Multi-Hazard Mitigation Plan Update 2019

Town of Lee, NH

Adopted 2006
Updated September 9, 2013
January 7, 2019

Submitted to the New Hampshire Homeland Security & Emergency Management

By the

Town of Lee, NH
with Strafford Regional Planning Commission

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Acknowledgements

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

The 2019 Town of Lee Multi-Hazard Mitigation Planning Committee

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

- Scott Nemet — Fire Chief/Emergency Management Director, Town of Lee
- Bill Booth — Building Inspector, Town of Lee
- Harry Mueller — Operations Manager McGregor, Town of Lee
- Caren Rossi — Planning and Zoning Administrator/Assistant EMD, Town of Lee
- Julie Glover — Town Administrator, Town of Lee
- Steve Bullek — Highway Supervisor, Town of Lee
- Tom Dronsfield — Chief of Police, Town of Lee

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Cover: High Road Bridge – May 2006 Flooding Event
Photo Credit: Randy Stevens, former Road Agent, Town of Lee

Executive Summary

This Plan was revised and updated to meet statutory requirements and to assist the Town of Lee 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 2019 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 Fire Chief/Emergency Management Director, Building Inspector, Operations Manager McGregor, Planning and Zoning Administrator/Assistant EMD, Town Administrator, and Chief of Police.

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

- ∴ 5 hazards rated as having a High overall risk in Lee: drought, public health threats, earthquake and landslide, wildfire, and flooding from dam failure
- ∴ 3 hazards rated as having a Moderate overall risk in Lee: hurricane and tropical storms, tornado and downburst, and extreme temperatures
- ∴ 4 hazards rated as having a Low overall risk in Lee: hazardous materials, severe winter storms, flooding (riverine/extreme rain event), and severe thunderstorms

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 Infrastructure and Key Resources (CI/KR) categorized as follows: Emergency Response Facilities (ERF), Non-Emergency Response Facilities (NERF), Critical Infrastructure (CI), Vulnerable Populations to Protect (VPP), and Water Resources (WR). All critical assets were inventoried and mapped.

The revision process included reviewing other Town hazards 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 Lee received conditional approval on December 14, 2018. A public meeting was held and the plan was adopted by the Board of Selectmen on January 2, 2019. The Plan received formal approval from FEMA on January 7, 2019.

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 Board of Selectmen.

∴ 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.

High Road Bridge, May 2006 Flooding Event

Chapter 1: Multi-Hazard Mitigation Planning Process

Authority

Lee'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". Lee'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.

Lee'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 Lee, NH. The Plan addresses 12 types of natural and man-made hazards that may affect the Town:

- Flooding (Riverine/Extreme Rain Event)
- Flooding (Dam Failure)
- Hurricane & Tropical Storms
- Tornado & Downburst
- Severe Winter Storms
- Severe Thunderstorms
- Wildfire
- Earthquake/Landslide
- Extreme Temperatures
- Drought
- Public Health Threats
- Hazardous Material

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 Lee; 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.

High Road Bridge, May 2006 Flooding Event

Multi-Hazard Mitigation Goals

The Town's multi-hazard goals are based on the State of New Hampshire Multi-Hazard Mitigation Plan (2018) goals and include:

- *Minimize loss and disruption of human life, property, the environment, and the economy due to natural, technological, and human-caused hazards through a coordinated and collaborative effort to implement appropriate hazard mitigation measures*
- *Enhance protection of the general population, citizens, and guests of the Town of Lee before, during, and after a hazard event through public education about disaster preparedness and resilience, and expanded awareness of the threats and hazards which face the Town.*
- *Promote continued comprehensive hazard mitigation planning to identify, introduce, and implement cost effective hazard mitigation measures.*
- *Address the challenges posed by climate change as they pertain to increasing the risk and impacts of the hazards identified within this plan.*
- *Strengthen continuity of operations and continuity of government to ensure continuation of essential services*

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 Lee, 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 four times over a two 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: October 16, 2018

Members present: Bill Booth (Building Inspector), Tom Dronsfield (Chief of Police), Harry Mueller (Operations Manager McGregor), Scott Nemet (Fire Chief/EMD), Caren Rossi (Planning and Zoning Administrator/Assistant EMD), and Julie Glover (Town Administrator).

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 is currently expired as of 9/9/18. SRPC staff detailed the in-kind match documentation, committee responsibilities, and steps towards successful adoption.

First, SRPC and the committee reviewed the draft community profile chapter. Committee members provided general comments and feedback. Members agreed the Census 5-year estimates seemed to have some inaccuracies and that local housing data should be supplemented into this section. The building department would provide the local data to SRPC. The committee also decided that the building permit on Fox Garrison Road was built on a hill and was not deemed as vulnerable to flooding, and should be removed from table that detailed permits near the floodplain.

SRPC, and the committee, reviewed the draft asset inventory chapter. The following is a summary of comments and changes:

1. Emergency Response Facilities
    a. Town Hall Annex address to 13 Mast Road
    b. Mast Way Elementary School removed as back-up shelter
    c. Public Safety Complex (Fire/Police) is back-up shelter
    d. Oyster River Middle School added as primary regional shelter
    e. S & J Transportation added as primary emergency fuel
    f. Highway Department is back-up emergency fuel
    g. All helipad locations (lat/long coordinates) will be provided by the Fire Chief
2. Non-Emergency Response Facilities
    a. Wentworth Douglass Express Care added to medical treatment facilities
3. Critical Facilities
    a. Electric substation added as power substation
    b. Solar array added as renewable energy source (Town of Durham)
    c. Pump station added on Angell Road (Lee Well)
4. Vulnerable Populations to Protect

a. Lee USA Speedway added as large crowd event
b. The Town Administrator and Building Department would determine the status of the housing development on Mast Road

5. Water Resources
    a. Noble Farm Drive was added to the dry hydrant list
    b. Whittier Lane and Wheelwright Drive were removed from dry hydrant list
    c. Thurston Road was changed to Thurston Drive
    d. Friendly Pets (Concord Road), Wentworth Douglass (65 Calef Highway), Chestnut Way (2), Daniels Drive (2), Kelsey Road, Walgreens (91 Calef Highway), and Dollar General (60 Concord Road) were added to the cistern list
    e. Old Concord Turnpike Road was changed to Angell Road (3) and Sherburne Road (5)
    f. Lamprey River, Wadleigh Falls, and Oyster Rive were added as drafting sites for auxiliary fire aid
    g. Lee Well and Packers Falls Well (Durham/UNH Water System) were added as water supplies

Next, the Planning Committee reviewed the Town's National Flood Insurance Program (NFIP) status and past floodplain management actions. The Town Administrator noted that within Lee's program status, Jenkins Lane should be changed to Osprey Lane. NFIP compliance actions the town has completed included: the 2005 FEMA Community Assistance Visit; the 2011 NH Geological Survey's fluvial erosion assessment; a 2012 flooding study along the Lamprey River; an effort in 2014 to review floodplain maps from the Lamprey River assessment; ongoing efforts to assess additional rivers for flooding and potential changes to the town's existing floodplain ordinance; and review of economic damages from a recent HAZUS model along the Lamprey River. Lee is currently participating in the ongoing regional effort with UNH GRANIT to generate updated floodplain maps. The town has also completed various drainage and stormwater improvements including culvert replacements on Lamprey Lane and Thompson Mill Road. Efforts to address flooding and embankment issues on Tuttle Road are ongoing. The town has applied for funding assistance, but has been denied on various occasions.

Lastly, the committee reviewed past actions and provided feedback on what strategies have been completed over the course of the past five-year plan cycle.

The next meeting was set for October 30, 2018 at 10AM at the Public Safety Building. 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.

<u>Meeting # 2: October 30, 2018</u>

Members present: Bill Booth (Building Inspector), Tom Dronsfield (Chief of Police), Harry Mueller (Operations Manager McGregor), Scott Nemet (Fire Chief/EMD), Caren Rossi (Planning and Zoning Administrator/Assistant EMD), and Julie Glover (Town Administrator).

SRPC staff opened the meeting with reviewing old business agenda items. The first item was the meeting notes from the October 16th meeting. There were no additions or revisions. Next, the planning committee reviewed the updated

asset tables. Only two changes were identified including changing the primary regional emergency shelter from Oyster River Middle School to the High School and revising Angel Road to Angell Road. A small discussion determined that the committee did not feel it was appropriate to add a few low income housing units along Mast Road as vulnerable populations to protect

The planning committee then reviewed the handful of disaster and emergency declarations that have taken place over the course of the past five years. There were no major impacts in Lee.

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:

1. Flooding
    a. The committee identified a number of areas that were impacted in both the 2006 and 2007 flooding events including: portions of Route 152 at the Newmarket town line (commonly known as the "s-curves"), Osprey Lane, Jan Lane, Tuttle Road near 152, Wadleigh Falls Road (Rte. 152), West Mill Pond Road, Harvey Mill Road (Rte. 152 at the Nottingham town line), Kelsey Road, and Gile Road. The High Road Bridge (over the North River) overtopped and failed during one of these storms. The town requested FEMA funding, and the bridge was replaced in 2012. An existing crossing that routinely floods is Route 152 by West Mill Pond Road. This portion of the state-owned roadway is currently in the 10-tear transportation plan for engineering design and full replacement. Lee provided mutual aid to the town of Durham when the Wiswall Bridge failed during flooding along the Lamprey River.
    b. During the 2007 storm event the Nottingham Lake Dam failed. The dam, which is fed by Mendums Pond in Barrington, collapsed in the middle of the night and impacted a number of roads in Nottingham. Lee provided mutual aid to Nottingham. Emergency personnel evacuated residents on West Mill Pond Road and parts of Tamarack Road due to flooding. Tuttle Road flooding was higher than normal at the Little River crossing. The dam was rebuilt in 2009 and has not had any other significant issues.
2. Hurricane and Tropical Storms
    a. No significant impacts; minor wind and rain.
3. Tornado and Downburst
    a. In June 2018 there was a severe storm event that hit part of southeastern New Hampshire. Tornado warnings were issued in Durham and Lee. A partial funnel cloud appeared in Durham, but never touched down. High winds knocked down one tree on Tuttle Road. Lee provided mutual aid for traffic detours due to road closures. According to NHPR, the storm knocked out power for more than 63,000 residents throughout NH.

Funnel Cloud in Durham, NH [Photo Credit: Julie Smith]

4. Severe Winter Weather
    a. Impacts for the Ice Storm of 1998 included long-term power outages, school closures, and challenges with traffic at busy intersections.
    b. Impacts for the Ice Storm of 2008 included long-term power outages and school closures. A tree fell on a house on Tuttle Road. The public safety complex was opened as the EOC for a few days. One residential home on Old Mill Road was damaged from soot build-up from running kerosene heaters.
    c. Both the 2013, 2015, and 2018 large snow events resulted in snow removal challenges, and some line of site issues due to high snow banks along roadways and intersections. The town submitted for FEMA reimbursement for plowing, salt/sand, and truck repair costs. Some of these storms resulted in the need to shovel the roofs of all the municipal buildings to clear the snow load and to ensure the buildings were not in danger of collapsing.
    d. The Thanksgiving Day snow event in late November (2017) 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 on local and state roadways. The public safety complex was opened as the EOC for nearly a week.
5. Severe Thunderstorms and Lightning
    a. The planning committee referenced two lightning strikes. The first was located at a residential home on Little Hook Road. Lightning struck a 10x10 shed, and traveled along a fence to ignite a barn. It knocked out power for the entire street and fried all the electrical appliances in the house. The second strike was at the public safety complex. A late summer thunderstorm in 2018 led to a lightning strike that hit the garage door frame of the public safety complex and blew out the cameras and monitors.
6. Wildfire
    a. No major impacts; there was one small human-caused brush fire in 2016 that consumed less than 2 acres.
7. Earthquake and Landslide
    a. No major impacts.
8. Extreme Temperatures
    a. In February 2018, during a particularly cold stretch, the public safety complex was opened as a warming station. This tends to happen a few times a year. During prolonged heat waves, the public safety complex is opened as a cooling station. In recent years, there has not been much attendance from residents.
9. Drought
    a. During the most recent drought, Lee encouraged residents to reduce their water use and to volunteer to implement water conservation efforts. There were some shallow wells that went dry. One community well, owned and operated by Pennichuck Water Works, restricted outdoor water use.
10. Public Health Threats
    a. According to the police department, since 2016 there have been six overdoses and one death. These numbers may be low as they were initially reported as medical aids prior to the police department adding a code for overdose. Another set of numbers for 2018 state there have been up to 17 overdoses, with five from heroin.

b. Narcan has been made available through the town's affiliation with Wentworth Douglas Hospital, and is stored in all the town's fire trucks. The hospital also offers in-house training to all emergency responders.
c. Levels of arsenic and radon are significantly high in Lee. There is a radon detection unit installed at the library and town hall annex. All municipal buildings use bottled water due to unsafe levels of arsenic. The town has completed various well-testing efforts over the past several years.

11. Hazardous Materials Threat
    a. A half dozen or so properties around the Lee traffic circle have groundwater wells contaminated by MtBE traced to leaking underground gas tanks from the Mobil station. The state Department of Environmental Services is working with Durham, Lee and the University of New Hampshire to extend water lines to the affected properties, which currently use treatment systems to remove the additive.
    b. Any accident involving trucks carrying hazardous waste along Routes 125 and 4 are potential future threats.

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

- There were 5 hazards ranked as high, including: drought, public health threats, earthquake and landslide, wildfire, and flooding from dam failure
- There were 3 hazards ranked as medium, including: hurricane and tropical storms, tornado and downburst, and extreme temperatures
- There were 4 hazards ranked as low, including: hazardous materials, severe winter storms, flooding (riverine/extreme rain event), and severe thunderstorms

Lastly, SRPC and the committee 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 next meeting was set for November 19, 2018 at 2PM at the public safety complex. 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 November 19, 2018

Members present: Bill Booth (Building Inspector), Tom Dronsfield (Chief of Police), Scott Nemet (Fire Chief/EMD), Julie Glover (Town Administrator), and Steve Bullek (Highway Supervisor)

SRPC staff opened the meeting with reviewing old business agenda items. The first item was the meeting notes from the October 30th meeting; there were no comments or revisions.

The committee then reviewed the preliminary critical facilities and key resources maps and provided feedback.

Next, SRPC and the committee brainstormed a series of new mitigation actions for the town to consider over the next five year cycle. The committee organized the actions into the implementation table, and prioritized them using the STAPLEE method.

The final meeting to review the final maps was set for December 3, 2018 at 2PM at the public safety complex. 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 #4: December 3, 2018

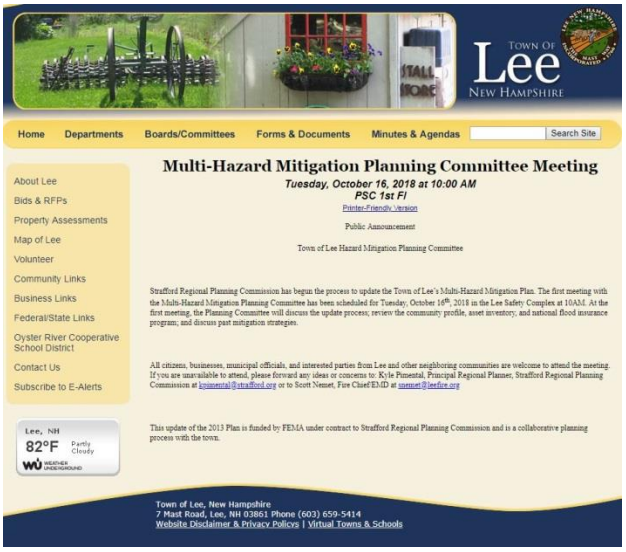
Members present: Bill Booth (Building Inspector), Tom Dronsfield (Chief of Police), Scott Nemet (Fire Chief/EMD), and Caren Rossi (Planning and Zoning Administrator/Assistant EMD).

