Town of Charlestown, New Hampshire Hazard Mitigation Plan

APPROVED AUGUST 2008

Prepared by the:
Town of Charlestown Hazard Mitigation Committee

&

Upper Valley Lake Sunapee Regional Planning Commission

TABLE OF CONTENTS

TABLES

I. INTRODUCTION

A. BACKGROUND

The New Hampshire Bureau of Emergency Management (NHBEM) has a goal for all communities within the State of New Hampshire to establish local hazard mitigation plans as a means to reduce future losses from natural or man-made hazard events before they occur. The NHBEM has provided funding to the Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC), to prepare local Hazard Mitigation Plans with several of its communities. UVLSRPC began preparing a local Hazard Mitigation Plan for the Town of Charlestown in March 2006. The *Charlestown Hazard Mitigation Plan* serves as a strategic planning tool for use by the Town of Charlestown in its efforts to reduce future losses from natural and/or man-made hazard events before they occur. This *Plan* does *not* constitute a section of the Master Plan.

The Charlestown Hazard Mitigation Committee prepared the *Charlestown Hazard Mitigation Plan* with the assistance and professional services of the Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC) under contract with the New Hampshire Bureau of Emergency Management (NHBEM) operating under the guidance of the Federal Emergency Management Agency (FEMA). After a public hearing held in the Charlestown Town Offices, the Charlestown Board of Selectmen adopted the *Plan* on August 20, 2008.

B. PURPOSE

The Charlestown Hazard Mitigation Plan is a planning tool for use by the Town of Charlestown in its efforts to reduce future losses from natural and/or man-made hazards. This plan does not constitute a section of the Town Master Plan, nor is it adopted as part of the Zoning Ordinance.

C. HISTORY

On October 30, 2000, President Clinton signed into law the Disaster Mitigation Act of 2000 (DMA 2000). The ultimate purpose of the DMA 2000 is to:

- Establish a national disaster mitigation program that will reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from disasters, and to
- Provide a source of pre-disaster mitigation funding that will assist States and local governments in accomplishing that purpose.

DMA 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by, among other things, adding a new section: 322 – Mitigation Planning. This places new emphasis on local mitigation planning. It requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans as a condition to receiving Hazard Mitigation Grant Program (HMGP) project grants. *Local governments must review and if necessary, update the mitigation*

plan every five years to continue program eligibility. It is recommended that the project list and disaster history sections be reviewed and updated annually.

Why develop a mitigation plan? The full cost of the damage resulting from the impact of natural hazards – personal suffering, loss of lives, disruption of the economy, and loss of tax base – is difficult to quantify and measure. The State of New Hampshire is vulnerable to many types of hazards which can have significant economic and social impacts.

D. SCOPE OF THE PLAN

The scope of the *Charlestown Hazard Mitigation Plan* includes the identification of natural hazards affecting the Town, as identified by the Charlestown Hazard Mitigation Committee. The hazards were reviewed under the following categories:

Flooding/Ice Jams
Dam Failure
Drought
Hurricanes
Tornados & Downbursts
Thunderstorms & Lightning
Severe Winter Weather
Wildfire
Extreme Heat
Earthquakes
Landslides
Natural Contaminants
Hazardous Materials
Terrorism

E. METHODOLOGY

Using the *Hazard Mitigation Planning for New Hampshire Communities* handbook, as developed by the Southwest Regional Planning Commission (SWRPC), the Charlestown Hazard Mitigation Committee, in conjunction with the UVLSRPC, developed the content of the *Charlestown Hazard Mitigation Plan* by following the ten-step process set forth in the Handbook. The Committee held a total of six meetings beginning on March 2, 2006 and ending on November 2, 2006. In February 2008, the draft plan was made available at the town offices and the public was invited to comment through a public notice in the local paper. Letters were sent to each abutting town in New Hampshire to review the plan at the Charlestown town offices or by request for an electronic version of the draft plan. The Charlestown Board of Selectmen tentatively approved the draft plan for submittal to the FEMA for review. After FEMA's conditional approval, the Board adopted the Plan contingent upon FEMA final approval on August 20, 2008.

Support for mitigation strategies is important in order to carry out implementation. Every effort will be made in the future to incorporate representation in future revisions of this plan. In order to ensure in the future that opportunity to participate in the planning process is given to other interested parties, the Town will send invitations to appropriate local businesses, educational institutions and non-profit organizations. Revisions of this plan shall incorporate press releases that will notice citizens, businesses and organizations of the progress of the plan while also soliciting input that could strengthen the value of the plan. This process will enable more successful implementation actions. By nature, natural hazards affect areas not defined by political boundaries. Additionally, response to these disasters often may rely on neighboring

communities for assistance such as the mutual aid services. Because of this it is important to notify and work with adjacent communities.

Upon notification from FEMA that this plan has been conditionally approved, the Town of Charlestown will hold a public meeting. At this public meeting, public comment and input regarding the plan shall be taken. Once public input has been heard, the Town shall adopt the plan with any improvements or recommended changes that are appropriate.

The following hazard mitigation meetings were vital to the development of this Plan:

- March 2, 2006
- July 6, 2006
- August 3, 2006
- September 7, 2006
- October 5, 2006
- November 2, 2006
- June 17, 2008

To complete this plan the Charlestown Hazard Mitigation Committee followed these planning steps:

Step 1: Map the Hazards (March 2006)
Committee members identified areas where damage from natural disasters had previously occurred, areas of potential damage, and man-made facilities and infrastructure that were at risk for loss of life, property damage, and other risk factors. A GIS-generated base map provided by the UVLSRPC was used in the process.

Step 2: Determine Potential Damage (March and July 2006)
Committee members identified facilities that were considered to be of value to the Town for emergency management purposes, for provision of utilities and services, and for historic, cultural and social value. A GIS-generated map was prepared to show critical facilities identified by the Charlestown Hazard Mitigation Committee. A summary listing of identified hazards, critical facilities, and hazard prone areas can be found in Section III, IV, and V.

Step 3: Identify Plans/Policies Already in Place (August 2006)
Using information and activities in the Handbook, the Committee and UVLSRPC staff identified existing mitigation strategies which are already implemented in the Town related hazards. The results of this activity are presented in Section VI.

Step 4: Identify the Gaps in Protection/Mitigation (August 2006)
Existing strategies were then reviewed for coverage, effectiveness and implementation, as well as need for improvement. A summary of recommended improvements in the current protection can be found in Section VI.

Step 5: Determine Actions to Take (September 2006 – June 2008)
During an open brainstorming session, the Hazard Mitigation Committee developed a list of other possible hazard mitigation actions and strategies for the Town of Charlestown. Ideas proposed included structural projects, emergency operations projects, planning and engineering and public education. The list of potential mitigation actions can be found in Section VII.

Step 6: Evaluate Feasible Options (September 2006 – June 2008)
The Emergency Management Committee evaluated potential strategies based on eight criteria derived from the criteria listed in the evaluation chart found on page 27 of the Handbook. The eight criteria used for evaluation of potential mitigation strategies are listed in Section VII, p. 30. Each strategy was rated (good (3), average (2), or poor (1)) for its effectiveness in meeting each of the eight criteria (e.g., Does the mitigation strategy reduce disaster damage?). Strategies were ranked by overall score for preliminary prioritization then reviewed again under step eight. The ratings of the potential mitigation strategies can be found in Section VII.

Step 7: Coordinate with other Agencies/Entities (Ongoing)
UVLSRPC staff reviewed the Charlestown Master Plan. This was done in order to determine if any conflicts existed or if there were any potential areas for cooperation. NH Bureau of Emergency Management field staff was also invited to participate.

Step 8: Determine Priorities (October 2006 – June 2008)
The Committee reviewed the preliminary prioritization list in order to make changes and determine a final prioritization for new hazard mitigation actions and existing protection strategy improvements identified in previous steps. UVLSRPC also presented recommendations for the Committee to review and prioritize.

Step 9: Develop Implementation Strategy (October 2006 – June 2008)
Using the chart provided under step nine of the Handbook, the Committee created an implementation strategy which included person(s) responsible for implementation (who), a schedule for completion (when), and a funding source and/or technical assistance source (how) for each of the identified hazard mitigation actions. The prioritized implementation list can be found in Section VIII.

Step 10: Adopt and Monitor the Plan (Ongoing)
UVLSRPC staff compiled the results of steps one through nine in a draft document, as well as helpful and informative materials from the State of New Hampshire Natural Hazard Mitigation Plan, which served as a resource for the Charlestown Hazard Mitigation Plan. The details related to the adoption and monitoring of the Plan can be found in Section IX.

F. HAZARD MITIGATION GOALS

The Town of Charlestown Hazard Mitigation Committee reviewed the hazard mitigation goals for the State of New Hampshire, and revised them for Charlestown. They are as follows:

1. To protect the general population, the citizens of the town and guests, from all natural and man-made hazards.

2. To reduce the potential impact of natural and man-made disasters on the town's critical support services, critical facilities, and infrastructure.

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

4. To reduce the potential impact of natural and man-made disasters on the town's natural environment, especially the water bodies.

5. To reduce the potential impact of natural and man-made disasters on the town'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 town.

6. To identify, introduce and implement cost effective hazard mitigation measures so as to accomplish the town's goals and to raise the awareness and acceptance of hazard mitigation.

G. ACKNOWLEDGEMENTS

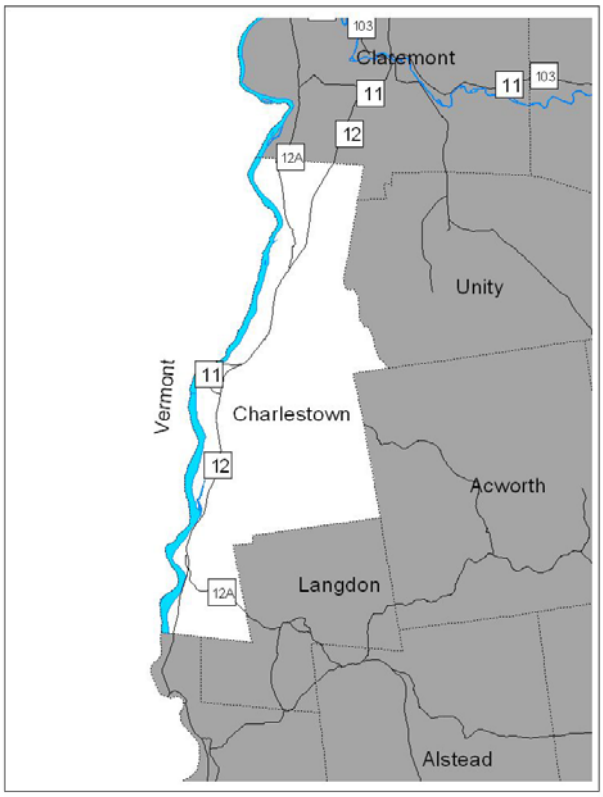
The following people participated in the development of this plan. A broad spectrum of experience was represented by the Committee and the Upper Valley Lake Sunapee Regional Planning Commission staff members assisted in coordinating the process and plan development.

- David Edkins, Administrative Assistant to the Selectboard
- Dave Duquette, Superintendent, Water & Sewer
- Keith Weed, Superintendent, Highway
- Gary Stoddard, Fire Chief
- Todd Templeton, Assistant Fire Chief
- Bud Von Ahnen, Building & Health Inspector
- Richard Holmes, Conservation Commission
- Gary Wallace, Former Emergency Management Director, Retired Fire Chief
- Charlie Baraley. Emergency Management Director
- Ed Smith, Chief of Police
- Eric Lutz, Charlestown Planning Board
- Victoria Boundy, UVLSRPC
- Courtney Daniell, UVLSRPC

II. COMMUNITY PROFILE

A. INTRODUCTION

The Town of Charlestown, NH is located in the southwestern corner of the state along the Connecticut River for 13 miles, in Sullivan County. Within the boundaries of the town are the smaller hamlets of North Charlestown and South Charlestown. New Hampshire Route 12 connects Charlestown with the City of Claremont to the north and the Town of Walpole to the south. Route 12A provides access to the Town of Langdon, southeast of Charlestown.



Watersheds

All of Charlestown is within the Connecticut River watershed. In most of the town, surface waters drain into the Little Sugar River, and a small section drains into the Cold River. A watershed is made up of all the land that drains into a body of water. The line that connects all of the highest elevations around the water body defines the boundary of a watershed. As rain and snowmelt travel within this "catch basin" and flow by gravity into the water bodies and ground, they carry various amounts of nutrients and pollutants with them. A watershed approach to water resources planning is critically important, as watersheds are the main units of surface water and

groundwater recharge. In addition, the land uses located within a watershed directly impact the water quality.

Charlestown's wetlands are valuable for mitigating flooding events and erosion. Because of their soils and vegetation, wetlands act as a giant sponge during periods of high runoff and flooding, controlling the rate of runoff downstream and slowing floodwaters. In late summer, this stored water is slowly released, maintaining stream flows down river.

Damaging floods along the Connecticut River have been recorded since the 1700s. Principal damaging floods of the twentieth century have occurred in 1913, 1927, 1936, 1938 and 1968. Ice jams near the Bellows Falls Hydropower Dam have backed up as far as Charlestown. A story in the "Valley News" in 1996 reported flooding in Charlestown, closing Route 12 and necessitating the evacuation of 18 families in the Connecticut River Mobile Home Park.[1]

Charlestown adopted a building code ordinance in 1975 for flood hazard areas. This ordinance was amended in 1981 to comply with the requirements of the National Flood Insurance Program (NFIP). Floodplain maps were prepared by the Federal Emergency Management Agency (revised May 4, 2000, and 2005) and these maps show where flooding is likely to occur.

Topography and Slope

Approximately ten percent of the Town of Charlestown has slopes greater than 15 percent and the majority of town has slopes of eight to fifteen percent. As the slope increases, the more challenging it is to develop the land and the greater the potential to increase erosion and stormwater runoff and exacerbate flooding. Generally, slopes over 25 percent are considered undevelopable.

