Town of Hebron, New Hampshire
Hazard Mitigation Plan

September 2002
Revised: December 2003
Revised: April 2009

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Prepared by:
Hebron Hazard Mitigation Plan Committee

Bruce Barnard	Vice-Chairman, Board of Selectmen
Travis Austin	Police Department
Maynard Young	Fire Department
Roger Bedard	Highway Supervisor

With Assistance from:
Lakes Region Planning Commission
103 Main Street, Suite #3
Meredith, NH 03253
www.lakesrpc.org
Phone: (603) 279-8171
Fax: (603) 279-0200

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THE LAKES REGION PLANNING COMMISSION

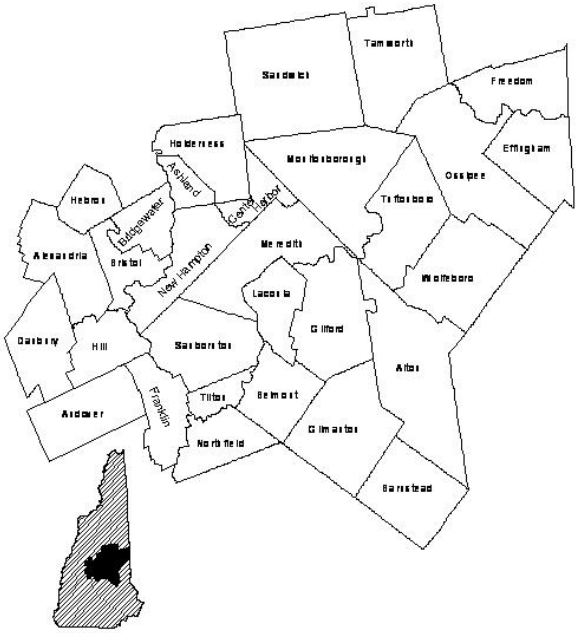

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The *Hebron Hazard Mitigation Plan* (the Plan) serves as a means to reduce future losses from natural or man-made hazard events before they occur. The Plan was developed by the Hebron Hazard Mitigation Planning Committee with assistance from the Lakes Region Planning Commission, and contains statements of policy adopted by the Board of Selectmen in Chapter VI.

Natural and human hazards for Hebron are summarized as follows:

High Risk	Moderate Risk
Beaver Dams	Flood
Blizzard/Snow Storm	Thunder Storm/Lightning
	Wildfire
	Radon
	Tornado/Downburst
	Nor'easter

The Hebron Hazard Mitigation Planning Committee, as shown in Chapter IV, identified "Critical Facilities" and "Populations to Protect" as follows:

Critical Facilities	Populations to Protect
Public Safety Building (Primary EOC)	Camp Berea
Union Congregational Church	Camp Wi-co-su-ta
Town Shed	Camp Mowglis
Berea Youth Camp Recreation Hall	Camp Pasquaney
Hebron Firehouse	Camp Onaway
Town Selectmen's Office	
Primary Access Routes: NH 3A, North Shore Rd, West Shore Rd, Groton Rd	

The Hebron Hazard Mitigation Planning Committee identified numerous existing hazard mitigation programs including the following:

- Hazard Mitigation Plan 2003
- National Flood Insurance Program
- Emergency Preparedness Plan
- Permits System
- Emergency Power Generation
- Subdivision Regulation Restrictions
- Police/Fire/EMT Training Programs

The Hebron Hazard Mitigation Planning Committee developed a list of 14 general mitigation and hazard-specific mitigation actions. These actions were prioritized based on local criteria. Discussions were held regarding how implementation might occur.

CHAPTER I: PLANNING PROCESS

A. BACKGROUND

The Federal Emergency Management Agency (FEMA) has mandated that all communities within the state of New Hampshire establish local hazard mitigation plans as a means to reduce and mitigate future losses from natural or human hazard events. In response to this mandate, the NH Homeland Security and Emergency Management (NH HSEM) and regional planning commissions in the state entered into agreements to aid communities with plan development. The plan development process followed the steps outlined in the *Guide to Hazard Mitigation Planning for New Hampshire Communities.*

B. AUTHORITY

This Hazard Mitigation Plan was prepared in accordance with the Planning Mandate of Section 409 of Public Law 93-288 as amended by Public Law 100-707, the Robert T. Stafford Act of 1988, hereinafter referred to as the "Stafford Act." Accordingly, this Hazard Mitigation Plan will be referred to as the "Plan."

C. FUNDING SOURCE

The New Hampshire Department of Safety's Homeland Security and Emergency Management (NH HSEM) funded the Plan with matching funds from the Lakes Region Planning Commission.

D. PURPOSE

The Hebron Hazard Mitigation Plan is a planning tool to be used by the town of Hebron, as well as other local, state, and federal government entities, in their efforts to reduce the effects from natural and man-made hazards. The Plan contains statements of policy as outlined in the Implementation Schedule for Mitigation Actions (page 35) and Chapter VI: Plan Adoption and Monitoring (page 38). All other sections of this plan are support and documentation for informational purposes only and are not included as a statement of policy.

E. SCOPE OF PLAN

The scope of this Plan includes the identification of natural hazards affecting the town of Hebron, as identified by the Hebron Hazard Mitigation Planning Committee (Committee). The hazards were reviewed under the following categories as outlined in the New Hampshire's Natural Hazards Mitigation Plan:

I. **Flood, Wild Land Fire, Drought** (Flood, Dam Break, Ice Jam, Wildfire, Drought)
II. **Geological Hazards** (Earthquake, Radon, Landslide).

III. **Severe Wind** (Tornado/Downburst, Hurricane, Thunderstorm/Lightning, Hail).
IV. **Winter Weather** (Blizzard/Snow Storm, Ice Storm, Nor'easter, Avalanche).
V. **Other Hazards** (Motor Vehicle Accident involving Hazardous Materials, Oil Spill, Military Aircraft Accident, Pandemic, Rabies).

F. METHODOLOGY

The Lakes Region Planning Commission (LRPC) made contact with the town of Hebron in November of 2008 regarding the start of the hazard mitigation update process. The Hebron Hazard Mitigation Planning Committee (Committee) was established in December of 2008 for the purpose of updating a long-range plan for hazard mitigation. The Committee consisted of representatives from the departments of Fire, Police, Public Works, and Selectboard.

Using the *Guide to Hazard Mitigation Planning for New Hampshire Communities*, the Committee developed the content of the Plan by following the nine-step process set forth in the handbook. The Committee held meetings starting December 10, 2008 through February 4, 2009 in order to develop and review the Plan. The following timeline shows the dates and corresponding Committee actions.

Committee Meetings

December 10, 2008, 6:30 pm: Informational meeting: Hebron Selectmen's Office
- Step 1: Review Potential Hazard Areas on base map
- Step 2: Review Development Trends
- Step 3: Review Critical Facilities

December 16, 2008, 6:30 pm: Committee meeting: Hebron Selectmen's Office
- Step 4: Review Risk Assessment
- Step 5: Review Existing Plans or Policies
- Step 6: Review Existing Gaps in Protection

January 13, 2009, 6:30 pm: Committee meeting: Hebron Selectmen's Office
- Introduction of Water Resource Plan (P. Tarpey)
- Step 7: Review Existing Implementation Strategy
- Step 8: Brainstorm new Strategies (STAPLEE homework)

February 4, 2009, 9:00 am: Committee meeting: Hebron Selectmen's Office
- Step 9: Evaluate Strategies (STAPLEE)
- Step 10: Update Implementation Strategy

March 27, 2009: Draft Plan completed, submitted to town for one-week review period

April 2009: Submitted to NH HSEM/FEMA for review.

Public Involvement
Announcements and the agenda were posted in town in advance of each meeting and on the LRPC website (example notice in Appendix C). Information about the Hazard Mitigation Plan and invitations for the public to attend were also posted prominently on the website and in notices. Agenda and meeting notes were also posted at the Hebron Town Hall in order to reach as many residents as possible.

The Committee held a public comment period in order to obtain additional feedback. The Plan (including comment instructions) was available for public review at the Town Hall, the town website, and LRPC website from March 27- April 3, 2009. Press releases were distributed to regional media announcing the public comment period (Appendix D). The neighboring towns of Alexandria, Groton, Plymouth, and Bridgewater were also notified of the review period. This provided an opportunity for local and regional businesses, organizations, agencies, educational and health institutions in Hebron and surrounding towns to review the plan.

G. ACKNOWLEDGMENTS

The Hebron Board of Selectmen extends special thanks to those that assisted in the development of this Plan:

John Fischer	Chief, Fire Department, Emergency Management Director
Travis Austin	Police Sergeant
Bruce Barnard	Selectboard Representative
Roger Bedard	Highway Supervisor
Maynard Young	Fire Department
Karen Corliss	Administrative Assistant
Paul Hatch	Homeland Security and Emergency Management Field Representative
Adam Hlasny	Lakes Region Planning Commission
Patricia Tarpey	North Country Resource Conservation and Development District
Karl Berardi	North Country Resource Conservation and Development District

CHAPTER II: COMMUNITY PROFILE

The town of Hebron is located in Central New Hampshire in Grafton County. Hebron is bordered to the north by Groton, to the east by Plymouth, to the west by Alexandria, and to the south by Bristol and Bridgewater. The town is comprised of approximately 16.8 square miles of land area (12,153 acres). The topography is generally hilly with areas of steep slopes found throughout the town. Approximately 20 percent of the land area in Hebron has some degree of development limitations based on steep slopes (25% slope or greater). The most prominent elevations are found on Hobart Hill, Tenney Hill, and Bear Mountain. Newfound Lake is the largest body of water in town and this 4,106 acre lake is shared with Bridgewater, Bristol and Alexandria. Other surface waters in Hebron include Cilley, Fretts, and Georges Brooks and the Cockermouth River.

Water and septic systems are privately maintained throughout the community. Public Service of New Hampshire (PSNH) provides 90% of the electric power for the community with New Hampshire Electric Cooperative providing the remainder. The town currently has fifteen paid volunteers who provide emergency medical technician (EMT) and fire assistance for the community, as well as for the neighboring town of Groton. Currently police and fire are housed in a common public safety building, newly constructed in 2004.

K-6 students from Hebron attend the Bridgewater/Hebron School. Middle School students attend Newfound Memorial Middle School in Bristol and the high school is the Newfound Regional School in Bristol. The nearest Community College is Lakes Region Community College in Belmont, and the nearest college is Plymouth State University in Plymouth. There are no childcare facilities, adult homes, or assisted living homes in Hebron.

Much of the developed land in the community is in close proximity to Newfound Lake. The developed land is comprised of 97% residential properties. The remaining 3% includes municipal facilities and limited commercial uses such as summer youth camps, a marina, and a general store. Excluding roads, structural footprints (houses, commercial buildings, parking lots, etc.) make up less than 1% of the total land area in Hebron. The outlying undeveloped land in Hebron is predominately comprised of forest and steep slopes. Forestland represents 82% (9,979.28 acres) of the total land area in Hebron.

The town has a 28 member volunteer Fire Department. The Police Department consists of a full-time Police Chief, four part-time officers, and one administrative staff. The Highway Department has a part-time Supervisor and six part-time staff.

A. DEVELOPMENT TRENDS

Population, Housing Stock, and Growth Patterns

Table I: Hebron Population

Year	Population
2002	513
2003	523
2004	533
2005	539
2006	543
2007	542

According to the US Census (2000), 34.8% of all the housing units in Hebron were more than 70 years old (built before 1939), while 8.0% were built since 1995. In 1999, there was a total of 517 housing units, of which 294 were for seasonal, recreational, or occasional use.

Hebron is home to an aging population of 459 people, 84% of which are over 21 years of age, and 31% are over 62 years of age. A median age of 50 (2000) makes Hebron the oldest municipality in the state. Of the 206 households, 42 contain individuals less than 18 years of age. The trend over the past four decades, with the exception of 1980-1990, is that Hebron's population growth has outpaced that of the State and Grafton County.

According to the 2000 US Census, the mean travel time to work for Hebron residents was 34.5 minutes, nine minutes greater than the national average. This was based on the fact that 52.3% of residents commuted outside the community to work. NH Route 3A, North Shore Road, and West Shore Road provide the primary access routes to and from the community.

The number of building permits issued by Hebron has remained relatively consistent from 2000-2007 (Table III).[1] The decline in permits issued in 2006-2007 is representative of the declining housing market throughout the state.

Weather Conditions

The average temperature for the area varies from 19.7 degrees Fahrenheit in January to 70.0 degrees Fahrenheit in July. The average annual precipitation is 42.0 inches. New Hampshire is in a 160-mph wind zone; the majority of the southern half of the state (including all of Grafton County) is located in a hurricane-susceptible region.