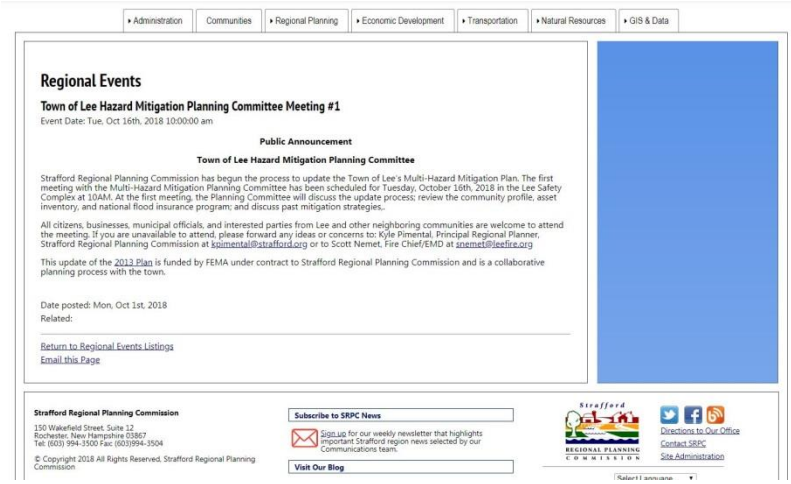
SRPC staff opened the meeting with reviewing old business agenda items. The first item was the meeting notes from the November 19th meeting; there were no comments or revisions. The remainder of the meeting was spent on reviewing the actions and implementation tables, as well as the critical facilities and key resources maps.

SRPC will finalize the plan for conditional approval and submit the plan to HSEM in the next week or two.

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 Select Board, Conservation Commission, Planning Department; Police, Fire, and Highway Departments; and local business owners, interested organizations, and Lee residents were invited to participate. 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.





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 Lee'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 the municipal offices in advance of each meeting. The Committee met 4 times between October 16, 2018 and December 3, 2018. All feedback from participants of the planning committee was incorporated into the Plan. There was no participation from surrounding communities.

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 Select Board will a meeting to review the revised Plan, and will hold a public meeting to consider public comments and must promulgate a signed Resolution to Adopt the Plan.

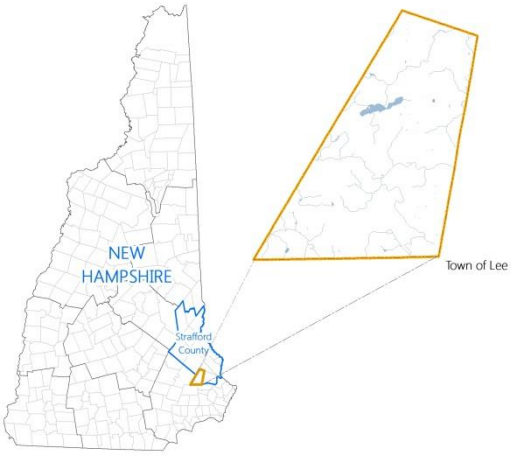
Elements of the Plan will be incorporated into other planning processes and documents, such as the Town's Master Plan, Capital Improvement Plan, and Emergency Operations Plan. The Town will refer to this Multi-Hazard Mitigation, as appropriate, in other documents.

Damage to Lee Hook Road, Flooding

Chapter 2: Community Profile

Overview

The Town of Lee is located in southeastern NH within Strafford County. The towns bordering Lee are: Madbury to the north, Epping and Newmarket to the south, Durham to the east, and Nottingham and Barrington to the west. With a population of 4,388 (according to the 2016 American Community Survey 5-year population estimates), Lee has experienced roughly a 5.5% increase in total population since 2000 (4,145). This population increase is significantly lower than the regional demographic trend of Strafford County, which experienced a 10.9% increase between 2000 and 2010 and represents one of the fastest growing areas in the state of New Hampshire.



Map 1: Lee Locus Map (Source: SRPC, 2018)

The Town of Lee covers a total area of 20.2 square miles (12,927.3 acres), with a land area of 19.7 square miles (12,636.8 acres) and a water area of 0.5 square miles (290.5 acres). The six principal watersheds are the Piscassic, North, Lamprey, Oyster, Little, and Bellamy Rivers. Within these subwatersheds, the primary river systems include: the Oyster, North, Little, and Lamprey Rivers; smaller tributaries include: Rollins Brook and Chelsey Brook. It is a rural town with a strong agricultural heritage where farmland and forest are only broken by the various wetlands, rivers, ponds, and lakes. The general topography of Lee is flat with a mix of rolling hills and few sharper bedrock ridges[1].

Lee's history stems from its roots of farming and timber and since has evolved through past development treads to become primarily a bedroom community. With the University of New Hampshire just a couple of miles away, Lee has been home to many who work on campus. Lee saw large changes through the seventies and eighties with many large parcels of land being developed into housing units, whether single family or multi-family development and growth in and around the Lee traffic circle remained limited.

Although many of the large farms have long since passed, Lee lends itself to a quiet, peaceful setting of small back roads with its rural character preserved through smaller agricultural uses and protected lands, and Lee remains and keeps its "bedroom community" status. Since the late eighties and up through even today, Lee has protected a quarter of its lands in order to preserve and encourage agriculture uses and its rural nature.

With many new homes and the doubling of its population since the late seventies, Lee's citizens now find easy access to the seacoast to the east, Boston to the South, Portland to the North and Manchester to the West therefore diversifying its working population and although the University still remains a large draw for people to reside in Lee. A recent trend is the "modernization" of the commercial zone located in and around the Lee traffic circle, development continues and some of the older buildings have been replaced and vacant land is now being developed. It would appear that this trend will continue.[2]

[1] Town of Lee, Master Plan 2016-2026
[2] Written by Allan Dennis, former Code Enforcement Officer in Lee

Housing

In the period between 2012 and 2016, Lee experienced an overall decrease of 199 total housing units (roughly 11.6%). Lee experienced the lowest number of total housing units in 2016, and the highest in 2012. According to housing tenure data for that same 5-year time period, the total renter-occupied unit counts significantly increased by 32.2% while owner-occupied housing units decreased by 11%. During this time period, the vacant housing units significantly decreased by 151.7% (using data from 2015) and total occupied housing units stayed relatively the same, with a small decrease of 3.1%. As of 2016, Lee's occupied housing units are roughly 81.7% owner-occupied and 18.3% renter occupied. Vacant housing units have steadily decreased from a high of 146 in 2012 to a low of 58 in 2015. As of 2015, the Town exhibits a 3.2% vacancy rate; this rate does not take into consideration Lee's limited seasonal homes. The 2010 Census estimates (not shown) that 34 homes in the Town 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 1.3%.

Table 1: Housing Data 2012 - 2016

	2012	2013	2014	2015	2016	% Change 2012-2016
Total Housing Units	1,919	1,877	1,899	1,834	1,720	-11.6%
Occupied Housing Units	1,773	1,744	1,774	1,776	1,720	-3.1%
Owner Occupied Housing Units	1,560	1,493	1,487	1,414	1,406	-11.0%
Renter Occupied Housing Units	213	251	287	362	314	32.2%
Vacant Housing Units	146	133	125	58	N/A	-151.7%

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

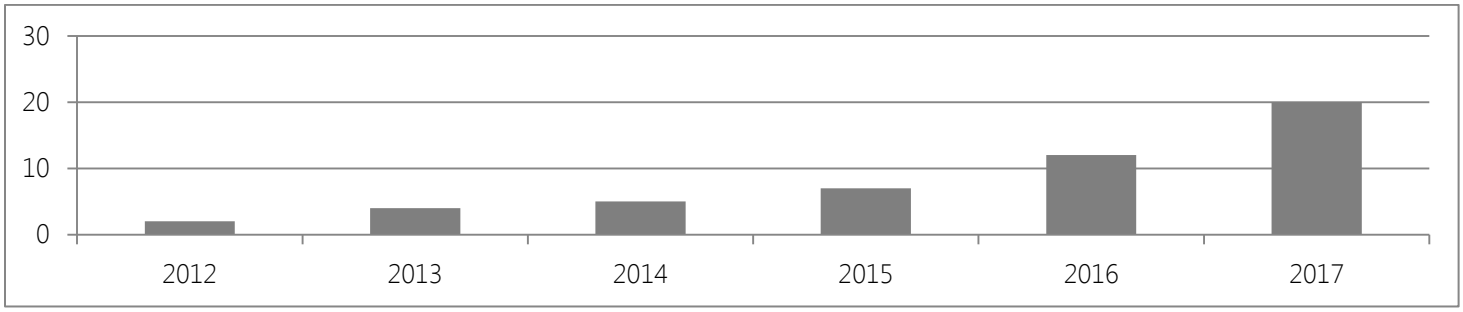
According to local parcel data provided by the Building Department, Lee has a total of 1,798 total housing units. This includes residential land and building[3] (1,366); residential land and building with current use (154); manufactured housing on own land (18); manufactured housing on land of another (164); and duplex and multi-family (96). The parcel database was accessed on October 16, 2018. The 2018 parcel data most closely resembles the ACS 5-year estimates in 2016. It is unknown as to why the earlier years were represented as a higher number of units – Lee has seen consistent residential growth, which has resulted in an increase in housing units, not a percent decrease.

Building Permit Data

According to the data that was received from the Town, a total of 50 new building permits have been issued from 2012 through 2016. Lee experienced an average of roughly 8 new structures (mostly single-unit residential, with a handful of commercial and other uses) between 2012 and 2016. Figure 1 (below) shows that Lee has experienced consistent growth since 2012; the largest number of permits was received in 2017 (20 permits). 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.

[3] This includes residential condominiums.

Figure 1: New Building Permits 2012 - 2016



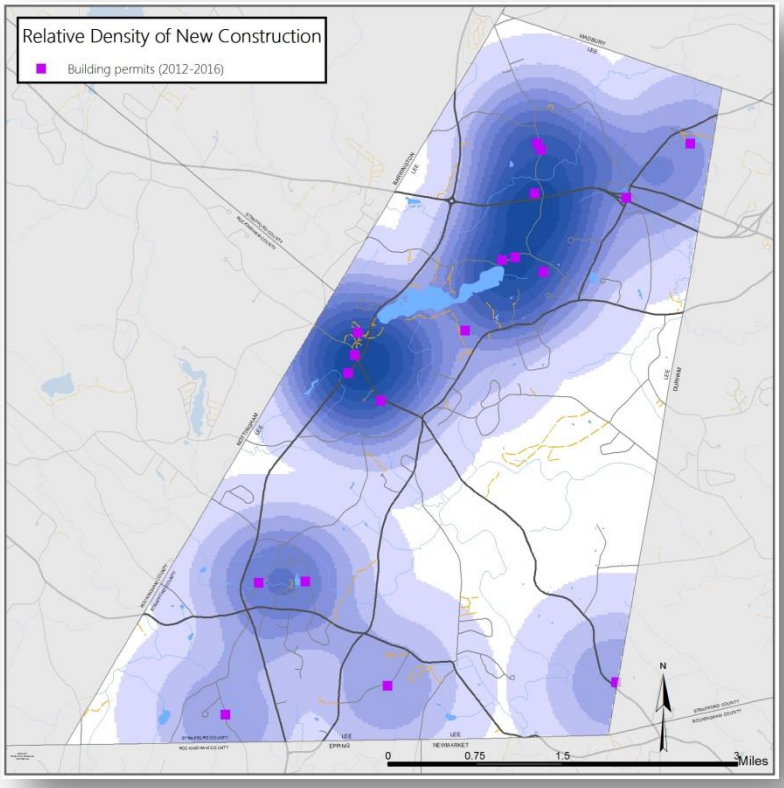
Source: Lee's Planning and Zoning Administrator

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 clustered into two general areas including: 1) Old Mill Road, Sheep Road, and Stepping Stones Road; and 2) the intersection of George Bennet Road, Mitchell Road, and Route 125. Other development has been largely scattered throughout the Town along existing roadways.

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/Lee, 2018)

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 damage.

In 2018, the Strafford Regional Planning Commission, in partnership with Geosyntec and UNH, received funding from the NHDES Coastal Program to prepare planning level inundation maps for the mainstem of the Lamprey, North, Little, and Oyster Rivers. As part of this project the town will consider amendments to their existing floodplain ordinance to incorporate the new maps and to strengthen overall floodplain management for future storm events.

Development within the FEMA Floodplain

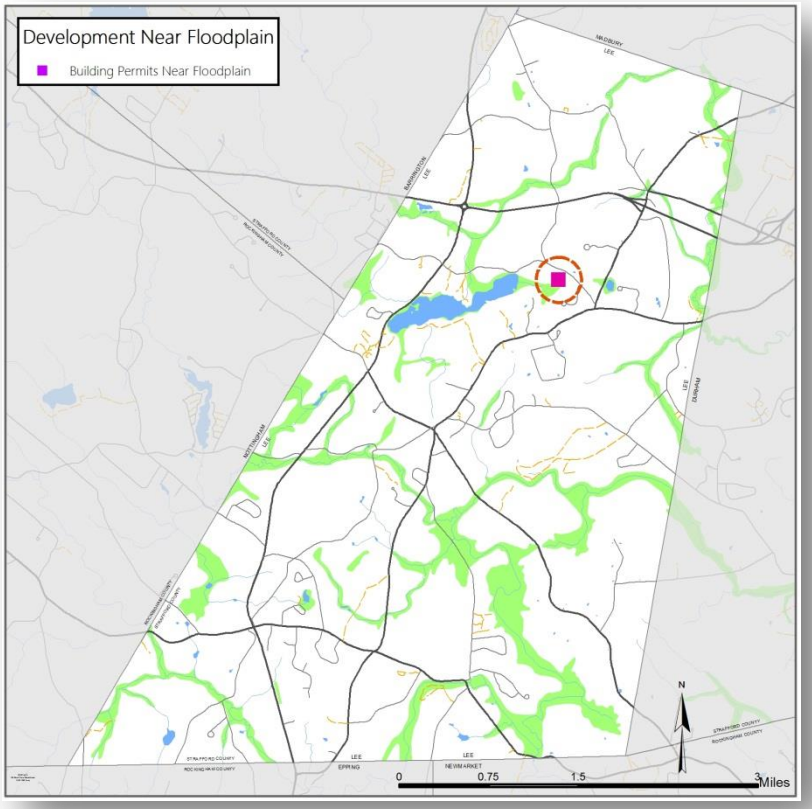
According to a simple GIS analysis, of all the building permits issued over the course of the last five years (2012 – 2016), there were zero homes identified to be within the FEMA floodplain; however, a follow-up analysis was completed to select locations that may be within 75 to 100 feet adjacent to the FEMA floodplain. The results of that analysis indicated that only one potential location was in close proximity to the floodplain and is shown on Map 3. It is important to note building permit data does not always correlate directly with new construction; permits may refer to renovations or additions to existing structures.

Over the course of the last five years, there was only one new residential building permit issued within an estimated 75-100 feet of the FEMA floodplain (one single unit residential). It is unclear as to the exact location of that structure and whether or not it is vulnerable to flooding. The location of that building permit is identified in more detail in Table 2 below and can be viewed on Map 3.