B. DEVELOPMENT TRENDS

Charlestown's year-round population increased significantly from 1940 to 1980 and then only slightly between 1980 and 2000. Consistent with regional and statewide trends, the period of most active growth (35%) occurred between 1970 and 1980. Of area communities shown in the table below for comparison, Charlestown and Unity have had the largest average growth rates, at 3.0 and 4.4 per year respectively during the 1970s, and have been growing slower in recent years. The table shows population growth between 1970 and 2000.

[1] Cold Regions Research and Engineering Laboratory (CRREL), Ice Jam Database.

Table II-1: Area Population Trends

Area	1970	1980	Avg. Annual Rate of Growth 70-80	1990	Avg. Annual Rate of Growth 80-90	2000	Avg. Annual Rate of Growth 90-00	30 Yr. Avg. Annual Rate
Charlestown	**3,274**	**4,417**	**3.0**	**4,630**	**0.5**	**4,749**	**0.3**	**1.2**
Claremont	14,221	14,557	0.2	13,902	-0.5	13,151	-0.6	-0.3
Unity	709	1,092	4.4	1,341	2.1	1,530	1.3	2.6
Newport	5,899	6,229	0.5	6,110	-0.2	6,269	0.3	0.2
Acworth	459	590	2.5	776	2.8	836	0.7	2.0
Sullivan County	30,949	36,063	1.5	38,592	0.7	40,458	0.5	0.9
New Hampshire	737,681	920,610	2.2	1,109,252	1.9	1,235,786	1.1	1.7

Source: U.S. Census Bureau, 1970-2000 Census

In September 2004, at the request of the Charlestown Planning Board, UVLSRPC completed a build-out study of the town, in conjunction with the Board's update of the master plan. The build-out analysis is a tool for assessing the compatibility between the community's vision for the future and its current land use regulations. Timing is not relevant to the analysis as it is assumed that time is condensed to allow all possible development to occur today.

The analysis of the potential residential growth associated with undeveloped land in Charlestown indicates that under current zoning, Charlestown has the potential to grow to a year-round population of at least 20,586. This represents a 300 percent increase over the 4,749 residents counted in the 2000 US Census. An examination of developed land in Charlestown would likely reveal some infill potential which would increase this number further.

Increasingly, available sites for development are constrained by steep slopes, exposed ledge, wetlands and other natural features. These sites are more expensive to develop and increase the community's vulnerability to natural hazards such as flooding, landslide, forest fire, and other events. These developments also challenge the capabilities and efficiency of emergency response services in town, as they are often more remote and difficult to access.

III. HAZARD IDENTIFICATION

The Charlestown Hazard Mitigation Committee used the State of New Hampshire Hazard Mitigation Plan and hazard histories for the State of New Hampshire and Sullivan County to begin to determine which hazards affect Charlestown. The Committee created a list of past and/or potential hazards events in Charlestown. After the Committee had identified past and/or potential hazards a risk assessment was completed to determine which hazards were the most likely to occur and inflict the most damage. The results are provided with the hazard descriptions below and the risk determination methodology is described at the end of this section. Charlestown is vulnerable to the following natural and/or man-made hazards: flooding and ice jams, dam failure, drought, hurricanes, tornados and downbursts, severe winter weather, wildfire, extreme heat, earthquakes, landslides, natural contaminants, hazardous materials spills, and terrorism. Appendix D is a map of wildland/urban interface for wildfire; Appendix E is a map of FEMA determined special flood hazard areas; and Appendix F is a map of the past and potential hazard events as delineated by the Committee.

Some hazards occurring in New Hampshire were eliminated from further review as they were not considered to be relevant to the Town of Charlestown due to topography, soils, and past experience. These included subsidence, avalanche, and expansive soils.

A. DESCRIPTIONS OF NATURAL HAZARDS

Flooding/Ice Jams

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

Floods in the Charlestown area are most likely to occur in the spring due to the increase in rainfall and snowmelt; however, floods can occur at any time of the year. A sudden winter thaw or a major summer downpour can cause flooding.

100-Year Floods
The term “100-year flood” does not mean that flooding will occur once every 100 years, but is a statement of probability to describe how one flood compares to others that are likely to occur. What it actually means is that there is a one percent chance of a flood in any given year.

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

Bank Erosion and Failure
As development increases, changes occur that increase the rate and volume of runoff, and accelerate the natural geologic erosion process. Erosion typically occurs at the outside of river

bends and sediment deposits in low velocity areas at the insides of bends. Resistance to erosion is dependent on the riverbank's protective cover, such as vegetation or rock riprap, or its soils and stability.

Location and Extent of Past Flooding

The extent of floods is generally thought to follow river and streams and is concentrated on floodplain and floodway areas. Charlestown has experienced flood damage in recent years that follows these trends and is adjacent to one of New England's largest rivers: the Connecticut River. Charlestown has a considerable amount of floodplain area and these areas have been the most affected by flooding in the past. Appendix E provides a map of National Flood Insurance Program special flood hazard or 100-year flood areas. These areas include the ice jam flooding.

Some areas within Charlestown have seen continual flooding. Basements of residences within flood-prone areas are pumped on an annual basis. Several Main Street businesses are also located in the flood-prone areas.

Table III-1: Flooding – Disaster Declarations

Date	Location	Description of Areas Impacted
November 3- 4, 1927	Southern NH	Caused many roads to wash out.
March 11-21, 1936	Statewide	Flooding due to simultaneous heavy snowfall totals, heavy rains and warm weather caused rivers to overflow and damage to road network.
July – August 1986	Statewide	Severe summer storms: heavy rains, tornados, flash floods and severe floods: FEMA-DR-771-NH
August 7-11, 1990	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan Co.	FEMA Disaster Declaration # 876. Flooding caused by a series of storm events with moderate to heavy rains. $2,297,777 in damage.
October 29, 1996	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan Counties	FEMA Disaster Declaration # 1144- DR. Flooding caused by heavy rains. $2,341,273 in damage.
July 2, 1998	Southern NH	FEMA Declaration #1231. Severe storms and flooding.
October 26, 2005	Cheshire, Grafton, Merrimack, Sullivan, & Hillsborough Co.	FEMA Disaster Declaration # 1610. Severe storms and flooding.
October-November 2005	Grafton, Merrimack, Hillsborough, Rockingham, Strafford & Sullivan counties	FEMA Disaster Declaration # DR-1144- NH
April 15 - 19, 2007	All counties, NH	FEMA Declaration # 1695. Severe storms and flooding.

Table III-2: Ice Jam Flooding

Date	Location	Description of Areas Impacted
December 19th, 2003	Connecticut River	"The Connecticut River was sheet ice covered from Bellows Falls up to the Cheshire Bridge. Above Charlestown, a several-mile-long jam filled the channel. This jam had reportedly caused minor flooding of US Route 5 the previous day. Upstream of the jam, a frazil ice cover was actively forming in the bends just upstream of North Charlestown. Above that, the Connecticut River was open as far as Wilder Dam. The White River was also open and carrying frazil ice."
January 19th, 1996	Connecticut River	Damages included road flooding and an evacuation of eighteen families in the Connecticut River Mobile Home Park. Following is a description from the CRREL website: "Jim Lever, CECRL-IE, was on location of the Bellows Falls, VT ice jam on the Connecticut River on 1/21/96. The jam formed on 1/19/96 and Ruth Kitowicz, CENED, contacted J. C. Tatinclaux, CECRL-IE, via telephone on 1/21/96 reporting the jam near the Bellows Falls Hydropower Dam. Lever noted the toe of the jam as 1/2 mile upstream of the dam and the head just below the Rt. 11 Bridge in Springfield. Andy Tuthill, CECRL-IE, observed the jam on 1/22/96. He reported that the toe had plowed into sheet ice, extended upstream for 10 miles with the head being 1/2 mile downstream of the Charlestown, NH Toll Bridge. He also noted that the upper 1/2-mile of the jam was made up of frazil pans and below this was broken sheets and brash ice. Tuthill observed the jam by airplane on 1/25/96 and again on 2/11/96. Scott Acone, CENED-ED-WH, was on the location of the jam on 1/26/96. His report states the same as Tuthill's and Lever's. The NWS reported flooding in Springfield, VT and Charlestown, NH on 1/21/96. Rt. 5 and Rt. 12 were closed due to the flooding. On 1/24/96 the NWS Flood Statement reported backup water on the Black River with field flooding due to the jam in Bellows Falls. The ice jam was still in place on 2/21/96 according to a NWS Flood Watch. A story in the "Valley News" on 1/23/96 reported flooding in Charlestown closing Rt. 12 and the evacuation of 18 families in the Connecticut River Mobile Home Park."
1960s	Connecticut River	Committee recalled ice jam floes were ten feet thick. No damages were recalled as a result.

Potential Future Events

The potential for flooding along the Connecticut River is great. The extent of future flooding could be great in the flood-prone areas adjacent to the Connecticut River and the Little Sugar River. Charlestown Hazard Mitigation Committee members noted the following flood-prone areas in the Town of Charlestown:

- Hackett Swamp Road: There are 16 residences located along Hackett Swamp Road. The road runs through a swamp, and the potential for major damages to the 16 residences is great.
- Areas affected by the October 2005 floods: Major washouts occurred on Acworth Road, South Hemlock Road, North Hemlock Road, and Pecor Road. A total of 18 roads were affected by the flooding. No homes were damaged in this event. Charlestown has incurred $229,000 in damages to date.
- Main Street Flooding: The east side of Charlestown is prone to flooding by man-made ponds located on this side of town. In a major storm event, Paris Ave., parts of E Street, and Main Street would be impacted. A few hundred residences exist in this flood-prone area, and basements are pumped on an annual basis during regular flood events. Several Main Street businesses are also located in the flood-prone area, and there exists the potential for millions of dollars in damages if a major flooding event should occur. The Fort at #4 and Patch Park are within the floodplain.

The Charlestown Hazard Mitigation Committee mentioned that pump stations and utility lines are in the floodplain, and that the Sewer Treatment Plant is surrounded by the floodway.

Discussions with the Cold Region Research Engineering and Laboratory in Hanover, NH in February 2008 indicate it could cost as much as $20-30,000 for a study to review the ice jam data, assess problems, and develop conceptual solutions. This would not include the cost of any proposed resolutions which could include engineering plans and construction.

The Committee determined that flooding is a medium/high risk.

Dam Breach/Failure

Dam failure or breach results in rapid loss of water that is normally held by the dam. These kinds of floods pose a significant threat to both life and property.

Location and Extent of Past Occurrences

There have been no dam failures in Charlestown or any surrounding towns which impacted Charlestown. All but one active dam in Charlestown are rated by the State as “non menace” or “low” hazard structures. This means there is no possibility for loss of life if any of these dams fail. A “low” hazard dam failure could cause some structural damage to buildings and roads though a “non menace” dam failure would not.

Table III-3: Dams in Charlestown

DAMS – Low/Medium Risk							
Dam #	Class	Dam Name	Owner	Status	Type	Surface Elevation (ft)	Impoundment Area (acres)
041.27	NM	Dierks Hydro Dam	A. Dierks	ACTIVE	Concrete	9.00	0.200
041.03	NM	Little Sugar River	A. Dierks	ACTIVE	Concrete	12.00	2.000
041.19	NM	Fire Pond Dam	O. Williams	ACTIVE	Earth	13.00	0.140
041.18	NM	Wildlife Pond	T. Beaudry	ACTIVE	Earth	11.00	0.310
041.11	NM	Wildlife Pond	TJ Frizzell	ACTIVE	Earth	6.00	0.300
041.07	L	Hall Pond Dike	Town of Charlestown	ACTIVE	Earth	7.00	14.500
041.26	NM	Frizzell Pond	R Frizzell	ACTIVE	Earth	11.00	0.810
041.06	L	Hall Pond Dam	Town of Charlestown	ACTIVE	Concrete	9.00	14.500
041.22	NM	Frizzell Strawberry	R Frizzell	ACTIVE	Timber/Stone	5.00	0.100
041.08	NM	Upper Clay Brook Dam	Town of Charlestown	ACTIVE	Stone/Earth	14.00	0.750
041.09	NM	By Pass Dam	Town of Charlestown	ACTIVE	Concrete	6.00	0.100
041.10	NM	Lower Reservoir Dam	Town of Charlestown	ACTIVE	Stone/Earth	11.00	0.400
041.23	NM	Frizzell Dam	R Frizzell	ACTIVE	Earth	16.00	0.400
041.01	NM	Clay Brook Dam	D Bacon	ACTIVE	Concrete	27.50	0.250
041.20	NM	Brown Dam	W Brown	ACTIVE	Earth	4.00	0.250
041.17	NM	Recreation Pond	Camp Good News	ACTIVE	Earth	8.00	1.070
041.13	NM	Recreation Pond	R Metcalf	ACTIVE	Earth	7.00	0.450
041.25	NM	Putnam Pond	Putnam Bros Farm	ACTIVE	Earth	6.00	0.200
041.14	NM	Wildlife Pond	W Stearns	ACTIVE	Earth	6.00	0.300
041.04	NM	N Charlestown Reservoir	Town of Charlestown	ACTIVE	Concrete	10.00	0.400
041.16	NM	Fire Pond Dam	GW Moulton	ACTIVE	Earth	13.00	0.230
041.29	S	Charlestown Wastewater Lagoons	Town of Charlestown	ACTIVE	Earth	4.50	5.500
041.28	NM	Comstock Hydro	L Comstock II	ACTIVE	Concrete	6.00	0.009
041.12	NM	Farm Road	L Shaw	ACTIVE	Earth	11.00	0.400
041.24	NM	Putnam Lagoon	Putnam Bros Farm	ACTIVE	Earth	13.00	0.600

Source: Dam information provided by the NH Dam Bureau in 2007 and will be verified by Town officials:
The State of New Hampshire classifies dams into the following four categories:
NM – Non-menace S – Significant hazard *Blank- Non-Active*
L – Low hazard H – High Hazard.