Table III: Number of Residential Building Permits in Hebron

Year	Number of Permits
2000	15
2001	7
2002	9
2003	13
2004	11
2005	11
2006	7
2007	7

Summary

The town of Hebron is comprised of mostly undeveloped forestland. Developed areas are predominately residential, with the majority of the housing units being unoccupied at times throughout the year. The citizens of the community are generally older, a large segment of the population is of retirement age, and there are relatively few school-aged children. Population growth trends in Hebron have exceeded State and County rates of growth. As the population grows and ages, so does the potential for hazard losses.

[1] http://nhetwork.nhes.state.nh.us/nhetwork/blding.aspx?sid=2, visited October 23, 2008.

CHAPTER III: RISK ASSESSMENT

A. IDENTIFYING HAZARDS

The town of Hebron is prone to a variety of man-made and natural hazards. The Committee used the *2004 Natural Hazard Mitigation Plan*, developed by the New Hampshire Governor's Office of Emergency Management, to identify all hazards that could affect the Lakes Region.[2] The Committee also reviewed plans, ordinances, land use regulations, university databases, and internet sources for information about past hazard events in Hebron. The State Hazard Mitigation Planning Committee identified several natural hazards that have the potential to impact the State. Table IV provides a summary of previous occurrences and severity of these hazards.[3] The following narratives provide an overview for the hazards most likely to impact the Lakes Region.

Table IV: Frequency & Severity of Hazards in New Hampshire

Natural Hazard	Frequency	Severity
Flooding	High	High
Dam Failure	Low	Moderate
Drought	Low	Moderate
Wildfire	High	Low
Earthquake	Low	Low
Landslide	Low	Low
Radon	Moderate	Low
Tornado/Downburst	Moderate	Moderate
Hurricane	Moderate	High
Lightning	Moderate	Low
Severe Winter Weather	High	High
Snow Avalanche	Low	Low

I. Flood, Wild Land Fire, Drought

Flooding

Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. It results from the overflow of rivers and tributaries or inadequate drainage. Flooding in the Lakes Region is most commonly associated with structures and properties located within a floodplain. There are numerous rivers and streams within the region and significant changes in elevation, leading to some fast-moving water. The region also has a great deal of shoreline, making it exposed to rising water levels as well. Although historically, there

[2] http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/documents/Chapter_IV_Risk_Assessment.pdf, visited October 24, 2008.

[3] http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/documents/Chapter_III_Hazard_Analysis.pdf, visited October 24, 2008.

have not been high instances of shoreline flooding, the potential always exists for a major flood event to occur. Recent rain events have proven this is becoming an increasing concern as additional development is contributing to flood hazards. As areas are covered with impervious surfaces, less water is allowed to infiltrate. This includes the likelihood of flash floods and sheet flow. Of greatest concern are the waterfront properties on the lakes, ponds, and associated tributaries.

Culvert and roadwork have been conducted throughout the region as a result of localized flooding events. Of particular concern in the region are areas of steep slopes and soils with limited capacity to accept rapid volumes of rainwater. Roads and culverts in close proximity to these conditions are most at risk of localized flooding.

Dam Failure

Alton earthen dam failure

Dam failure results in rapid loss of water that is normally held back by a dam. These types of floods can be extremely dangerous and pose a threat to both life and property. Dam classifications in New Hampshire are based on the degree of potential damages that a dam failure is expected to cause. Class AA dams are those which would not threaten life or property if a dam failure occurred. Class A dams have the potential for major damage to city roads, with minimal economic losses, and no associated possible loss of life. Both Class AA and A dams are considered *low hazard* dams. A Class B, or *significant hazard*, dam has a potential to cause no probable loss of life, major economic loss to structure or property, structural damage to roads, and major environmental and public loss if it fails or is misoperated. A Class C, or *high hazard*, dam has a potential to cause failure of building foundations, water levels to rise above first floor windows, structural damage to interstate highways, the release of hazardous waste from containment structures, and likely more than one death.[4] The hazard potential for dams relates to damage that would occur if the dam were to break – not the structural integrity of the dam itself. In the Lakes Region, the Town of Alton was impacted by an earthen dam failure on March 12, 1996. Although listed in the NH Hazard Mitigation Plan as a significant hazard, it did result in the loss of one life.

Ice Jam

Ice forming in riverbeds and against structures often presents significant hazardous conditions for communities. Meltwater or stormwater may encounter these ice formations and apply lateral and/or vertical force upon structures. Moving ice may scour abutments and riverbanks.

[4] http://www.des.state.nh.us/factsheets/dam/db-15.htm visited November 28, 2007.

Ice may also create temporary dams. These dams can create flood hazard conditions where none previously existed.

According to the Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL), the Pemigewasset River ranks second in the state for the number of ice events where more than 35 events occurred prior to 2000.

Wildfire

A wildfire is defined as a fire in wooded, potentially remote areas that may endanger lives. New Hampshire has about 500 wild land fires each year; most of these burn less than half an acre. Much of the Lakes Region is forested and susceptible to fire. A present concern of NH Department of Resources and Economic Development (DRED) Division of Forests & Lands is that the Ice Storm of 1998 has left a significant amount of woody debris in the forests of the region that may fuel future wildfires.[5]

Courtesy: White Mountains National Forest

Several areas in the region are relatively remote in terms of access and fire fighting abilities. Of greatest concern are those areas characterized by steep slopes and vast woodlands, with limited vehicular access. These areas include the Ossipee, Squam, Belknap, and Sandwich Mountain Ranges. The islands in the region also pose a unique fire safety concern given that access is limited and most of the islands are predominately wooded with residential development. Most of the residential development on the islands is situated on the shores, and inland fire fighting capabilities are often limited.

As these once remote areas begin to see more development (the urban wildfire interface), care should be taken to ensure that adequate fire protection and buffers are established. Techniques include increased buffers between wooded areas and residential buildings, requirements for cisterns or fire ponds, a restriction on the types of allowable building materials such as shake roofs, and special considerations for landscaping. While historically massive wildfires have been western phenomena, each year hundreds of woodland acres burn in New Hampshire. The greatest risk exists in the spring when the snow has melted and before the tree canopy has developed, and in the late summer – early fall. Appropriate planning can significantly reduce a community's vulnerability for woodland fires. There are four-zone suggestions that could be potentially helpful for the community.

[5] http://www.nh.gov/safety/divisions/bem/HazardMitigation/documents/Chapter_III_Hazard_Analysis.pdf, visited November 28, 2007.

ZONE 4 is a natural zone of native or naturalized vegetation. In this area, use selective thinning to reduce the volume of fuel. Removing highly flammable plant species offers further protection while maintaining a natural appearance.

ZONE 3 is a low fuel volume zone. Here selected plantings of mostly low growing and fire resistant plants provides a decreased fuel volume area. A few well-spaced, fire resistant trees in this zone can further retard a fire's progress.

ZONE 2 establishes a vegetation area consisting of plants that are fire resistant and low growing. An irrigation system will help keep this protection zone green and healthy.

ZONE 1 is the protection area immediately surrounding the house. Here vegetation should be especially fire resistant, well irrigated and carefully spaced to minimize the threat from intense flames and sparks.[6]

Conflagration

Conflagration is an extensive, destructive fire in a populated area that endangers lives and affects multiple buildings. Historically, many New Hampshire towns were settled in areas along waterways in order to power the mills. Often the town centers were at a low point in the topography, resulting in dense residential development on the steeper surrounding hillsides. Hillsides provide a natural updraft that makes fire fighting more difficult. In particular, structural fires spread more readily in hillside developments because burning buildings pre-heat the structures that are situated above them.

Within the Lakes Region the city of Laconia was the site of one of the most devastating structural fires to occur in the state of New Hampshire. The 1903 Great Lakeport Fire consumed more than 100 homes; two churches, two factories, a large mill, a power plant, and a fire station. The town of Wolfeboro's history includes a significant fire in the winter of 1956. This event is recognized as the last block fire in town and is considered a small conflagration. The majority of structures in the region are old, wood buildings, some of which still lack fire suppression systems. As such, several town and city centers in the region are susceptible to conflagration.

Drought

Drought occurs when less than the normal amount of water is available for extended periods of time. Effects may include decreased soil moisture, groundwater levels, streamflow, and lake, pond, and well levels may drop. Factors that may contribute to drought include reduced rain/snowfall, increased rates of evaporation, and increased water usage. New Hampshire generally receives adequate rainfall; it is rare that the state experiences extended periods of below normal water supplies.

Since 1990 New Hampshire has had a state Drought Emergency Plan, which identifies four levels of action indicating the severity of the drought: Alert, Warning, Severe, and Emergency.

[6] http://www.firewise.org/, visited August 10, 2007.

There have been four extended droughts in New Hampshire in the past century and a Drought "Warning" was issued by the Governor's Office in June of 1999.

II. Geological Hazards

Earthquake

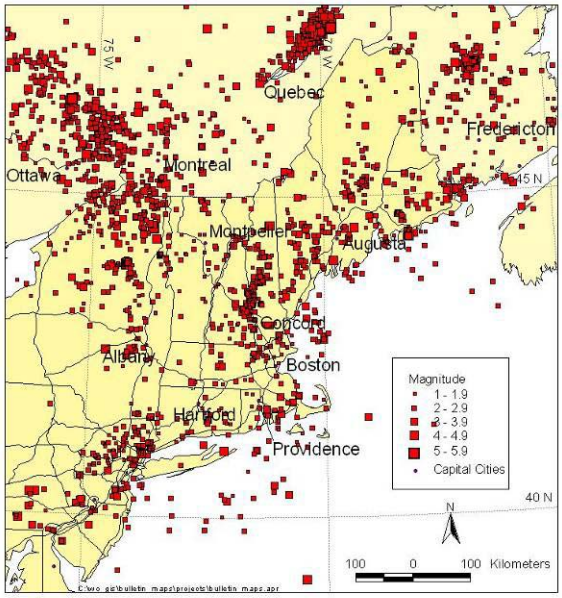
An earthquake is a series of vibrations induced in the Earth's crust by the abrupt rupture and rebound of rocks in which elastic strain has been slowly accumulating. Earthquakes are commonly measured using *magnitude*, or the amount of seismic energy released at the hypocenter of the earthquake. The Richter magnitude scale is a mathematical devise used to compare the size of earthquakes, shown in Table V.[7]

Table V: Richter Magnitude Scale

Magnitude	Earthquake Effects
2.5 or less	Usually not felt, but can be recorded by seismograph.
2.5 to 5.4	Often felt, but only causes minor damage.
5.5 to 6.0	Slight damage to buildings and other structures.
6.1 to 6.9	May cause a lot of damage in very populated areas.
7.0 to 7.9	Major earthquake. Serious damage.
8.0 or greater	Great earthquake. Can totally destroy communities near the epicenter.

New Hampshire is considered to be in an area of moderate seismic activity with respect to other regions of the country. This means the state could experience large (6.5-7.0 magnitude) earthquakes, but not likely to occur as frequently as in a high hazard area like the Pacific coast. On average, every other year the Lakes Region experiences an earthquake, though these earthquakes are mild and go mostly undetected by people. Figure I shows an arc of past earthquake activity over the New Hampshire Lakes Region that coincides with a regional fault line.

Figure I: Northeast Seismicity 1975–2006



Source: http://www.bc.edu/research/westonobservatory/

According to the US Geologic Survey, the overall earthquake risk to the state is high due to the built environment. Meaning, many structures in the state are old or not built to withstand an earthquake. Additionally, due to the unique geology of New Hampshire,

[7] http://pubs.usgs.gov/gip/earthq4/severitygip.html, visited August 15, 2007.

earthquake propagation waves travel up to 40 times further than they do in the western United States, possibly enlarging the area of damage.[8] The strongest earthquakes to strike New Hampshire occurred December 20 and 24, 1940 in the town of Ossipee. Both earthquakes had a magnitude of 5.5 and were felt over an area of 400,000 square miles.

Landslide

A landslide is the downward or outward movement of slope-forming materials reacting under the force of gravity, including mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Seismicity may play a role in the mass movement of landforms also. New Hampshire, although mountainous, consists largely of relatively "old" geologic formations that have been worn by the forces of nature for eons prior to the arrival of the Europeans. Consequently, much of the landscape is relatively stable and the exposure to this hazard type is generally limited to areas in the north and north central portion of the state. Formations of sedimentary deposits and along the Connecticut and Merrimack Rivers also create potential landslide conditions.

Although the overall vulnerability for landslides in the state is low, there is considerable terrain susceptible to landslide action. This was exemplified in May of 2003 when the Old Man of the Mountain collapsed. The continuous action of freezing and thawing of moisture in rock fissures causes it to split and separate. This action occurs frequently on the steeply sloped areas of the state, increasing the risk of landslides. In addition to being susceptible to this freeze/thaw process, the Ossipee Mountain Range, Squam Range and other mountains throughout the Lakes Region are also proximate to seismic faults and at risk to increased pressure to development. Consideration must be given to the vulnerability of man-made structures in these areas due to seismicity and/or soils saturation induced landslide activity. Landslide activities are also often attributed to other hazard events. For example, during a recent flood event, a death occurred when a mass of saturated soil collapsed. This death was attributed to the declared flood event.[9] Also, during the 2007 Nor'easter a landslide occurred in Wilton, resulting in the temporary closure of Route 101.