Table 2: Building Permits Near Floodplain

Location	Year	Type
39 Stepping Stones Rd	2012	Residential

[Source: Town of Lee, 2018]



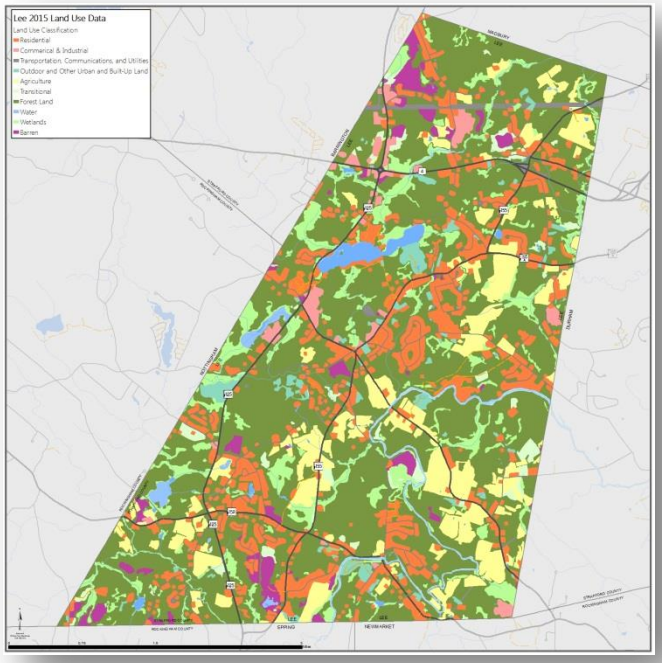
Map 3: Building Permits within the FEMA Floodplain (Source: SRPC/OSI, 2018)

As shown on Map 3, over the course of the last five years, Lee has successfully steered almost all new developments away from existing and potential flooding dangers; therefore, the community's vulnerability has been reduced. However, as more extreme precipitation events are projected to occur throughout the region, Lee will need to continue to proactively plan for future flooding scenarios. Along with guiding development away from vulnerable areas, the Town should consider revising and improving its floodplain management as necessary.

Looking ahead, the Town will use this plan as a guide to determine where past hazards have been documented and try to steer 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, Lee has experienced 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.



Map 4: 2015 Land Use Data (Source, GRANIT, 2018)

According to the 2015 regional land use layer, roughly 22% (2,837.8 acres) of Lee's total acreage is currently classified as developed, with residential (15%) as the predominate land use type. Development is scattered throughout the Town along existing transportation corridors, including Routes 4, 125, 155, 155A, and 152. Lee did not experience any substantial increase in residential land use conversion in the last five years (>0.5%). Nor did the Town see any major changes in commercial and industrial uses, agriculture, or wetlands. The Town experienced roughly a 1.6% loss of forest land due to land conversion.

In 2016, Lee completed a Master Plan update, which was adopted by the Planning Board on August 31, 2016, and provides direction to establish and update the town regulations and ordinances that meet the desired vision of Lee's future.

Table 3: Land Use Data 2010 - 2015

Land Use Classification	Acres (2010)	% of total acreage	Acres (2015)	% of total acreage	5-year (+/-) % change
Residential	1,952.1	15.1%	1,999.7	15.5%	0.4%
Commercial & Industrial	213.7	1.7%	240.0	1.9%	0.2%
Agriculture	1,365.5	10.6%	1,382.8	10.7%	0.1%
Forest Land	6,947.5	53.7%	6,747.0	52.2%	-1.6%
Wetlands	1,205.6	9.3%	1,171.2	9.1%	-0.3%
TOTAL	12,927.3	90.4%	12,927.3	89.3%	N/A

This analysis does not include: transportation, communications, and utilities; outdoor and other urban built-up land; cemeteries; maintained open space; vacant land; brush or transitional land; open water; and disturbed lands, which together make up the remaining 10-11%.

Chapter 3: Asset Inventory

Critical Facilities and Key Resources

This chapter includes Critical Facilities and Key Resources (CF/KR) within the Town of Lee 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.[4] 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. [5]

"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 (Municipal Office)	Administrative Office & Communication	7 Mast Road (Rte. 155)
Town Hall Annex	Administrative Office & Communication	13 Mast Road (Rte. 155)
Fire & Rescue Station	Emergency Operations Center/Backup Shelter	20 George Bennett Road
Police Station	Emergency Operations Center/Backup Shelter	20 George Bennett Road
Oyster River High School	Primary Regional Emergency Shelter	1 Coe Drive (*Durham, NH*)
S & J Transportation	Emergency Fuel	251 Calef Highway
Highway Department	Backup Emergency Fuel	6 Recycling Center
Cell Tower	Communication Function	11 Concord Rd (Rte. 4) at Barrington TL 373 Calef Highway (Rte. 125)
Helipad Location	Emergency Medical Evacuation	George Bennett Road Soccer Field Transfer Station Back Lot Mast Way School/Town Field Market Basket Plaza Parking Lot Concord Road (Rte. 4) Barrington TL Toys Manufacturing Parking Lot Concord Road (Rte. 4) Sullivan Tire Concord Road (Rte. 4) Durham TL Davis Lane – North River Road Calef Highway (Rte. 125) – Epping TL Lee USA Speedway Front Parking Lot Lee USA Speedway Back Parking Lot

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

Table 5: Non-Emergency Response Facilities (NERF)		
NERF's are facilities considered essential, that although critical, not necessary for the immediate emergency response effort.		
Facility	Type	Address
Transfer Station & Recycling Center	Residential Waste	11 Recycling Center
S & J Transportation Services	Freight Resources	251 Calef Highway
Wentworth Douglas Express Care	Medical Treatment Facility	65 Calef Highway

Table 6: Critical Infrastructure (CI)		
CI are important structures that may be vulnerable during a hazardous event		
Facility	Type	Address
Distribution Substation	Power Substation	West Mill Pond Road & Rte. 125
Solar Array	Renewable Energy Supply (*Durham, NH*)	397 Packers Falls Road
Lee Well Pump Station	Pump Station	Angell Road
Recreation Pond	Non Menace Structure	Natural Swale
Wildlife Pond	Non Menace Structure	Natural Swale
Demeritt Hill Farm Pond Dam	Non Menace Structure	Natural Swale
Farm Pond Dam	Non Menace Structure	Unnamed Stream
White Recreation Pond	Non Menace Structure	Unnamed Stream
Demeritt Hill Farm IRR Pond Dam	Non Menace Structure	Tributary Oyster River
Noble Farm Dam	Non Menace Structure	Unnamed Stream
A non-menace structure means a dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is: 1) less than six feet in height if it has a storage capacity greater than 50 acre-feet; or 2) less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.		
Bridge (063/045)	Transportation (Town Owned)	High Street over North River
Bridge (087/084)	Transportation (Town Owned)	Cartland Road over Little River
Bridge (097/074)	Transportation (Town Owned)	Tuttle Road over Little River
Bridge (116/130)	Transportation (Town/State Owned)	Old Mill Road over Oyster River
Bridge (124/145)	Transportation (Town Owned)	Snell Road over Oyster River
Bridge (050/055)	Transportation (State)	NH152 over North River
Bridge (103/078)	Transportation (State)	Lee Hook Road over Lamprey River
Bridge (073/084)	Transportation (State)	NH125 over Little River
Bridge (094/078)	Transportation (State)	NH155 over Little River
Bridge (099/124)	Transportation (State)	NH125 over Oyster River
Bridge (102/046)(E-2)	Transportation (State)	NH152 over Lamprey River
Bridge (106/126)	Transportation (State)	US4 over Oyster River
Bridge (131/127)	Transportation (State)	US4 over NH155
Bridge (142/128)	Transportation (State)	NH155A over Oyster River
Bridge (144/142 (E-1)	Transportation (State)	NH155 over Oyster River
Bridges have been identified by the NHDOT Bridge Design Bureau; Dams have been identified by the NHDES, Water Division Note: According to NHDOT, there is one REDLIST bridge in the Town of Lee		

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
Mast Way Elementary School	School	23 Mast Road (Rte. 155)
Lee Cooperative Nursery School	Daycare	17 Mast road (Rte. 155)
Live and Learn Early Living Center	Daycare	114 Mast Road (Rte. 155)
Growing Places	Day Care	54 Pinkham Road
Kirkwood Corners	Assisted Living	206 N. River Road
Lee USA Speedway	Large Crowd Gathering	380 Calef Highway

Table 8: Water Resources

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

Facility	Type	Address
Dry Hydrant	Auxiliary Fire Aid	Caverno Drive Darby Field Common Hobbs Road James Farm Road Captain Smith Emerson Noble Farm Road Market Basket – Concord Rd West Packers Falls Road – Route 155A Riverside Farm Drive Tamarack Lane Whittier Lane
Cistern(s)	Auxiliary Fire Aid	South Lee Depot Wednesday Hill Road/Toon Lane Thurston Drive (2x) Piper Lane Davis Lane Elder Osborne Drive (2x) Captain Parker Drive Caverno Drive Langley Drive Durgin Drive Spencer Lane Wendy's on Calef Highway Steppingstone/Route 125 Friendly Pets (Concord Road) Wentworth Douglass Express Care (2x) Chestnut Way (2x) Daniels Drive (2x) Kelsey Road Walgreens (91 Calef Highway) Dollar General (60 Concord Road)
Pressure Hydrant	Fire Aid	Angell Road (3x) Sherburne Road (5x) Thurston Drive (7x)

Surface Water Resources	Auxiliary Fire Aid (drafting site)	Lamprey River at Lee Hook Road Wadleigh Falls at Wadeligh Falls Road Oyster River at Mast Road
Lee Well[6] Packers Falls Well	Drinking Water Supplies (Durham, NH)	Angell Road Packers Falls Road

[6] The Lee Well serves less than 10 residential units in Lee.

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, and identified past and potential flooding areas from previous updates. Table 9 lists the 18 CF/KRs located within those areas with a potential loss value estimate of $5,376,000 at 100%.

Table 9: Vulnerable Critical Facilities/Key Resources

CF/KR and Other Assets	Hazard	100% of Structure Value
Critical Infrastructure		
Cartland Road over Little River	FEMA Floodplain	$240,000 (20' x 12' x $1000
NH152 over North River	FEMA Floodplain	$444,000 (37' x 12' x $1000)
NH152 over Lamprey River	FEMA Floodplain, Updated Lamprey River Study, and Microburst	$1,632,000 (136' x 12' x $1000)
NH155 over Little River	FEMA Floodplain	$192,000 (16' x 12' x $1000)
NH155 over Oyster River	FEMA Floodplain	$228,000 (19' x 12' x $1000)
NH155A over Oyster River	FEMA Floodplain	$180,000 (15' x 12' x $1000)
Tuttle Road over Little River	FEMA Floodplain	$312,000 (26' x 12' x $1000)
NH125 over Oyster River	FEMA Floodplain	$192,000 (16' x 12' x $1000)
Lee Hook Road over Lamprey River	FEMA Floodplain & Updated Lamprey River Study	$900,000 (75' x 12' x $1000)
Old Mill Road over Oyster River	FEMA Floodplain	$180,000 (15' x 12' x $1000)
High Street over North River	FEM A Floodplain & Microburst	$588,000 (49' x 12' x $1,000)
US4 over Oyster River	FEMA Floodplain	$288,000 (24' x 12' x $1000)
Water Resources		
Whittier Lane (Pressure Hydrant)	FEMA Floodplain	N/A
Angell Road (Pressure Hydrant)	FEMA Floodplain	N/A
Sherburne Road (Pressure Hydrant 2x)	FEMA Floodplain	N/A
Oyster River at Mast Road (drafting site)	FEMA Floodplain	N/A
Lamprey River at Lee Hook Road (drafting site)	FEMA Floodplain & Updated Lamprey River Study	N/A
	Total	$5,376,000

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 there were no emergency non-emergency response facilities that fell within the FEMA floodplain or any past identified flooding areas. The data did reflect significant impacts to the town's transportation infrastructure, specifically bridges (there are impacts to 12 bridges in town) – 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 four pressurized hydrants and two surface water sites that serve as fire aid. Fire aids 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 Lee'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 **$304,679,147** including **$297,519,547** for buildings and **$7,159,600** 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 $3,046,791 (low)** or **$3,046,791 to $15,233,957 (medium)** or **$15,233,957 to $30,467,915 (high)** based on the 2017 Lee Town valuation. Table 10 provides more detail on these estimated economic losses.

Table 10: Economic Loss Data

Local Assessed Valuation				
	Total Assessed Value (2017)	Economic Loss		
		Low 1% Damage	Medium 5% Damage	High 10% Damage
Buildings				
Residential	$248,636,547	$2,486,365	$12,431,827	$24,863,655
Manufactured Housing	$5,998,700	$59,987	$299,935	$599,870
Commercial Industrial	$42,884,300	$428,843	$2,144,215	$4,288,430
Total Buildings	**$297,519,547**	**$2,975,195**	**$14,875,977**	**$29,751,955**
Utilities				
Public Water	$15,100	$151	$755.00	$1,510.0
Gas	-	-	-	-
Electric	$7,144,500	$71,445	$357,225	$714,450
Total Utilities	**$7,159,600**	**$71,596**	**$357,980**	**$715,960**
Net Valuation Building and Utilities	**$304,679,147**	**$3,046,791**	**$15,233,957**	**$30,467,915**

Source: NH Department of Revenue Administration. 2017 Annual Report. Assessed value does not include value of land or local exemptions. (https://www.revenue.nh.gov/mun-prop/property/equalization-2017/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.

Lee's National Flood Insurance Program Status

According to FEMA's Community Status Book Report, Lee has been a member of the National Flood Insurance Program (NFIP) since April 2, 1986. The Town does have portions of land in the 1% annual chance floodplain along the Oyster, Lamprey, Little, and North Rivers; Beaver and Rollins Brooks; and areas around Wheelwright Pond.

Article XIX of the Town's Zoning Ordinance (as revised March 2014) outlines the Town's floodplain development performance standards and ensures that all development within the floodplain conform to the Town's floodplain development ordinance. Lee recognizes the need to minimize the potential loss of life and property during periods of flooding regulating the alteration and/or the development of those areas of special flood hazard identified by FEMA. The Town's floodplain development ordinance shall apply to all lands designated as areas of special flood hazard by FEMA in its "Flood Insurance Study for the County of Strafford, N.H." dated May 17, 2005.

According to information from the FEMA Community Overview (as of 7/3/2018) provided by NH OSI Principal Planner Samara Ebinger, Lee has 14 total policies (14 single family homes) in the floodplain hazard area. There have been 12 paid loss claims totaling $291,311 with two repetitive loss[7] claims totaling $165,053.97. The two repetitive loss properties were both single family residential homes located on Osprey Lane. Of the 14 total policies, 11 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).

[7] 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.

Table 11: Lee's Insurance Zone Policies

Zone	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Loses	Amount of closed Paid Loses
AE Zones	0	$0	$0	0	$0
A Zones	3	$10,721	$605,000	7	$187,325
B,C & X Zone					
Standard	2	$1,075	$700,000	1	$50,160
Preferred	9	$3,356	$2,345,000	4	$53,826
TOTAL	14	$15,152	$3,650,000	12	$291,311

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

∴ In 2005, a FEMA Community Assistance Visit (CAV) was completed. The results did not find any major problems with the existing floodplain management regulations or any other problems in the community's floodplain management program. It should be noted that this CAV was completed 13 years ago, and the town should work with FEMA to schedule another visit in the near future.

∴ In 2011, the New Hampshire Geological Survey conducted a fluvial erosion assessment on reaches of the Lamprey River mainstem and its tributaries, including the Little, North, North Branch Lamprey, and the Piscassic Rivers (the Lamprey, North, and Little Rivers are all located in Lee). The study evaluated the physical conditions, adjacent floodplain, and identified problematic areas such as crossings, culverts and locations where erosion may be a hazard. These zones were mapped for the Town of Lee and were used in the update of the hazard mitigation plan. These maps will also be used to identify areas most at risk to erosion, flooding and future river adjustments through an understanding of the physical condition of the river, and to identify priorities for the replacement and rehabilitation of problematic culverts, and river restoration projects.

∴ In 2012, there was a study called "Assessing the Risk of 100-year Freshwater Floods in the Lamprey River Watershed of New Hampshire Resulting from Changes in Climate and Land Use," which was completed by the Complex Systems Research Center, UNH. Decision-makers and the public within the watershed have access to new information regarding local flood risk, and have been educated about how past and potential future land use patterns and climate change will influence the frequency and spatial extent of flooding.