Potential Future Events

The Charlestown Wastewater Lagoons have been listed by the state as a significant hazard. Due to the proximity of the lagoons to the Connecticut River, the State has waived the requirement for an emergency plan or inundation map. It is believed that if the lagoons are breached, the waters will enter the river without damage to structures. However, this will add pollution to the river.

Although the Lower Reservoir Dam is classed as a non-menace dam, the Committee is concerned about the structural integrity of the dam. The Town will be consulting with a hydrogeologist to see about

breaching the dam to avoid an accidental breach. The hydrogeologist will assess the impact of a breach upon a Town well along the banks of the Clay Brook about one-half mile below the Lower Reservoir Dam. The concern is that in dry weather, the Town has been able to release water from dams to recharge the aquifer feeding the Town wells.

The Committee determined that dam failure is a low/medium risk.

Drought

A drought is defined as a long period of abnormally low precipitation. The effects of drought are indicated through measurements of soil moisture, groundwater levels and stream flow; however, not all of these indicators will be low during a drought.

Location and Extent of Past Occurrences

Droughts in the region have had no geographic extent. Any drought in the past has affected the entire town to varying degree. The Committee could not recall any major periods of drought in Charlestown that made a significant impact on the community.

Table III-4: Drought

DROUGHT- Low/Medium Risk			
Drought	1929-1936	Statewide	Regional. Recurrence Interval 10 to > 25 years
Drought	1939-1944	Statewide	Severe in southeast and moderate elsewhere. Recurrence Interval 10 to > 25 years
Drought	1947-1950	Statewide	Moderate. Recurrence Interval 10 to > 25 years
Drought	1960-1969	Statewide	Regional longest recorded continuous spell of less than normal precipitation. Encompassed most of the Northeastern US. Recurrence Interval > 25 years
Drought	2001-2002	Statewide	Third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942.

Potential Future Events

Based on the cyclical nature and past history of drought in the State of New Hampshire it is most probable that Charlestown will see drought again in the future. This is based on the State Hazard Plan Sullivan County listing as a medium risk of drought and its average recurrence intervals between 10 and 25 years. Droughts in the past have had no geographic extent within the Town of Charlestown. It is reasonable to assume that future droughts that affect the region will not be isolated to any geographic extent. The Committee determined that drought is a low/medium risk.

Hurricanes

A hurricane is an intense tropical weather system with a well-defined circulation and maximum sustained winds of 74 mph (64 knots) or higher. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally 20 to 30 miles wide, and the storm may extend outward 400 miles. As a hurricane nears land, it can bring torrential rains, high winds, and storm surges. A single hurricane can last for more than 2 weeks over open waters and can run a path across the entire length of the eastern seaboard. August and September are peak months during the hurricane season that lasts from June 1 through November 30. Damage resulting from winds of this force can be substantial, especially considering the duration of the event, which may last for many hours (NH Hazard Mitigation Plan; FEMA website).

Location and Extent of Past Occurrences

The location of hurricanes is general and large in nature and when occurring in Charlestown affects the entire town. Sullivan County has experienced high winds from some hurricane events but is at a more significant risk to flooding from the associated rainfall from hurricanes. Specifically, due to the plain area following the Connecticut River valley there is increased potential for wind associated events. The Committee could not recall specific damages associated with hurricanes.

Table III-5: Hurricanes & Tropical Storms

HURRICANES & TROPICAL STORMS- Low/Medium Risk			
Hurricane	August, 1635	n/a	
Hurricane	October 18-19, 1778	n/a	Winds 40-75 mph
Hurricane	October 9, 1804	n/a	
Gale	September 23, 1815	n/a	Winds > 50mph
Hurricane	September 8, 1869	n/a	
Hurricane	September 21, 1938	Southern New England	Flooding caused damage to road network and structures. 13 deaths, 494 injured throughout NH. Disruption of electric and telephone services for weeks. 2 Billion feet of marketable lumber blown down. Total storm losses of $12,337,643 (1938 dollars). 186 mph maximum winds.
Hurricane (Carol)	August 31, 1954	Southern New England	Category 3, winds 111-130 mph. Extensive tree and crop damage in NH, localized flooding
Hurricane (Edna)	September 11, 1954	Southern New England	Category 3 in Massachusetts. This Hurricane moved off shore but still cost 21 lives and $40.5 million in damages throughout New England. Following so close to Carol it made recovery difficult for some areas. Heavy rain in NH

HURRICANES & TROPICAL STORMS- Low/Medium Risk			
Hurricane (Donna)	September 12, 1960	Southern and Central NH	Category 3 (Category 1 in NH). Heavy flooding in some parts of the State.
Tropical Storm (Doria)	August 28, 1971	New Hampshire	Center passed over NH resulting in heavy rain and damaging winds
Hurricane (Belle)	August 10, 1976	Southern New England	Primarily rain with resulting flooding in New Hampshire. Category 1
Hurricane (Gloria)	September, 1985	Southern New England	Category 2, winds 96-110 mph. Electric structures damaged; tree damages. This Hurricane fell apart upon striking Long Island with heavy rains, localized flooding, and minor wind damage in NH
Hurricane (Bob)	August 19, 1991	Southern New England	Structural and electrical damage in region from fallen trees. 3 persons were killed and $2.5 million in damages were suffered along coastal New Hampshire. Federal Disaster FEMA-917-DR
Hurricane (Edouard)	September 1, 1996	Southern New England	Winds in NH up to 38 mph and 1 inch of rain along the coast. Roads and electrical lines damaged
Tropical Storm (Floyd)	September 16-18, 1999	Southern New England	FEMA DR-1305-NH. Heavy Rains

Potential Future Events

The State Hazard Plan lists Sullivan County as a medium risk for future hurricanes based on past evidence. Hurricanes in Charlestown are more likely to cause flooding from associated rain than disturbance and destruction from winds speeds, although the region has seen remnants from many hurricanes from the coast over the past 100 years. The extent of hurricanes in Charlestown would most likely not be geographically bound and would affect the entire community. The Committee determined that hurricanes are a low/medium risk.

Tornadoes & Downbursts

"A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. These events are spawned by thunderstorms and, occasionally by hurricanes, and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction." (NH Hazard Mitigation Plan). The Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. Most tornadoes are in the F0 to F2 Class. Building to modern wind standards provides significant property protection from these hazard events. New Hampshire is located within Zone 2 for Design Wind Speed for Community Shelters, which suggests that buildings should be built to withstand 160 mph winds.

"A downburst is a severe localized wind blasting down from a thunderstorm. These 'straight line' winds are distinguishable from tornadic activity by the pattern of destruction and debris.

Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories." Microbursts cover an area less than 2.5 miles in diameter and macrobursts cover an area at least 2.5 miles in diameter."

Location and Extent of Past Tornados

All areas of Charlestown are potentially at risk for property damage and loss of life due to tornadoes. Although the Statewide Plan lists Sullivan County as a medium risk for tornados, the Charlestown Hazard Mitigation Committee could not recall any events within the community. The plains associated with the Connecticut River valley could provide a flat area where tornadoes could exist, but the Committee members could not recall any specific damages associated with tornados.

Within the County, there have been four events of F2 severity and four additional tornadic events at level F1, although the impacts of these events were not felt in Charlestown.

Potential Future Events

The State Hazard Plan lists Sullivan County as an area of medium risk for tornados and downbursts. Tornados in Charlestown could be associated with a specific location. Previous tornados have not documented any location specific to local implications. Any tornados that may occur would most likely be localized. The Committee determined that tornadoes and downbursts are a low/medium risk.

Thunderstorms & Lightning

A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado. Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. When the hail particle becomes heavy enough to resist the updraft, it falls to the ground. The resulting wind and hail can cause death, injury, and property damage.

An average thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Winter thunderstorms are rare because the air is more stable, strong updrafts cannot form because the surface temperatures during the winter are colder.

Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Fires are a likely result of lightning strikes, and lightning strikes can cause death, injury, and property damage. It is impossible to predict where lightning will strike.

Location and Extent of Past Events
Although lightning events have occurred in Charlestown, no significant event was recalled by the Committee. In Sullivan County, five lightning strikes have been reported from 1950 and 2007 to the National Climatic Data Center, including two lightning strikes that damaged equipment in town-owned buildings.

Table III-6: Lightning Strikes in Sullivan County

Hazard	Date	Location	Description of Areas Impacted	Hazard
Lightning	July 21, 1994	Sullivan County	1 person injured	--
Lightning	May 31, 2002	Town of Sunapee	Storage barns struck & destroyed	$20,000
Lightning	June 5, 2002	Town of Washington	Tower of Town Hall struck; damage to tower and equipment	$11,000
Lightning	August 18, 2002	Town of Sunapee	Three people injured	--
Lightning	July 8, 2004	Town of Sunapee	Computer and radio equipment damaged at Town Office	$3,000

Potential Future Events
Lightning kills an average of 87 people per year in the United States, and New Hampshire has the 16th highest casualty rate in the nation. All areas of Charlestown are potentially at risk for property damage and loss of life due to lightning. The Committee determined that thunderstorms and lightning are low/medium risk.

Severe Winter Weather

Ice and snow events typically occur during the winter months and can cause loss of life, property damage, and tree damage.
Heavy Snow Storms
"A heavy snowstorm is generally considered to be one which deposits four or more inches of snow in a twelve-hour period… A blizzard is a winter storm characterized by high winds, low temperatures, and driving snow- according to the official definition given in 1958 by the U.S. Weather Bureau, the winds must exceed 35 miles per hour and the temperatures must drop to 20°F (-7°C) or lower. Therefore, intense Nor'easters, which occur in the winter months, are often referred to as blizzards. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range. Such conditions, when extreme enough, are called 'white outs'."

Ice Storms
"When a mass of warm moist air collides with a mass of cold arctic air, the less dense warm air will rise and the moisture may precipitate out in the form of rain. When this rain falls through the colder more dense air and comes in contact with cold surfaces, the latent heat of fusion is removed by connective and/or evaporative cooling. Ice forms on these cold surfaces and may continue to form until the ice is quite deep, as much as several inches. This condition may strain branches of trees, power lines and even transmission towers to the breaking point and often creates treacherous conditions for highway travel and aviation. Debris impacted roads make emergency access, repair and cleanup extremely difficult.

"Nor'easters"
In the winter months, [Towns within] the State may experience the additional coincidence of blizzard conditions with many of these events as well as the added impact of the masses of snow and/or ice upon infrastructure thus, impacting upon transportation and the delivery of goods and services for extended periods of time, as well as various related impacts upon the economy. The entire area of the State may be impacted by these events… Heavy snow and/or rainfall may be experienced in different areas of the State and the heavy rains may contribute to flood conditions. Nor'easter events which occur toward the end of a winter season may exacerbate the spring flooding conditions by depositing significant snow pack at a time of the season when spring rains are poised to initiate rapid snow pack melting."

Location and Extent of Past Events

Severe winter weather by nature can affect the entire community or be localized in some of the higher elevations of the town. The Committee documented that Dean Hill Flats in North Charlestown is an area impacted heavily by winter storms. In this area the roads are constantly covered by windblown snow during storms.

Table III-7: Severe Winter Weather/Ice Storms

SEVERE WINTER WEATHER/ICE STORMS – Medium/High Risk			
	Date	Location	Extent/severity
Ice Storm	December 17-20, 1929	New Hampshire	Unprecedented disruption and damage to telephone telegraph and power system. Comparable to 1998 Ice Storm (see below)
Ice Storm	Dec. 29-30, 1942	NH	Glaze storm; severe intensity
Snow Storm	December 10-13, 1960	Southern NH	Up to 17 inches of snow
Snow Storm	January 18-20, 1961	Southern NH	Up to 25 inches of snow
Snow Storm	February 2-5, 1961	Southern NH	Up to 18 inches of snow
Snow Storm	January 11-16, 1964	Southern NH	Up to 12 inches of snow
Blizzard	January 29-31, 1966	Central NH	Third and most severe storm of 3 that occurred over a 10-day period. Up to 10 inches of snow across central NH
Snow Storm	December 26-28, 1969	West Central NH	Up to 41 inches of snow
Snow Storm	February 18-20, 1972	Southern NH	Up to 19 inches of snow
Snow Storm	January 19-21, 1978	Southern NH	Up to 16 inches of snow
Blizzard	February 5-7, 1978	New Hampshire	New England-wide. Up to 25 inches of snow in central NH
Snow Storm	April 5-7, 1982	Southern NH	Up to 18 inches of snow

SEVERE WINTER WEATHER/ICE STORMS – Medium/High Risk			
Ice Storm	February 14, 1986	Monadnock Region	Fiercest ice storm in 30 yrs in the higher elevations in the Monadnock region. It covered a swath about 10 miles wide from the MA border to Acworth NH
Extreme Cold	November-December, 1988	New Hampshire	Temperature was below 0 degrees F for a month
Ice Storm	March 3-6, 1991	New Hampshire	Numerous outages from ice-laden power lines in southern NH
Ice Storm	January 15, 1998	New Hampshire	Federal disaster declaration DR-1199-NH, 20 major road closures, 67,586 without electricity, 2,310 without phone service, $17+ million in damages to Public Service of NH alone

Potential Future Events

Three types of winter events are heavy snow, ice storms and extreme cold. Occasionally heavy snow will collapse buildings. Ice storms have disrupted power and communication services. Extreme cold affects the elderly. These random events make it difficult to set a cost to repair or replace any of the structures or utilities affected. The whole town is at risk from severe winter weather.

Similar to the rest of the state Sullivan County, Charlestown has a high risk of severe winter weather storms. While some storms may be localized as those indicated on Dean Hill Flats, other storms clearly extend to the entire town. The Committee determined that severe winter weather is a medium/high risk.