Radon

Radon is a naturally occurring colorless, odorless radioactive gas usually associated with granite rock formations. The gas can seep into basements through the air. It can also be transported via water and is released once the water is aerated, such as during a shower. Extended exposure to radon can lead to higher rates of cancer in humans. Radon is not a singular event – it can take years or decades to see the effects. The NH Department of Public Health Services Bureau of Radiological Health indicates that one third of homes in New Hampshire have indoor radon levels that exceed the US Environmental Protection Agency's "action level" of 4 picocuries per

[8] http://www.nh.gov/safety/divisions/HSEM/NaturalHazards/index.html, visited August 10, 2007.
[9] http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/documents/Chapter_III_Hazard_Analysis.pdf, visited August 10, 2007.

liter (pCi/l).[10] Table VI lists the indoor radon test levels for the four counties comprising the Lakes Region. Belknap County has notably lower levels than the other counties.

Figure VI: Short-term Indoor Radon Test Results (May 7, 1999)

County	# of Tests	Maximum	% > 4.0 pCi/l
Belknap	744	22.3	14.1
Carroll	1,042	478.9	45.4
Grafton	1,286	174.3	23.2
Merrimack	1,961	152.8	25.2

III. Severe Wind

The Lakes Region is at risk of several types of natural events associated with high winds, including nor'easters, downbursts, hurricanes and tornadoes. Figure II below indicates the building standards that should be implemented in the various wind zones throughout the country. The northeast is located in a zone that should be built to withstand 160 mile an hour wind gusts.[11] A large portion of the northeast, including the Lakes Region, is in a designated hurricane susceptible region.

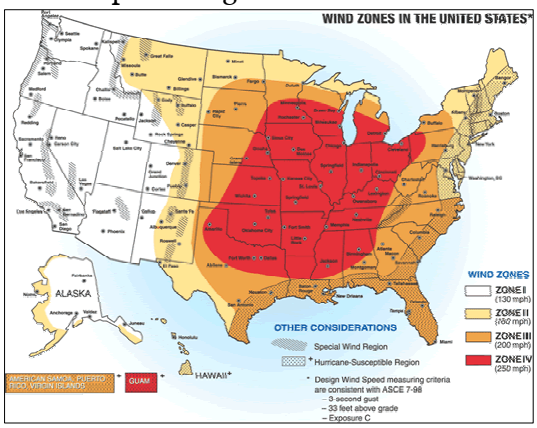


Figure II: Wind Zones in the United States*

*Source: FEMA

[10] http://www.nh.gov/safety/divisions/bem/HazardMitigation/documents/Chapter_III_Hazard_Analysis.pdf, visited August 14, 2007.

[11] http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm, visited November 16, 2007.

Tornado/Downburst

On average, six tornadoes per year touch down somewhere in New England. There is no way of knowing where or when the next damaging tornado will strike as they are among the most unpredictable weather phenomena. Tornadoes are violent storms, rotational in nature, that extend to the ground with winds that can reach 300 miles per hour. They are produced from thunderstorms and can uproot trees and buildings. Although tornadoes are locally produced, damage paths can be in excess of one mile wide and 50 miles long.[12] The Fujita Scale is used to measure the intensity of a tornado (or downburst) by examining the damage caused in the aftermath, shown in Table VII.[13] An F2 tornado ripped through a 5-mile section of central NH in July of 2008 from Epsom to Ossipee, leading to requests for federal disaster declarations in several counties[14].

Table VII: The Fujita Scale

F-Scale #	Intensity Phrase	Wind Speed	Type of Damage
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted.
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.
Source: http://www.tornadoproject.com/fscale/fscale.htm			

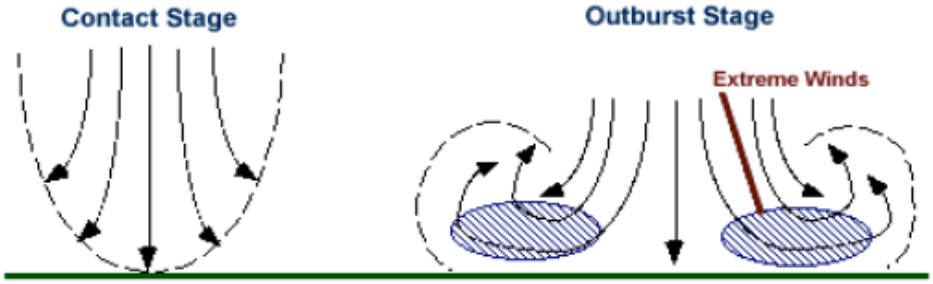
[12] FEMA Hazards: Tornadoes, http://www.fema.gov/business/guide/section3e.shtm.

[13] http://www.tornadoproject.com/fscale/fscale.htm, visited August 15, 2007.

[14] July 28, 2008 request for federal disaster declaration on NH state website, http://www.governor.nh.gov/news/2008/072808_president.htm visited August 27, 2008.

According to the National Oceanic and Atmospheric Administration (NOAA) a downburst is a strong downdraft, rotational in nature, which causes damaging winds on or near the ground. Winds can exceed 130 mph.[15] Downbursts are 10 times more likely to occur than tornadoes and fall into two categories based on their size:

- microbursts, which cover an area less than 2.5 miles in diameter, and
- macrobursts, which cover an area at least 2.5 miles in diameter.



The major damage from downbursts is from falling trees, which may take down power lines, block roads, or damage structures and vehicles. New Hampshire has experienced three such events in the 1990's. One event occurred in Moultonborough on July 26, 1994 and was classified as a macroburst. It affected an area one-half mile wide by 4-6 miles in length.

The tornado/downburst risk for an individual community in New Hampshire is relatively low compared to many other parts of the country. Though the danger that these storms present may be high, the frequency of these storms is relatively low to moderate. However, the July 24, 2008 tornado resulted in one fatality and affected ten New Hampshire communities, including several in southern Belknap County.

Damage from the July 24, 2008 Tornado, NH DOS, HSEM

Hurricane

Hurricanes are severe tropical storms that have winds at least 74 miles per hour. In the Lakes Region, they can produce heavy rain and strong winds that could cause flooding or damage buildings, trees, power lines, and cars.[16] Hurricanes are measured by the Saffir-Simpson Hurricane Scale: a 1-5 rating based on a hurricane's intensity using wind speed as the determining factor (Table VIII). The scale is used to give an estimate of the potential property damage and flooding expected from a hurricane landfall.

[15] *Weather Glossary*. National Oceanic and Atmospheric Administration, http://www.srh.noaa.gov/fwd/glossarymain.html, visited June 21, 2007.

[16] http://www.fema.gov/kids/hurr.htm, visited August 15, 2007.

Table VIII: Saffir-Simpson Hurricane Scale

Category	Characteristics
1	Winds 74-95 mph (64-82 kt or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.
2	Winds 96-110 mph (83-95 kt or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.
3	Winds 111-130 mph (96-113 kt or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.
4	Winds 131-155 mph (114-135 kt or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut off by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km).
5	Winds greater than 155 mph (135 kt or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut off by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.

Source: http://www.nhc.noaa.gov/aboutsshs.shtml

On September 21, 1938, a Category 3 hurricane claimed 494 lives in New Hampshire and many more throughout New England. Official records at the Weather Bureau in Concord show sustained winds of 56 miles per hour, but around the state, gusts near 100 miles per hour were reported, mostly due to topographical acceleration. The Merrimack River rose nearly 11 feet above its flood stage. The Hanover Gazette reported that in New Hampshire, 60,000 people were homeless and many areas were without power. The Disaster Relief Committee estimated public and private property damages at $12,337,643.[17]

Thunderstorm/Lightning

Thunderstorms have several threats associated with them including heavy rain, high wind, and hail. In a heavy rain storm, large amounts of rain may fall in a short period of time, severely

[17] http://www.nhoem.state.nh.us/Mitigation/SecIII.shtm#Hurricane, visited November 28, 2007.

impacting roads and low-lying developments. All thunderstorms contain lightning, which can cause death, injury, and property damage and have great potential to cause structure and wildfires. The discharge of lightning causes an intense sudden heating of air. The air rapidly expands when heated then contracts as it cools which causes a shock wave that we hear as thunder. This shock wave is sometimes powerful enough to damage windows and structures.

On average, more people are killed by lightning than any other weather event. There is more than $2 billion [of] damage annually in the United States from lightning.[18] In the Lakes Region, however, fewer than two lightning strikes occur per square kilometer annually.[19] While this value is not particularly high, the concern that lightning might ignite a wildfire is quite high since a large percentage of the area is rural and forested.

Hail

High winds can bring down limbs and trees, knocking out electricity and blocking roads. Hail can cause damage to crops, structures and vehicles. Hail is measured by the TORRO intensity scale, shown in Table IX. Although hailstorms are not particularly common in the Lakes Region, which averages less than two hailstorms per year, several have occurred in New Hampshire in the last few years.[20]

Table IX: TORRO Hailstorm Intensity Scale

Code	Diameter	Description	Typical Damage
H0	5-9 mm*	Pea	No damage
H1	10-15 mm	Mothball	Slight damage to plants, crops
H2	16-20 mm	Marble, grape	Significant damage to fruit, crops, vegetation
H3	21-30 mm	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	31-40 mm	Pigeon's egg	Widespread glass damage, vehicle damage
H5	41-50 mm	Golf ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	51-60 mm	Hen's egg	Aircraft bodywork dented, brick walls pitted
H7	61-75 mm	Tennis ball	Severe roof damage, risk of serious injuries
H8	76-90 mm	Large orange	(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	91-100 mm	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	> 100 mm	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

***mm** = millimeters (Approximate range since other factors (e.g. number, density of hailstones, hail fall speed, surface wind speed) affect severity
Source: http://www.torro.org.uk/torro/severeweather/hailscale.php

[18] *National Lightning Safety Institute webpage,* http://www.lightningsafety.com/nlsi_info/glossary.html, visited August 14, 2007.

[19] *Northeast States Emergency Consortium,* http://www.serve.com/NESEC/, visited August 14, 2007.

[20] *Northeast States Emergency Consortium,* http://www.serve.com/NESEC/, visited June 21, 2007.

IV. Winter Weather

Severe winter weather occurs frequently in the northeast and the possibility exists to have to withstand several days without power. It is felt that no one area of the region is at greater risk than another, but there are segments of the population that are more at risk. These include the elderly, people that are in need of regular medical care and young children.

Blizzard/Snow Storm

A heavy snowstorm can be defined as one which deposits four or more inches of snow in a twelve hour period.[21] Heavy snow can cause damage to property, disrupt services, and make for unsafe travel, even for emergency responders. Due to poor road conditions, residents may be stranded for several days. Extra pressure is placed on road crews and emergency services under these conditions.

Snow load in severe winter storms is of concern as well. This is particularly true for flat roofed structures. Several small storms can produce the same snow load as a single larger storm and the combined weight of the snow load can damage rooftops. Ice adds additional weight as well. It is not uncommon in New Hampshire to experience mixes of winter precipitation as temperatures fluctuate above and below the freezing mark. While not widespread, instances of collapsed roofs are not uncommon.

Snowstorms are a common occurrence throughout the Lakes Region. Blizzards, which may produce 12" – 36" or more of snow in a one to three-day period are less frequent, but can have a serious impact on structures, utilities, and services. The region typically receives greater than 66" of snow annually – between 1955 and 1985 the annual snowfall was between 6.5 and 8.0 feet. [22]

Ice Storm

An ice storm coats trees, power lines, streets, vehicles, and roofs with a very slick and heavy coating of ice. The major threats to a community due to ice storms include structural damage due to heavy loads on roofs, interruptions of services such as electricity, fuel, water, and communications, as well as hazardous road conditions.

In the winter of 1998, a major ice storm crippled much of New Hampshire, where

[21] http://www.nhoem.state.nh.us/Mitigation/SecIV.shtm, visited November 16, 2007.

[22] *Northeast States Emergency Consortium*, http://www.serve.com/NESEC/, visited June 20, 2007.

as much as three inches of rain fell, resulting in radial ice thickness of one inch or more on structures, power lines, and trees.[23] The ice load bent trees and power lines and led to massive power outages throughout the state. This ice storm resulted in over $17 million dollars of damage in New Hampshire alone.[24] The U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory estimates a 40 – 90 year return period for an event with a uniform ice thickness of between 0.75 and 1.25 inches.[25]

Nor'easter

New Hampshire generally experiences at least 1 or 2 nor'easters each year with varying degrees of severity. A nor'easter is defined as a large anticyclone weather system that resides near the New England region. These storms have the potential to inflict more damage than many hurricanes because high winds can last from 12 hours to 3 days, while the duration of hurricanes ranges from 6 to 12 hours. A nor'easter also has the potential to sustain hurricane force winds, produce torrential rain, and create blizzard conditions in winter months.[7] Infrastructure, including critical facilities, may be impacted by these events, and power outages, communications, and transportation disruptions (i.e., snow and/or debris-impacted roads, as well as hazardous to navigation and aviation) are often associated with the event.[26]

In the winter months, the State may experience the additional coincidence of blizzard conditions with many of these events. The added impact of the masses of snow and/or ice upon infrastructure often affects transportation and the delivery of goods and services for extended periods. The 2007 Patriots' Day Nor'easter was one of the largest springtime storms to strike New England.[27] The storm brought heavy snowfall to central and northern New Hampshire which flooded many rivers. The storm also packed hurricane force winds which caused structural damage and power outages from downed trees. To date, FEMA and the U.S. Small Business Administration have obligated nearly $30 million in disaster aid for this nor'easter.