∴ In 2014, an ad-hoc working group, unofficially named the Lamprey River Floodplain Mapping Committee, underwent a comprehensive planning process with the Strafford Regional Planning Commission to review additional floodplain data and were tasked with making recommendations to the Planning Board. In a letter that was submitted to the Planning Board on November 13, 2014, members of the mapping committee "encouraged the Planning Board to consider amending the Town's current Floodplain Ordinance to reflect all lands designated as special flood hazard areas to include both the FEMA flood insurance study as well as the updated 1% annual chance floodplain extent referenced in the 'Assessing Flood Risk in the Lamprey River Watershed' report". Consensus was reached that this initiative would ensure that future development in these areas would adhere to local regulations designed to minimize damages during future flooding events. The

Board was generally interested in moving forward; however, at the May 14, 2015 Planning Board meeting, members expressed concerns that other rivers in town (and in the watershed) did not have the same assessment and would therefore make it difficult to implement a zoning amendment. Members requested that a similar analysis be completed for the Oyster River and the remaining tributaries along the Lamprey.

∴ In 2018, at the request of the Lee Planning Board, SRPC, in partnership with Geosyntec and UNH, embarked on a project to prepare planning level inundation maps for the mainstem of the Lamprey, North, Little, and Oyster Rivers within the Town of Lee. Flood inundation maps included: the 24-hour, 1% annual chance flood, an existing land use condition map, and a 2050 build out condition map with projected 24-hour 100 year storm event derived from downscaled global climate model simulations. A second phase of this project will take place in early 2019 to incorporate the data from the new maps into the town's existing ordinance.

∴ In 2018, UNH completed its research on economic damages from flooding along the Lamprey River. Economic damages were determined using the Federal Emergency Management Agency [FEMA] Hazus model, which estimates flood damage based on base-flood elevation and building type. A two-page fact sheet was developed to show the increases in flood damage over the last three decades, as well as project future flood damages along the Lamprey River. Data was shared with communities within the watershed.

∴ Lee is currently participating in a regional effort with UNH GRANIT to generate updated floodplain maps for 9 communities in Strafford County that were not part of the original coastal flood mapping project.

∴ The Town has completed various drainage and stormwater improvements. The following is a summarize list of other drainage and stormwater improvement projects the Town has completed over the past plan cycle:

- Lamprey Lane culvert replacements
  - Replaced two 24" steel pipe culverts that were rusted with two 24" plastic pipes
  - Replaced one 12" steel pipe culvert that was rusted with a 12" plastic pipe
- Thompson Mill Road culvert replacements
  - Replaced a 15" plastic pipe that had caved in with a 18"concrete pipe
  - Replaced a 12" steel pipe with a 12" concrete pipe
  - Replaced a 30" steel pipe with a 30" concrete pipe
- Tuttle Road Project – The town has hired Right Angle Engineering to work on the Tuttle Road wetland permitting for flooding and embankment issues at this site. To date the town has applied to and been denied the following FEMA grants:
  - 2014 – HMA grant for Tuttle Rd embankment project; projected cost $199,500
  - 2015 – HMGP grant for both Tuttle Rd embankment and Beaver Brook Culvert replacement; projected cost $398,708
  - 2017 – HMGP grant for Tuttle Rd embankment/culvert replacement; projected cost $508,875; this was not denied, but rather not prioritized based up limited funding
  - 2018 – LOI sent for HMGP grant; will be considered for funding under DR4370/DR4371

Chapter 6: Hazards & Mitigation Strategies

Overview

This section describes the location and extent of hazards that could impact the Town of Lee, 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 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 Lee will experience a hazardous event within the next 25 years. Score = 3
- ∴ Moderate: There is moderate likelihood (34-66% chance) that Lee will experience a hazardous event within the next 25 years. Score = 2
- ∴ Low: There is little likelihood (0-33% chance) that Lee 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 the Planning Committee 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 Lee. Score = 5 or greater
- ∴ Moderate: There is moderate risk of this hazard in Lee. Score = 3-4
- ∴ Low: There is little risk of this hazard in Lee. Score = 0-3

Hazards Ratings in Lee, NH

The Committee determined that the hazards are distributed as follows:

- ∴ 5 hazards rated as having a High overall risk in Lee: drought, public health threats, earthquake and landslide, wildfire, and flooding from dam failure
- ∴ 3 hazards rated as having a Moderate overall risk in Lee: hurricane and tropical storms, tornado and downburst, and extreme temperatures
- ∴ 4 hazards rated as having a Low overall risk in Lee: hazardous materials, severe winter storms, flooding (riverine/extreme rain event), and severe thunderstorms

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 Lee

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 = 0-1* *Moderate = 2-4* *High = 5 or greater* *(Severity x probability)*
Hazard Event						
Drought	0	0	0	0.0	3	0.0
Public Health Threats	1	0	0	0.3	1	0.3
Earthquake & Landslide	0	1	1	0.7	1	0.7
Wildfire	1	1	1	1.0	1	1.0
Flooding (Dam Failure)	0	3	0	1.0	1	1.0
Hurricane & Tropical Storms	1	2	1	1.3	2	2.7
Tornado & Downburst	1	2	1	1.3	2	2.7
Extreme Temperatures	2	1	1	1.3	3	4.0
Hazardous Materials	1	2	2	1.7	3	5.0
Severe Winter Storms	1	2	2	1.7	3	5.0
Flooding (Riverine/Extreme Rain Event)	1	3	2	2.0	3	6.0
Severe Thunderstorms	1	3	3	2.3	3	7.0

Declared Disasters and Emergency Declarations

Table 13: Presidentially Declared Disasters (DR) 1990-October 2018 impacting the Town Lee

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.
October 29, 1996	Severe Storms & Flooding	Oct 20-23, 1996	FEMA 1144-DR	PA	$2,341,273	Heavy rains. Severe storm, flooding.
January 15, 1998	Ice Storm	January 7-35, 1998	FEMA 1199-DR	PA/IA	$12,446,202	Major tree damage, electric power interrupted for a number of 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, dams breaching, evacuations at Wellington,, Wadleigh Falls, and Ferndale Acres campgrounds, High and Tuttle Roads, West Mill Pond.
April 27, 2007	Severe Storm & Flooding	April 15-23, 2007	FEMA 1695-DR	PA/IA	$26,826,780	Not as much damage as the 2006 storm; High Road bridge approached needed to be replaced; No evacuations; Tuttle Bridge was damaged.
August 11, 2008	Severe Storms, Tornado, & Flooding	July 24, 2008	FEMA 1782-DR	PA	$3,673,097	No significant damage or major impacts.
January 2, 2009	Severe Winter Storm	December 11-23, 2008	FEMA 1812-DR	DFA/PA	$14,898,663	Very cold; power outages ranging from 5 to 10 days in some places; structural damages to Pine Knoll residence.
March 29, 2010	Severe Winter Storm	February 23-March 3, 2010	FEMA 1892-DR	PA	$6,841,093	Trees down; power outages ranging from 5 to 10 days in some areas of town.

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	No major impacts; rain and wind.
March 19, 2013	Severe Snow and Blizzard	February 9-11, 2013	FEMA 4105-DR	PA	$6,153,471	Emergency protective measures; snow removal assistance; school closures, and cost-sharing basis for emergency work.
March 25, 2015	Severe Snow & Snowstorm	January 26-29, 2015	FEMA 4209-DR	PA	$4,939,214	Emergency protective measures; snow removal assistance; school closures, and cost-sharing basis for emergency work.
August 9, 2017	Severe Storms and Flooding	July 1-2, 2017	FEMA 4329-DR	ND	$1,852,059.28	Strafford County was not included in the designated counties. No major impacts in Lee.
January 2, 2018	Severe Storms and Flooding	October 29 - Nov 1, 2017	FEMA 4355-DR	ND	$1,987,507.41	Strafford County was not included in the designated counties. No major impacts in Lee.
June 8, 2018	Severe Storms and Flooding	March 2-8, 2018	FEMA 4370-DR	ND	N/A	Strafford County was not included in the designated counties. No major impacts in Lee.
June 8, 2018	Severe Snow & Snowstorm	March 13-14, 2018	FEMA 4371-DR	PA	$820,824.38	Emergency protective measures; snow removal assistance; school closures, and cost-sharing basis for emergency work.
14 declarations totaling approximately $120,449,463						
Program Key: PA: Public Assistance, IA: Individual Assistance, DFA: Direct Federal Assistance, ND: No Designation						

Table 14: Emergency Declaration (EM) 1990-October 2018 impacting the Town Lee

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	Snow removal
November 1, 2011	Severe Winter Storm	October 29-30, 2011	FEMA 3344-EM	PA	Data not available	Known as the "Halloween Snowstorm." Significant amount of large oak trees came down due to the leaves still on the trees; power outages ranging from 4 to 5 days
October 30, 2012	Hurricane Sandy	October 26-31, 2012	FEMA 3360-EM	PA	$643,660	Minor impacts, including periods of heavy rain and short-term power outages.
7 emergency declarations totaling approximately $11,709,470						
Program Key: PA: Public Assistance, DFA: Direct Federal Assistance						

Flooding

Overview			
Hazard Type	Flooding		
Location/Extent	Oyster, Lamprey, Little, and North Rivers; Beaver and Rollins Brooks; and areas around Wheelwright Pond.		
Vulnerability	Riverine/Extreme Rain Event	Dam Failure	
Severity	2.0	1.0	
Probability	3	1	
Overall Threat	6.0 (High)	1.0 (Low)	

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.[8] 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 Lee include:

Special Flood Hazard Areas are areas with a one percent annual chance flood hazard in a community. The one percent annual chance flood is also referred to as the base flood or 100-year flood.

[Source: Office of Strategic Initiatives (OSI)

- ∴ 1% annual chance 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 Lee
- ∴ River ice jams, which could occur, although the Army Corps of Engineers Ice Jam Database contains no record of ice jams in Lee.
- ∴ Dam breach or failure.

[8] 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

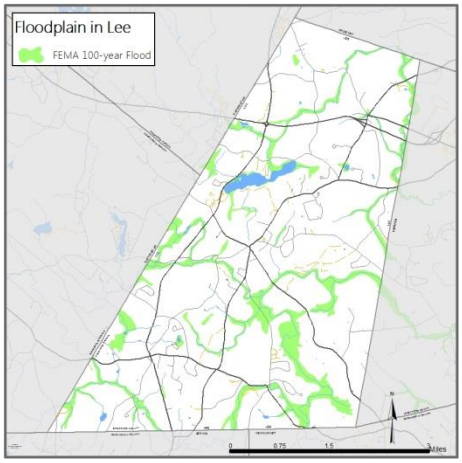
Flooding can occur in any area of the Town but is more likely to occur within the 1% annual chance floodplain, downstream of dams, along river and stream banks, near wetlands and road crossings, and other low-lying areas. Lee has approximately 12.1% (1,568.4 acres) of its area in the 1% annual chance 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 portions along Wheelwright Pond were removed the approximate acreage may be more accurately depicted as 11.3% (1,436.1 acres). Based on extent of the floodplain, the Town does have significant portions of land in the 1% annual chance floodplain along the Oyster, Lamprey, Little, and North Rivers; Beaver and Rollins Brooks; and areas around Wheelwright Pond.

Although flooding of the full extent of this floodplain by definition would require a 1% annual chance 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 1% annual chance storm could also be affected by smaller, more frequent flooding. It is likely that the 1% annual chance 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.

Past Events and Impacts

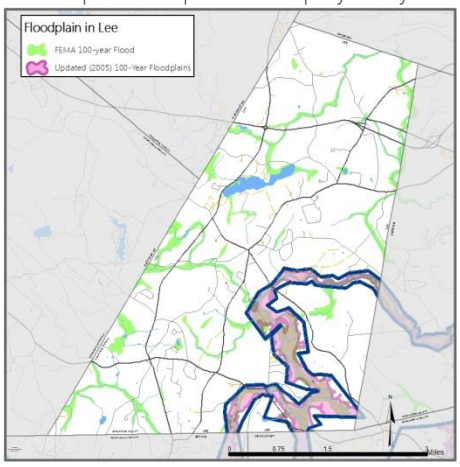
Two other consequential flooding events took place in 2006 and 2007, both of which were considered 1% annual chance events. During those events, there were several areas that experienced severe impacts, including: portions of Route 152 at the Newmarket town line (commonly known as the "s-curves"), Osprey Ln, Jan Ln, Tuttle Rd near 152, Wadleigh Falls Road (Rte. 152), West Mill Pond Rd, Harvey Mill Rd (Rte. 152 at the Nottingham town line), Kelsey Rd, and Gile Rd. The High Rd Bridge (over North River) overtopped and failed. The town requested FEMA funding to replace the bridge in 2012. An existing crossing that routinely floods is Route 152 by West Mill Pond Rd. This portion of the state-owned roadway is currently in the 10-tear transportation plan for design and full replacement. Lee provided mutual aid to Durham when the Wiswall Bridge failed during flooding along the Lamprey River.

Map 5: Floodplain Areas in Lee

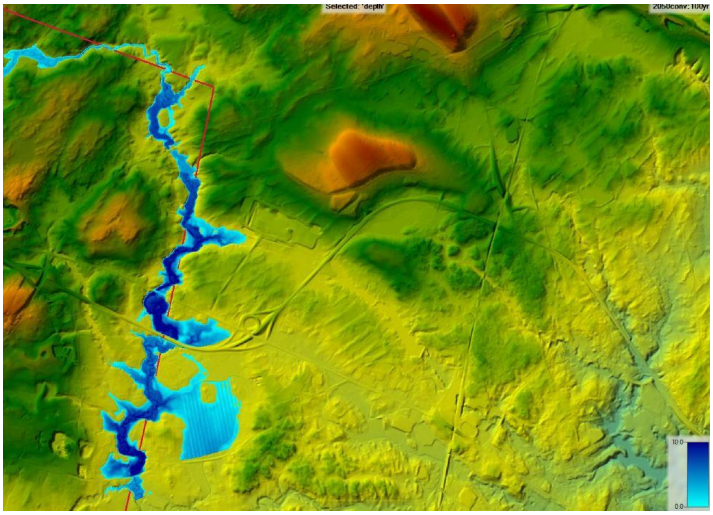


In 2014, an ad-hoc working group, unofficially named the Lamprey River Floodplain Mapping Committee, underwent a comprehensive planning process with SRPC to review additional floodplain data and were tasked with making recommendations to the Planning Board. In a letter that was submitted to the Planning Board on November 13, 2014, members of the mapping committee "encouraged the Planning Board to consider amending the Town's current Floodplain Ordinance to reflect all lands designated as special flood hazard areas to include both the FEMA flood insurance study as well as the updated 1% annual chance floodplain extent referenced in the 'Assessing Flood Risk in the Lamprey River Watershed' report".

Map 6: Floodplain & Lamprey Study

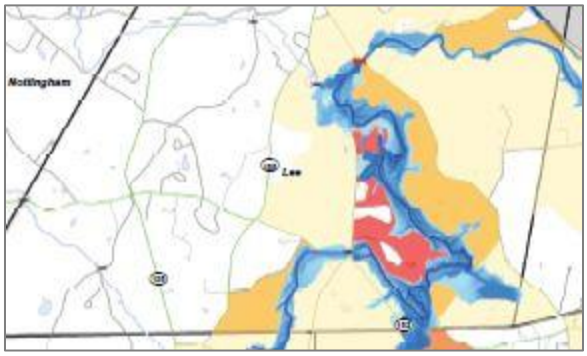


Lee Floodplain Study Preliminary Results (Geosyntec, 2018)



In 2018, at the request of the Lee Planning Board, SRPC, in partnership with Geosyntec and UNH, embarked on a project to prepare planning level inundation maps for the mainstem of the Lamprey, North, Little, and Oyster Rivers within the Town of Lee. Flood inundation maps included: the 24-hour, 1% annual chance flood, an existing land use condition map, and a 2050 build out condition map with projected 24-hour 100 year storm event derived from downscaled global climate model simulations. A second phase of this project will take place in early 2019 to incorporate the data from the new maps into the town's existing Floodplain Ordinance.