Wildfire

There are many types and causes of fires. Wildfires, arson, accidental fires and others all pose a unique danger to communities and individuals. Since 1985, approximately 9,000 homes have been lost to urban/wild land interface fires across the United States (Northeast States Emergency Consortium: www.nesec.org). The majority of wildfires usually occur in April and May, when home owners are cleaning up from the winter months, and when the majority of vegetation is void of any appreciable moisture making them highly flammable. As weather and human activities change with the seasons of the year, so does the incidence, causes and severity of fires. Cold winter weather increases indoor activities and the need for heating, which brings about the peak period of heating structure fires. Daily fire incidence is at its highest in the spring. Spring is characterized by an increase in outside fires and a decrease in fires related to heating. The increase in outside spring fires is in large part due to the increase in tree, grass, and brush fires. Summer fires reflect an increase of incendiary and suspicious fires, fires associated with fireworks and natural fires caused by lightning strikes. These fires are a reflection of the change to warmer weather and the consequent increase in both outside activities and dry natural vegetation. Fire incidence is at its lowest in the fall. In fall, there is a decrease in outside fires, an increase in heating-related structure fires and the peak period of cooking fires.

Location and Extent of Past Events

"Historically, large NH wildland fires run in roughly 50 year cycles. Present concerns of New Hampshire Department of Resources and Economic Development, Division of Forests & Lands are that the Ice Storm of 1998 has left a significant amount of woody debris in the forests of the region as may fuel future wildfires." "NH averages 500 fires per year and averages ½ acre or less per fire due to the excellent coordination between Fire Towers and local Fire Departments." Forested, high elevation areas in Charlestown are particularly vulnerable to wildfire events as the Wildland/Urban Interface map in Appendix D shows although as in many rural communities, the entire Town could be at risk. Prolonged drought increases the likelihood of such events. Charlestown has experienced many railroad bed brush fires in the past and in 1961, there was a fire at the town landfill though no structures were damaged.

Unlike other natural hazards wildfires tend to be more localized and controllable through mitigation measures and education to residents. Extreme heat can aid in the potential for fires that are not mitigating events. However, there tends to be a greater risk of wildfire in the spring and fall when extreme heat is not an issue.

Potential Future Events

The map of the wildland-urban interface in Appendix D provides an overview of the large amount of interface area that is vulnerable to wildfire. The State has indicated that there is a high risk for wildfire in this region, although historic knowledge of wildfires within Charlestown is limited. Charlestown has many remote homes with a significant amount of forest. The areas shown on the wildland-urban interface map are the most likely to be impacted.

Charlestown has experienced many railroad bed brush fires in the past. The potential exists for these fires to occur in the future. The railroad owner pays for wildfire response along the railroad bed.

The Committee felt there were four sources of potential chemical fires in Charlestown:

- Merriam Graves – bulk gas
- Propane storage facility near Claremont
- PAC
- BOMAR

The Committee determined wildfires are a low/medium risk.

Extreme Heat

Extreme heat is characterized by abnormally high temperatures and/or longer than average time periods of high temperatures. These event conditions may impact the health of both humans and livestock.

Past Extreme Heat Events

The following table lists the extreme heat events in the past which included the Northeast and New Hampshire.

Table III-8: Extreme Heat

Date	Location	Description	Damage
July, 1911	New England	11-day heat wave in New Hampshire	Unknown
Late June to September, 1936	North America	Temps to mid 90s in the northeast	Unknown
Late July, 1999	Northeast	13+ days of 90+ degree heat	Unknown
Early August, 2001	New Hampshire	Mid 90s and high humidity	Unknown
August 2-4, 2006	New Hampshire	Regional heat wave and severe storms	Unknown

Potential Future Extreme Heat Events

Extreme heat would impact the entire town though those with air conditioning in their homes would have less impact. The costs of extreme heat are most likely to be in human life. The elderly are especially susceptible to extreme heat. The State did not develop a county risk factor for extreme heat in its *NH Hazard Mitigation Plan*. The Committee determined extreme heat to be a low/medium risk in Charlestown.

Earthquakes

New England is considered a moderate risk earthquake zone. An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and cause landslides, flash floods and fires. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale and the Mercalli scale.

Location and Extent of Past Occurrences

The topography of Charlestown does not give large concern to the impact of earthquakes. The Hazard Mitigation Committee only noted those earthquakes that were felt in Charlestown but that were centered in other areas of New England so impact was minimal. Specifically, the event

that took place in 1938 was recalled. Earthquakes have been felt throughout the entire town, and have not been associated with localized damage.

Table III-9: Earthquakes

EARTHQUAKES - Low-Medium Risk			
Earthquake	1638	Central New Hampshire	6.5-7
Earthquake	October 29, 1727	Off NH/MA coast	Widespread damage Massachusetts to Maine
Earthquake	December 29, 1727	Off NH/MA coast	Widespread damage Massachusetts to Maine
Earthquake	November 18, 1755	Cape Ann, MA	6.0, much damage
Earthquake	1800s	Statewide New Hampshire	83 felt earthquakes in New Hampshire
Earthquake	1900s	Statewide New Hampshire	200 felt earthquakes in New Hampshire
Earthquake	March 18, 1926	Manchester, NH	Felt in Hillsborough County
Earthquake	December 20, 1940	Ossipee, NH	Both earthquakes of magnitude 5.5, both felt for 400,000 sq miles, structural damage to homes, damage in Boston MA, water main rupture.
Earthquake	December 24, 1940	Ossipee, NH	
Earthquake	December 28, 1947	Dover-Foxcroft, ME	4.5
Earthquake	June 10, 1951	Kingston, RI	4.6
Earthquake	April 26, 1957	Portland, ME	4.7
Earthquake	April 10, 1962	Middlebury, VT	4.2
Earthquake	June 15, 1973	Near NH Quebec Border, NH	4.8
Earthquake	January 19, 1982	Gaza (west of Laconia), NH	4.5, walls and chimneys cracked, damage up to 15 miles away in Concord
Earthquake	October 20, 1988	Near Berlin, NH	4

Potential Future Events

New Hampshire lies in a zone of moderate seismic vulnerability. The County lies in an area of moderate seismicity. The extent of most earthquakes would be town-wide. The entire Town of Charlestown would be vulnerable in the event of an earthquake. The Committee identified the railroad with the potential for derailments as a concern, the Old Town all and the Bakery buildings as sites with potential increased vulnerability. The Committee determined earthquakes to be a low/medium risk.

Landslides

A landslide is the downward or outward movement of slope-forming materials reacting under the force of gravity, including mudslides, debris flows, and rockslides. Formations of sedimentary deposits along the Connecticut River also create potential landslide conditions. Landslides can damage or destroy roads, railroads, electrical and phone lines, and other structures.

Location and Extent of Past Occurrences

Landslides events are thought to be moderate to low risk given the topography of the town. Although the town is situated at a high elevation compared to surrounding communities, the slope of many of the hillsides is gradual enough to not have a significant threat of landslides. The extent of landslides would be localized although for this plan a study of steep slopes that are at risk was not done. The Town of Charlestown has no history of these events and it is unlikely that there will be an increase in these events in the future.

Potential Future Events

Statewide Hazard Plan has listed Sullivan County as a medium risk for landslide events. Those events would be localized along steep sloped roads and areas along streams. The Committee determined landslides to be a low/medium risk.

Natural Contaminants

Radium, radon and uranium are grouped together because they are radionuclides, unstable elements that emit ionizing radiation. These three particular substances are a health risk only if taken into the body by ingestion or inhalation. They occur naturally in the environment, uranium and radium as solids in rock while radon exists as a gas. Radionuclides are undetectable by taste, odor, or color, so only analytical testing can determine if they are present in water. Because they are associated with rock, wells drilled into bedrock are more likely to contain elevated levels of radionuclides than shallow or dug wells.

Radon gas can also be found in the soil. Openings between the soil and buildings, such as foundation cracks and where pipes enter, provide conduits for radon to move into structures. The difference in air pressure, caused by heated indoor air moving up and out of buildings, results in a flow of soil gas toward the indoors, allowing radon to potentially accumulate in structures. Air quality in a home can also be tested for radon.

There are many other natural contaminants which can render drinking water unsafe such as arsenic. The Drinking Water and Groundwater Bureau of the NH Department of Environmental Services has several fact sheets available to address these natural materials and suggests which materials to be included in testing. See their list of fact sheets at http://www.des.state.nh.us/dwg.htm.

Location and Extent of Past Events

There have been no known events related to natural water and air contamination in Charlestown although uranium is a known water contaminant in nearby towns. Concentrated amounts of uranium were also found during the construction of I-89.

Table III-10: Radon

RADON - LOW RISK					
Summary Table of Short-term Indoor Radon Test Results in NH's Radon Database 11/04/2					
County	**# Tests**	**G. Mean**	**Maximum**	**% > 4.0 pCi/l**	**% > 12.0 pCi/l**
Belknap	744	1.3	22.3	14.4	1.3
Carroll	1042	3.5	478.9	45.4	18
Cheshire	964	1.3	131.2	15.6	2.3
Coos	1072	3.2	261.5	41	17
Grafton	1286	2.0	174.3	23.2	5.2
Hillsborough	2741	2.1	202.3	29.6	6.8
Merrimack	1961	2.0	152.8	25.2	6
Rockingham	3909	3.0	155.3	40	9.5
Strafford	1645	3.4	122.8	44	13
Sullivan	**466**	**1.4**	**29.4**	**15.7**	**2.1**
STATEWIDE	**15860**	**2.4 pCi/L**	**478.9 pCi/L**	**32.4**	**8.6**

Potential Future Events

Although there are no known records of illness that can be attributed to radium, radon, or uranium or other contaminants in Charlestown, residents should be aware that they are present. Houses with granite and dirt cellars are at increased risk to radon gas infiltration. According to the table above, Sullivan County radon levels are below average for the State. According to the State's mitigation plan, Sullivan County has a medium probability of a radon related hazard.

In addition radium, radon, and uranium as well as other natural materials can be present in drinking water. Residents, especially with bedrock wells, should be aware of the possibility of water contamination and the availability of testing and remediation. The Committee determined that the risk of natural contaminants is low.

Hazardous Materials Spills

The Committee felt there was a potential threat for a hazardous materials spill along Main Street as it is a major truck thoroughfare. There is also the threat of spills along Route 12 as this major road travels parallel to the Connecticut River. Chemicals are known to be transported along the railroad. A derailment could result in a hazardous material spill. This could be significant as the railroad also parallels Route 12 and the Connecticut River.

There was a mercury leak, and the subsequent evacuation of a school in Charlestown. The schools are potential fixed hazardous materials sites.

The gravel pack well on Clay Brook is vulnerable to oils spills and other contaminants. The well has over 1,100 connections, and its contamination would affect many residents. The Hazard Mitigation Committee acknowledges the potential to be impacted by terrorism and other man made events such as civil disturbance. Charlestown's water supply is potentially vulnerable to contamination through a terrorist attack. To ensure preparedness the Town of Charlestown has completed a vulnerability and terrorism assessment on their water system resulting in new fences. The railroad could be targeted in a terrorist attack, and the resulting contamination of the water supply from hazardous materials transport is the greatest concern.

The Committee determined that hazardous materials spills are a medium risk.

Terrorism

Terrorism has been defined in many ways. The word terrorism is derived from the Latin term "terrere" which means to frighten. Under current United States law, set forth in the US Patriot Act, acts of domestic terrorism are those which: "(A) involve acts dangerous to human life that are a violation of the criminal laws of the United States or of any State; (B) appear to be intended— (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping; and (C) occur primarily within the territorial jurisdiction of the United States."

Location and Extent of Past Events

There have been no known terrorism events in Charlestown.

Potential Future Events

There are several terrorism events which could occur in any community including tampering with public water sources. The railroad; the old Toll Bridge across the Connecticut River; businesses in North Charlestown such as Merriam Graves and the Irving Oil depot; the power station owned by National Grid on South Main Street; military contractors such as GKN Aerospace and Bomar are a potential terrorism risks.

The Committee determined that terrorism is a low risk.

Sources: Town of Charlestown residents; New Hampshire Office of Emergency Management; Northeast State Emergency Consortium (NESEC) Website; US Army Corps of Engineers Ice Jam Database; www.tornadoproject.com.

B. HAZARD RISK RATINGS

The Town of Charlestown Hazard Mitigation Committee reviewed each potential hazard and rated the probability of occurrence and vulnerability (cost if the hazard actually occured) to come

up with an overall risk rating. The ratings were based on past occurrences of hazards affecting the State of New Hampshire, Sullivan County, and the Town of Charlestown**.** Flooding and ice jams and severe winter weather were ranked as the highest risk in Charlestown with a risk rating of "medium-high."

Assessing Probability

The process involved assigning a number to each hazard type based on its potential of occurring determined using the committee's knowledge of past events:

1 – Unlikely: may occur after 25 years
2 – Possible: may occur within 10-25 years
3 – Likely: may occur within 10 years

An n/a score was given if there was insufficient evidence to make a decision. To ensure some balance with a more scientific measurement, the plan also identifies the probability of occurrence from the State Hazard Plan as shown in Table III-8. For comparative purposes the Low rating was given a designation of "1," the Medium rating a designation of "2," and the High rating a designation of "3." Finally, the Committee-determined probability and the State-determined probability were averaged for the final probability ranking. These figures are shown in Table III-8 and III-9.

Table III-11: Probability of Hazards in Sullivan County

Flood	Dam Failure	Drought	Wildfire	Earth-quake	Land-slide	Radon	Tornado	Hurricane	Lightning	Severe Winter
H	L	M	H	M	M	M	M	M	M	H

Assessing Vulnerability

The Committee members assigned a vulnerability rating to each type of hazard based upon the Committee's opinion of the extent of damage the hazard may cause based upon past occurrences and current assessments of the Town: a great amount of damage and cost (3), moderate amount of dmage and cost (2), and limited damage or costs (1). The Committee-determined vulnerabilities were then averaged with the "low" vulnerability determined for Sullivan County in the *NH Natural Hazard Mitigation Plan*.

Assessing Risk

The averages of each vulnerability and probability were multiplied to arrive at the overall risk the hazard has on the community. The overall risk or threat posed by a hazard over the next 25 years was determined to be high, medium, or low. Table III-9 provides the result of this evaluation.