Avalanche

A snow avalanche is a slope failure, similar to a landslide, consisting of a mass of rapidly moving, fluidized snow that slides down a mountainside. The flow can be composed of ice, water, soil, rock and trees.[28] Most avalanches result from structural weaknesses in the snow pack caused by temperature fluctuations or multiple snowfall events. Avalanches occur on steep slopes averaging 25-50 degrees and are triggered by both natural events (thermal changes, blizzards, seismic activity) and human activities (i.e. skiers, hikers, snowmobilers, sound waves). While avalanches are more common in the Presidential Range in Northern New Hampshire, conditions exist in a few mountain ranges within the Lakes Region as well.

[23] http://www.crrel.usace.army.mil/library/contractreports/IceStorm98.pdf, visited December 5, 2007.
[24] http://www.nh.gov/safety/divisions/bem/HazardMitigation/documents/Chapter_III_Hazard_Analysis.pdf, visited November 16, 2007.
[25] http://www.crrel.usace.army.mil/icejams/index.htm, visited November 16, 2007.
[26] http://www.nh.gov/safety/divisions/bem/HazardMitigation/haz_mit_plan.html, Aug. 15, 2005
[27] http://www.fema.gov/about/regions/regioni/patriotsdaynoreaster.shtm, visited October 1, 2007.
[28] http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/, visited August 15, 2007.

V. Other Hazards

The Lakes Region, as its name suggests, is comprised of many surface waterbodies. Many of the towns in the region depend on a portion of this resource to provide public drinking water to the community. Area tourism and water recreation are also highly dependent on the availability of clean and attractive water resources. For these reasons the protection of surface waters in the Lakes Region is highly valued both as a necessity and for economic reasons. The leading potential sources of water contamination include in-transit and fixed hazardous materials.

Motor Vehicle Accident involving Hazardous Materials
Hazardous materials, i.e., chemicals and chemical compounds in many forms, are found virtually everywhere - in common household products; agricultural fertilizers and pesticides; carried by vehicles as fuels, lubricants, and transported products; and, used in business and industrial processes. When improperly used, released, or spilled, they can burn or explode, diffuse rapidly through the air or in water, and endanger those who come in contact with them.

Chemicals, of all types are used, stored, and transported throughout the Lakes Region. The types and locations of many of these hazardous materials are unknown. While the New Hampshire Department of Environmental Services maintains a database of hazardous waste generators and underground storage tanks located in the state, detailed information on the types and volume of hazardous materials that are transported through the region is not documented. Likewise, only a small portion of the stored hazardous materials are reported and cataloged. Thus, there is a potential of a hazardous material incident at every transportation accident or fire in the area. Further, there is extensive use of liquefied gases for heating in the area, which means that significant amounts are transported, by both vehicle and major gas pipelines, and stored in the region.

Several major north-south and east-west transportation connections to points throughout central New Hampshire and beyond are found in the Lakes Region. These major roadways and a passenger railway are in many places located in close proximity to local water resources. The region is at risk of an over-land hazardous material spill that could cause infiltration of spilled

hazardous materials into the water resources. The potential for water resources to be contaminated is increased by the miles of storm drains that outlet directly into surface water bodies.

Pandemic

A pandemic is a global disease outbreak. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine. The disease spreads easily person-to-person, can cause serious illness, and can sweep across the country and around the world in very short time.[29] The New Hampshire Department of Health and Human Services is developing an epidemic and pandemic response plan so that communities can be prepared and respond to outbreaks.[30] The town of Holderness is part of a ten community all health hazards region and is a host community for mass inoculation of vaccines.

As of June 2006, the Avian Influenza H5N1 virus has infected 81 people and killed 52 in 10 countries in Asia and Africa. The total number of deaths for the first half of 2006 has already exceeded the total for 2005. Currently, most of the H5N1 cases have been a result of human contact with infected poultry and the spread of the virus has not continued beyond that person. Concerns about the H5N1 virus would increase exponentially if the virus was capable of being transmitted from human-to-human. Although no human-to-human cases have been reported, viruses have the ability to mutate. It is extremely difficult to predict where the next outbreak will occur, so preparing for the possibility of an outbreak is important. The Lakes Region of New Hampshire has a large influx of seasonal visitors, which could make viral containment very difficult. The US Department of Health & Human Services estimates that nearly 2 million people in the United States would perish if the Avian Influenza H5N1 virus was able to be transmitted from human-to-human. [21]

Infectious Diseases are diseases or viruses that negatively impact human health and can be contracted from insect, animal, human, or through the air. In 2005, the West Nile Virus infected 3,000 people and killed 119 in 44 states and Washington, DC. In comparison, annually the flu infects approximately 10-20% of the United States population (28-56 million people), resulting in approximately 20,000 deaths. Currently, there is no known cure for West Nile Virus, no medicine exists to treat it, and no vaccine is available to prevent it.[31]

Concerns regarding West Nile Virus include fear about mosquito populations that carry the virus. A study from the state of Wisconsin indicates that mosquitoes responsible for transmitting the West Nile Virus don't prefer wetlands, but breed prolifically in stagnant water in discarded tires, birdbaths, and roof gutters. These artificial containers lack the natural

[29] http://www.pandemicflu.gov/, visited August 15, 2007.
[30] http://www.dhhs.state.nh.us/DHHS/CDCS/ppcc.htm, visited August 15, 2007.
[31] http://www.cdc.gov/ncidod/dvbid/westnile/qa/prevention.htm, visited August 15, 2007.

predators that keep mosquito populations in check in naturally occurring wetlands. Often these artificial containers are located near developed areas providing mosquitoes with human hosts.[32]

Eastern equine encephalitis (EEE) is also of concern to the Lakes Region as it is one of the most serious mosquito-borne diseases in the United States. EEE causes disease in humans, horses, and some bird species. Symptoms of EEE include flu-like illness, inflammation of the brain, coma, and death with a mortality rate of approximately one-third. There is no specific treatment for the disease but the Centers for Disease Control and Prevention (CDC) suggests using EPA-registered insect repellant, wearing protective clothing, and removing standing water which are breeding grounds for mosquitoes.

Summary

It is cost prohibitive to make the built environment resistant to the most devastating natural hazards that could occur, though reasonable measures can be taken to minimize loss of life and property damage. The town may be affected by an unavoidable extraordinary circumstance such as a violent earthquake, but historically, events of this magnitude have been infrequent. Natural events that are common to the northeast also have common elements of concern for public safety. These include the potential for long-term power outages, the potential need for short-term sheltering facilities, and the availability of equipment and trained personnel. Key to loss prevention in these relatively common event scenarios is pre-event planning that critically assesses communications within the community, mutual aid resources regionally, public awareness and education, and emergency response training.

B. PROFILING HAZARD EVENTS

Identifying hazards of potential import to Hebron was based on local knowledge of department heads and town management, internet research, and conversation with the New Hampshire Homeland Security and Emergency Management and other agencies. A matrix was created to determine an overall hazard risk assessment rating. Each criterion (probability of occurrence and vulnerability) was given a rating of severe, moderate, or minimal to show which hazards are the greatest threat to the community, based on indicators: danger/destruction, economic, environmental, social, and political planning level. These ratings were then transformed into numerical values 3, 2, and 1, respectively. The overall risk rating associated with each hazard was determined by multiplying the two factors. This resulted in risk ratings ranging from 1 to 9; 1-3 = minimal risk, 4-6 = moderate risk, 7-9 = severe risk. This Plan will focus on those events that pose at least a moderate risk to the town of Hebron as determined by the Committee (Table X). The entire Risk Assessment Matrix can be found in Appendix I.

The extent (i.e. magnitude or severity) has been determined through research and past events in Hebron, and the potential degree of damage that could occur. Extent was based on potential assistance needed, as defined below:

[32] http://www.dnr.state.wi.us/, visited August 15, 2007.

- Minimal: local residents can handle the hazard event without help from outside sources
- Moderate: county or regional assistance is needed to survive and/or recover
- Severe: state or federal assistance is necessary to survive and/or recover

Table X: Town of Hebron Risk Assessment

Hebron	RISK ASSESSMENT									
	Extent			Probability of Occurrence			Vulnerability			
Hazard Type	Severe	Moderate	Minimal	High	Moderate	Low	High	Moderate	Low	Risk Rating
Flood, Drought, Extreme Heat & Wildfire										
Beaver Dams	X			3			3			**9**
Flood		X		3				2		**6**
Dam Failure			X			1		2		**2**
Ice Jam			X			1			1	**1**
Drought			X			1			1	**1**
Conflagration			X			1			1	**1**
Extreme Heat			X			1			1	**1**
Wildfire		X			2			2		**4**
Geologic Hazards										
Earthquake			X		2				1	**2**
Landslide			X			1			1	**1**
Radon		X			2			2		**4**
Severe Wind Hazards										
Thunder Storm/Lightning		X		3				2		**6**
Hurricane			X			1	3			**3**
Tornado/Downburst			X		2			2		**4**
Hail			X			1		2		**2**
Winter Weather Hazards										
Blizzard/Snow Storm		X		3			3			**9**
Ice Storm		X				1	3			**3**
Nor'easter		X			2			2		**4**
Avalanche			X			1			1	**1**
Human-Related Events										
MV Accident involving Hazardous Materials			X			1		2		**2**
Oil Spills			X			1		2		**2**
Military Aircraft Accident			X			1			1	**1**
Pandemic	X					1	3			**3**
Other										
Recreational Activities			X			1			1	**1**

It should be noted that the ranking of individual hazards for the purposes of planning discussion should not in any way diminish the potential severity of the impacts of a given hazard event. Further, hazards ranked as low risk may have the impact of increasing the risk of other hazards when they occur. For example, in the event of a drought, the risk of woodland fire may be greater. In combination, hazard events may have the impact of overwhelming existing emergency response systems. Similarly, the likelihood of each hazard addressed in this plan is based on historic events and local knowledge.

I. HIGH RISK HAZARDS

BLIZZARD/SNOW STORM
Location: Regional
Specific Areas of Concern: *schools, congregate care facilities, residences, inaccessible roads from downed trees and power lines, power outages*
Critical Facilities: Essential Services, Populations to Protect, all Emergency Shelters
Extent: Moderate
Probability of Occurrence: High
Overall Risk: High

Heavy snows can cause damage to property, disrupt services, and make for unsafe travel, including emergency response. The build up of snow on roofs, especially when combined with ice, can lead roofs to collapse; it can also down power lines. Due to poor road conditions, residents may be stranded for several days. Extra pressure is placed on road crews and emergency services under these conditions.

Snowstorms are a common occurrence throughout Grafton County. Blizzards, which may produce 12" – 36" or more of snow in a one- to three-day period are less frequent, but can have a serious impact on structures, utilities, and services. Hebron is in a region that receives greater than 66" of snow annually. Between 1955 and 1985, the mean annual snowfall for the Lakes Region of New Hampshire was between 6.5 and 8.0 feet. [33] Heavy quantities of snow can build up on roofs that do not have appropriate pitch.

Heavier snow accumulations are not necessary to have a major impact on a community. Ice build-up on structures, power lines, trees, and roads can lead to devastating destruction, as seen in the Ice Storm of 1998. During an ice storm the major threats to a community come from structural damage due to heavy loads on roofs, interruptions of services such as electricity, fuel, water, and communications, as well as hazardous road conditions. The build-up of snow and ice on trees can knock limbs and trees onto power lines along most town roads. In order to keep these roads cleared town plows and contractors hired for winter road maintenance have to work around the clock – placing a large physical burden on people and financial burden on the town.

[33] *Northeast States Emergency Consortium,* http://www.serve.com/NESEC/, visited June 20, 2007.