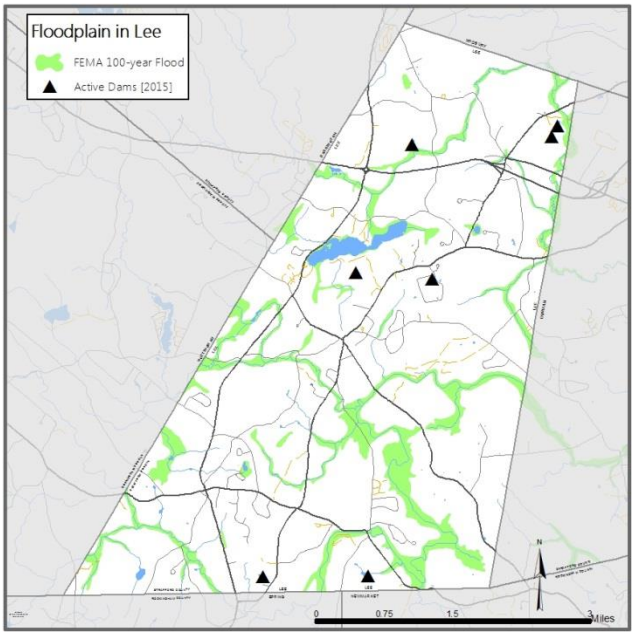
Hazus Results for Lee (UNH, 2018)



In 2018, UNH completed its research on economic damages from flooding along the Lamprey River. Economic damages were determined using the Federal Emergency Management Agency [FEMA] Hazus model, which estimates flood damage based on base-flood elevation and building type. A two-page fact sheet was developed to show the increases in flood damage over the last three decades, as well as project future flood damages along the Lamprey River. Data was shared with communities within the watershed.

Dam Failure

Map 7: Active Dams in Lee



Dam failure could potentially result in flooding in Lee. According to the NHDES 2015 database, there are a total of 7 active dams (there are an additional 15 dams that are classified as ruins, removed, breached, or exempt). Lee has no high hazard dams.

All of the dams have a non-menacing hazard classification, which means they have a relatively low hazard potential because of their size and location. Failure or misoperation of any number of these dams would not result in an economic loss to structures and property and no probable loss of lives. During the 2007 storm event the Nottingham Lake Dam failed. The dam, which is fed by Mendums Pond in Barrington, collapsed in the middle of the night and impacted a number of roads in Nottingham. Lee provided mutual aid to Nottingham. Emergency personnel evacuated residents on West Mill Pond Road and parts of

Tamarack Road due to flooding. Tuttle Road flooding was higher than normal at the Little River crossing. The dam was rebuilt in 2009 and has not had any other significant issues.

A more comprehensive list of dams, their associated classifications, and inspection schedules are located in Table 15.

Table 15: Active Dams in Lee

Dam Classification	Classification Definition	Number of Active Dams in Lee	Inspection Interval (Years)
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.	7	6

Potential Future Impacts on the Community

According to FEMA flood maps, areas along the Oyster, Lamprey, Little, and North Rivers; Beaver and Rollins Brooks; and areas around Wheelwright Pond are all susceptible to future flooding. Overall, flooding potential in Lee is high. Flood conditions will continue to affect the Town of Lee. Both seasonal flooding and flooding due to extreme weather events have the potential to occur during all seasons.

Estimated Potential Losses

Based on the high hazard ranking for riverine/extreme rain event and assessed value of residential, commercial, and utilities structures, there is approximately **$30,467,915** in estimated potential losses from flooding. Based on the low hazard ranking for dam failure and assessed value of residential, commercial, and utilities structures, there is approximately **$3,046,791** in estimated potential losses from flooding.

Hurricane and Tropical Storms

Overview	
Hazard Type	Hurricane and Tropical Storms
Location/Extent	Town-wide
Severity	1.3
Probability	2
Overall Threat	2.7 (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 (2018) tropical cyclones with maximum sustained winds of less than 39 mph are called tropical disturbances. Once the tropical cyclone reaches winds of at least 39 mph, they are typically called a tropical storm and assigned a formal name. If the winds reach 74 mph or greater, they are upgraded and called a hurricane. A major hurricane is considered a tropical cyclone with maximum sustained winds of >111 mph.

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.

Table 16: Saffir-Simpson Hurricane Wind Scale

Category	Sustained Winds	Types of Damage due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

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 Lee, most notably in 1938 and 1954 (Hurricane Carol).

The NOAA National Climatic Data Center's Storm Events database (NCDC 2018) does not list any Hurricanes as directly affecting Strafford County from January 1, 2008 to July 31, 2018; however, Strafford 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 Lee is considerably inland from the New Hampshire coast, wind speeds may be diminished from their coastal strength, and significant impact on the Town would be dependent on the exact track of these concentrated storms.

Lee 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. The 2018 hurricane season produced 15 (7 hurricanes and 8 tropical storms/depressions) named storms. Both hurricane Florence and Michael were category 4 storms and produced catastrophic damage in the Carolinas and the Florida Panhandle.

Estimated Loss Potential

Based on the moderate ranking and assessed value of residential, commercial, and utilities structures, there is approximately $15,233,957 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	1.3
Probability	2
Overall Threat	2.7 (Moderate)

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 2018) lists only seven tornadoes that have impacted Strafford County since 1950. One was an EF-0 event (65-85 mph); one was an EF1 event (73-112

mph); and five were EF2 events (111-135 mph). Over the course of the past six decades, there haven't been any fatalities, 0 injuries, but approximately $2.9 million in property damages associated with tornados. The majority of property damage was sustained during an event that took place in 1981. The most recent touchdown was in 2008.

In June 2018 there was a severe storm event that hit part of southeastern New Hampshire. Tornado warnings were issued in Durham and Lee. A partial funnel cloud appeared in Durham, but never touched down. High winds knocked down one tree on Tuttle Road. Lee provided mutual aid for traffic detours due to road closures. According to NHPR, the storm knocked out power for more than 63,000 residents throughout NH.

Table 17: Tornado Data for Strafford County

Date	Magnitude	Death	Injuries	Property Damages
06/09/1953	EF1	0	0	250
05/14/1963	EF2	0	0	25,000
05/03/1976	EF2	0	0	250,000
06/22/1981	EF2	0	0	2,500,000
08/02/1993	EF0	0	0	5,000
07/06/1999	EF2	0	0	0
07/24/2008	EF2	0	0	126,000
	TOTAL	0	0	$2,906,000

Between 1991 and 2010, the average annual number of tornadoes in New Hampshire was one.[9] 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.[10] Since the July 2008 tornado, the NCDC Storm Events database reports that eleven tornados have hit New Hampshire; however, none have hit Strafford County. The most recent event occurred in June 2018 in Bath/Lincoln in Grafton County.

[9] NOAA. U.S. Tornado Climatology (https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology)
[10] Homeland Security and Emergency Management. State Multi-Hazard Mitigation Plan Update 2018.

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:

- ∴ Franklin, NH – October 30, 2012: Several large trees came down, landing on two summer homes, completely demolishing one. No injuries were reported.
- ∴ Plaistow, NH – July 18, 2016: Hundreds of trees were brought down closing numerous roads, thousands without power, significant property damage.
- ∴ Barrington, NH – July 20, 2017: In the area of Route 125, dozens of trees blown down, thousands of people without power across multiple towns, multiple roads closed.

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 more densely populated areas.

Potential Future Impacts on Community

There have been 7 reported tornadoes over the course of 68 years in Strafford County; the average annual probability of recurrence, therefore, is 10.3% (7/68 x 100). The probability may be slightly higher if local reports of tornadoes were considered; however, this 10.3% probability is for all of Strafford County – not just Lee. The actual probability for Lee 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 (Strafford and New Durham) to the Town, which would suggest the average annual probably of recurrence to be less than 3%. The tornado recurrence probability for Lee, therefore, is relatively low.

Estimated Loss Potential

Based on the moderate hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $15,233,957 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	1.7
Probability	3
Overall Threat	5.0 (High)

Description of the Hazard

Winter snow and ice events are common in New Hampshire. The National Climatic Data Center (NCDC 2018) Storm Events database reports 32 severe winter weather events, which include: 2 blizzards, 28 heavy snow events, and 2 winter storms (nor'easters) that have impacted Strafford County from January, 1 2013 to July 31, 2018.

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.

The State's Multi-Hazard Mitigation Plan Update 2018 identifies four types of winter storms:

- ∴ *Heavy snowstorms*: A storm that deposits 4" or more in depth of snow in 12 hours or less; or 6" or more in depth in 24 hours or less.
- ∴ *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.)

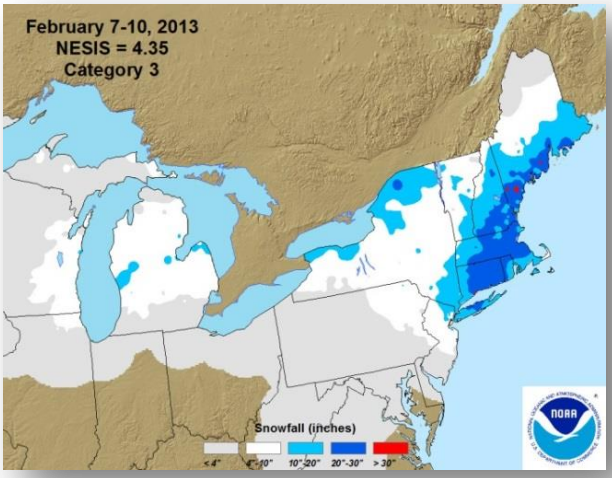
Past Events and Impacts

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 long-term power outages (upwards of 7+ days), 1 fatality associated with carbon monoxide poisoning, school closures, and challenges with traffic at busy intersections. Local impacts included long-term power outages, school closures, and challenges with traffic at busy intersections.

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 long-term power outages and school closures. A tree fell on a house on Tuttle Road. The public safety complex was opened as the EOC for a few days. One residential home on Old Mill Road was damaged from soot build-up from running kerosene heaters.

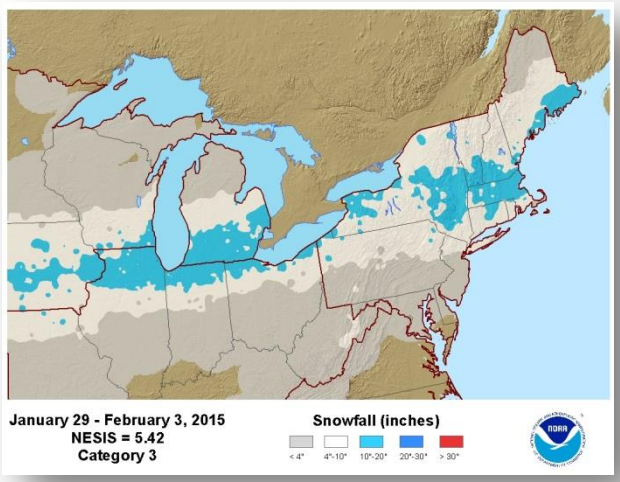
The Blizzard of 2013 – NEMO (February 8th-9th) was an area of low pressure developed rapidly off the Carolina coast late on the 7th and early on the 8th. The storm moved very slowly northeast during the 8th and 9th as it continued to intensify. By the morning of the 10th, the storm was located just to 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 Lee 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.[11] Local impacts included snow removal challenges, and some line of site issues due to high snow banks along roadways and intersections. The town submitted for FEMA reimbursement for plowing, salt/sand, and truck repair costs. Some of these storms resulted in the need to shovel the roofs of all the municipal buildings to clear the snow load and to ensure the buildings were not in danger of collapsing.

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.



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 Lee reported between 18 and 24 inches from January 25-January 28th, 2015[12]. Similar to the storm in 2013, this snow storm brought heavy bands of snow and wind, causing blizzard-like conditions. Local impacts included snow removal challenges, and some line of site issues due to high snow banks along roadways and intersections. The town submitted for FEMA reimbursement for plowing, salt/sand, and truck repair costs. Some of these storms resulted in the need to shovel the roofs of all the municipal buildings to clear the snow load and to ensure the buildings were not in danger of collapsing.

The March 2018 storm event brought roughly 25" of snow. Local impacts included snow removal challenges, and some line of site issues due to high snow banks along roadways and intersections. The town submitted for FEMA reimbursement for plowing, salt/sand, and truck repair costs.

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. Various storm events have knocked out power for several days. In Lee, 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

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

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

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. The Thanksgiving Day snow event in late November (2017) 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 on local and state roadways. The public safety complex was opened as the EOC for nearly a week.

Potential Future Impacts on Community

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

Estimated Loss Potential

Based on the high hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $30,467,915 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	2.3
Probability	3
Overall Threat	7.0 (High)

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 Lee 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.

Table 18: 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

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 301 fatalities (236 were men; 65 were women) in the United States from 2008 to 2018 – none were in New Hampshire. In 2018, there were 20 fatalities (16 were men; 4 were women).

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.

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 13 reported events of severe thunderstorm winds in Strafford County from January, 1 2013 to July 31, 2018. One event took place in in Lee. On July 23, 2016 a severe thunderstorm downed a tree on power lines and snapped a power pole in Lee.

There were no reported lightning strike related deaths in New Hampshire. The NCDC database lists zero reported lightning events in Strafford Country from January, 1 2013 to July 31, 2018. The planning committee referenced two lightning strikes. The first was located at a residential home on Little Hook Road. Lightning struck a 10x10 shed, and traveled along a fence to ignite a barn. It knocked out power for the entire street and fried all the electrical appliances in the house. The second strike was at the public safety complex. A late summer thunderstorm in 2018 led to a lightning strike that hit the garage door frame of the public safety complex and blew out the cameras and monitors.

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 5 reported hailstorms in Strafford County from January, 1 2013 to July 31, 2018. None of these events took place in Lee.

Potential Future Impacts on Community

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

Estimated Loss Potential

Based on the high hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $30,467,915 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. Lee is a rural Town, and much of the land cover of the Town is unfragmented woodland and grassland. Exposure to natural factors, such as lightning, that start wildfires is consequently high.

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.[13]

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;
Class G - 5,000 acres or more.

Past Impacts and Events

There was an increased incidence of large wildland fire activity in the late 1940s and early 1950s that is thought to be associated, in part, with debris from the Hurricane of 1938. Significant woody "fuel" was deposited in the forests during that event. Large fires burned in rural, suburban, and urban areas, including one fire of over 1,500 acres in Salem and Atkinson, and numerous large fires in Farmington and Rochester which spread in to southern Maine.[14] Here, 70+ 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 Strafford County from January, 1 2013 to July 31, 2018. There have been no major local impacts; there was one small human-caused brush fire in 2016 that consumed less than 2 acres.

[13] How to Generate and Interpret Fire Characteristics Charts for Surface & Crown Fire Behavior. https://www.fs.fed.us/rm/pubs/rmrs_gtr253.pdf
[14] Homeland Security and Emergency Management. State Multi-Hazard Mitigation Plan Update 2018.

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 $3,046,791 in estimated potential losses from impacts associated from wildfire.

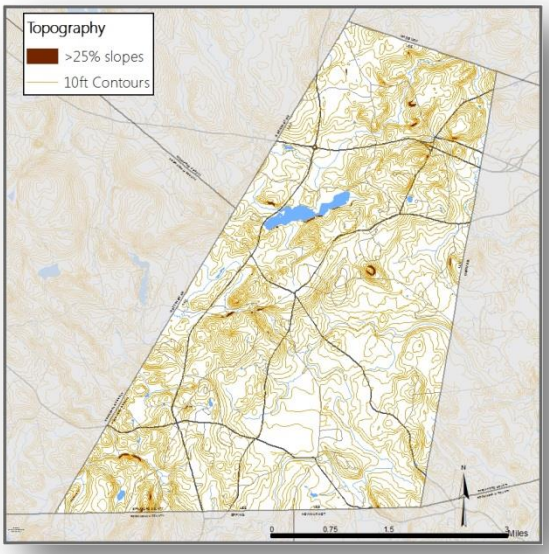
Earthquakes & Landslide

Overview	
Hazard Type	Earthquake & Landslide
Location/Extent	Town-wide and areas with steep slopes (>25%)
Severity	0.7
Probability	1
Overall Threat	0.7 (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.[15] Earthquakes in the Northeast are not associated with specific know faults.

