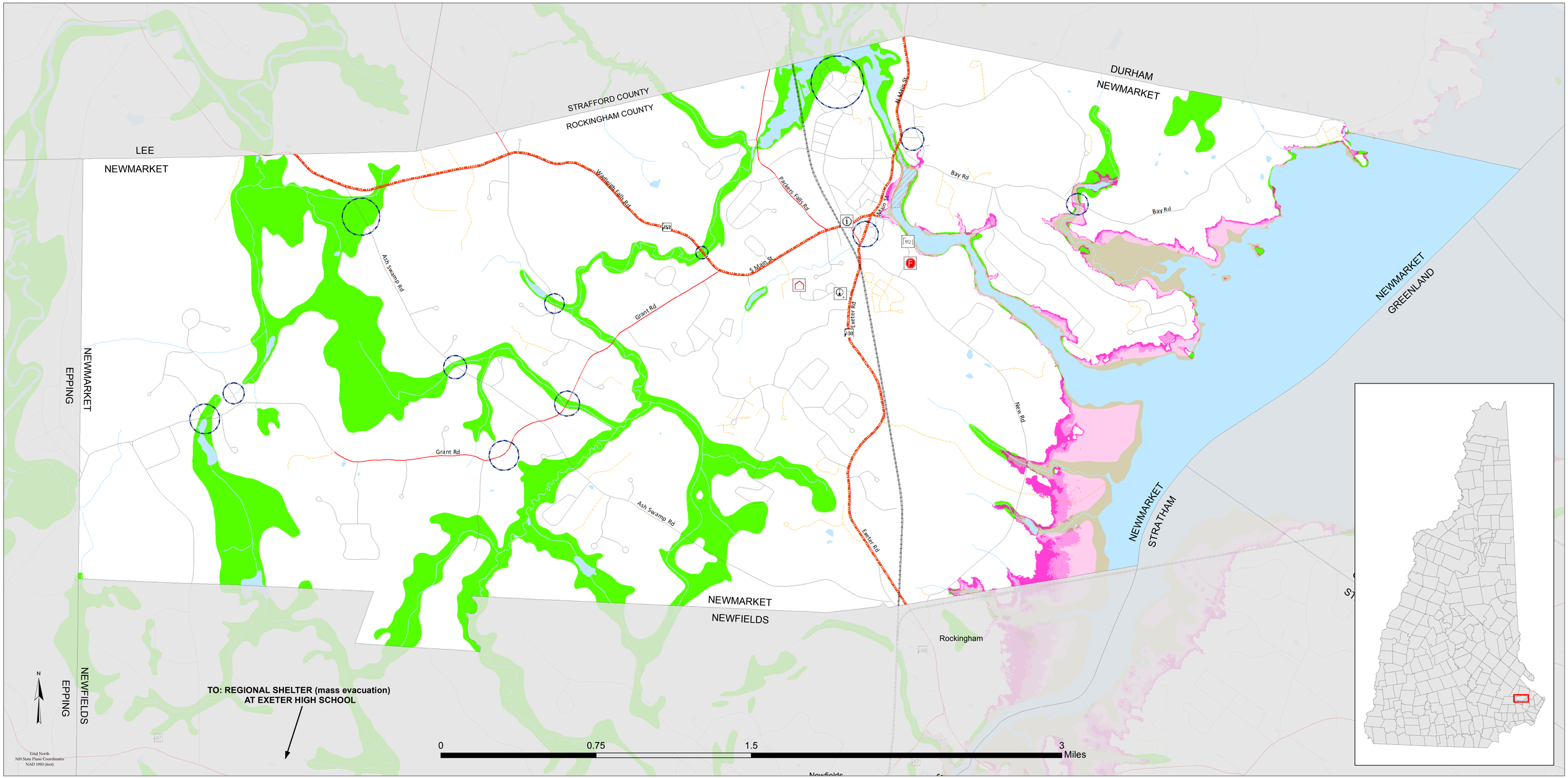
Three types of FMA grants are available to States and communities:

- Planning Grants to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants
- Project Grants to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least $1,000 within any ten-year period since 1978.
- Technical Assistance Grants for the State to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants

Appendix E: Maps

Maps

- Emergency and Non-Emergency Response Facilities
- Critical Facilities
- Vulnerable Populations to Protect
- Water Resources



Emergency and Non-Emergency Response Facilities & Past and Potential Hazards

2018
Hazard Mitigation Plan

NEWMARKET, NH

Emergency Response Legend

Emergency Response Facilities

- Administrative
- Back-up Emergency Operations Center
- Emergency Operations Center (EOC)
- Emergency Shelter
- Regional Shelter (mass evacuation)
- Warming/Cooling Station
- Evacuation Routes