BEAVER DAMS
Location: Localized
Specific Areas of Concern: *Cockermouth River, Georges Brook, Newfound Lake*
Critical Facilities: Populations to Protect, Residences (especially on George and N. Shore Rds.)
Extent: Moderate
Probability of Occurrence: High
Overall Risk: High

The Hazard Mitigation Planning Committee (HMPC) identified areas on the Cockermouth River and Georges Brook where beaver damming has been a persistent problem for property owners. There is currently a potentially a threat to buildings and potentially life at the confluence of George Bridge and North Shore Rd. The active beavers have effectively stopped culverts, affecting drainage and stream flow, which has resulted in the change of stream course and loss of productivity of farmlands. As a result of this activity those lands remain habitually flooded. Action is being taken to trap and remove the beavers. It is suggested that after removal, the existing beaver dams should be removed. As a result of heavy rainfall over a prolonged period of time, a committee member reported that the Newfound Lake waters have recently risen five feet over the course of several hours. The result of the rapid rise was that boats were torn from their moorings and docks. Many boats were overturned, causing fuels to be introduced into the lake.

Another concern expressed by HMPC members is the amount of debris that is located in the streams and along stream banks. The debris is in part a result of the beaver activity, but is also noted in areas absent of active beavers. The concern is that the debris can significantly reduce the natural capacity of the stream and increase the magnitude of flooding and the number of areas prone to flooding.

II. MODERATE RISK HAZARDS

FLOODING
Location: Localized
Specific Areas of Concern: *Cockermouth River, Georges Brook, "The Flats", FIRM Identified Floodplain, Steep Slopes*
Critical Facilities: North Shore Rd, Groton Rd
Extent: Severe
Probability of Occurrence: High
Overall Risk: Moderate

Hebron has participated in the National Flood Insurance Program (NFIP) since 1975, and town flood maps were last updated on February 20, 2008. There has been one claim filed since 1978 for flood-related damages, for which NFIP paid a total of $19,816. There have been no repetitive losses in Hebron.

Both the Cockermouth River and Georges Brook have been subjected to perennial and flash flooding that has resulted in road closures, varying degrees of erosion, and loss of property use. The flooding on these watercourses can occur at any time of the year and is typically caused by periods of heavy rainfall or excessive snowmelt. The HMPC has delineated specific areas of concern on these watercourses and the locations of past flooding events, as indicated on the Critical Facilities and Potential Hazards Map (see Appendix E).

Concern about flooding on the Cockermouth led to the town purchase of land adjacent to the Braley Bridge in the 1950's. At that time, work was undertaken to restore the meandering river to its historic course. Later in 1973 the town obtained a wetlands permit to maintain approximately 1.5 miles of the river upstream of the Braley Bridge. In the 1990's, increased frequency and magnitude of flooding has led to the loss of road access in the area of North Shore Road called "The Flats." In periods of heavy rain and/or snowmelt, this low-lying section of North Shore Road is completely covered with as much as 18 inches of water.

WILDFIRE
Location: Localized
Specific Areas of Concern: *Isolated areas of northern, western, and eastern Hebron (see map)*
Critical Facilities: none
Extent: Moderate
Probability of Occurrence: Moderate
Overall Risk: Moderate

Areas for greatest concern are those where the lack of roads makes fire fighting difficult. Another area for potential concern is land susceptible to future development. Known as urban wildfire interface, vulnerability to fire can be greatly reduced by requiring developments to establish readily accessible water sources for fire suppression if non-existent on site. Firebreaks act to prevent damage to buildings and timber stands from fire as well. Firebreaks consist of a strip of mowed grass or fire-retarding vegetation that provide a natural barrier between developed areas and timber stands. The need for added fire protection measures can be addressed through the planning board in the site plan review process, by allowing the Fire Chief to provide comment on development proposals in close proximity to inaccessible or limited-access timber stands.

While historically massive wildfires have been a western phenomenon, each year hundreds of woodland acres burn in New Hampshire. The greatest risk exists in the spring when the snow has melted and before the tree canopy has developed and in the late summer/early fall. Appropriate planning can significantly reduce a community's vulnerability for woodland fires.

TORNADO/DOWNBURST
Location: Town-wide
Specific Areas of Concern: *Populated areas, critical facilities*
Critical Facilities: all, Populations to Protect
Extent: Minimal

Probability of Occurrence: Moderate
Overall Risk: Moderate

Hebron is at risk for several types of natural events associated with high winds; these include nor'easters, tornados, and downbursts. Macrobursts and microbursts are generally classified as downbursts, the difference being the size of the area that these severe winds impact. Microbursts impact an area that is less than 2.5 miles in diameter and macrobursts impact an area at least 2.5 miles in diameter. A downburst is a strong downdraft that includes an outburst of potentially damaging winds. New Hampshire experienced three such events in the 1990's. The event closest to Hebron was in Moultonborough on July 26, 1994 and was classified as a macroburst, which affected an area one-half mile wide by 4-6 miles in length.

NOR'EASTER
Location: Localized
Specific Areas of Concern: *Union Congregational Church, Town Shed, Old Firehouse*
Critical Facilities: all
Extent: Moderate
Probability of Occurrence: High
Overall Risk: Moderate

Because of their long duration and large amounts of precipitation of all sorts, nor'easters put additional pressure on all municipal facilities and services.

THUNDERSTORM/LIGHTNING
Location: Localized
Specific Areas of Concern: *Union Congregational Church, Town Shed, Old Firehouse*
Critical Facilities: all
Extent: Moderate
Probability of Occurrence: High
Overall Risk: Moderate

The concern that lightning might ignite a wildfire in Hebron is quite high due to the amount of forested mountains in town. The height and construction of the Union Congregational Church, Town Shed, and Old Firehouse make them the most vulnerable critical facilities to a lightning strike.

RADON
Location: Town-wide
Specific Areas of Concern: *None*
Critical Facilities: none
Extent: Moderate
Probability of Occurrence: Moderate
Overall Risk: Moderate

The impact of radon depends upon the local geology, the design, construction, and ventilation of the structure, and the amount of exposure by residents. Hebron town facilities do not have basement offices; those working in or visiting town facilities are not at high risk of exposure to radon.

C. HISTORICAL HAZARD EVENTS

On January 7 and 8, 1998, a devastating ice storm hit and mainly affected upstate New York, northern New Hampshire and Vermont, much of Maine, and southeast Canada. Some locations received over 3 inches of rain (as freezing rain), with radial ice thickness of one inch or more. New England reported over 500,000 customers without power and overall damages approached $3 billion for Canada and were at least $1.4 billion for the U.S. In New Hampshire, 140,000 people lost electricity, some for as long as eight days, 38 shelters were set up that served 700 refugees, and two storm related deaths were reported.

On December 11-12, 2008, another severe ice storm befell the region, leaving 400,000 in New Hampshire, or roughly 30% of the state's population without electricity for up to two weeks following the storm. Restoring power cost an estimated $75 million, and took 1,205 crews from as far as the Midwest and Canada[34]

Table XI details historic events that have impacted the town of Hebron within the last eighty years. NOAA reports 107 snow and Ice Storms impacting Grafton County between 1993 and 2007 and 124 thunderstorm/wind events from 1960 through 2007.

Table XI: Past Hazard Events in the Region

Hazard	Date	Location	Impacts/Assessment
Tornado	July 14, 1963	Grafton County	F1, $3,000 in damages
Tornado	June 27, 1964	Grafton County	F0, $25,000 in damages
Tornado	August 11, 1966	Grafton County	F2, $250,000 in damages
Tornado	August 25, 1969	Grafton County	F1, $25,000 in damages
Tornado	July 21, 1972	Grafton County	F1, $25,000 in damages
Tornado	July 21, 1972	Grafton County	F1, $25,000 in damages
Tornado	May 11, 1973	Grafton County	F2
Tornado	June 11, 1973	Grafton County	F0
Downburst	July 6, 1999	Grafton County, Merrimack and Hillsborough	
Drought	1929-1936	Statewide	Regional
Drought	1939-1944	Statewide	Sever in Southeast

[34] *The Union Leader, http://www.unionleader.com/article.aspx?headline=PSNH%27s+estimated+ice+storm+bill%3a+%2475+million&articleId=014030af-0548-4211-92fa-ef55dfa98ed9,* visited February 27, 2009.

Hazard	Date	Location	Impacts/Assessment
Drought	1947-1950	Statewide	Moderate
Drought	1960-1969	Statewide	Longest record continuous period of below normal precipitation.
Drought	June 1, 1999	Statewide	Governor's Office declaration moderate drought for most of the state.
Drought	Aug. – Dec. 2001	Statewide	Governor's Office declaration moderate drought for most of the state. Palmer Drought Severity Index was Moderate.
Earthquake	December 24, 1940	Carroll County	5.5 - felt over 400,000 square miles. Severe damage.
Flood	July 4, 1973	Grafton County	Fourteen bridges and many roadways were damaged which totaled $171,000.
Flood	July 1, 1986 - August 10, 1986	Statewide	Severe summer storms with heavy rains, flash flooding and severe high winds
Flood	August 7-11, 1990	Statewide	Wide spread flooding, a series of storm events with moderate to heavy rains
Flood	October 1, 1996	Grafton County	Heavy Rains
Flood	October - November 1995	Grafton County	Heavy Rains
Hazard	**Date**	**Location**	**Impacts/Assessment**
Flood	June 1998	Bridgewater	Numerous road and culvert washouts. This led to the release of FEMA funding over the next two years for upgrades. 1 death.
Flood	Sept. 16-18, 1999	Grafton County	Remnants of Hurricane Floyd resulted in $570,500 of property damage. Power out to 10,000 customers.
Flood	September 12, 2003	Statewide	Severe storms and flooding
Flood	June 9, 2005	Southern Grafton County	Flash flooding resulted in $1.0 M in property damages.
Flood	October 26, 2005	Statewide	Severe storms and flooding
Flood	May 14 – 16, 2006	Grafton County	Up to 12 inches of rain in three days.
Flood	May, 12 - June 30, 2006	Statewide	Severe storms and flooding
Forest Fire	August 9, 2001	Grafton County	Fire caused by lightning burned 0.75 acres.
Forest Fire	Summer 2006	Bristol	Adjacent town – Bristol Peak had seven acre forest fire.
Lightning	April 12, 2001	Plymouth, Ashland	Separate fires in apartment building and house.
Lightning	Sept. 4, 2003	Bristol	Damage to home electrical system and equipment totaled $10,000.
Lightning	June 27, 2005	Plymouth	Three separate strikes caused a barn fire, damage to Town Hall and communications and electronics equipment were damaged, and one injury. Total damages were $110,000.
Hurricane	September 9, 1991	Statewide	Hurricane Bob, severe storms
Hurricane	September 18- 19, 1999	Grafton County	Heavy Rains associated with tropical storms, Hurricane Floyd affected the area.

Hazard	Date	Location	Impacts/Assessment
Blizzard	March 16, 1993	Statewide	High winds and record snowfall
Ice Storm	January 7, 1998	Statewide	In Grafton County there were moderate to severe conditions. 52 communities in the county were impacted, six injuries and one fatality; major roads closures, 67,586 without electricity, 2,310 without phone service, one communication tower, $17 million of damages. Some in Bridgewater were without power for six months.
Ice Storm	December 11-12, 2008	Statewide	On December 11-12, 2008, a severe ice storm befell the region, leaving 400,000 in New Hampshire, or roughly 30% of the state's population without electricity for up to two weeks following the storm. Restoring power cost an estimated $75 million, and took 1,205 crews from as far as the Midwest and Canada[35]
Nor'easter	April 27, 2007	Statewide	Nor'easter caused flooding, damage in excess of $25 million s of August 2007.
Snow Storm	December 1, 1973	Grafton County	Two back-to-back snow storms
Snow Storm	February 6, 2001	Grafton County	Accumulation of 34 inches
Snow Storm	March 16, 1993	Statewide	
Snow Storm	March 30, 2005	Statewide	$6.5 million in public assistance. This storm had a heavy impact on Bridgewater.
Snow Storm	January 15, 2004	Statewide	
Snow Storm	March 28, 2001	Statewide	

Table Sources:
http://www.tornadoproject.com
New Hampshire Homeland Security and Emergency Management (NH HSEM)
National Oceanic and Atmospheric Administration (NOAA)
National transportation Safety Board (NTSB)
Federal Emergency Management Agency (FEMA)
Northeast States Emergency Consortium (NESEC)
National Interagency Fire Center (NIFC)

[35] *The Union Leader*, *http://www.unionleader.com/article.aspx?headline=PSNH%27s+estimated+ice+storm+bill%3a+%2475+million&articleId=014030af-0548-4211-92fa-ef55dfa98ed9*, visited February 27, 2009.

CHAPTER IV: VULNERABILITY ASSESSMENT

A. CLASSIFICATION OF CRITICAL INFRASTRUCTURE

The Committee identified a list of critical infrastructure for the town of Hebron (Appendix F). The critical infrastructure list is divided into four categories, 1) Essential Services; 2) Emergency Shelters; 3) Structures and Services; 4) Special Populations. The first category contains facilities essential in a hazard event. The second contains non-essential facilities that have been identified by the Committee as services and facilities to protect. The third category is a list of the pre-defined emergency shelters within the community. The fourth category contains populations that the Committee wished to protect in the event of a disaster.