Map 8: Steep Slopes in Lee (Source: SRPC, 2018)



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.[16]

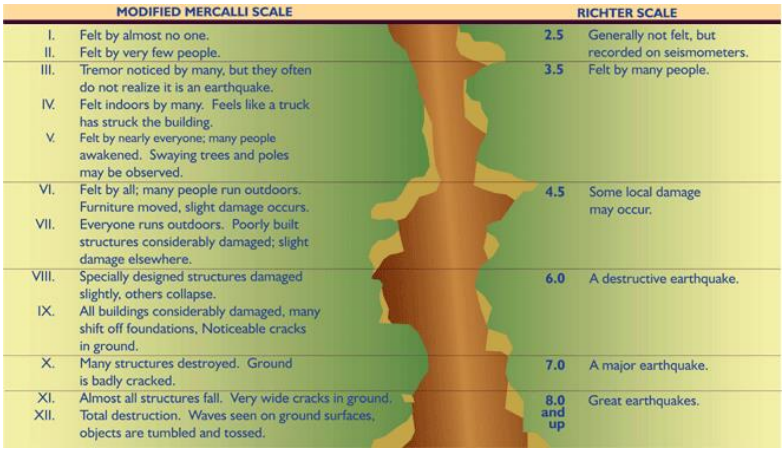
[15] The Northeast States Emergency Consortium Earthquake Hazards. http://nesec.org/earthquakes-hazards/.
[16] http://nesec.org/earthquakes-hazards/

Landslides could occur in Lee 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. In Lee, the topology is relatively flat and there are not a significant amount of steep slopes in the town. Given seismic or precipitation events that could initiate landslide, landslide hazard is likely quite high in steep slope areas; however, there are only approximately 26 acres (<1%) of steep slopes greater than 25% in Lee.

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.[18]



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.	Almost all structures fall. Very wide cracks in ground.	8.0 and up	Great earthquakes.
XII.	Total destruction. Waves seen on ground surfaces, objects are tumbled and tossed.		

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 2016. Approximately 40-50 earthquakes are detected in the Northeast annually.[19] 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 local impacts of earthquakes. The Lee Planning Committee could not recall or identify any instances of landslide activity.

Earthquakes are on average an annual occurrence but significant quakes have an annual probability of occurrence (based on the 1638 to 2016 period) of about 2.6%.

[17] USGS. Earthquake Hazard Program. http://earthquake.usgs.gov/learn/glossary/?term=Richter%20scale.
[18] USGS. Earthquake Hazard Program. http://pubs.usgs.gov/gip/earthq4/severitygip.html.
[19] http://nesec.org/earthquakes-hazards/

Table 19: 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 Lee. The USGS (1997) classifies landslide incidence regionally as very low (less than 1.5% of land area involved). The local probability in Lee will depend on specific soil/rock types and upon the probability of initiating events; however, it should be noted that there are very few areas in Lee with slopes greater than 25%.

Estimated Loss Potential

Based on the low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $3,046,791 in estimated potential losses from impacts associated from earthquakes and landslides.

Extreme Temperatures

Overview	
Hazard Type	Extreme Temperatures
Location/Extent	Town-wide
Severity	1.3
Probability	3
Overall Threat	4.0 (Moderate)

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

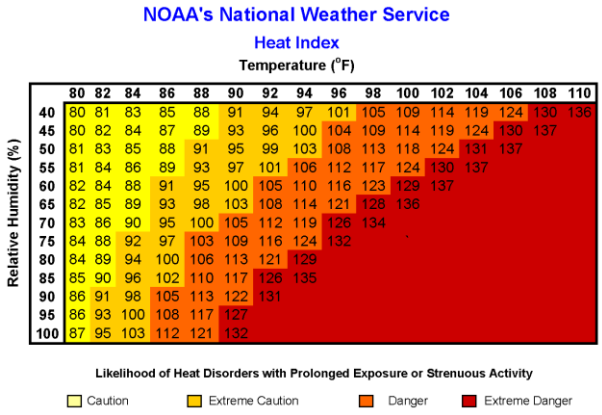
humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight 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."[20]

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.

Extent of the Hazard

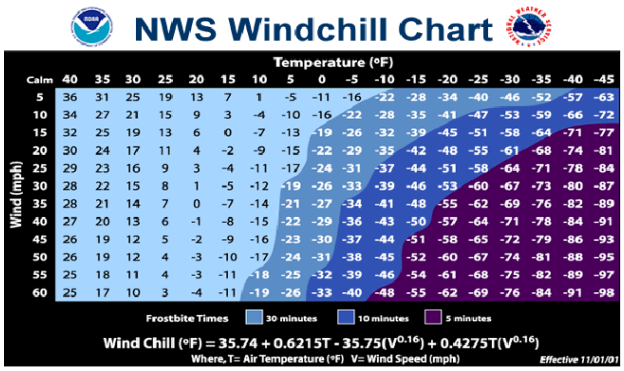
Extreme Heat

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)



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

[20] 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/

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.[21] 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 Lee included in the study). During this time the hottest day of the year averaged 95.0°F.[22] During prolonged heat waves, the public safety complex is opened as a cooling station. In recent years, there has not been much attendance from residents.

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 Lee included in the study).[23] 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. In February 2018, during a particularly cold stretch, the public safety complex was opened as a warming station. This tends to happen a few times a year.

Potential Future Impacts on Community

Annual average temperatures may increase on average by 3-5°F by 2050 and 4-8°F by 2100[24]

Estimated Loss Potential

Based on the moderate hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately **$15,233,957** in estimated potential losses from impacts associated from extreme temperatures.

Drought

Overview	
Hazard Type	Drought
Location/Extent	Town-wide
Severity	0.0
Probability	3
Overall Threat	0.0 (Low)

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

[21] Wake, C. et al. "Climate Change in Southern New Hampshire; Past, Present, and Future." Climate Solutions of New England. 2014
[22] Ibid
[23] Ibid
[24]

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, Lee was a little over 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.

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 20. 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.[25]

Table 20: 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	High Pollen Count, High Fire Danger, and high prices for produce, wells dried up, rivers, ponds and reservoirs became mud holes. Foggy mornings disappeared. Water Emergencies and Restrictions. Wild birds had trouble getting fish.
2001 – 2002	Statewide	Severe	Numerous forest fires. Water systems and private wells were adversely impacted by the drought. Impacts to agricultural crops also occurred.
2016-2017	Statewide	Extreme	Water systems and private wells were adversely impacted by the drought. Impacts to agricultural crops also occurred. Hundreds of private wells failed.

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

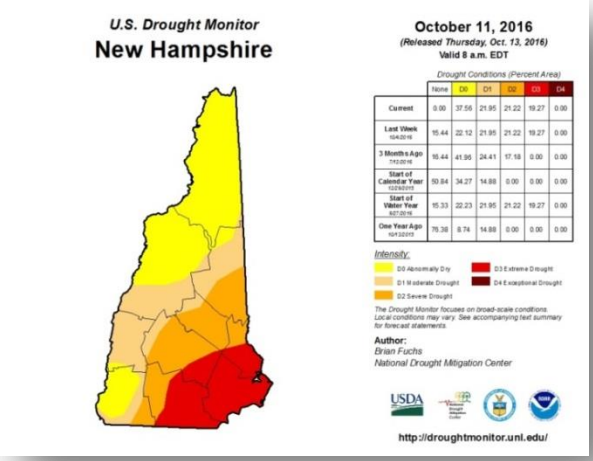
[25] NHDES. Drought Management Program. Publications. *NH Drought Historical Events.* http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf

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 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 municipalities had reported implementing voluntary or mandatory outdoor use bans in the state. During the most recent drought, Lee encouraged residents to reduce their water use and to volunteer to implement water conservation efforts. There were some shallow wells that went dry. One community well, owned and operated by Pennichuck Water Works, restricted outdoor water use.



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 low hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $3,046,791 in estimated potential losses from drought.

Public Health Threats

Overview	
Hazard Type	Public Health Threats
Location/Extent	Town-wide
Severity	0.3
Probability	1
Overall Threat	0.3 (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."[26] 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 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[27]:

- 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).[28] For the purposes of this Plan, widespread drug and substance abuse may also be considered epidemics.

[26] Slate; http://www.slate.com/id/2092969/
[27] Homeland Security and Emergency Management. State Multi-Hazard Mitigation Plan Update 2018.
[28] Ibid

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).[29]

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.[30] 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. In 2016, there were 437 opioid-related overdose deaths – a rate of 35.8 deaths per 100,000 persons – nearly 3 times higher than the national rate of 13.3 deaths per 100,000[31]. According to the Lee police department, since 2016 there have been six overdoses and one death. These numbers may be low as they were initially reported as medical aids prior to the police department adding a code for overdose. Another set of numbers for 2018 state there have been up to 17 overdoses, with five from heroin.

Leading causes have been from heroin and/or fentanyl. 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. Narcan has been made available through the town's affiliation

[29] Ibid

[30] EPA. Arsenic in Drinking Water. (http://water.epa.gov/lawsregs/rulesregs/sdwa/arsenic/index.cfm)

[31] National Institute on Drug Abuse. Opioid-Related Overdose Deaths. https://www.drugabuse.gov/drugs-abuse/opioids/opioid-summaries-by-state/new-hampshire-opioid-summary

with Wentworth Douglas Hospital, and is stored in all the town's fire trucks. The hospital also offers in-house training to all emergency responders.

Lyme Disease

The number of New Hampshire residents diagnosed with Lyme disease has increased over the past 10 years. In 2016, the rate of cases reported in Strafford County was 177 cases and a rate of 138.9 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.[32] According to the NH Division of Public Health Services, Strafford, Rockingham, and Hillsborough Counties have some of the highest reported cases of Lyme disease in New Hampshire. Between 2011 and 2016, Strafford has experienced roughly an average of 175 cases each year.

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 Lee, >49.9% 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.[33] There is a radon detection unit installed at the library and town hall annex

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.[34] Levels of arsenic are significantly high in Lee. All municipal buildings use bottled water due to unsafe levels of arsenic. The town has completed various well-testing efforts over the past several years.

[32] HealthyPeople.gov. About Healthy People. Accessed April 2014. Available at: http://healthypeople.gov/2020/about/default.aspx
[33] NHDES https://www.des.nh.gov/organization/divisions/air/pehb/ehs/radon/documents/radon_by_town.pdf
[34] New Hampshire Environmental Services. Drinking Water and Groundwater Bureau. Arsenic in Drinking Water Fact Sheet.

Potential Future Impacts on Community

With the occurrence of worldwide pandemics such as SARS, H1N1 and Avian Flu, Lee 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.[35] 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 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.

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 **$3,046,791** 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	3
Overall Threat	5.0 (High)

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.

[35] Homeland Security and Emergency Management. State Multi-Hazard Mitigation Plan Update 2018.

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 along Route 4 and Route 125, as these are major transportation corridors that often have trucks carrying bio-diesel fuel and other harmful chemicals through Town.

Past Impacts and Events

A half dozen or so properties around the Lee traffic circle have groundwater wells contaminated by MtBE traced to leaking underground gas tanks from the Mobil station. The state Department of Environmental Services is working with Durham, Lee and the University of New Hampshire to extend water lines to the affected properties, which currently use treatment systems to remove the additive.

Potential Future Impacts on Community

Any accident involving trucks carrying hazardous waste along Routes 125 and 4 are potential future threats.

Estimated Potential Losses

Based on the high hazard ranking and assessed value of residential, commercial, and utilities structures, there is approximately $30,467,915 in estimated potential losses from hazardous materials impacts.

Hazards Not Included in this Plan

The State of New Hampshire identifies avalanches, coastal flooding, and solar storms and space weather as hazards in the State Multi-Hazard Mitigation Plan Update of 2018. Avalanches, coastal flooding, and solar storms and space weather are not included in this Plan for the Town of Lee. 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. Coastal flooding was not included as Lee is not a coastal community and is not subject to coastal storm surge. Lastly, the planning committee did not have enough knowledge to determine if solar storms and space weather deserved to be recognized in this plan update as a hazard. 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 2019
1) Purchase and install a repeater at the Public Safety Building to allow for a town channel.	Deferred Action. To date, there has been no repeater installed on the Public Safety Building; however, a town channel has been established with a frequency that is used by EOC and highway department radios. Installing a repeater remains an obstacle due to operability issues. Recognized as a county-wide challenge, a steering committee is needed to investigate the economic feasibility of engineering and eventual implementation of county-wide infrastructure upgrades.
2) Develop strategies for the Mast Way Elementary School to become an emergency shelter as defined by Red Cross standards; will need a generator and showers installed.	Removed Action. The primary regional shelter is the Oyster River Middle School. The backup shelter is the EOC. Both facilities meet Red Cross standards, and the Mast Way School will no longer be considered for a shelter. It is important to note that the School did purchase and install a generator.
3) Research satellite service capabilities for the Public Safety Building (EOC).	Removed Action. Satellite service capabilities are no longer viewed as an action that is economically justified. The town should explore other options.
4) Complete a feasibility study on the value of creating local evacuation routes. The Seabrook Evacuation Plan will be referenced and used as a regional resource.[36]	Deferred Action. The town recognizes that any evacuation route planning at the local level should be conducted in coordination with other communities and agencies at the region level. A regional effort will require additional resources and participation.
5) Update all street annotation on current maps to reflect the E-911 changes.	Completed Action. Strafford Regional Planning Commission (SRPC), in partnership with the town, completed this update. The town has also adopted an E-911 ordinance and is in the midst of fulfilling any outstanding compliance issues.
6) The Conservation Commission and the Planning Department will review the new Lamprey River Watershed study and use the data as a planning tool when discussing plans for new developments.	Completed Action. In 2014, an ad-hoc working group, unofficially named the Lamprey River Floodplain Mapping Committee, underwent a comprehensive planning process with SRPC to review additional floodplain data and made recommendations to the Planning Board. A follow initiative is currently underway to assess additional rivers in town.

[36] It was discussed that designating region-wide evacuation routes may be the better option, but coordination and participation of all towns would be a challenge.

Proposed Mitigation Action	Update 2019
7) Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	Deferred Action. This has not been completed due to lack of resources. The planning committee would like to carry this action forward for implementation.
8) Rehabilitate existing fire ponds that are non-functioning due to their maintenance not being kept up.	Completed Action. The James Farm Road fire pond has been repaired. Ongoing work is being completed on the Tamarack Road fire pond. The town's CIP has future plans for other fire pond rehabilitation as necessary.
9) Tuttle Road culvert and bridge replacement project to address flooding and bank erosion problem.	Deferred Action. The town has hired Right Angle Engineering to work on the Tuttle Road wetland permitting for flooding and embankment issues at this site. To date the town has applied to and been denied on two occasions in 2014 and 2015. IN 2017, the town's application was not prioritized based up limited funding. In 2018, a letter of intent was sent to HSEM and will be considered for funding under DR4370/DR4371. Once the plan is updated, the town will continue to explore available funding sources.
10) Build off the existing Water Resource Plan (2010) prepared by the NH Rural Fire Protection Initiative to continue the maintenance and installation of new dry hydrants and cisterns.	Completed Action. The town has procedures in place to ensure the ongoing maintenance and installation of new dry hydrants is completed on an as needed basis.
11) Rehabilitate the Noble Farm Dam. It has sustained minor damage over the years and is in need of repair and maintenance.	Removed Action. The town no longer owns this dam. It was sold to a private developer. The future of repair and maintenance now reside with the new owner. The dam has a classification of non-menacing structure, so there is a low probability of property damage or loss of life.