Non-Emergency Response Facilities

- Wastewater Plant

Past and Potential Hazards

- Past Flooding
- Dam Inundation Areas
- FEMA 100-year Floodplain
- Extent of Sea-Level Rise of 1.7' with Storm Surge
- Extent of Sea-Level Rise of 4.0' with Storm Surge
- Extent of Sea-Level Rise of 6.3' with Storm Surge

Base Features

- Municipal Boundary
- Rivers, Brooks, Streams
- Lakes and Ponds

Roads [NHDOT, 2017]

- State
- Local
- Private

Prepared by: Strafford Regional Planning Commission
150 Wakefield St, Suite 12, Rochester, NH 03867
T: (603) 994-3500 F: (603) 994-3504 Em: srpc@strafford.org
Emergency Response Facilities & Past and Potential Hazards
Date: January 2018
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DATA SOURCES

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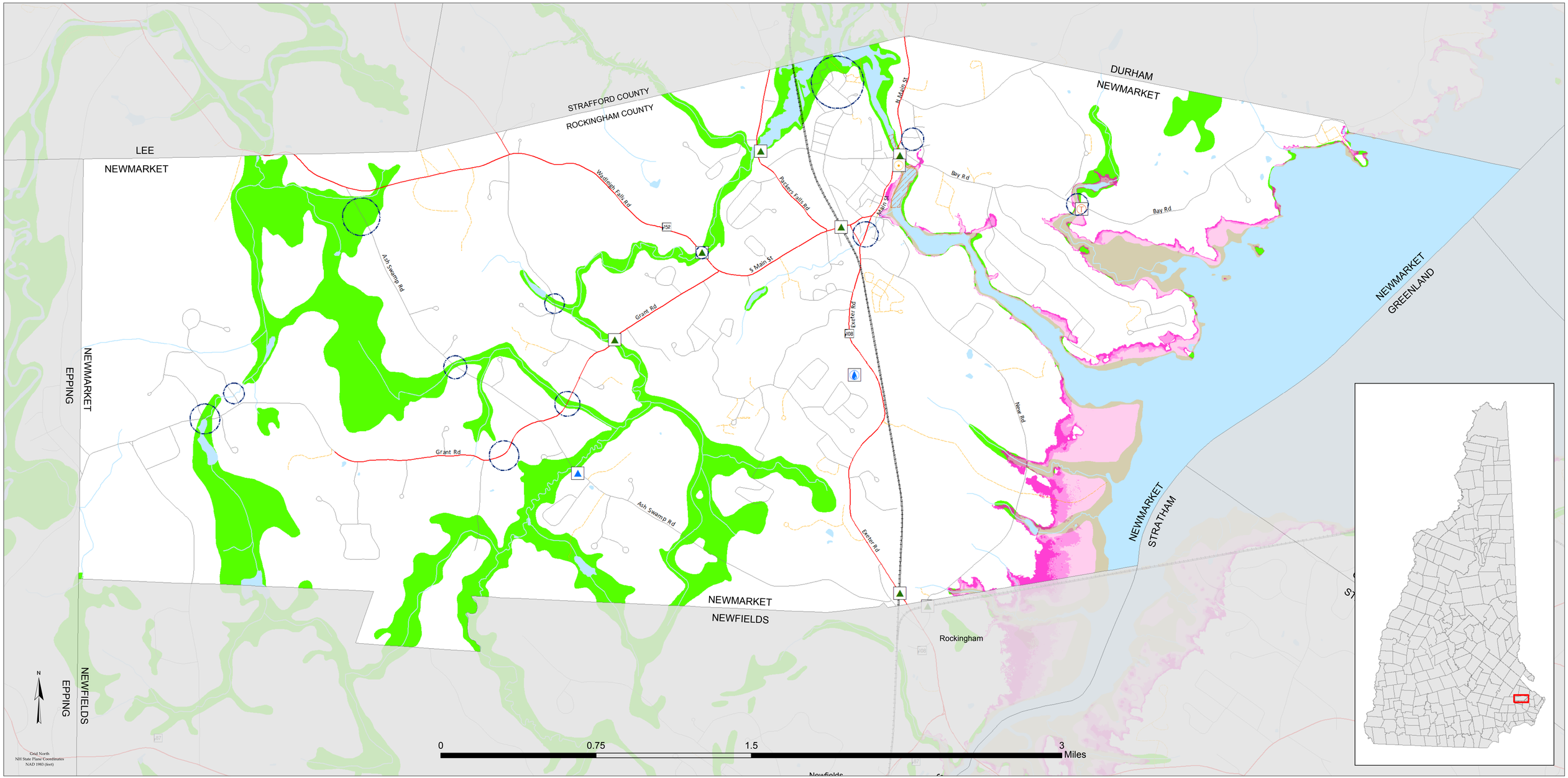