Essential Services:
Facility: Public Safety Building (Emergency Operations Center (EOC))
Location: 37 Groton Rd
Hazard Vulnerability: Low

Emergency Shelters:
Facility: Union Congregational Church
Location: 16 Church Rd
Hazard Vulnerability: Low

Facility: Town Shed
Location: 21 Town Shed Dr
Hazard Vulnerability: Low

Structures and Services:
- Old Hebron Firehouse (Storage Bldg)
- Town Selectmen's Office
- Berea Youth Camp Recreation Hall
- Evacuation Routes:
  - NH Route 3A north/south
  - North Shore Rd east/west
  - West Shore Rd north/south
  - Groton Rd east/west

Populations to Protect:
- Berea Youth Camp (year-round)
  Camp Wi-co-su-ta (seasonal)
  Camp Mowglis (seasonal)
  Camp Pasquaney (seasonal)
  Camp Onaway (seasonal)

- Special Needs Population – (Data maintained by Community Nurse)
  - Oxygen-dependent people
  - People assisted by home health care personnel
  - Elderly
  - Hearing impaired
  - Sight impaired

B. NATURAL HAZARDS VULNERABILITY OF CRITICAL FACILITIES

The Critical Facilities and Potential Hazards Map (Appendix E) identifies the location of critical facilities in relation to mapped hazard areas. No essential service critical facilities are located within the flooding hazard area. The Critical Facilities Natural Hazards Vulnerability Assessment, Appendix G, ranks each moderate to high risk hazard discussed in Chapter III for each critical facility. They are ranked low to high, based on the potential economic, environmental and social impacts, and level of danger/damage to buildings, infrastructure and services of the hazard to the facility.
Of highest concern is the impact of severe winter storms on the populations of concern, infrastructure, and essential services in town and is the focus of several identified mitigation actions (page 34) including;

- Update existing Emergency Operations Plan (in process)
- Update Capital Improvements Plan (CIP) (continually in process)
- Update Transportation Improvement Plan (TIP)

C. ESTIMATING POTENTIAL LOSSES TO CRITICAL FACILITIES

The critical facilities identified in Hebron are estimated to be worth just over $7 million dollars. Table XIII provides an estimate of the current monetary value for each of the publicly owned critical facilities in Hebron. These values can also be used to determine potential loss estimates in the event a natural or manmade hazard damages a part of or the entire facility. The estimates were generated by the town assessor and are based on property tax documentation.

Table XIII: 2008 Value of Public Critical Facilities in Hebron

TYPE	NAME	CLASSIFICATION	VALUE
EOC	Public Safety Building	Essential Services	$685,500
Public Service	Berea Youth Camp Recreation Hall	Structures & Services	$5,066,000
Public Service	Union Congregational Church	Emergency Shelter	$419,200
Public Service	Town Shed	Emergency Shelter	$335,300
Public Service	Old Hebron Firehouse (Storage Bldg)	Structures & Services	$284,500
Public Service	Town Selectmen's Office	Structures & Services	$214,300

The town of Hebron actively participates in the National Flood Insurance Program. The Flood Insurance Rate Maps (FIRM) were last updated in February 2008. Additionally, brochures are available in the town offices for public use. A list of parcels located in the 100-year floodplain, and the values of buildings located on these parcels can be found in Appendix J.

CHAPTER V: MITIGATION STRATEGIES

A. STATE OF NEW HAMPSHIRE HAZARD MITIGATION GOALS[36]

The State of New Hampshire Natural Hazard Mitigation Plan prepared and maintained by the New Hampshire Homeland Security and Emergency Management (NH HSEM), sets forth the following overall hazard mitigation goals for the State of New Hampshire:

I. To improve upon the protection of the general population, the citizens of the State and guests, from all natural and man-made hazards.

II. To reduce the potential impact of natural and man-made disasters on the State's Critical Support Services.

III. To reduce the potential impact of natural and man-made disasters on Critical Facilities in the State.

IV. To reduce the potential impact of natural and man-made disasters on the State's infrastructure.

V. To improve Emergency Preparedness.

VI. Improve the State's Disaster Response and Recovery Capability.

VII. To reduce the potential impact of natural and man-made disasters on private property.

VIII. To reduce the potential impact of natural and man-made disasters on the State's economy.

IX. To reduce the potential impact of natural and man-made disasters on the State's natural environment.

X. To reduce the State's liability with respect to natural and man-made hazards generally.

XI. To reduce the potential impact of natural and man-made disasters on the State's specific historic treasures and interests as well as other tangible and intangible characteristics which add to the quality of life of the citizens and guests of the State.

XII. To identify, introduce and implement cost effective Hazard Mitigation measures so as to accomplish the State's Goals and Objectives and to raise the awareness of, and acceptance of Hazard Mitigation generally.

[36] NH Bureau of Emergency Management website. http://www.nhoem.state.nh.us/mitigation/, visited June 19, 2007.

B. TOWN OF HEBRON, NEW HAMPSHIRE HAZARD MITIGATION GOALS

The Hebron Hazard Mitigation Planning Committee concurs with the State Hazard Mitigation goals and further defined goals most pertinent to the town. Based on the hazards studied, and the assessment of current and proposed mitigation strategies, the Committee recommends the following hazard mitigation goals for the town of Hebron:

Goal I: Prevention

1. To reduce the potential impact of natural and man-made disasters on public and private property in the community.

Goal II: Protection

2. To improve the level of protection of the health, safety, and well-being of all Hebron community members.

3. To maintain and improve the existing emergency response system.

Goal III: Coordination

4. To work in cooperation with the State of New Hampshire's Hazard Mitigation goals.

5. To maintain compatibility with the goals of the master plan.

Goal IV: Education

6. To gain a greater understanding of the alternatives available for the implementation of cost-effective hazard mitigation opportunities.

C. CURRENT POLICIES, PROGRAMS and REGULATIONS

A review of existing mitigation strategies was conducted. The assessment included review of pertinent documents including the zoning ordinance, subdivision regulations, Emergency Operations Plan, site plan regulations, annual report, and discussion with Committee members. Table XIV details the mitigation strategies that currently exist or are in the process of being developed for the town of Hebron.

Table XIV: Existing Mitigation Strategies

Entity	Description	Area Covered	Responsible Party
Zoning Ordinance	▪ National Flood Insurance Program (NFIP) requirements have been adopted in the town's zoning ordinance. The current Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) were revised February 20, 2008.	Town	Planning Board

Entity	Description	Area Covered	Responsible Party
Subdivision Regulations	▪ Contains soil base lot size requirements for subdivision of sloped land, which aids in minimizing the impact of development in terms of stormwater management, erosion, and potential flooding. ▪ Identifies and further restricts the subdivision of land in the delineated special flood hazard area. ▪ Limits the grade of streets to 10 percent, unless the Planning Board grants approval.	Town	Board of Selectmen, Planning Board
Site Plan Regulations	▪ Require the site plans to contain surface water locations, and surface and subsurface drainage facilities. This information can be useful in making determinations regarding on-site and off-site flooding issues and the availability of fire protection measures.	Town	Planning Board
Police/Fire/EMT	▪ Training Programs ▪ Common town radio frequency for departmental coordination	Town	Emergency Management Director (EMD)
Emergency Preparedness Plan (EPP)	▪ The town maintains an Emergency Preparedness Plan. The current plan is in need of updating and is referenced in the recommendation section of this plan.	Town	Emergency Management Director
Permits System	▪ The town has an "intent to build" permit system that is administered by the Board of Selectmen. Though no official building codes have been adopted, application review affords the town the ability to take hazards into consideration prior to construction.	Town	Board of Selectmen
Emergency Power Generation	▪ Emergency power generation exists in the old fire station; this source additionally supplies emergency power to the Congregational Church. The following town facilities also have emergency power generation: Safety Services Building, Highway Shed, Selectmen's Office	Town	EMD
Shelters	▪ Union Congregational Church ▪ Town Shed	Town	EMD

D. IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

The use of the existing mitigation strategies and multiple brainstorming sessions yielded recommended mitigation strategies. These strategies can be used to reduce the effects of hazards on both new and existing buildings and infrastructure of the community. These strategies were then prioritized using the STAPLEE method, which analyzes Social, Technical, Administrative, Political, Legal, Economic, and Environmental aspects of a project and is commonly used by public administration officials and planners to make planning decisions. Table XV represents the average score given to each mitigation goal by the Committee.

The Committee then identified the Hebron Hazard Mitigation Plan Goals (pp. 30-31) to which each recommendation best corresponds; Prevention, Protection, Coordination, or Education. The recommendations were placed in order of priority for each goal. Higher priority is placed on recommendations that received a higher STAPLEE score, with the maximum score being 21. The mitigation strategies listed in Table XV were modified from those ranked during the STAPLEE prioritization activity (Appendix J) as a result of final Committee discussions to better represent actions the town of Hebron can take.

Additionally, STAPLEE scores were given to the 11 recommendations from North Country RC&D's Water Resource Plan. This plan can be found in its entirety in Appendix K.

Table XV. Recommended Mitigation Actions in Ranked Order

STAPLEE Score	Mitigation Action	Goal
21	Upgrade Materials in Shelters to assist residents in times of emergency.	**II**
21	Update existing Emergency Operations Plan	**II**
21	Update CIP (Capital Improvement Plan)	**I**
21	Utilize Hebron/Bridgewater School as an additional shelter for both towns	**III**
20	Implement Stream Maintenance Program	**I**
20	Mitigate increasing problem with Beaver Dams	**II**
20	Replace twin 6' diameter culverts on Braley Rd	**II**
20	Elevate Cooper Rd North of Town Shed Dr	**II**
19	Update the TIP (Transportation Improvement Plan)	**III**

STAPLEE Score	Mitigation Action	Goal
19	Conduct road improvements to George Rd to mitigate poor sight lines	II
18	Purchase All-Terrain Vehicles for the primary purpose of fire suppression	II
17	Compile Water Resource List	I
17	Compile list of residents with special needs	IV
17	Compile list of private residents with generators	IV

STAPLEE Score	Water Resource Plan Strategies	Goal
21	Dry hydrant and fire pond maintenance program	WRP
21	Subdivision regulations for fire protection	WRP
21	Incorporate Water Resource Plan into Master Plan	WRP
21	Fire Department Training	WRP
21	Address driveway standards for emergency vehicle access	WRP
21	Investigate possibility of constructing dry hydrant systems	WRP
21	Repair or replace dry hydrant system	WRP
21	Construct dry hydrants	WRP
20	Install cisterns	WRP
13	Map woods roads	WRP
9	Assess and maintain condition of Class VI roads	WRP

E. IMPLEMENTATION OF MITIGATION ACTIONS

There are many factors that influence how a town chooses to spend its energy and resources in implementing recommended actions. Factors include:

- Urgency
- How quickly an action could be implemented
- Likelihood that the action will reduce future emergencies
- Regulations required to implement the action

- Administrative burdens
- Time (both paid and volunteer)
- Funding availability
- Political acceptability of the action.

In the context of these factors, the Committee discussed the mitigation actions and utilized the STAPLEE method as a guide to reach consensus regarding their relative level of priority, recognizing that some actions are of greater priority to different town departments. This implementation schedule contains a matrix (Table XVI) indicating the parties responsible for bringing about these actions, a time frame, and potential funding sources. To keep the plan current, the implementation schedule should be updated and re-evaluated on a regular basis as outlined in the monitoring section of this plan.

Table XVI: Completed Mitigation Actions

Potential Hazards	Completed Mitigation Action
All	Standardized communications
All	Town Shed emergency power generation
All	Town Hall emergency power generation
All	Creation of an emergency services capital reserves fund

Table XVII: Implementation Schedule for Mitigation Actions

Potential Hazards	Proposed Mitigation Action	Responsible Party	Potential Funding	Time Frame	Status
All	Upgrade Materials in Shelters to assist residents in times of emergency.	All Depts.	Town	2009	Planning
All	Update existing Emergency Operations Plan	EMD	Town	2009	In process
All	Update CIP (Capital Improvement Plan)	All Depts.	Town	2009	In process
All	Utilize Hebron/Bridgewater School as an additional shelter for both towns	All Depts.	unknown	unknown	Preliminary
Flooding	Implement Stream Maintenance Program	Conservation Commission	FEMA	2011	Planning
Flooding	Mitigate increasing problem with Beaver Dams	All Depts.	Trust Fund	2014	Planning
Flooding	Twin 6' diameter culverts on Braley Rd	Highway Dept.	unknown	2010	Planning
Flooding	Elevate Cooper Rd North of Town Shed Dr	Highway Dept.	unknown	2010	Planning
All	Update TIP (Transportation Improvement Plan)	LRPC	NH DOT	Ongoing	In process
All	Road improvements to George Rd	Highway Dept.	unknown	2010	Planning

Potential Hazards	Proposed Mitigation Action	Responsible Party	Potential Funding	Time Frame	Status
Wildfires	Purchase All-Terrain Vehicles for the primary purpose of fire suppression	Fire Dept.	unknown	2011	Planning
All	Compile Water Resource List	NCRC&D	NCRC&D	2009	In process
Severe Winter Weather	Compile list of residents with human special needs	Police Dept.	unknown	unknown	Preliminary
Severe Winter Weather	Compile list of private residents with generators	Police Dept.	unknown	unknown	Preliminary

CHAPTER VI: PLAN ADOPTION AND MONITORING

A. IMPLEMENTATION

The Hazard Mitigation Plan Evaluation Committee, established by the Selectboard and EMD, will continue to meet annually and provide a mechanism for ensuring that an attempt is made to incorporate the actions identified in the plan into ongoing town planning activities. Essential elements of implementation require all responsible parties for the various recommendations understand what is expected of them, and that they are willing to fulfill their role in implementation. It is therefore important to have the responsible parties clearly identified when the town adopts the final plan. Where appropriate it would be helpful to have any hazard mitigation activities identified in job descriptions.