Status Update:

Completed Action – This program was implemented as a 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	2019 Update
Building Codes	Establishes regulations for the design and installation of building systems	Excellent	The town is currently using the 2009 IBC for commercial buildings, and the IRC for residential. Lee 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 2018 codes.
Local Emergency Operations Plan (LEOP)	Defined notification procedures and actions that should be taken in different emergency situations.	Excellent	The LEOP was last fully updated in 2014 with a grant from HSEM to fund an outside consultant. The next update is scheduled for 2019.
Stormwater Infrastructure Maintenance	Responsible for catch basins, culverts cleaning, ditch maintenance, structure upkeep and maintenance	Good	Lee has a catch basin cleaning schedule of once a year. The town as completed culvert replacements on Lamprey Lane and Thompson Mill Road. The town's CIP identifies future culvert replacement and repairs, as well as other stormwater infrastructure needs.
Tree Maintenance	Utility companies (Eversource and NH Electric Cooperative) and the Town have tree maintenance programs to clear trees and limbs from power lines and roadways.	Excellent	Over the last several years, utility companies have completed an aggressive town-wide cutting schedule, as well as spraying for invasive species.
Evacuation and Notification	Evacuation and notification procedures are defined in Lee's LEOP.	Excellent	ECRIER system, E-alerts, various Facebook pages, and an Emergency Management page on the town's website. The police department operates a phone app that allows residents to report crimes and receives notifications directly from the department. More recently, the police department has purchased an electronic sign that displays important notifications. During a table-top exercise the town identified the need to purchase two additional electronic message boards. One permanent sign at the public safety complex and another portable sign.

Existing Program	Description	Effectiveness	2019 Update
Emergency Backup Power	The public safety complex (100kW), Mast Way School, Wentworth Douglass Urgent Care, and Kirkwood Corners all have generators. The town hall, annex, and library are equipped with a portable generator.	Good	The highway department staff set up the portable generator, which can take up to several hours. There has been discussion of moving the 100kW generator from the public safety building to the transfer station, and to purchase a 50kW generator for the public safety building.
Fire Department Mutual Aid Program	Seacoast Chief Fire Officers Mutual Aid District.	Excellent	Lee's fire department participates with other member departments for improved fire service in the region. Personnel attend all meetings to discuss potential grants, training, and matters of mutual interest.
Police Department Mutual Aid Program	Strafford County Chiefs (Mutual Aid)	Excellent	Lee's police department participates with other member departments for improved police service in the region. Personnel attend all meetings to discuss potential grants, training, and matters of mutual interest.
Public Works Mutual Aid Program	The Mutual Aid Program for Public Works is the first statewide program in the U.S. specifically for Mutual Aid between Public Works Departments	Excellent	Lee continues to participate in a network of municipalities that assist one another during emergencies through partnering agreements and a protocol for requesting and receiving aid. The public works department shares a number of resources including air compressors; chain saws; dump truck sander, plow, and wing; brush chipper, and a steer loader backhoe among others.
Strafford County Health and Safety Council	Council that deals with countywide health & safety issues.	Excellent	Lee continues to participate in this effort with a focus on public health, chronic disease prevention, and public health emergency planning. Over the last several years, participation has been less active.
Hazard Materials Response Team	Mutual response system with Seacoast START team for action.	Excellent	Lee recognizes that additional grant funding is needed for ongoing training and equipment purchases.
Floodplain Management	Local ordinance to regulate development in the floodplain, and other activities to reduce risk.	Excellent	The Town has a zoning ordinance that applies requirements for development within the floodplain. The Planning Board is also in the process of reviewing revised floodplain maps that will be considered into the town's existing floodplain ordinance.

Existing Program	Description	Effectiveness	2019 Update
Master Plan	A guiding document used to manage Lee's growth and development through local land use regulations.	Excellent	In 2016, the Town completed a comprehensive master plan update. The Planning Board will continue to review and revise chapters on an as needed basis. In 2017, the town adopted a new economic development chapter.
Capital Improvements Program (CIP)	A program that helps to address improvement projects over a period of time.	Good	Each year, the planning board adopts a new five-year plan. The 2018-2023 CIP was presented to the planning board on November 8th and a subsequent presentation to the board of selectmen will follow.

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

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 Board of Selectmen 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 eight new strategies and is carrying over four additional actions from the previous (2013) iteration to implement during the life of this 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. All hazards identified in this Plan were considered; however, due to the low probability of some, and frequency of others – not every hazard was given an associated action. For example, a strong tornado may result in large amounts of damage but has a very small probability of occurring. Another example is severe thunderstorms and lightning. These storms happen multiple times each summer with varying degrees of damage. At the time of this plan update, the Planning Committee agreed that other hazards were more important to address and allocate limited resources to.

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
Construct a new town hall and renovate the existing town hall to address code compliance issues. The new town hall will serve as the town's back-up EOC and provide adequate space to conduct day-to-day operations.	1	3	3	1	3	1	1	13
	It is unknown as to whether residents will vote to support this effort			It is unknown as to whether residents will vote to support this effort		Large cost associated with this project	State permits and land alterations in surrounding areas	
Evaluate options to address degrading conditions of the Cartland Road bridge over Little River. This bridge is a half metal arch with concrete sides that are deteriorating due to scour. Failure at this crossing would increase emergency response times.	2	3	3	2	3	1	2	16
	There may be issues with surrounding neighbors			The design of the bridge would need to match rural character of town		Large cost associated with this project	State permits (wetlands and shoreline); area is within intake to UNH watershed	
Implement a neighborhood watch program to teach citizens how to identify and report suspicious activity. This program will also provide the opportunity to make neighborhoods safer and improve quality of life.	3	3	3	3	3	2	3	20
						Low cost of time and materials		
Provide education and awareness on generator safety before and after large storm events in order to reduce incidents of carbon monoxide poisoning, electrocution, and fire.	2	3	3	3	3	3	2	19
	There may be those disinterested in learning more about generators						More generators could lead to increases in noise and smell	

New Mitigation Project	S	T	A	P	L	E	E	Total
Incorporate data from the new planning level inundation maps for the mainstem of the Lamprey, North, Little, and Oyster Rivers into the town's existing Floodplain Ordinance.	3	3	2	2	2	3	3	18
			Issues with additional enforcement	There may not be public support for regulation changes	Small chance of legal challenges			
Replace existing, cable-rail guard rails along Garrity Road to improve safety measures for vehicular traffic – especially during storm events. Cable railings are an older technology that are no longer being used and should be phased out.	3	3	3	3	3	1	3	19
					May be legal challenges if steps are not taken	High installation cost & price increases in steel		
Replace the 5 and 6 foot elliptical culverts on Packers Falls Rd and Stepping Stones Rd. Both of these are prone to flooding in 100 year events. There are several smaller culverts to be replaced in the near future are on Tamarack Rd and Wheelwright Drive (rotted steel culverts).	3	3	3	3	3	1	2	18
						High cost; need grant assistance	State permits (wetlands and shoreline);	
Replace several smaller culverts (rotted steel culverts) in the near future are on Tamarack Rd and Wheelwright Drive.	3	3	3	3	3	1	2	18
						High cost; need grant assistance	State permits (wetlands and shoreline);	
*Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	3	3	3	3	3	3	3	21
*Tuttle Road culvert and bridge replacement project to address flooding and bank erosion problem.	3	3	3	3	3	1	2	18
						High cost; need grant assistance	State permits (wetlands and shoreline);	

New Mitigation Project	S	T	A	P	L	E	E	Total
*Complete a feasibility study on the value of creating local evacuation routes. The Seabrook Evacuation Plan will be referenced and used as a regional resource.	3	2	3	3	2	2	3	18
		Coordinate with other regional evacuation plans			Signage may be difficult. Will have to work w/ NHDOT	Moderate cost and capacity needed		
*Purchase and install a repeater at the Public Safety Building to allow for a town channel.	3	3	3	3	3	2	3	20
						Moderate cost		

*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* *6 months - 1 year* *1 - 2 years* *2 - 5 years*
Construct a new town hall and renovate the existing town hall to address code compliance issues. The new town hall will serve as the town's back-up EOC and provide adequate space to conduct day-to-day operations.	Multi-Hazard	Town Hall	Structure and Infrastructure Project	Board of Selectmen	Town funding	High >$10,000	2 – 5 years
Evaluate options to address degrading conditions of the Cartland Road bridge over Little River. This bridge is a half metal arch with concrete sides that are deteriorating due to scour. Failure at this crossing would increase emergency response times.	Flooding	Cartland Road	Local Planning & Regulations	Highway Department	Town funding; NH bridge aid; other grants	High >$10,000	2 – 5 years
Implement a neighborhood watch program to teach citizens how to identify and report suspicious activity. This program will also provide the opportunity to make neighborhoods safer and improve quality of life.	Public Health	Select Locations	Education & Awareness Program	Police Department	Town funding	Medium $5,000-$10,000	1 – 2 years
Provide education and awareness on generator safety before and after large storm events in order to reduce incidents of carbon monoxide poisoning, electrocution, and fire.	Hurricanes, Tropical Storms, and Winter Storms	Town-wide	Education & Awareness Program	Planning Department	Town funding	Low <$5,000	1 – 2 years

Incorporate data from the new planning level inundation maps for the mainstem of the Lamprey, North, Little, and Oyster Rivers into the town's existing Floodplain Ordinance.	Flooding & Dam Failure	Floodplain Areas	Local Planning & Regulations	Planning Department	Town funding	Low <$5,000	6 months – 1 year
Replace existing, cable-rail guard rails along Garrity Road to improve safety measures for vehicular traffic – especially during storm events. Cable railings are an older technology that are no longer being used and should be phased out.	Winter Storms	Garrity Road	Structure and Infrastructure Project	Highway Department	Town funding	High >$10,000	2 – 5 years
Replace the 5 and 6 foot elliptical culverts on Packers Falls Rd and Stepping Stones Rd. Both of these are prone to flooding in 100 year events. There are several smaller culverts to be replaced in the near future are on Tamarack Rd and Wheelwright Drive (rotted steel culverts).	Flooding	Packers Falls Road & Stepping Stone Road	Structure and Infrastructure Project	Highway Department	Town funding	High >$10,000	1 – 2 years
Replace several smaller culverts (rotted steel culverts) in the near future are on Tamarack Rd and Wheelwright Drive.	Flooding	Tamarack Road	Structure and Infrastructure Project	Highway Department	Town funding	High >$10,000	1 – 2 years
*Obtain NFIP brochures from FEMA and have them available at the Town Offices for new developers and current homeowners.	Flooding	Town-wide	Education & Awareness Program	Planning Department	No cost	Low <$5,000	6 months – 1 year
*Tuttle Road culvert and bridge replacement project to address flooding and bank erosion problem.	Flooding	Tuttle Road	Structure and Infrastructure Project	Highway Department	Town funding; HSEM grants	High >$10,000	2 – 5 years

*Complete a feasibility study on the value of creating local evacuation routes. The Seabrook Evacuation Plan will be referenced and used as a regional resource.	Multi-Hazard	Town-wide	Local Planning & Regulations	Police and Fire Departments	Town funding; regional grants	High >$10,000	2 – 5 years
*Purchase and install a repeater at the Public Safety Building to allow for a town channel.	Multi-Hazard	Public Safety Building	Equipment Purchase	Police Department	Town fundng	Medium $5,000-$10,000	1 – 2 years
*Deferred or ongoing actions from the 2013 Plan. Previous implementation notes were reaffirmed. Ongoing actions will be completed throughout the life of the plan.							

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 Board of Selectmen. Chapter 9 contains a representation of a draft resolution for Lee to use once a conditional approval is received from FEMA.

Integration with Other Plans

This multi-hazard plan will only enhance mitigation if balanced with all other Town plans. Lee 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 Lee, 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 Local Emergency Action Plan. The Board of Selectmen and the Hazard Mitigation Committee will work with Town officials to incorporate elements of this Plan into other planning mechanisms, when appropriate. The Emergency Management Director along with other

members of the Hazard Mitigation Committee will work with the Planning Board to suggest including information developed for the updated Hazard Mitigation Plan into appropriate Town's Master Plan chapters.

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 Lee, NH Local 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 Whitney.Welch@dos.nh.gov or 603.223.3667.

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

Sincerely,

Whitney Welch

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

TOWN OF LEE
Select Board
7 Mast Road
Lee, New Hampshire 03861
(603) 659-5414

CERTIFICATE OF ADOPTION

Town of Lee New Hampshire
Select Board
A Resolution Adopting the Lee, NH Multi-Hazard Mitigation Plan Update 2019

Conditionally Approved by NHHSEM: December 14, 2018

WHEREAS, the Town of Lee 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 Lee, NH Multi-Hazard Mitigation Plan Update 2019; and

WHEREAS, several public planning meetings were held between October 16, 2018 and December, 2018 regarding the development and review of the Lee, NH Multi-Hazard Mitigation Plan Update 2019; and

WHEREAS, the Lee, NH Multi-Hazard Mitigation Plan Update 2019 contains several potential future projects to mitigate hazard damage in the Town of Lee; and

WHEREAS, a duly-noticed public meeting was held by the Lee Select Board on January 2, 2019 to formally approve and adopt the Lee, NH Multi-Hazard Mitigation Plan Update 2019.

NOW, THEREFORE BE IT RESOLVED that the Lee Select Board adopts the Lee, NH Multi-Hazard Mitigation Plan Update 2019.

ADOPTED AND SIGNED this day of January 2, 2019

Chairman Cary Brown

Selectman Scott Bugbee

Selectman John LaCourse

Notary

DENISE A. DUVAL, Notary Public
State of New Hampshire
My Commission Expires September 5, 2023

1|2|2019
Date

Final Approval Letter from FEMA

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

FEMA

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

Dear Ms. Welch:

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. Our Agency has been notified that your office completed its review of the Multi-Hazard Mitigation Plan Update, 2019, Town of Lee, New Hampshire and approved it effective **January 7, 2019** through **January 6, 2024** in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, the National Flood Insurance Act of 1968, as amended, and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the jurisdiction 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 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.

The plan must be updated and resubmitted to the FEMA Region I Mitigation Division for approval every five years in order to remain eligible for FEMA mitigation grant funding.

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 contact Melissa Surette at (617) 956-7559 or Melissa.Surette@fema.dhs.gov.