Critical Infrastructure & Past and Potential Hazards

2018 Hazard Mitigation Plan

NEWMARKET, NH

Critical Infrastructure Legend

Critical Facilities

- High Hazard Dam
- Transportation (State Owned)
- Transportation (Town Owned)
- Vulnerable Transportation Asset
- Water Reservoir

Past and Potential Hazards

- Past Flooding
- Dam Inundation Areas
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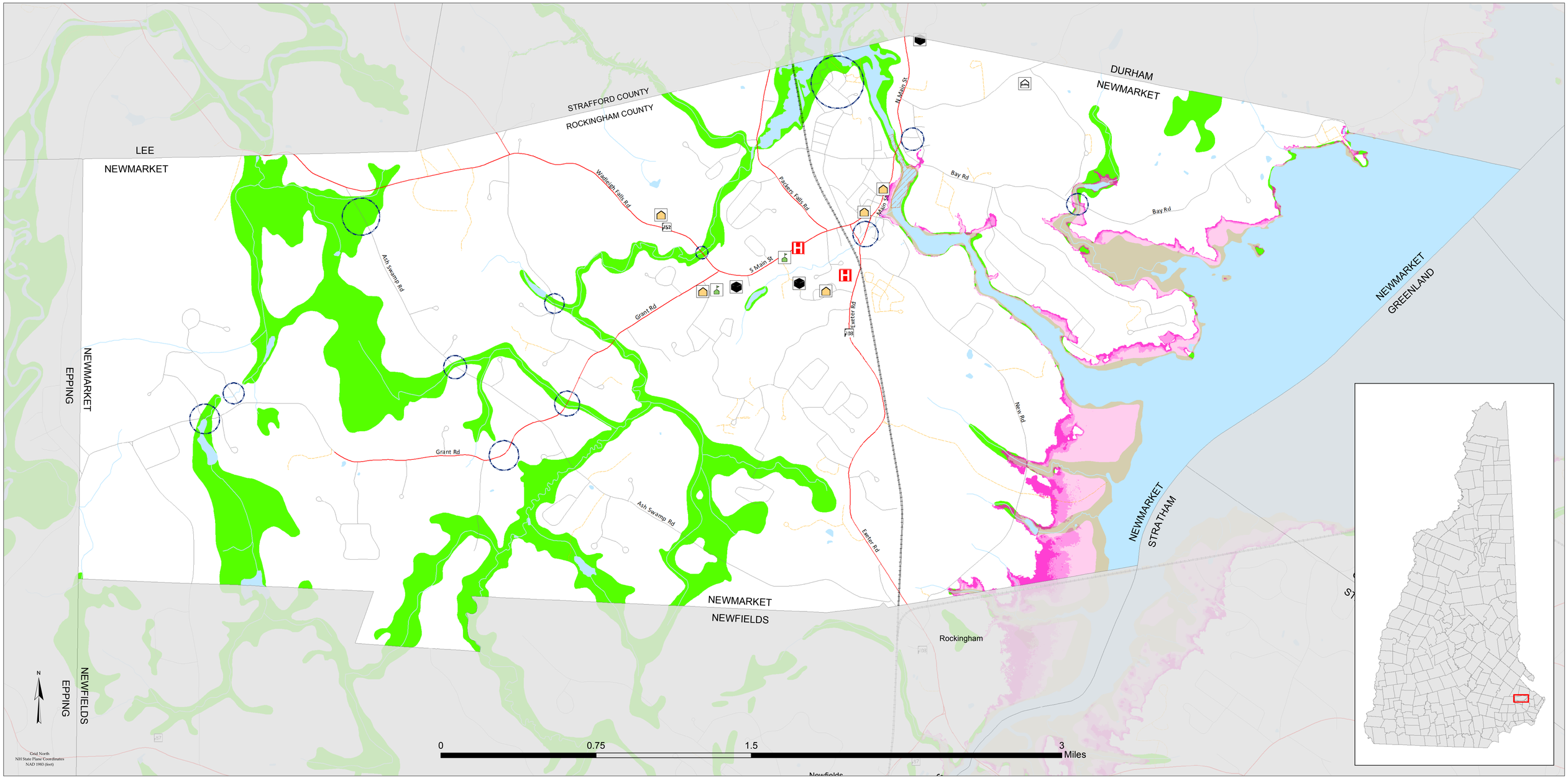

Vulnerable Populations to Protect & Past and Potential Hazards

2018
Hazard Mitigation Plan

NEWMARKET, NH

Vulnerable Populations to Protect Legend

Facility Type
- Assisted Living
- Medical Facility
- Preschool/Daycare
- School
- Specialized Care