NH RSA 674:2(e) makes the recommendation that a natural hazard section may be included in the town master plan. Inclusion of this document as an addendum to the Hebron Master Plan provides an opportunity for issues addressed in this plan to be taken into consideration when planning for development within the community. The capital improvement planning that occurs in the future will also contribute to the goals in the Hazard Mitigation Plan. When appropriate, an effort will be made to incorporate this plan into the Hebron Master Plan, the Hebron Capital Improvements Plan, and the Emergency Operations Plan. Within a year after the town officially adopts the 2009 update to the Hazard Mitigation Plan, an attempt will be made to have hazard mitigation strategies integrated into these existing mechanisms and into all other ongoing town planning activities.

B. PLAN MAINTENANCE

The Hebron Hazard Mitigation Planning Committee and the Board of Selectmen, in order to track progress and update the mitigation strategies identified in Chapter V-E, will review the Hebron Hazard Mitigation Plan every year or after a hazard event. The town of Hebron Emergency Management Director is responsible for initiating this review and needs to consult with members of the Hebron Committee identified in this Plan. Changes will be made to the Plan to accommodate projects that have failed, or are no longer: (1) consistent with the timeframe identified, (2) the community's priority, (3) lack 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 this Plan to determine feasibility of future implementation. In keeping with the process of adopting the Plan, a public hearing will be held to receive public comment on the Plan. Maintenance and updating will be held during the annual review period, best suggested time is mid-year, and the final product adopted by the Board of Selectmen. The Committee will meet quarterly as part of this plan maintenance. The Emergency Management Director is also responsible for updating and resubmitting the plan to FEMA to be re-approved every five years.

C. ADOPTION

The Hebron Board of Selectmen by majority vote does hereby adopt the Hebron Hazard Mitigation Plan, as a statement of policy. Actions for implementation under this statement of policy are set forth in priority order in the *"Implementation of Mitigation Actions"* (page 35) and *"Plan Maintenance"* (page 38) sections of this document. All other sections of this Plan are supporting documentation for informational purposes only and not included as the statement of policy.

June 25, 2009
Date

HEBRON BOARD OF SELECTMEN

John W. Dunklee, Chair

John W. Matthews, Vice-Chair

Bruce A. Barnard

APPENDIX A: TECHNICAL RESOURCES

NH Homeland Security and Emergency Management 271-2231
http://www.nh.gov/safety/divisions/HSEM/
Hazard Mitigation Section 271-2231
http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/index.html

Federal Emergency Management Agency ..... (617) 223-4175
http://www.fema.gov/
FEMA, National Flood Insurance Program, Community Status Book
http://www.fema.gov/fema/csb.htm

NH Regional Planning Commissions:
Central NH Regional Planning Commission 796-2129
http://www.cnhrpc.org/
Lakes Region Regional Planning Commission 279-8171
http://www.lakesrpc.org/
Nashua Regional Planning Commission 883-0366
http://www.nashuarpc.org/
North Country Council 444-6303
http://www.nccouncil.org/
Rockingham Regional Planning Commission 778-0885
http://www.rpc-nh.org/
Southern New Hampshire Regional Planning Commission 669-4664
http://www.snhpc.org/
Southwest Regional Planning Commission 357-0557
http://www.swrpc.org/
Strafford Regional Planning Commission 742-2523
http://www.strafford.org/
Upper Valley Lake Sunapee Regional Planning Commission 448-1680
http://www.uvlsrpc.org/

NH Governor's Office of Energy and Planning 271-2155
http://www.nh.gov/oep/index.htm

NH Department of Transportation 271-3734
http://www.nh.gov/dot/index.htm

NH Department of Cultural Affairs 271-2540
http://www.nh.gov/nhculture/
Division of Historical Resources 271-3483
http://www.nh.gov/nhdhr/

NH Department of Environmental Services 271-3503
http://www.des.state.nh.us/
Air Resources 271-1370
http://www.des.state.nh.us/ard_intro.htm
Waste Management 271-2900

http://www.des.state.nh.us/waste_intro.htm
Water Division 271-3406
http://www.des.state.nh.us/water_intro.htm
Pollution Prevention Division 271-6460
http://www.des.state.nh.us/nhppp/

NH Municipal Association 224-7447
http://www.nhmunicipal.org/LGCWebsite/index.asp

NH Fish and Game Department 271-3421
http://www.wildlife.state.nh.us/

NH Department of Resources and Economic Development 271-2411
http://www.dred.state.nh.us/
Natural Heritage Inventory 271-3623
http://www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/aboutus.htm
Division of Forests and Lands 271-2214
http://www.dred.state.nh.us/divisions/forestandlands/index.htm
Division of Parks and Recreation 271-3255
http://www.nhparks.state.nh.us/

NH Department of Health and Human Services 271-8835
http://www.dhhs.nh.gov/DHHS/DHHS_SITE/default.htm
Greater Plymouth Public Health Network Coordinator:
Ann Graves 536-1120
http://www.dhhs.state.nh.us/DHHS/CDCS/LIBRARY/Fact+Sheet/PPCC-AHR-Map.htm

Northeast States Emergency Consortium, Inc. (NESEC) ..... (781) 224-9876
http://www.nesec.org/

US Department of Commerce ..... (202) 482-2000
http://www.commerce.gov/
National Oceanic and Atmospheric Administration ..... (202) 482-6090
http://www.noaa.gov/
National Weather Service, Eastern Region Headquarters
http://www.erh.noaa.gov/
National Weather Service, Tauton, Massachusetts ..... (508) 824-5116
http://www.erh.noaa.gov/er/box/
National Weather Service, Gray, Maine ..... (207) 688-3216
http://www.erh.noaa.gov/er/gyx/

US Department of the Interior
http://www.doi.gov/
US Fish and Wildlife Service 225-1411
http://www.fws.gov/
US Geological Survey 225-4681
http://www.usgs.gov/
US Geological Survey Real Time Hydrologic Data
http://waterdata.usgs.gov/nwis/rt
US Army Corps of Engineers ..... (978) 318-8087

http://www.usace.army.mil/

US Department of Agriculture
http://www.usda.gov/wps/portal/usdahome
US Forest Service ..... (202) 205-8333
http://www.fs.fed.us/

Public Service of New Hampshire 436-7708
http://www.psnh.com/

Cold Region Research Laboratory 646-4187
http://www.crrel.usace.army.mil/

National Emergency Management Association ..... (859) 244-8000
http://nemaweb.org

National Aeronautics and Space Administration
http://www.nasa.gov/
NASA – Goddard Space Flight Center "Disaster Finder"
http://disasterfinder.gsfc.nasa.gov/
NASA Optical Transient Detector
http://thunder.msfc.nasa.gov/

Dartmouth Flood Observatory
http://www.dartmouth.edu/artsci/geog/floods/

National Lightning Safety Institute
http://lightningsafety.com/

The Tornado Project Online
http://www.tornadoproject.com/

National Severe Storms Laboratory
http://www.oar.noaa.gov/atmosphere/atmos_nssl.html

Plymouth State University Weather Center
http://vortex.plymouth.edu/

APPENDIX B: MITIGATION FUNDING RESOURCES

404 Hazard Mitigation Grant Program (HMGP) NH Homeland Security and Emergency Management
406 Public Assistance and Hazard Mitigation..... NH Homeland Security and Emergency Management
Community Development Block Grant (CDBG) ..... NH HSEM, NH OEP, also refer to RPC
Dam Safety Program ..... NH Department of Environmental Services
Disaster Preparedness Improvement Grant (DPIG)NH Homeland Security and Emergency Management
Emergency Generators Program by NESEC..... NH Homeland Security and Emergency Management
Emergency Watershed Protection (EWP) Program..... USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMAP) ... NH Homeland Security and Emergency Management
Flood Plain Management Services (FPMS) ..... US Army Corps of Engineers
Mitigation Assistance Planning (MAP) ..... NH Homeland Security and Emergency Management
Mutual Aid for Public Works ..... NH Municipal Association
National Flood Insurance Program (NFIP) .....NH Office of Energy & Planning
Power of Prevention Grant by NESEC ..... NH Homeland Security and Emergency Management
Project Impact ..... NH Homeland Security and Emergency Management
Roadway Repair & Maintenance Program(s) .....NH Department of Transportation
Section 14 Emergency Stream Bank Erosion & Shoreline Protection ..... US Army Corps of Engineers
Section 103 Beach Erosion ..... US Army Corps of Engineers
Section 205 Flood Damage Reduction ..... US Army Corps of Engineers
Section 2098 Snagging and Clearing..... US Army Corps of Engineers
Shoreline Protection Program..... NH Department of Environmental Services
Various Forest and Lands Program(s) .....NH Department of Resources & Economic Development
Wetlands Programs ..... NH Department of Environmental Services

APPENDIX C: PUBLIC NOTICE EXAMPLE

FOR IMMEDIATE RELEASE:

QUESTIONS MAY BE DIRECTED TO:
PAUL HATCH, HSEM FIELD REPRESENTATIVE (603) 852-3792
ADAM HLASNY, LAKES REGION PLANNING COMMISSION (603) 279-8171

The Lakes Region Planning Commission is pleased to announce the establishment of the Town of Hebron Hazard Mitigation Committee. The Committee is working in cooperation with the NH Homeland Security and Emergency Management, Hebron Board of Selectmen and the Lakes Region Planning Commission to develop a Hazard Mitigation Plan for the Town of Hebron.

The Plan is designed to address Hebron's vulnerability to natural and man-made hazards and will serve to reduce future residential and commercial property losses from hazardous events before they occur. The most significant areas of concern for Hebron will be determined. With the development of the plan, community leaders will be able to identify goals and actions to reduce the impacts of these hazards. The plan is also a useful tool for leveraging additional sources of funding in the event of a disaster.

The Committee would like to have participation from local businesses and citizens. The plan requires their input and involvement. If anyone would like to serve on the Committee, please contact Adam Hlasny at 279-8171 for further information.

The meetings are held at the Hebron Selectmen's Office beginning at 6:30 pm on December 10, 16, January 13, and February 4. Following the completion of the Draft Hazard Mitigation Plan, there will be a press release announcing the public comment period.