HIGH**:** (1) There is strong potential for a disaster of major proportions during the next 25 years; or (2) history suggests the occurrence of multiple disasters of moderate proportions during the next 25 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the town's emergency management training and exercise program.

MEDIUM: There is moderate potential for a disaster of less than major proportions during the next 25 years. The threat is great enough to warrant modest effort to prepare for, respond to, recover from, and mitigate this hazard. This hazard should be included in the town's emergency management training and exercise program.

LOW**:** There is little potential for a disaster during the next 25 years. The threat is such as to warrant no special effort to prepare for, respond to, recover from, or mitigate this hazard. This hazard need not be specifically addressed in the town's emergency management training and exercise program except as generally dealt with during hazard awareness training.

Table III-12: Risk Assessment

Risk Assessment 0-1.9- Low 2.0-3.9- Low-Med 4-5.9- Med 6-7.9- Med-High 8-9- High							
Hazard	**Probably of Occurrence (Likely -3; Possible – 2; Unlikely – 1)**			**Vulnerability (High – 3; Moderate – 2; Low – 1)**			**Risk**
	Committee Determination	**State Hazard Plan**	**Average of Prob-abilities**	**Committee Determination**	**State Hazard Plan**	**Average of Vulner-abilities**	**(Probability x Vulner-ability)**
Flooding/Ice Jams	3	3	3	3	1	2	6
Dam Failure	1	1	1	3	1	2	2
Drought	2	2	2	1	1	1	2
Hurricanes	2	2	2	2	1	1.5	3
Tornados/Downbursts	2	2	2	2	1	1.5	3
Thunderstorms/Lightning	2	2	2	2	1	1.5	3
Severe Winter Weather	3	3	3	3	1	2	6
Wildfire	2	3	2.5	2	1	1.5	3.75
Extreme Heat	2	n/a	2	1	n/a	2	3
Earthquake	1	2	1.5	2	1	1.5	2.25
Landslide	1	2	1.5	2	1	1.5	2.25
Natural Contaminants	1	2	1.5	1	1	1	1.50
HazMat	3	n/a	3	2	1	1.5	4.5
Terrorism	1	n/a	1	1	n/a	1	1

IV. CRITICAL FACILITIES & LOCATIONS

The Critical Facilities list, identified by the Charlestown Hazard Mitigation Committee, is divided into three categories. The first category contains facilities needed for emergency response in the event of a disaster. The second category contains non-emergency response facilities that are not required in an event, but that are considered essential for the everyday operation of the Town of Charlestown. The third category contains facilities/populations that the Committee wishes to protect in the event of a disaster. A map of critical facility locations in included as Appendix G.

The "hazard vulnerability" column in the following table was completed by assessing vulnerability of the critical facilities. All facilities are vulnerable to potential town-wide hazards such as earthquakes, hurricanes, tornados & downbursts, wildfire**.** The structure and content values for Town buildings were taken from Town insurance policy information. Information for replacement value of private structures was taken from current tax assessment information.

Table IV-1: Emergency Response Facilities, Services, & Structures

Critical Facility	Hazard Vulnerability	Value
Waste Water Treatment Plant	Flood, Severe Winter Weather	Structure: $2,122,800 Contents: $762,700
Library/Municipal Building/Police	Severe Winter Weather	Structure: $505,400 Contents: $935,800
Town Hall	Severe Winter Weather	Structure: $301,600 Contents: $20,000
Water and Sewer Department	Severe Winter Weather	Structure: $102,100 Contents: $150,500
Fire Department	Severe Winter Weather	Structure: $283,300 Contents: $53,600
Highway Department	Severe Winter Weather	Structure: $84,500 Contents: $126,600
Sewer Pump Station Old Charlestown Road	Severe Winter Weather	Structure: $48,300 Contents: $325,000
Sewer Pump Station Old Claremont Road	Severe Winter Weather	Structure: $18,810 Contents: $55,000
Ambulance	Severe Winter Weather	Structure: $123,400 Contents: $34,400
Bull Run Well	Severe Winter Weather	Structure: $20,200 Contents: $78,100
Clay Brook Well	Severe Winter Weather	Structure: $113,700 Contents: $100,300
North Charlestown Wells	Flood, Severe Winter Weather	Structure: $61,700 Contents: $55,300
Clay Brook Storage Tank	Flood, Severe Winter Weather	Structure: $483,300
North Charlestown Tank	Severe Winter Weather	Structure: $450,000
Solid Waste Transfer Station	Severe Winter Weather	Structure: $37,500 Contents: $142,800

Old Cheshire Toll Bridge (spans Connecticut River)	Flood, Severe Winter Weather	NA

Table IV-2: Non-Emergency Response Facilities and Services

Critical Facility	Hazard Vulnerability	Replacement Value
North Charlestown Dam	Flood, Dam Breach/Failure, Severe Winter Weather	NA
Claybrook Dams	Flood, Dam Breach/Failure, Severe Winter Weather	NA
Hall's Pond Dam	Flood, Dam Breach/Failure, Severe Winter Weather	Structure: $201,685
Charlestown Primary School	Fixed Hazardous Materials Site, Severe Winter Weather	Structure: $1,715,200
Town Pool	Severe Winter Weather	Structure: $169,000 Contents: $63,000
Charlestown Elementary School	Fixed Hazardous Materials Site, Severe Winter Weather	Structure: $1,785,500
Bakery Building	Severe Winter Weather	Structure: $147,700 Contents: $28,600
North Charlestown Community School	Fixed Hazardous Materials Site, Severe Winter Weather	Structure: $1,232,100
Patch Park	Flood, Severe Winter Weather	Structure: $9,400
Senior Center	Severe Winter Weather	Structure: $386,500
Fort at No. 4 Historic Site	Flood, Severe Winter Weather	Land & Structures: $600,000

Table IV-3: Facilities and Populations to Protect

Critical Facility	Hazard Vulnerability	Replacement Value
47 Residences Around Merriam Graves/Irving Gas Bottling; new subdivision with 11 undeveloped lots	Chemical Fire, Fixed Hazardous Materials Site, Severe Winter Weather	$8 million

V. DETERMINING HOW MUCH WILL BE AFFECTED

A. IDENTIFYING VULNERABLE FACILITIES

It is important to determine which critical facilities and other structures are the most vulnerable and to estimate potential losses. The first step is to identify the facilities most likely to be damaged in a hazard event. To do this, the locations of critical facilities were compared to the location of various topographical elements, floodplains, roads and water bodies. There is neither large land areas slated for potential development nor large development projects in the works, so vulnerability of undeveloped land is limited. There is one 12-lot approved subdivision which is located near the Merriam Graves site and is considered vulnerable to a hazardous waste spill. One of the lots has been developed so the remaining 11 lots are considered future vulnerable areas.

Table V-1: Vulnerability of Existing Developed Areas

Hazard Area/Hazard	Structures	Estimated Value	Critical Facilities
Hackett Swamp Road/Flooding	Road; residences not anticipated to be impacted	$10,000 road only	None
Area Affected by the October 2005 Flood/Flooding	18 Roads; Major Washouts on Acworth Road, North Hemlock Road, South Hemlock Road, and Pecor Road; river bank near Clay Brook Well (village water system); no buildings impacted though several driveways washed;	$229,000 (FEMA estimate for roads & river bank only); estimated $10,000 for driveways	None
East Side of Charlestown/Flooding	Paris Ave., E Street, Main Street, Hundreds of Residences, Main Street Businesses	Several million of dollars	Primary, middle school, school super office, water & sewer mains, Water Dept bldg, town hall;
Connecticut River/Flooding & High Winds	31 residences including 23 in the Connecticut River Mobile Home Park homes	$665,400 for homes; $2.75 M for public facilities	Wastewater Treatment Facility; Bull Run Well; Fort #4 & Patch Park
North Charlestown Dam Area/Flooding (trib of Little Sugar River)	Unity Stage Road; residences	$100,000 for road; $8.8 million for homes	None
Railroad Corridor/Hazardous Materials Spills	Hundreds of residences and many businesses along the 14-mile corridor including downtown	Unknown	Town water supply at Bull Run Well; Municipal building; Highway Garage; Police Department

Bridges are important to the Town's infrastructure. They need to be maintained or replaced when necessary to avoid potential damage to property or life due to bridge failure. Bridges are often located along emergency routes, and bridge failures could be devastating during a hazard or other event requiring evacuation or emergency access. Charlestown has four red-listed

bridges on town roads. This is from a State Bridge Condition Category which means "priority for repair." Most of the bridges in Charlestown are State-owned and are considered adequate.

Table V-2: Bridges in Charlestown

Bridge I.D.	Owner	Facility	Feature Crossed	Yr Built/Reconstr	Rating
253/048	Town	Old State Road	Jabes Meadow Brook	1993	Green
243/045	State	NH 12A	NH 12, railroad	1970/1999	Green
181/058	State	NH 12	Railroad	1959	Yellow
154/065	Town	Old Claremont Road	Clay Brook	2002	Green
150/055	State	NH 11	Railroad	1965	Green
135/059	State	Lovers Lane	Railroad	1996	Green
076/091	State	NH 12A	Railroad	2000	Green
069/096	State	NH 12	Little Sugar River	1964	Green
071/115	Town	Chestnut Flat Road	Little Sugar River	1935	Green
064/090	State	NH 12A	Ox Brook	2002	Green
070/092	State	NH 12A	Little Sugar River	1984	Green
252/056	State	NH 12A	Hackett Brook	1954/1982	Green
135/052	State	NH 11	Connecticut River	1900/1992	Yellow
248/060	Town	Old Cheshire Turnpike	Hackett Brook	1940	Red
152/053	Railroad	Bridge Street	Railroad	1992	Red
155/062	Town	Fling Road	Clay Brook	1950	Red
142/101	Town	Borough Road	Clay Brook	1940	Red

B. POTENTIAL LOSS ESTIMATES

This section identifies areas in town that are most vulnerable to hazard events and estimates potential losses from these events. Human health issues and loss of life were not included in the potential loss estimates, but could be expected to occur.

Flooding & Ice Jams

The Charlestown Hazard Mitigation Committee has identified four areas of past and potential flooding. In the first of these flood hazard areas, Hackett Swamp Road, there are 16 residences. The second area prone to flooding is the area affected in the October 2005 flood. Eighteen roads in this area were damaged, including four roads that were subjected to major washouts. The money that has been spent to repair Charlestown after the October 2005 flooding totals $229,000 to date. The third area prone to flooding due to man-made ponds is the East Side of Charlestown. The following infrastructure and structures are included in this area: Paris Ave., E Street, Main Street, hundreds of residences, and Main Street businesses. A total loss estimate for this area would be in the millions of dollars. Finally, ice jam areas pose a potential threat for flooding. In past ice jam occurrences 31 residences and the Connecticut River Mobile Home Park have been affected. The total replacement cost of the facilities and buildings that the Committee identified equaled $2,878,885. The potential loss was calculated by multiplying the estimated value of the structure by the percent of the floodwaters. For example, FEMA estimates that in the event of a 100-year, 4-foot flood, structures in the 100-year floodplain would suffer 28% damage.

High Impact*:* Considers eight foot flooding in 100 and 500-year floodplain areas. All structures receiving 49% damage. Cost for repairing or replacing bridges, railroads, power lines, telephone lines, natural gas pipelines, water and wastewater treatment facilities, contents of structures and loss of cropland values are not included. $2,878,885 X 49% = $1,436,564

Moderate Impact*:* Considers 4-foot flooding in 100-year floodplain areas. All structures receive 28% damage. $2,878,885 X 28% = $906,087

Low Impact*:* Considers 1-foot flooding in 100-year floodplain areas. All structures receive 15% damage. $2,878,885 X 15% = $431,832

The potential loss estimates for flood in Charlestown for the identified facilities and buildings would be between $1,436,564and $431,832.

In addition, discussions with the Cold Region Research Engineering and Laboratory in Hanover, NH indicate it could cost as much as $20-30,000 for a study to review the ice jam data, assess problems, and develop conceptual solutions. This would not include the cost of any resolutions including engineering and construction. The Committee determined this was not a reasonable path to follow considering the benefit-cost considerations. It seemed more appropriate to prevent future development within the flood areas.

Dam Failure

The only dam with significant hazard potential involves the Charlestown Wastewater Lagoons. These lagoons are located near the Connecticut River which the NH DES Dam Bureau determined exempted them from an emergency action plan. There appears to be no cost if the lagoons were breached. However, there would be substantial pollution downstream.

The Town is concerned about the Lower Reservoir Dam as it is not in good condition. They will be consulting a hydrogeologist to determine if breaching the dam is appropriate considering there is a Town well below the dam. No costs are know at this point.

Drought

A long drought would cause damage to crops and dry up wells. There is no cost estimate for this hazard in Charlestown.

Hurricane

Given that the extent of hurricanes could encompass the entire town of Charlestown the total value of identified facilities and buildings was assessed at $10,142,495. A major hurricane can cause significant damage to a community. Since Charlestown is inland from the coast, less damage would be expected to occur here than elsewhere in New Hampshire. A community-wide approximation of damage of 1% to 5% could be anticipated in the event of a large scale event.

The potential loss estimate for hurricanes in Charlestown for the identified facilities and buildings would be between $101,424 and $506,120.

Tornado & Downbursts

Tornadoes, downbursts and microbursts are relatively uncommon natural hazards in New Hampshire. On average, about six tornado events strike each year. The total cost of tornadoes between 1950 and 1995 was $9,071,389[2]. Most tornadoes are in the F0 to F2 Class. Building to modern wind standards provides significant property protection from these hazard events. It is difficult to assess the monetary impact a tornado may have a on a community as the effect may vary from minor roof damage to a single structure, to destruction of an entire neighborhood. The range of damage is difficult to project as tornadoes can be erratic and localized.

The potential loss estimate for tornados in Charlestown for the identified facilities and buildings would be between $51,418 and $102,837 based on past history.