Past and Potential Hazards
- Past Flooding
- Dam Inundation Areas
- FEMA 100-year Floodplain
- Extent of Sea-Level Rise of 1.7' with Storm Surge
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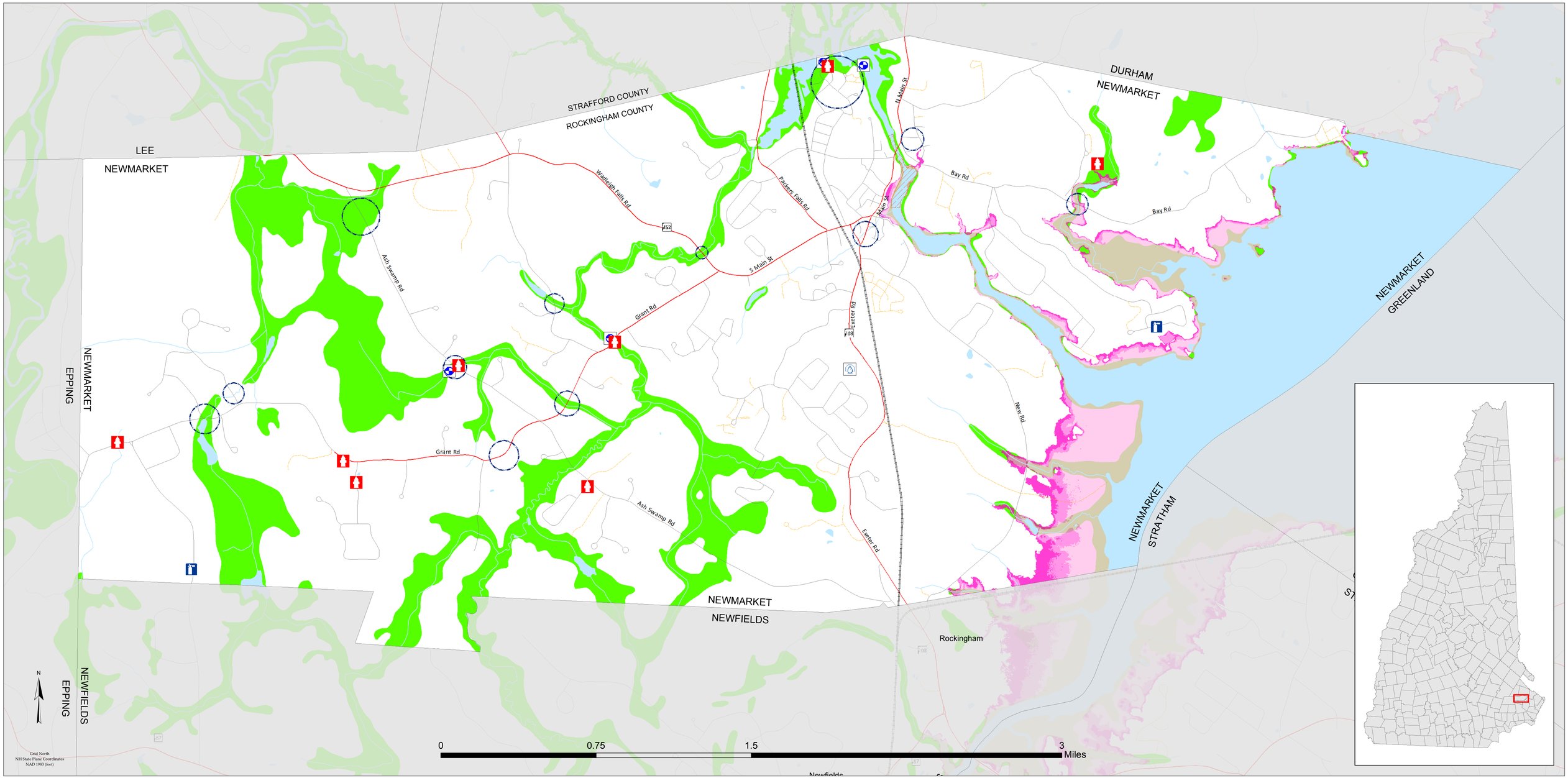

Water Resources & Past and Potential Hazards

2018 Hazard Mitigation Plan

NEWMARKET, NH

Water Resources Legend

Water Resources

- Additional Surface Water - Auxiliary Fire Aid
- Cistern - Auxiliary Fire Aid
- Dry Hydrant - Auxiliary Fire Aid
- Water Reservoir

Past and Potential Hazards

- Past Flooding
- Dam Inundation Areas
- FEMA 100-year Floodplain
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