Sincerely,

Paul F. Ford
Acting Regional Administrator

PFF: ms

cc: Fallon Reed, Chief of Planning, New Hampshire
Kayla Henderson, Hazard Mitigation Planner, New Hampshire

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

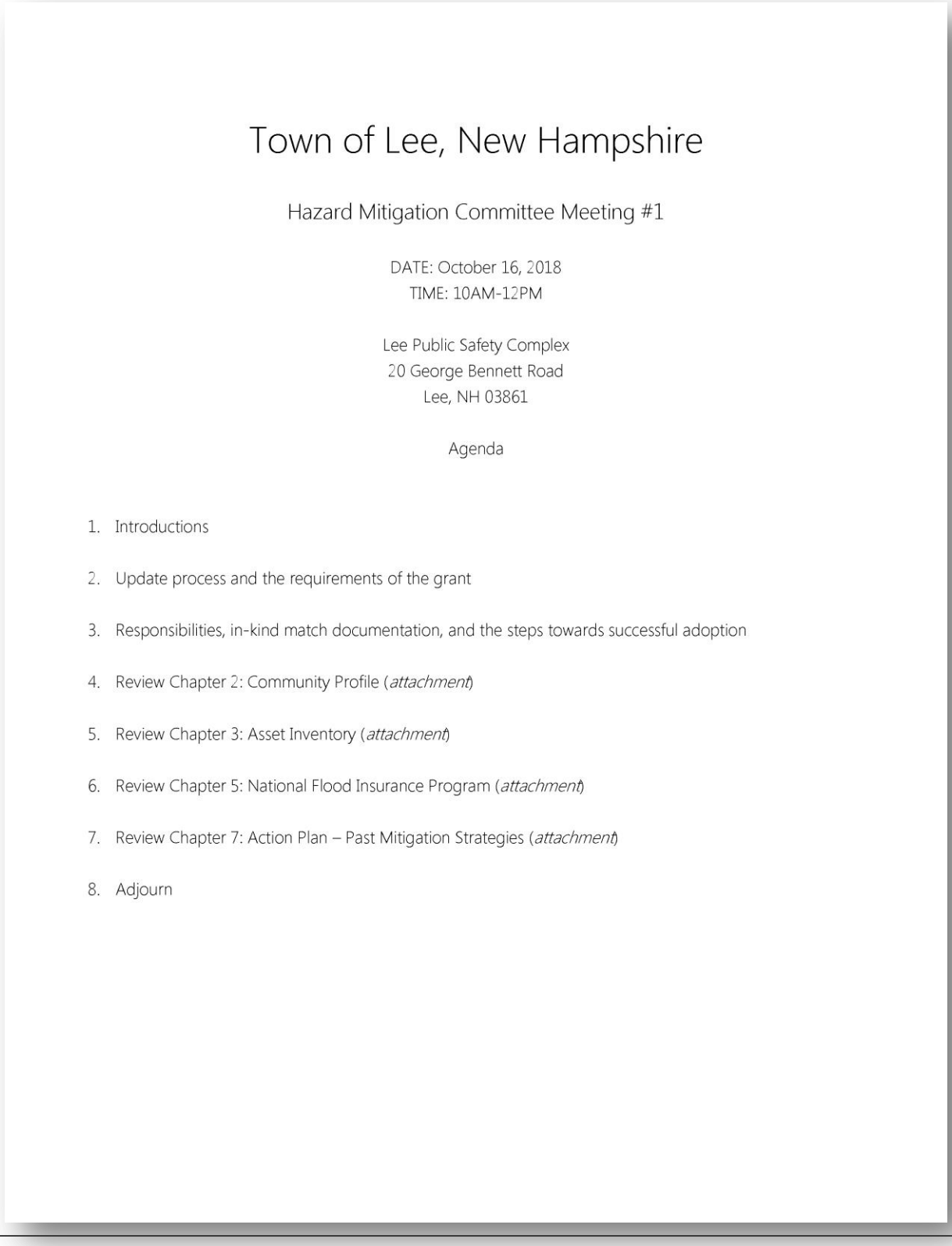
- Local Mitigation Plan Review Guide, FEMA, October 1, 2011
- Multi-Hazard Mitigation Plans
    - Town of Rollinsford, 2016
- State of New Hampshire Multi-Hazard Mitigation Plan (2018) - State Hazard Mitigation Goals
- Disaster Mitigation Act (DMA) of 2000, Section 101, b1 & b2 and Section 322a http://www.fema.gov/library/viewRecord.do?id=1935
- Economic & Labor Market Information Bureau, NH Employment Security, 2015; Census 2010 and Revenue Information
- NCDC [National Climatic Data Center, National Oceanic and Atmospheric Administration]. 2018. Storm Events

Photos

- Randy Stevens, Former Road Agent, Town of Lee

Appendix B: Planning Process Documentation

Agendas



Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #1

DATE: October 16, 2018
TIME: 10AM-12PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

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 5: National Flood Insurance Program (*attachment*)
7. Review Chapter 7: Action Plan – Past Mitigation Strategies (*attachment*)
8. Adjourn

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #2

DATE: October 30, 2018
TIME: 10AM-12PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

Agenda

1. Introductions

2. Old Business
    a. Review meeting notes (*Meeting_Notes_101618.docx*)
    b. Review revised asset inventory tables (*Revised_Asset_Tables.docx*)
    c. Mast Road development update

3. New Business
    a. Review Chapter 6: Declared Disasters (*Disaster_Emergency_Declarations.docx*)
    b. Review Chapter 6: Hazard Descriptions (*Hazard_Descriptions.docx*)
    c. Review Chapter 6: Hazard Vulnerability Ranking (*Hazard_Vulnerability_Rankings.docx*)
    d. Review Chapter 7: Existing Mitigation Strategies (*Existing_Mitigation_Strategies.docx*)

4. Next meeting date

5. Adjourn

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #3

DATE: November 19, 2018
TIME: 2PM-4PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

Agenda

1. Introductions

2. Old Business
    a. Review meeting notes (*Meeting_Notes_103018.docx*)

3. New Business
    a. 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*)
    b. Review draft critical facilities and key resources maps (large scale maps will be provided at the meeting)

4. Next meeting date

5. Adjourn

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #4

DATE: December 3, 2018
TIME: 2PM-4PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

Agenda

1. Introductions

2. Old Business
    a. Review meeting notes (*Meeting_Notes_111918.docx*)

3. New Business
    a. Review final asset inventory (*Asset_Inventory.pdf*)
    b. Review final maps
        i. 201812_EmergencyResponseFac_36x24.pdf
        ii. 201812_NonEmergencyResponseFac_36x24.pdf
        iii. 201812_VulnerablePopulations_36x24.pdf
        iv. 201812_CriticalInfrastructure_36x24.pdf
        v. 201812_WaterResources_36x24.pdf
    c. Review final mitigation actions and implementation plan (*Mitigation_Actions.pdf*)

4. Next steps

5. Adjourn

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #1

DATE: October 16, 2018
TIME: 10AM-12PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Bill Booth	Building Inspector	bbooth@leenh.org	.5
Tom Dransfield	Chief of Police	tdransfield@leenhpolice.org	.5
Harry Mueller	Operations Manager McGregor EMS	hmueller@mcgregorems.org	.5
Scott Nemet	EMD/Chief of Fire	snemet@leefire.org	.5
Caren Rossi	Ass EMD	CRossi@LeeNH.org	1
JulieGlover	Town Admin	townadministrator@leenh.org	.5

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #2

DATE: October 30, 2018
TIME: 10AM-12PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Harry Mueller	McGregor EMS		
Scott Nemet	Fire Chief/EMD		.5
Bill Booth	Building Inspector		.5
Carmen Rossi	Asst. EMD		1.5
Tom Dransfield	Police Chief		.5
Julie Glover	Town Admin		.5

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #3

DATE: November 19, 2018
TIME: 2PM-4PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Thomas DRONSFIELD	Police Chief	tdronsfield@leenhpolice.org	.75
Bill Booth	Building Inspector	bbooth@leenh.org	.50
SCOTT NEMET	FIRE CHIEF/EMD	SNEMET@LEENH.ORG	.50
Julie Glover	Town Admin	townadministrator@leenh.org	.5
Steve Bolleke	Hwy Supervisor	sbolleke@leenh.org	.5

Town of Lee, New Hampshire

Hazard Mitigation Committee Meeting #4

DATE: December 3, 2018
TIME: 2PM-4PM

Lee Public Safety Complex
20 George Bennett Road
Lee, NH 03861

ATTENDANCE SHEET

Name	Position Title/ Department Affiliation	E-mail	Time spent reviewing materials
Tom Dronsfield	Chief of Police	tdronsfield@leenhpolice.org	.5
Caren Rossi	Ass. EMD	CRossi@LeeNH.org	1.5
Scott Nemet	Fire Chief / EMD	snemet@leefire.org	.5
Bill Booth	Building Inspector	bbooth@leenh.org	.5

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[37] - 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.

[37] 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 the 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 Strategic Initiatives (OSI), 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

.

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[38]:

- 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

[38] 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

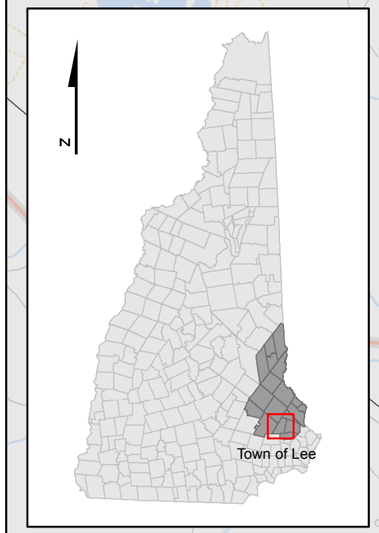
Three types of FMA grants are available to States and communities:

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



Critical Infrastructure & Past and Potential Hazards

Hazard Mitigation Plan (2018 - 2019)
LEE, NH

Emergency Response Facilities
- Administrative (Information Technology)
- Cell Tower
- Backup Emergency Fuel
- Emergency Fuel
- Primary Emergency Operations Center
- Primary Back-Up Emergency Shelter
- Primary Emergency Shelter
- Landing zone

Base Features
- Past Hazard Microburst
- Past Hazard Flooding
- Limits of Inundation Mapping
- FEMA 100-year Floodplain
- Updated (2005) 100-Year Floodplains
- Rivers, Brooks, Streams
- Lakes and Ponds

Roads [NHDOT, 2017]
- State
- Local
- Private
- Municipal Boundary

Data Sources:

Base features are from USGS 1:24,000 scale Digital Line Graphs, as archived in the GRANIT database. All base features distributed by Complex Systems Research Center, Durham, NH. Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center, under contract to the NH Office of State Planning and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OSP, CSRC and the cooperating agencies make no claim as to the validity or reliability or toany implied uses of these data.

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Date: November 2018

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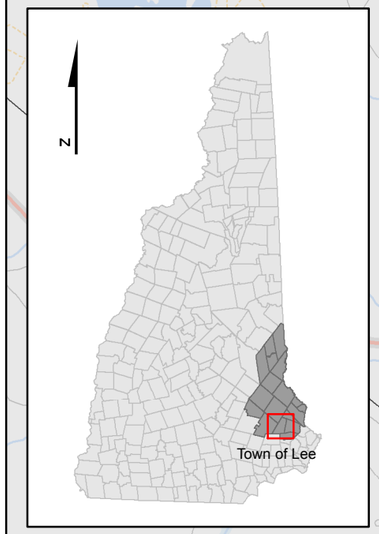
Strafford REGIONAL PLANNING COMMISSION

Critical Infrastructure & Past and Potential Hazards

Hazard Mitigation Plan (2018 - 2019)
LEE, NH



Non-Emergency Response Facilities

- Residential Waste, Transfer Station and Recycling Center
- Medical Facility
- Transportation Services

Base Features

- Past Hazard Microburst
- Past Hazard Flooding
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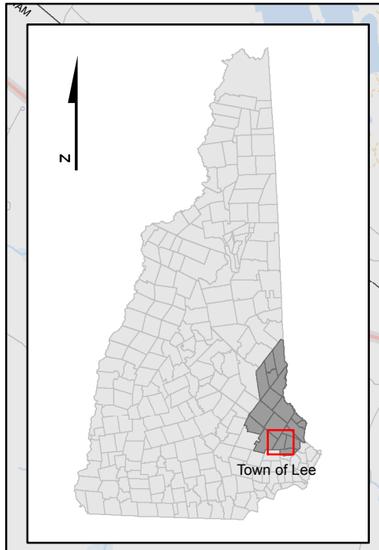
LEE, NH



Critical Infrastructure
- Bridges (DOT 2015)
- Dams (Active)
- SUB Power Station/Substation
- PS Pump Station
- Solar Array

Base Features
- Past Hazard Microburst
- Past Hazard Flooding
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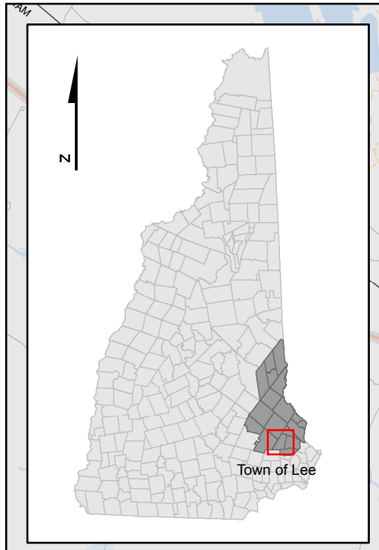

Critical Infrastructure & Past and Potential Hazards

Hazard Mitigation Plan (2018 - 2019)
LEE, NH

Vulnerable Populations
- Large Crowd Gathering
- Preschool/Daycare
- School
- Assisted Living

Base Features
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- Past Hazard Flooding
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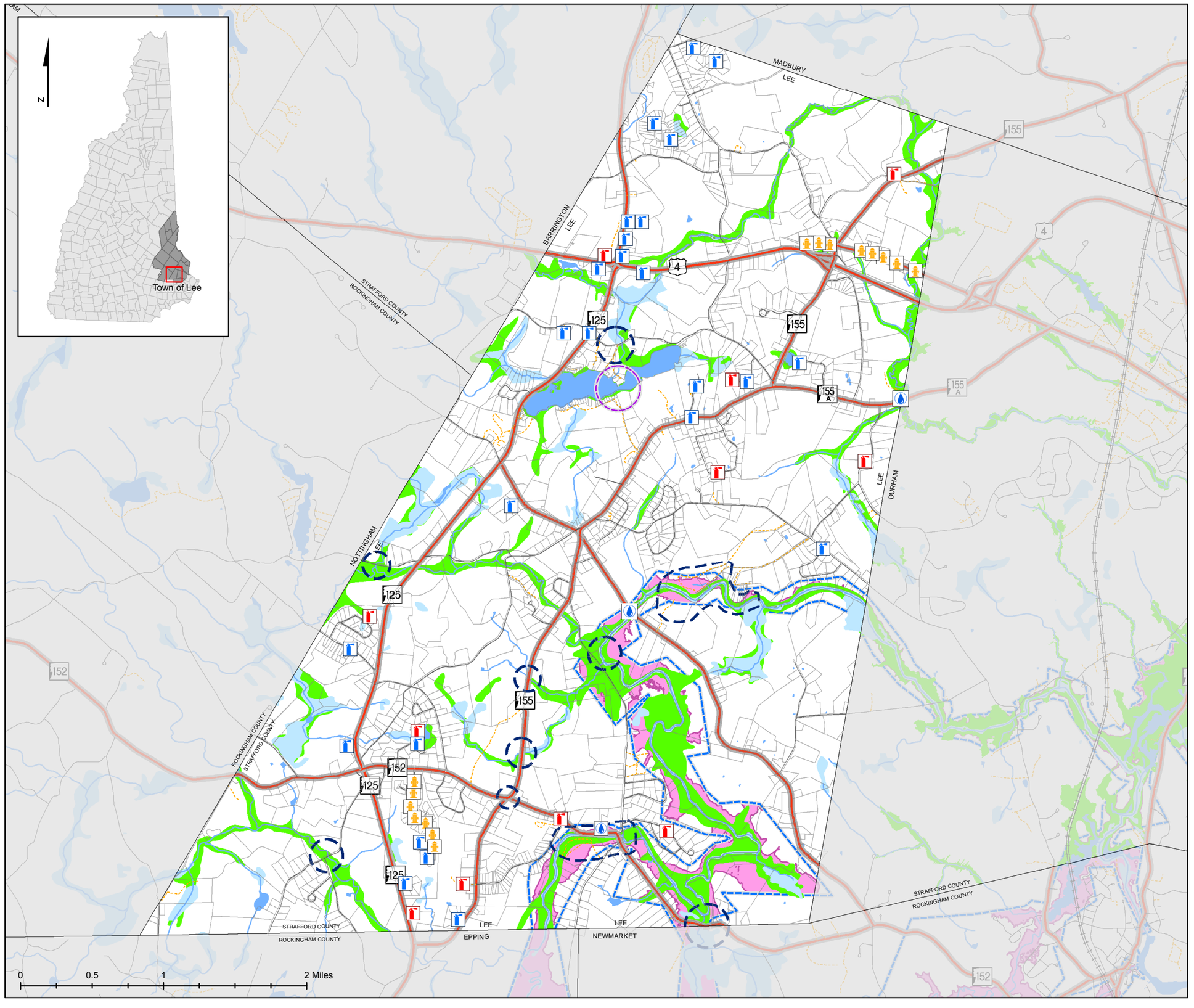

Critical Infrastructure & Past and Potential Hazards

Hazard Mitigation Plan (2018 - 2019)
LEE, NH

Water Resources

Auxiliary Fire Aid
- Surface Water Resources
- Cisterns
- Dry Hydrant
- Pressure Hydrant

Base Features
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