Thunderstorms & Lightning

According to the Federal Alliance for Safe Homes, in an average year, hail causes more than $1.6 billion worth of damage to residential roofs in the United States, making it, year in and year out, one of the most costly natural disasters. Lightning is one of the most underrated severe weather hazards, yet it ranks as the second-leading weather killer in the United States. More deadly than hurricanes or tornadoes, lightning strikes in America each year killing an average of 73 people and injuring 300 others, according to the National Weather Service. There is no cost estimation model for thunderstorms and lightning due to their random nature.

Severe Winter Weather

New England usually experiences at least one or two severe snow storms per year. The storms impact the region with varying degrees of severity. Typical effects of severe winter weather are power outages and damages to infrastructure. For example, in the storm of 2005 the total cost to clean up the Town was $12,000. Ice storms often cause widespread power outages by breaking power lines.

The potential loss estimate for severe winter storms in Charlestown for the identified facilities and buildings would be between $51,418 and $102,837 based on past history.

Wildfire

Wildfire is most likely to occur during drought years and the exact location of the occurrence is difficult to predict. However, areas and structures that are surrounded by dry vegetation that has not been suitably cleared are at high risk. The Wildland/Urban Interface map in Appendix D provides an overview of where wildfire is most likely to occur. Critical facilities and buildings identifies by the Committee included a large percentage of the Town of Charlestown. There is significant area within the town that is at risk.

Following the accepted formula for flooding the following assumptions regarding wildfire could be made.

High Impact - $10,142,495 X 49% = $5,061,105

[2] The Disaster Center

Moderate Impact - $10,142,495 X 28% = $2,837,898
Low Impact - $10, 142,495 X 15% = $1,521,374

The total potential loss due to wildfire in Charlestown could be between $5,061,105and $1,541,374.

Extreme Heat

Excessive heat kills more people in the U.S. than tornadoes, hurricanes, floods, and lightning combined. The elderly, very young, obese and those who work outdoors or have substance abuse problems are most at risk from succumbing to heat. Additionally, people in urban areas are more susceptible as asphalt and cement tend to hold in heat throughout the night (Federal Alliance of Safe Homes website). The costs for this hazard are in terms of human suffering. It is not anticipated that there would be any structural or infrastructure costs. There is no cost estimate for this hazard.

Earthquake

Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric and phone lines; precipitate landslides; and cause flash flooding events. Buildings in Charlestown that are not built to a high seismic design level would be vulnerable in the event of an earthquake. Additionally, Charlestown's dams could be breached or fail. There is no record of damages from earthquakes in Charlestown on which to base a potential loss estimate. Assuming a moderate earthquake in Charlestown where structures are not built to a high seismic design level, presuming mostly wood framed construction, it could be estimated that about 1% to 5% of the assessed structural valuation could be lost, including damage to homes.

The potential loss estimate for earthquakes in Charlestown for the identified facilities and buildings would be between $101,424 and $506,120.

Landslides

The Committee identified South Charlestown as an area of concern for landslides. The total replacement value of the 15 structures in that area is $1,347,400. It could be assumed that about 1% to 5% of the value of those structures could be lost.

The potential loss estimate for landslides in Charlestown for the identified facilities and buildings would be between $13,474 and $67,370.

Natural Contaminants

The cost of a natural contamination hazard would be the health of individuals exposed to the material. No cost estimate is provided for this hazard. Inexpensive radon test kits are available at hardware stores to test air quality. Individuals could also test their water which could cost from $30 - $300 depending on what contaminants they include in the test. Installing appropriate water purifiers could alleviate the risk of most contaminants with the exception of radon which would require an expensive aeration treatment system (estimated cost of $2,500), if it were present.

Hazardous Materials

The cost of a hazardous material spill would depend upon the extent of the spill, the location of the spill in relation to population, structures, infrastructure, and natural resources, as well as the type of hazardous material. The cost of any clean-up would be imposed upon the owner of the material. However, other less tangible costs such as loss of water quality might be borne by the community. No cost estimate has been provided for this possible hazard. Spills could also be a result of accidents from small quantity generators, heating fuel delivery, or transport of hazardous materials through the town on Routes 11, 12, and 12A. There is no cost estimate for this hazard.

Terrorism

The costs of potential terrorism are unknown. It would depend upon the act itself which could impact structures, infrastructure, natural resources, and human lives.

VI. EXISTING MITIGATION STRATEGIES

The next step involves identifying existing mitigation strategies for the hazards likely to affect the Town and evaluating their effectiveness. The following is a list of current policies, regulations and programs in the Town of Charlestown that protect people and property from natural and man-made hazards followed by proposed improvements.

A. EXISTING MITIGATION ACTIONS

Flooding

- National Flood Insurance Program participant
- Conservation Commission/Conservation Fund for land protection
- Shoreland Protection Act
- Dam Emergency Action Plans
- Routine culvert maintenance
- Routine bridge maintenance, by the State, every three years

Wind

- Utility tree trimming: National Grid, CVPS (N. Charlestown), PSNH, COOP, GSE. These companies are not very responsive, according to the Committee.

Winter Weather

- Town Highway & Winter Operations

Wildfire

- Fire Department:

Multiple Hazards

- Master Plan
- Zoning Ordinance
- Mutual Aid – Fire, Police, and Highway
- Town Emergency Management Plan
- Water Protection Overlay District

B. RECOMMENDED IMPROVEMENTS TO EXISTING MITIGATION ACTIONS

The Charlestown Hazard Mitigation Team recommended improvements to existing programs and potential mitigation measures as follows:

- Implement education and outreach program to inform citizens of Charlestown about hazard mitigation planning.
- Improve communications between emergency response departments.
- Work with the Planning Board to adopt or amend floodplain regulations, building codes, and a steep slopes ordinance. Work with FEMA to insure stream locations on their maps are correct as they do not match tax maps.
- Conduct a study of the storm water system in the downtown area.
- Conduct a culvert inventory
- Replace Pecor Road culverts with 10' culvert as recommended by FEMA after October 2005 flood
- Replace 10' culvert on Fling Road as it is rotted
- Hire CRREL to perform ice jam study to determine how to prevent flooding along river
- Provide shelter in severe winter weather through the acquisition of generators for public spaces.

VII. NEWLY IDENTIFIED MITIGATION ACTIONS

The Charlestown Hazard Mitigation Committee brainstormed potential mitigation actions at a meeting on September 7, 2006. The new proposed measures are organized by the type(s) of hazard event that the mitigation action is expected to mitigate.

A. POTENTIAL MITIGATION ACTIONS

Multiple Hazards

- Start a hazard mitigation column in the Charlestown newspaper, "Our Town" to inform Charlestown's citizens about the existence and importance of mitigation efforts that offer protection from natural hazards.
- Replace the Repeater on the cell tower on Birch Drive.

Flooding

- Develop a stormwater system in the downtown.
- Implement stricter floodplain regulations to mitigate flooding effects on new development. Prevent new development in the floodplains.
- Conduct a town wide culvert inventory to determine the condition of the culverts, and their ability to adequately carry water under roads and bridges.

Severe Winter Weather

- Acquire generators for the schools and senior center to provide citizens of Charlestown with shelter in the event of a severe winter storm and resulting power outage.

Hazardous Materials

- Continue training fire personnel in the use of Sullivan County's hazardous materials clean-up trailer provided through a grant from homeland security.
- Restrict development along the railroad.
- Place gates at all railroad crossings to prevent the derailment of railway cars carrying hazardous materials.

Hurricane/High Wind Events

- Update building codes to protect structures against powerful wind gusts associated with hurricanes.

Wildfire/Structure Fire

- On-going training of fire and emergency services personnel.

Seismic Hazards

- Update building codes to protect structures in the infrequent event of a small earthquake.
- Establish a steep slopes ordinance to protect new structures from areas of potential landslides.

B. SUMMARY OF CRITICAL EVALUATION

The Charlestown Hazard Mitigation Team reviewed each of the newly identified mitigation strategies using the following factors:

- Does it reduce disaster damage?
- Does it contribute to community objectives?
- Can it be quickly implemented?
- Is it socially acceptable?
- Is it technically feasible?
- Is it administratively possible?
- Is the action legal?
- Does the action offer reasonable benefit compared to cost of implementation?

The Charlestown Hazard Mitigation Team assigned the following scores to each strategy for its effectiveness related to the critical evaluation questions listed above. For each critical evaluation question the Committee assigned a 1, 2, or 3 to the strategy being scored. Three indicated that the strategy ranked high in regard to the evaluation question, and one indicated that the strategy ranked low in regard to the evaluation question. The sum of the scores for each evaluation question equals the overall score for a particular strategy. The highest score suggests the highest priority. The highest possible total score is 24.

Table VII-1: Project Evaluation of Proposed Mitigation Actions

Project	Score	Additional Cost/Benefit Consideration	Mitigate Existing or New Built Environment
Replace Pecor Road two pipe set with 10' culvert	24	Flooding	Both
Improve all emergency services communication by placing a Repeater on the cell tower on Birch Drive.	23	This mitigation effort is free to the Town of Charlestown through a grant from Homeland Security, and will reduce disaster damage in the future by improving response communications.	Both
Start a hazard mitigation column in the Charlestown newspaper, "Our Town" to inform Charlestown's citizens about the existence and importance of mitigation efforts that offer protection from natural hazards.	21	This form of education and outreach will not cost the town anything to create, and will be a free source of information for Charlestown's residents.	Both, indirectly
Conduct a town wide culvert inventory to determine the condition of the culverts, and their ability to adequately carry water under roads and bridges.	21	Town funds would be used to pay for this mitigation effort. The effort would prevent flooding and reduce road damage.	Both
Replace 10' culvert on Fling Road with 24' bridge	20	Culvert is rotted	Both

Project	Score	Additional Cost/Benefit Consideration	Mitigate Existing or New Built Environment
Continue training fire personnel in the use of Sullivan County's hazardous materials clean-up trailer provided through a grant from Homeland Security.	20	This on-going training will cost the Town of Charlestown the time of its staff, but will work to lessen the severity of a hazardous material spill by ensuring a fast and environmentally sound clean-up.	Both
Perform an initial study of the storm water system in the downtown area to mitigate the potential for flooding.	20	This mitigation effort would require the hiring of a consultant engineer paid for with local funds, or grant funding. The potential for flooding in the downtown area could be reduced as a result of this study.	Both
Implement stricter floodplain regulations to mitigate flooding effects on new development. Insure FEMA stream maps are correct in locating streams.	19	Staff time would be required to work on the new regulations. The effort would help to mitigate flooding effects on new development.	New
Update building codes to protect structures against powerful wind gusts associated with hurricanes, and against the infrequent event of a small earthquake.	17	Updating building codes would require the time of some staff from Charlestown. The mitigation effort will protect structures in the event of a hurricane or earthquake.	New
Acquire generators for the schools and senior center to provide citizens of Charlestown with shelter in the event of a severe winter storm resulting in a power outage.	16	The acquisition would require town funds and school board funds. The Committee has stated that the frequency of use and benefits resulting from that use cannot be predicted. The critical facilities with generators could potentially be protected freezing pipes.	Existing
Hire CRREL to perform ice jam study to prevent flooding along river	13	Limited area impacted.	Existing
Establish a steep slopes ordinance to protect new structures from areas of potential landslides.	11	Establishing a steep slopes ordinance would require effort on the part of the planning board, and the time of the supporting staff. No hazard events concerning landslides were identified by the Committee, so this mitigation effort will offer little benefit.	New
Prevent a hazardous materials spill from affecting developed areas along the railroad by placing stricter controls for development along the railroad.	11	This effort would require planning board and staff time, and will help to protect new development along the railroad.	New
Place gates at all railroad crossings to prevent the derailment of railway cars carrying hazardous materials.	11	The State, railroad, and town would pay for this mitigation effort. Potentially, the effort could decrease derailments.	Neither

VIII. PRIORITIZED IMPLEMENTATION SCHEDULE

The Charlestown Hazard Mitigation Committee created the following action plan for implementation of priority mitigation strategies:

Table VIII-1: Implementation Schedule

Mitigation Action	Who (Leadership)	When (Deadline)	Cost/Funding Source
Replace Pecor two pipe set with 10' culvert as recommended by FEMA after October 2005 floods	Highway Superintendent	Summer 2009	$150,000/Grants & Taxes
Improve all emergency services communication by placing a Repeater on the communication tower in Unity.	Police Chief	Spring 2008	Grant from Homeland Security $26,000
Start a hazard mitigation column in the Charlestown newspaper, "Our Town" to inform Charlestown's citizens about the existence and importance of mitigation efforts that offer protection from natural hazards.	Emergency Management Director	Summer 2008	No cost, Volunteer time
Perform an initial study of the storm water system in the downtown area to mitigate the potential for flooding.	Water and Sewer Superintendent	2009	Town funds $20,000-$30,000
Continue training fire personnel in the use of Sullivan County's hazardous materials clean-up trailer provided through a grant from Homeland Security.	Fire Chief	Spring 2009	Grant from Homeland Security
Conduct a town wide culvert inventory to determine the condition of the culverts, and their ability to adequately carry water under roads and bridges.	Highway Superintendent	Fall 2007	Staff time
Replace rotted 10' culvert on Fling Road	Highway Superintendent	Summer 2010	$200,000/Grants & Taxes
Implement stricter floodplain regulations to mitigate flooding effects on new development. Insure FEMA maps are correct.	Planning Board	Spring 2008	Staff time
Update building codes to mitigate powerful winds associated with hurricanes, and against a small earthquake.	Building Inspector, Planning Board	Spring 2008	Staff time

Mitigation Action	Who (Leadership)	When (Deadline)	Cost/Funding Source
Prevent a hazardous materials spill from affecting developed areas along the railroad by placing stricter controls for development along the railroad.	Planning Board	2009	Staff time
Establish a steep slopes ordinance to protect new structures from areas of potential landslides.	Planning Board	2009	Staff time
Place gates at all railroad crossings to prevent the derailment of railway cars carrying hazardous materials.	Board of Selectmen	2010	State, railroads, and town funds
Acquire generators for the schools and senior center to provide citizens of Charlestown with shelter in the event of a severe winter storm resulting in a power outage.	School District	*This depends on cooperation with the school board.*	*This depends on cooperation with the school board.*

IX. ADOPTION & IMPLEMENTATION OF THE PLAN

A good plan needs to provide for periodic monitoring and evaluation of its successes and challenges, and to allow for updates of the Plan where necessary. In order to track progress and update the Mitigation Strategies identified in the Plan, the Town of Charlestown will review the Hazard Mitigation Plan *annually, or after a hazard event.* The Plan will be updated on a five-year cycle. The Charlestown Emergency Management Director will initiate this review or update and should consult with the Hazard Mitigation Committee. Changes will be made to the plan to accommodate for projects that have failed, or that are not considered feasible after a review for their consistency with the evaluation criteria, the timeframe, the community's priorities, and funding resources. Priorities that were not ranked highest, but that were identified as potential mitigation strategies, will be reviewed as well during the monitoring and update of this plan, to determine feasibility for future implementation. During the five-year update, there will be a public hearing to receive public comment, and the Board of Selectmen will adopt the final Plan.