APPENDIX D: PRESS RELEASE FOR PUBLIC COMMENT PERIOD

FOR IMMEDIATE RELEASE:

QUESTIONS MAY BE DIRECTED TO:
PAUL HATCH, HSEM FIELD REPRESENTATIVE (603) 852-3792
ADAM HLASNY, LAKES REGION PLANNING COMMISSION (603) 279-8171

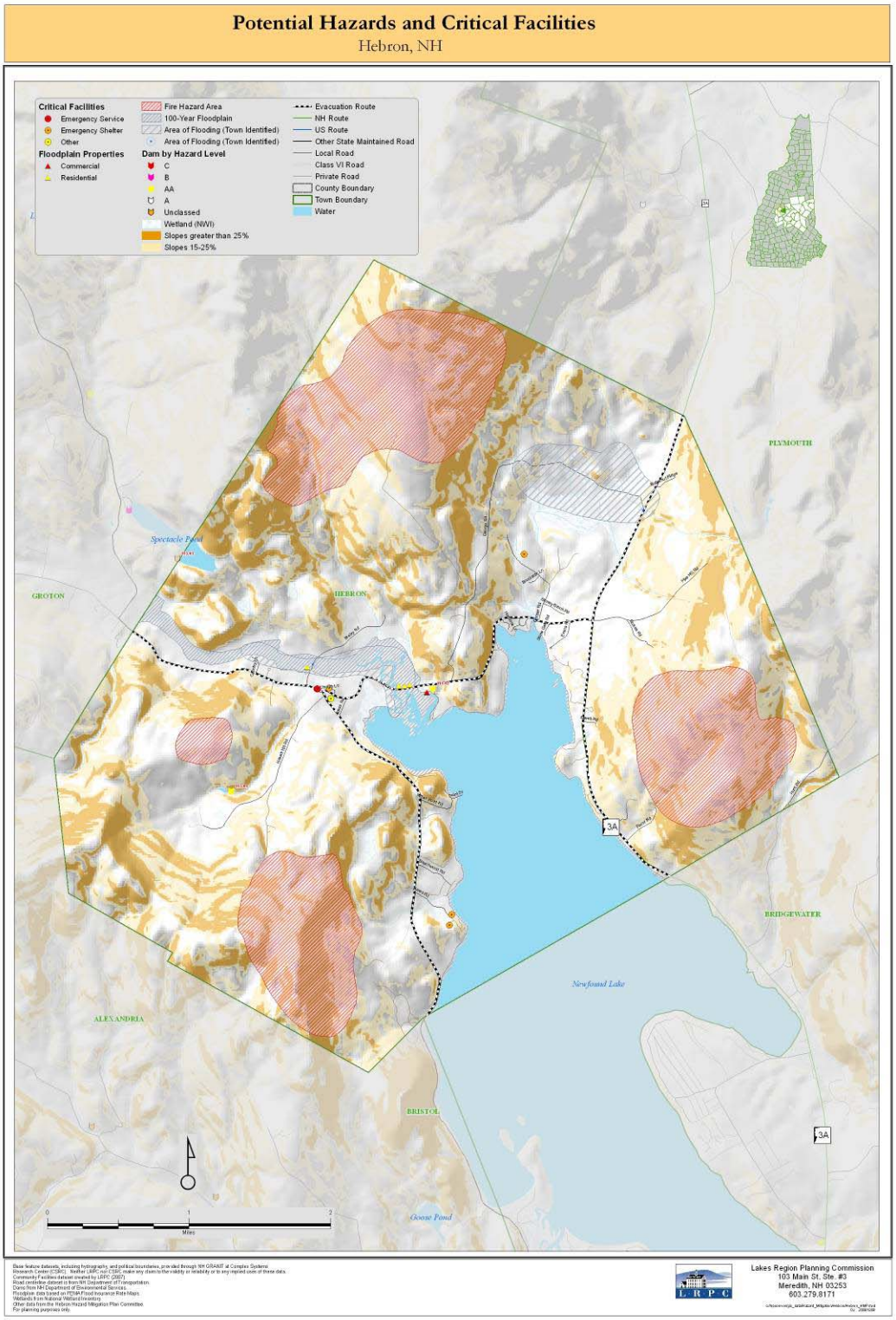
The Hebron Hazard Mitigation Update Committee and Lakes Region Planning Commission are pleased to announce the completion of the DRAFT Town of Hebron Hazard Mitigation Plan. The Committee is composed of members from the Board of Selectmen, Fire Department, Police Department, and Highway Department. The Committee worked in cooperation with the NH Department of Safety, Homeland Security and Emergency Management, Hebron Board of Selectmen and the Lakes Region Planning Commission to develop the DRAFT Hazard Mitigation Plan (Plan).

The Plan is designed to address Hebron's vulnerability to natural and man-made hazards and will serve to reduce future residential and commercial property losses from hazardous events before they occur. The most significant areas of concern for Hebron were determined to be threats to existing infrastructure, including severe snowstorms, beaver dams, and flooding. With the development of the Plan, community leaders will be able to identify goals and actions to reduce the impacts of these hazards. The Plan is also a useful tool for leveraging additional sources of funding prior to or in the event of a natural disaster.

The Committee would like to invite the local businesses, citizens, and neighboring municipalities to comment on the DRAFT Hazard Mitigation Plan. The Plan will be available for review during a public comment period from March 27 - April 3, 2009 at the Hebron Town Office. A copy will also be available on the LRPC website at: www.lakesrpc.org. Comments on the Plan may be sent via email or postal mail no later than April 3, 2009 to:

Adam Hlasny, LRPC
103 Main Street, Suite #3
Meredith, NH 03253
ahlasny@lakesrpc.org

APPENDIX E: CRITICAL FACILITIES & POTENTIAL HAZARDS MAP



APPENDIX F: CRITICAL FACILITIES

Hebron, NH Critical Facilities

NAME	ADDRESS	CLASSIFICATION	VALUE
Public Safety Building, 1st EOC	37 Groton Rd	Essential Services	$685,500
Union Congregational Church	16 Church Rd	Emergency Shelter	$419,200
Town Shed	21 Town Shed Dr	Emergency Shelter	$335,300
Old Hebron Firehouse (Storage Bldg)	10 Groton Rd	Structures & Services	$284,500
Town Selectmen's Office	7 School St	Structures & Services	$214,300
Berea Youth Camp Recreation Hall	70 Berea Rd	Structures & Services	$5,066,000
Berea Youth Camp	70 Berea Rd	Population to Protect	
Camp Wicosuta	21 Wicosuta Dr	Population to Protect	
Camp Mowglis	6 Mowgli Dr	Population to Protect	
Camp Pasquaney	19 Pasquaney La	Population to Protect	
Camp Onaway	42 Onaway Point Rd	Population to Protect	
NH Route 3A	N/A	Evacuation Route	
North Shore Rd	N/A	Evacuation Route	
West Shore Rd	N/A	Evacuation Route	
Groton Rd	N/A	Evacuation Route	

Classifications:

Essential Services Emergency Shelters Populations to protect Other

Structures and Services; non-essential but need to protect

APPENDIX G: CRITICAL FACILITIES NATURAL HAZARDS VULNERABILITY ASSESSMENT

Natural Hazards Vulnerability of Critical Facilities Matrix: Hebron NH

Facility/Infrastructure	Nor'easter	Flood	Thunder Storm/ Lightning	Blizzard/ Snow Storm	Ice Storm	MV Accident - HazMat	Pandemic
Public Safety Building	1	1	1	1	1	1	2
Union Congregational Church	1	1	3	1	1	1	2
Town Shed	1	1	3	1	1	1	1
Old Firehouse (Storage Bldg)	1	1	3	1	1	1	1
Town Selectmen's Office	1	1	2	1	1	1	1
Berea Youth Camp Rec Hall	1	1	1	1	1	1	2
Berea Youth Camp	1	1	1	1	1	1	2
Camp Wicosuta	1	1	1	1	1	1	2
Camp Mowglis	1	1	1	1	1	1	2
Camp Pasquaney	1	1	1	1	1	1	2
Camp Onaway	1	1	1	1	1	1	2
NH Route 3A	2	1	2	2	2	1	1
North Shore Rd	2	2	2	2	2	1	1
West Shore Rd	2	1	2	2	2	1	1
Groton Rd	2	2	2	2	2	1	1

APPENDIX H: RISK ASSESSMENT MATRIX

Hebron	Risk Assessment															
	Geographic Area					Extent			Specific Areas of Concern	Probability of Occurrence			Vulnerability			
Hazard Type	Localized	Town-wide	Regional	State-wide	Other (explain)	Severe	Moderate	Minimal	Describe potential impact areas (critical facilities, floodplain, etc)	High	Moderate	Low	High	Moderate	Low	Risk Rating
Flood, Drought, Extreme Heat & Wildfire																
Beaver Dams	X					X				X			X			9
Flood	X						X			X				X		6
Dam Failure	X							X				X		X		2
Ice Jam	X							X				X			X	1
Drought			X					X				X			X	1
Conflagration	X							X				X			X	1
Extreme Heat				X				X				X			X	1
Wildfire	X						X				X			X		4
Geologic Hazards																
Earthquake			X					X			X				X	2
Landslide	X							X				X			X	1
Radon		X					X				X			X		4
Severe Wind Hazards																
Thunder Storm/Lightning	X						X			X				X		6
Hurricane			X					X				X	X			3
Tornado/Downburst		X						X			X			X		4
Hail		X						X				X		X		2
Winter Weather Hazards																
Blizzard/Snow Storm			X				X			X			X			9
Ice Storm			X				X					X	X			3
Nor'easter			X				X				X			X		4
Avalanche	X							X				X			X	1
Human-Related Events																
MV Accident involving Hazardous Materials	X							X				X		X		2
Oil Spills	X							X				X		X		2
Military Aircraft Accident	X							X				X			X	1
Pandemic			X			X						X	X			3
Other																
Recreational Activities		X						X				X			X	1

APPENDIX I: STAPLEE RESULTS

This section contains a summary of STAPLEE rankings for each of the proposed Mitigation Actions by the Hebron Hazard Mitigation Committee. The highest possible rank in each of the seven categories is 3.0- the lowest is 1.0. The scores for each of the criteria have been totaled. A maximum score is 21.

	AVERAGE							
Hebron HMP Mitigation Actions **STAPLEE SUMMARY**	Socially Acceptable?	Technically feasible?	Administratively Workable?	Politically Acceptable?	Legal Authority?	Economically Beneficial?	Environmentally Beneficial?	Total
Upgrade Materials in Shelters to assist residents in times of emergency	3	3	3	3	3	3	3	21
Update existing Emergency Operations Plan	3	3	3	3	3	3	3	21
Update CIP (Capital Improvement Plan)	3	3	3	3	3	3	3	21
Utilize Hebron/Bridgewater School as an additional shelter for both towns	3	3	3	3	3	3	3	21
Implement Stream Maintenance Program	3	3	3	3	3	2	3	20
Mitigate increasing problem with Beaver Dams	3	3	3	2	3	3	3	20
Install twin 6' diameter culverts on Braley Road	3	3	3	3	3	3	2	20
Elevate Cooper Road North of Town Shed Drive	3	3	3	3	3	3	2	20
Update TIP (Transportation Improvement Plan)	3	3	3	3	3	2	2	19
Road Improvements to George Rd	3	3	3	3	3	2	2	19
Purchase All-Terrain Vehicles for the primary purpose of fire suppression	3	3	3	3	3	2	1	18
Compile Water Resource List	3	3	3	3	3	1	1	17
Compile list of residents with human special needs	3	3	2	2	1	3	3	17
Compile list of private residents with generators	3	3	2	2	1	3	3	17
Dry hydrant and fire pond maintenance program	3	3	3	3	3	3	3	21
Incorporate Water Resource Plan into Master Plan	3	3	3	3	3	3	3	21

Hebron HMP Mitigation Actions STAPLEE SUMMARY	AVERAGE							
	Socially Acceptable?	Technically feasible?	Administratively Workable?	Politically Acceptable?	Legal Authority?	Economically Beneficial?	Environmentally Beneficial?	Total
Subdivision regulations for fire protection	3	3	3	3	3	3	3	21
Assess driveway standards for emergency vehicle access	3	3	3	3	3	3	3	21
Fire Department training	3	3	3	3	3	3	3	21
Investigate possibility of constructing dry hydrant systems	3	3	3	3	3	3	3	21
Repair or replace dry hydrant system	3	3	3	3	3	3	3	21
Construct dry hydrants	3	3	3	3	3	3	3	21
Install cisterns	3	2	3	3	3	3	3	20
Map woods roads	3	3	1	1	1	3	1	13
Assess and maintain condition of Class VI roads	3	1	1	1	1	1	1	9

APPENDIX J: PARCELS LOCATED WITHIN 100-YR FLOODPLAIN

Building Owner Address1	Address2	Parcel	Value
19 Pasquaney Lane	Hebron, NH 03241	5-5	$41,000
2801 John Anderson Highway	Flagler Beach, FL 32136	17-13	$147,500
6 Braley Rd	Hebron, NH 03241	17-30	$172,700
88 Lady Slipper Rd	North Woodstock, NH 03262	17-32	$86,300
PO Box 249	Hebron, NH 03241	17-35	$156,200
214 Seventh St	Atlantic Beach, FL 32233	17-36	$61,800
30 Mayhew St	Bristol, NH 03222	17-38	$102,500
76 Groton Rd	Hebron, NH 03241	17-39	$176,100
PO Box 113	Hebron, NH 03241	17-42	$195,700
3 Fairfield Dr	North Easton, MA 02356	17-DW3	$168,700
4944 Burgundy Bay Blvd N	Medina, OH 44256	17-SB3	$190,200
PO Box 164	Hebron, NH 03241	17-SB5	$146,500
PO Box 99	Hebron, NH 03241	17-SB6	$254,400
PO Box 6	Hebron, NH 03241	23-10	$170,500
PO Box 188	Hebron, NH 03241	23-11	$53,000
PO Box 145	Hebron, NH 03241	23-RM3	$106,300
PO Box 157	Hebron, NH 03241	23-RM4	$170,900
38 Woodward Ave	Milford, NH 03055	23-RM5	$110,500
PO Box 296	Hebron, NH 03241	23-RM8	$96,300
PO Box 74	Hebron, NH 03241	24-CM5	$161,600
PO Box 92	Milford, NH 03055	17A-1	$28,300
PO Box 10	Hebron, NH 03241	17A-5-1	$153,100
TOTAL			**$2,950,100**

TOTAL TOWN ASSESSED VALUE **$109,171,800**
PERCENT OF TOWN BUILDINGS IN FLOODPLAIN **2.70%**

APPENDIX K: NCRC&D WATER RESOURCE PLAN