Implementation Through Existing Programs
The Plan will be adopted locally as a stand-alone document. The Board of Selectmen will review and include any proposed projects outlined in this plan. During periods of review or update the Hazard Mitigation Committee will consult the Charlestown Master Plan to ensure that the Hazard Mitigation Plan does not conflict with the Master Plan.

Continued Public Involvement
The public will continue to be involved in the hazard mitigation planning process. In future years, public meetings will be held (separate from the adoption hearing) to inform and educate members of the public. Prior to the meeting, a press release will be distributed, and information will be posted in the Town.

By their nature, natural hazards affect areas not defined by political boundaries. Response to these disasters often may rely on neighboring communities for assistance such as the mutual aid services. Because of this it is important to notify and work with adjacent communities. Notification of this plan and its meetings will be publicly noticed and posted, and direct invitations will be made to neighboring municipalities of Claremont, Unity, Acworth, Langdon, and Walpole.

Support for mitigation strategies is important in order to carry out implementation. The Town of Charlestown will make every effort in the future to incorporate community representation in future revisions of this plan. In order to ensure in the future that opportunity to participate in the planning process is given to other interested parties, the Town will send invitations to local businesses, educational institutions and non-profit organizations. Revisions of this plan shall incorporate press releases that will notice citizens, businesses and organizations of the progress of the plan while also soliciting input that could strengthen the value of the plan. This process will enable more successful implementation actions.

Copies of future draft Hazard Mitigation Plan updates will be sent to the following parties for review and comment prior to adoption:

- Emergency Management Directors: Claremont, Unity, Acworth, Langdon, Walpole
- Field Representative, NH HSEM
- Charlestown Board of Selectmen
- Charlestown Conservation Commission
- Charlestown Planning Board
- Charlestown Police Department
- Charlestown Fire Department
- Charlestown Highway Department

Adoption Resolution

RESOURCES USED IN THE PREPARATION OF THIS PLAN

NH BEM's *State of New Hampshire Natural Hazards Mitigation Plan* (9/99)

Guide to Hazard Mitigation Planning for New Hampshire Communities, prepared for NH BEM by the Southwest Regional Planning Commission (October 2002)

FEMA's *Community Based Hazard Mitigation Planning: Lowering the Risks and Costs of Disasters* (8/98)

Town of Charlestown Master Plan, 1998

Town of Hanover, New Hampshire Hazard Mitigation Plan

Town of New London, New Hampshire Hazard Mitigation Plan

www.nesec.org: *Website for Northeast States Emergency Consortium (NESEC)*

www.tornadoproject.com: Website for The Tornado Project

Natural Resource Inventory for the Town of Charlestown, 2001, Charlestown Conservation Commission, with the assistance of Lobdell Associates, Inc.

www.fema.gov: FEMA *website*

www.crrel.usace.army.mil/: *Cold Regions Research and Engineering Laboratory website*

APPENDICES

Appendix A: Technical Resources

Appendix B: Hazard Mitigation Assistance Grants

Appendix C: Meeting Documentation

Appendix D: Wildland/Urban Interface Map

Appendix E: 100-year Floodplain Map

Appendix F: Past & Potential Hazard Areas Map

Appendix G: Critical Facilities Map

Appendix A:

Technical Resources

APPENDIX A:

TECHNICAL RESOURCES

Agencies

New Hampshire Bureau of Emergency Management 271-2231
Hazard Mitigation Section 271-2231

Federal Emergency Management Agency .....(617) 223-4175

NH Regional Planning Commissions:
Upper Valley Lake Sunapee Regional Planning Commission 448-1680

NH Executive Department:
Governor's Office of Energy and Community Services 271-2611
New Hampshire Office of State Planning 271-2155

NH Department of Cultural Affairs: 271-2540
Division of Historical Resources 271-3483

NH Department of Environmental Services: 271-3503
Air Resources 271-1370
Waste Management 271-2900
Water Resources 271-3406
Water Supply and Pollution Control 271-3504
Rivers Management and Protection Program 271-1152

NH Office of State Planning and Energy Programs..... 271-2155

NH Municipal Association 224-7447

NH Fish and Game Department 271-3421

NH Department of Resources and Economic Development: 271-2411
Natural Heritage Inventory 271-3623
Division of Forests and Lands 271-2214
Division of Parks and Recreation 271-3255

NH Department of Transportation 271-3734

Northeast States Emergency Consortium, Inc. (NESEC).....(781) 224-9876

US Department of Commerce:
National Oceanic and Atmospheric Administration:
National Weather Service; Gray, Maine 207-688-3216

US Department of the Interior:
US Fish and Wildlife Service 225-1411
US Geological Survey 225-4681
US Army Corps of Engineers .....(978) 318-8087

US Department of Agriculture:
Natural Resource Conservation Service 868-7581

Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) ..... NH Office of Emergency Management
406 Public Assistance and Hazard Mitigation

Community Development Block Grant (CDBG) ..... NH OEM, NH OSP, also refer to RPC

Dam Safety Program..... NH Department of Environmental Services

Disaster Preparedness Improvement Grant (DPIG)..... NH Office of Emergency Management

Emergency Generators Program by NESEC‡ ..... NH Office of Emergency Management

Emergency Watershed Protection (EWP) ProgramUSDA, Natural Resources Conservation Service

Flood Mitigation Assistance Program (FMAP)..... NH Office of Emergency Management

Flood Plain Management Services (FPMS)..... US Army Corps of Engineers

Mitigation Assistance Planning (MAP) ..... NH Office of Emergency Management

Mutual Aid for Public Works ..... NH Municipal Association

National Flood Insurance Program (NFIP) † .....NH Office of State Planning

Power of Prevention Grant by NESEC‡..... NH Office of Emergency Management

Project Impact ..... NH Office of 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 208 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 and Economic Development

Wetlands Programs..NH Department of Environmental Services

[‡]NESEC – Northeast States Emergency Consortium, Inc. is a 501(c)(3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NH BEM for more information.

[†] Note regarding **National Flood Insurance Program** (NFIP) and **Community Rating System** (CRS):
The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS rating), a community's floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. The NH Office of State Planning can provide additional information regarding participation in the NFIP-CRS Program.

Websites

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	http://www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/disaster/	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.

USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/geog/floods/	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.htm	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://www.met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links
National Lightning Safety Institute	http://lightningsafety.com/	Information and listing of appropriate publications regarding lightning safety.
NASA Optical Transient Detector	http://www.ghcc.msfc.nasa.gov/otd.html	Space-based sensor of lightning strikes
LLNL Geologic & Atmospheric Hazards	http://wwwep.es.llnl.gov/wwwep/ghp.html	General hazard information developed for the Dept. of Energy.
The Tornado Project Online	http://www.tornadoroject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iiaa.iix.com/ndcmap.htm	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.
Northeast Emergency Consortium	http://www.serve.com/NESEC	Information on disasters and preparedness.

Appendix B:

Hazard Mitigation Assistance Grants

APPENDIX B:

Hazard Mitigation Assistance Grants

Hazard Mitigation Assistance (HMA) grant programs of the Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA), presents a critical opportunity to protect individuals and property from natural hazards while simultaneously reducing reliance on Federal disaster funds. The HMA programs provide pre-disaster mitigation grants annually to local communities. The statutory origins of the programs differ, but all share the common goal of reducing the loss of life and property due to natural hazards. Eligible applicants include State-level agencies including State institutions; Federally recognized Indian Tribal governments; Public or Tribal colleges or universities (PDM only); and Local jurisdictions that are participating in the National Flood Insurance Program (NFIP).

The HMA grant assistance includes four programs:

1. *The Pre-Disaster Mitigation (PDM) program*: This provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are awarded on a competitive basis.

2. *The Flood Mitigation Assistance (FMA) program*: This provides funds so that cost-effective measures can be taken to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities.

3. *The Repetitive Flood Claims (RFC) program*: This program provides funding to reduce of eliminate the long-term risk of flood damage to structures insured by NFIP that have had one or more claim payments for flood damages. The long-term goal of the RFC program is to reduce or eliminate claims under the NFIP through mitigation activities that are in the best interest of the NFIP.

4. *The Severe Repetitive Loss (SRL) program*: This program provides funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP.

Potential eligible projects are shown in the following table by grant program. For further information on these programs visit the following FEMA websites:

PDM – www.fema.gov/government/grant/pdm/

FMA – www.fema.gov/government/grant/fma

RFC – www.fema.gov/government/grant/rfc

SRL – www.fema.gov/government/grant/srl

Mitigation Project:	**PDM**	**FMA**	**RFC**	**SRL**
1. Property Acquisition and Demolition or Relocation Project				
Property Elevation	**X**	**X**	**X**	**X**
2. Construction Type Projects				
Property Elevation	**X**	**X**	**X**	**X**
Mitigation Reconstruction[1]				**X**
Localized Minor Flood Reduction Projects	**X**	**X**	**X**	**X**
Dry Floodproofing of Residential Property[2]		**X**		**X**
Dry Floodproofing of Non-residential Structures		**X**	**X**	
Stormwater Management	**X**	**X**		
Infrastructure Protection Measure	**X**			
Vegetative Management/Soil Stabilization	**X**			
Retrofitting Existing Buildings and Facilities (Wind/Earthquake)	**X**			
Safe room construction	**X**			
3. Non-construction Type Projects				
All Hazard/Flood Mitigation Planning	**X**	**X**		

1. The SLR Program allows Mitigation Reconstruction projects located outside the regulatory floodway or Zone V as identified on the effective Flood Insurance Rate Map (FIRM), or the mapped limit of the 1.5-foot breaking wave zone. Mitigation Reconstruction is only permitted if traditional elevation cannot be implemented.
2. The residential structure must meet the definition of "Historic Structure" in 44 CFR§59.1.

Source: "Hazard Mitigation Assistance Program Guidance," FEMA, June 19, 2008

Appendix C:

Meeting Documentation

Charlestown Hazard Mitigation Committee Meeting
AGENDAS

July 6, 2006; 2:00 – 4:00 pm; Library Building Community Room

- Re-establish meeting schedule
- Review potential hazards and assess vulnerability; Map potential hazard areas
- Identify critical facilities and estimate losses; Map critical facilities

August 3, 2006; 2:00 – 4:00 pm; Library Building Community Room

- Review identified hazards; Review identified critical facilities
- Identify existing mitigation strategies, and Charlestown's gaps in protection
- Brainstorm ideas for mitigation action

September 7, 2006; 2:00 – 4:00 pm; Library Building Community Room

- Review hazard areas
- Hazard mitigation project evaluation

October 5, 2006; 2:00 – 4:00 pm; Library Building Community Room

- Review hazard areas, critical facilities, assessed values
- Prioritize implementation schedule
- Discuss public process and adoption

November 2, 2006; 2:00 – 4:00 pm; Library Building Community Room

- Identify gaps in hazard mitigation plan
- Revise draft plan

June 17, 2008; 2:00 – 4:00 pm; Library Building Community Room

- Identify gaps in hazard mitigation plan
- Revise draft plan

February 26, 2008

Town of Unity
13 Center Road, Unit 3
Unity, NH 03603

Dear Selectboard Members and Emergency Management Director:

On behalf of the Town of Charlestown, I would like to invite you to participate in a planning process to develop a Hazard Mitigation Plan for Charlestown. A copy of the draft hazard mitigation plan is available for review at the Charlestown town offices, or I could e-mail you a draft copy.

The professional experience and historical knowledge of many citizens and town officials of neighboring communities will be extremely helpful in this planning effort, and it will provide a cooperative effort in developing a plan which may impact surrounding towns.

Please contact me if you have any questions or if you would like an e-mail copy of the draft plan. I can be reached by phone at (603) 448-1680 or by e-mail at vdavis@uvlsrpc.org.

Sincerely,

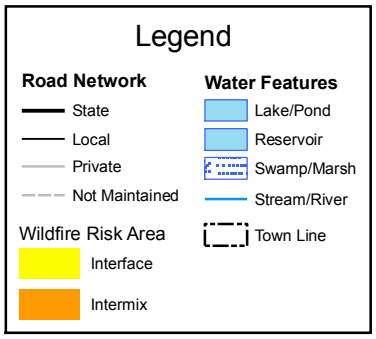
Victoria Davis

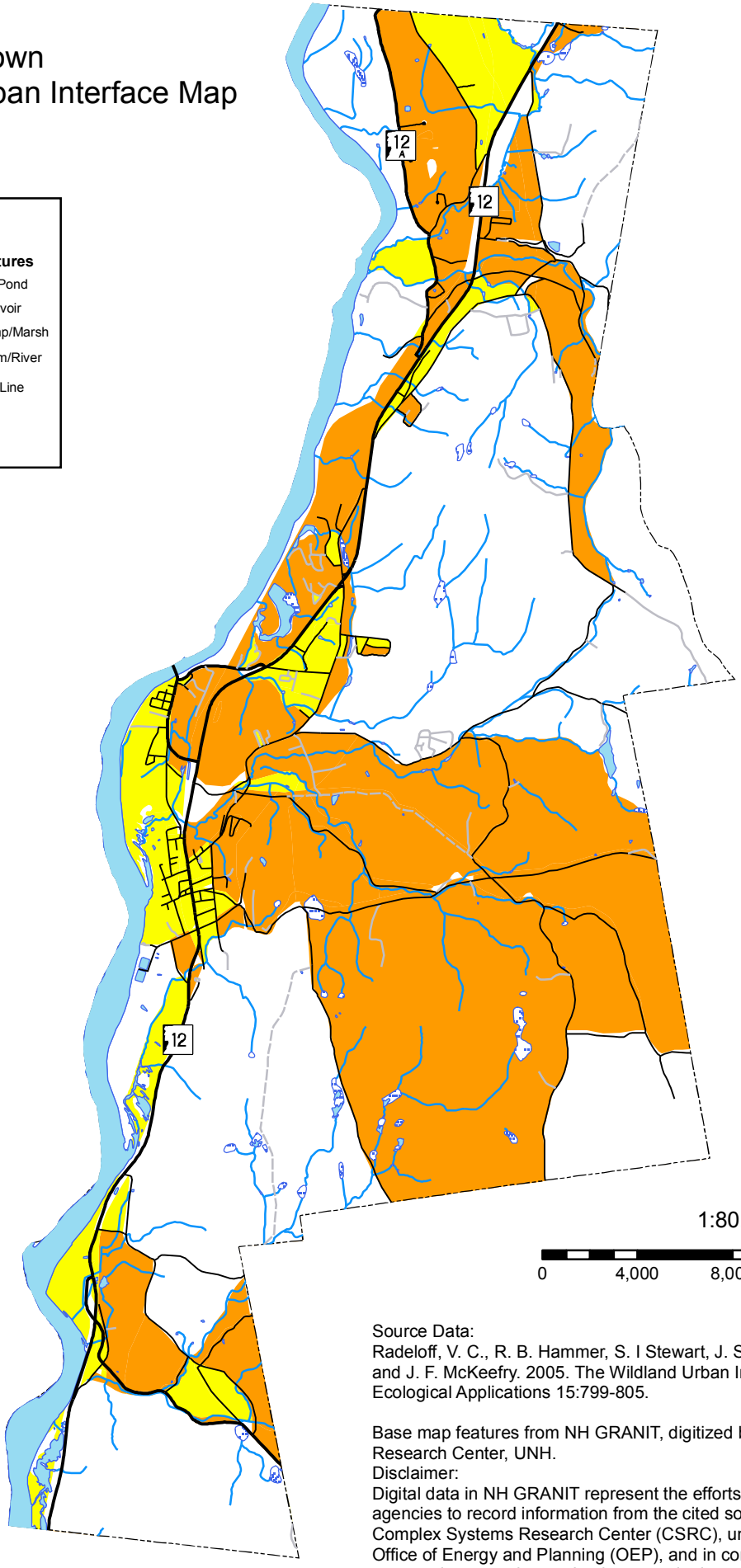
Copy:
Town of Charlestown
Town of Acworth
Town of Unity
City of Claremont
Town of Walpole
Town of Langdon

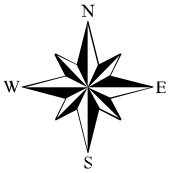
APPENDIX D:

Wildland Urban Interface Map

Town of Charlestown
NH Wildland - Urban Interface Map







1:80,000

0 4,000 8,000 12,000 16,000 Feet

Source Data:
Radeloff, V. C., R. B. Hammer, S. I Stewart, J. S. Fried, S. S. Holcomb, and J. F. McKeefry. 2005. The Wildland Urban Interface in the United States. Ecological Applications 15:799-805.

Base map features from NH GRANIT, digitized by Complex Systems Research Center, UNH.

Disclaimer:
Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of Energy and Planning (OEP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OEP, CSRC, and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.

Map created by
Upper Valley Lake Sunapee Regional Planning Commission,
November 2007.

APPENDIX E

100-Year Floodplain Map

Town of Charlestown, NH
100-Year Floodplains

The 100-year flood (or 1% annual chance flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood.

Legend

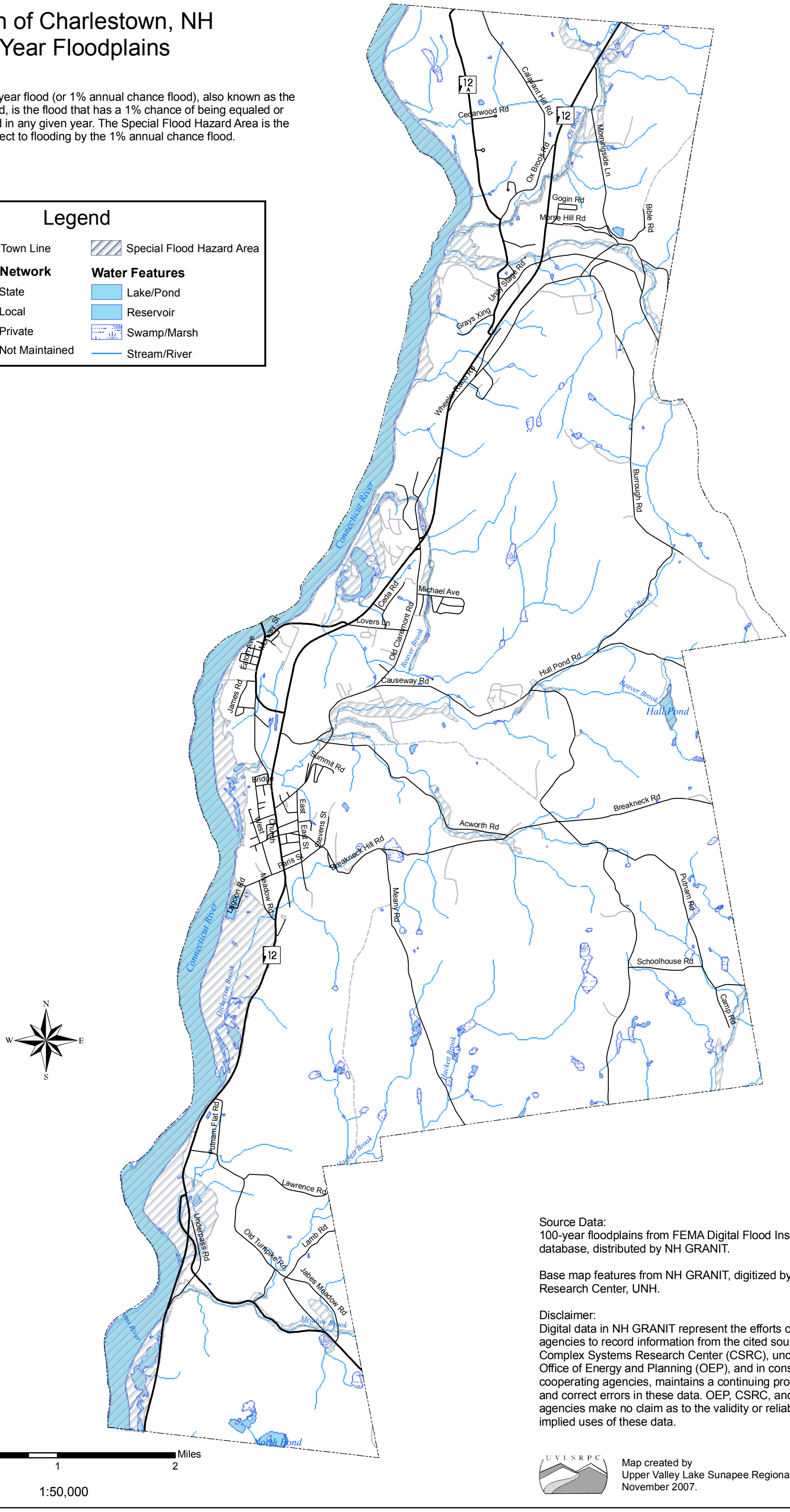
- Town Line
- Special Flood Hazard Area

Road Network

- State
- Local
- Private
- Not Maintained

Water Features

- Lake/Pond
- Reservoir
- Swamp/Marsh
- Stream/River



Source Data:
100-year floodplains from FEMA Digital Flood Insurance Rate Map database, distributed by NH GRANIT.

Base map features from NH GRANIT, digitized by Complex Systems Research Center, UNH.

Disclaimer:
Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of Energy and Planning (OEP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OEP, CSRC, and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.

Map created by
Upper Valley Lake Sunapee Regional Planning Commission,
November 2007.

APPENDIX F:

Past & Potential Hazard Areas Map

Map of Past and Potential Hazards, Charlestown, NH

Flood Hazards:
Locations in 100-year floodplain
Hackett Swamp Rd.
Acworth Rd.
South Hemlock Rd.
North Hemlock Rd.
Pecor Rd.
East of Main St.
Scott's Drive Culvert

Dam Failure:
Waste Water Lagoons

Wildfire:
Railroad
10-acre wildfire E of Meany Rd

Hazardous Materials:
Main St.
Route 12
Railroad
Schools
Clay Brook Well
Merriam Graves gas bottling

Legend

Hazards
- 100-Yr Floodplain
- Wildfire
- Hazardous Material
- Dam Failure
- Local Flooding
- Stream
- Waterbody
- Wetland

- Vermont Roads

New Hampshire Roads
- State
- Local
- Private
- Railroad

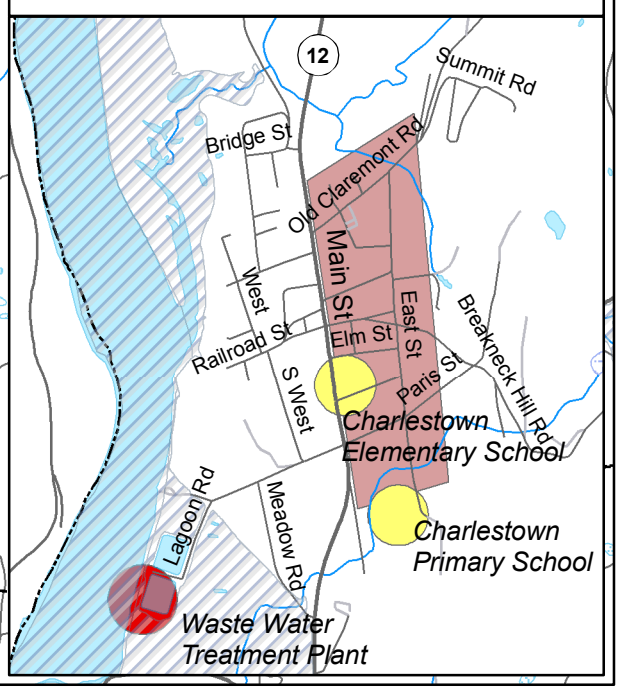
Charlestown
Unity
Springfield
Acworth
Rockingham
Langdon

Merriam Graves
North Charlestown School
Scott's Drive Culvert
Connecticut River
Clay Brook Well
Acworth Rd
North and South Hemlock Rd
Sam Putnam Rd
Hackett Swamp Rd
Unity Stage Rd
Meany Rd
10-acre wildfire May 2008
Pecor Rd
See Inset Map

N
W
E
S

Miles
0 1 2 3 4

Charlestown Village Inset



Data sources:
Roads and water features, 1:24,00 scale, from NH GRANIT and VT Center for Geographic Information.
Hazards identified by Charlestown Hazard Mitigation Committee, 2006.
100-year floodplains, Sullivan County, NH, from FEMA, distributed by NH GRANIT.
GRANIT, VCGI, UVLSRPC, and the Town of Charlestown, NH, make no claim as to the validity or reliability or to any implied uses of these data

Map created by Upper Valley Lake Sunapee Regional Planning Commission, March 2008.

Upper Valley Lake Sunapee Regional Planning Commission

APPENDIX G:

Critical Facilities Map

Map of Critical Facilities, Charlestown, NH

Charlestown Village Inset

Claremont
Charlestown
Unity
Springfield
Acworth
Langdon
Rockingham

Bridge St
Summit Rd
Old Claremont Rd
West St
Railroad St
Elm St
East St
Paris St
Breakneck Hill Rd
S West St
Lagoon Rd
Meadow Rd
Connecticut River
Unity Stage Rd
Acworth Rd
Meany Rd

See Inset Map

Legend

- Critical Facilities
- Water District
- Sewer District

Possible Extensions

- Water Service
- Water & Sewer Service
- Stream
- Waterbody
- Wetland
- Vermont Roads

New Hampshire Roads

- State
- Local
- Private

1:64,000 1 inch equals 1 mile

Miles 0 1 2 3 4

Critical Facilities
1 - Waste Water Treatment Plant
2 - Charlestown Primary School
3 - Town Pool
4 - Charlestown Elementary School
5 - Library/Municipal Building/Police
6 - Bakery Building
7 - Town Hall
8 - Water & Sewer Department
9 - Fire Department
10 - Highway Department
11 - Sewer Pump Station - Old Springfield Rd
12 - Ambulance
13 - Sewer Pump Station - Old Claremont Rd
14 - Clay Brook Storage Tank
15 - Bull Run Well
16 - North Charlestown Tank
17 - North Charlestown Community School
18 - North Chalestown Wells
19 - Senior Center
20 - Patch Park
21 - Fort at No. 4
22/23 - Clay Brook Dams
24 - Hall's Pond Dam
25 - North Charlestown Dam
26 - Cheshire Bridge
27 - Solid Waste Transfer Station

Data sources:
Roads and water features, 1:24,00 scale, from NH GRANIT and VT Center for Geographic Information.
Critical facilties identified by Charlestown Hazard Mitigation Committee, 2006.
Water and sewer district data provided by the Town of Charlestown, data unknown.
GRANIT, VCGI, UVLSRPC, and the Town of Charlestown, NH, make no claim as to the validity or reliability or to any implied uses of these data

Map created by Upper Valley Lake Sunapee Regional Planning Commission, March 2008.

Upper Valley Lake Sunapee Regional Planning Commission