-For Board of Selectmen Adoption-

01-17-17

Please adopt without amendments or we will need to resubmit to FEMA to receive another APA. All highlights & dates will be completed as the process moves forward to FEMA's Formal Approval of the Plan. Changes can be made to the Plan during its annual update (see Chapter 9).

Town of Pembroke

New Hampshire

Hazard Mitigation Plan Update 2017

Pembroke Dam (High Hazard Class) in Suncook Village at Main Street
Mother's Day Flood May 2006
Photo from Concord Monitor website

Adopted by the Pembroke Board of Selectmen
January 17, 2017

FEMA Approved [date], 2017

Approvable Pending Adoption (APA) Status Granted by FEMA on 12-14-16

Town of Pembroke
New Hampshire

Hazard Mitigation Plan Update 2017

Adopted January 17, 2017

FEMA Approved ____, 2017

Town of Pembroke
311 Pembroke Street
Pembroke, NH 03275
Phone: (603) 485-4747
Fire Department Phone: (603) 485-3621
Web: www.pembroke-nh.com

Central NH Regional Planning Commission
28 Commercial Street, Suite 3
Concord, NH 03301
Phone: (603) 226-6020
Web: www.cnhrpc.org

NH Department of Safety
NH Homeland Security and Emergency Management
33 Hazen Drive
Concord, NH 03305 *(Mailing Address)*

Incident Planning and Operations Center
110 Smokey Bear Blvd
Concord, NH 03301 *(Physical Address)*
Phone: (800) 852-3792 or (603) 271-2231
Web: www.nh.gov/safety/divisions/hsem

US Department of Homeland Security
Federal Emergency Management Agency
99 High Street, Sixth Floor
Boston, Massachusetts 02110
Phone: (617) 223-9540
Web: www.fema.gov

Table of Contents

1 PLANNING PROCESS

The Town's Hazard Mitigation Committee reformed in 2015 to develop an updated Hazard Mitigation Plan with fluvial erosion hazard information. The entire Plan was entirely rewritten into a new format from the **2010 Plan**, but includes information from previous Plan versions. This **2017 Plan Update** incorporates the newest changes required by FEMA in addition to Town changes over the last five years. This **PLANNING PROCESS CHAPTER** contains expanded public participation steps taken and a new plan development procedure as documented in the Methodology section.

Certificate of Adoption, 2017

Town of Pembroke, NH
Board of Selectmen
311 Pembroke Street
Pembroke NH 03275

A Resolution Adopting the Pembroke Hazard Mitigation Plan Update 2017

WHEREAS, the Town of Pembroke has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Hazard Mitigation Plan Update 2017** including but not limited to flooding, high wind events, severe winter weather, and fire, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Pembroke has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **Hazard Mitigation Plan Update 2017** under the requirements of 44 CFR 201.6; and

WHEREAS, public and Committee meetings were held between September 2015 to March 2016 regarding the development and review of the **Hazard Mitigation Plan Update 2017**; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Pembroke; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Pembroke with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of Pembroke eligible for funding to alleviate the effects of future hazards; now therefore be it

RESOLVED by Town of Pembroke Board of Selectmen:

The **Hazard Mitigation Plan Update 2017** is hereby adopted as an official plan of the Town of Pembroke; The respective officials identified in the mitigation action plan of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;

Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution; and

An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Emergency Management Director or designee.

IN WITNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Pembroke this 17th day of January, 2017.

ATTEST

Board of Selectmen

Justine Courtemanche, Chair date

Fred Kline, Selectman date

David Sheldon, Selectmen date

Town Clerk

Vincent Greco, Selectman date

James Goff, Town Clerk

Michael Crockwell, Selectman date

Plan Process Acknowledgments

The Board of Selectmen-appointed Hazard Mitigation Committee was comprised of these individuals who met between September 2015 through March 2016 to develop the **Pembroke Hazard Mitigation Plan Update 2017:**

- David Jodoin, Pembroke Town Administrator
- Harold Paulsen, Pembroke Fire Department Chief/Emergency Management Director
- Larry Young, Pembroke Assistant Emergency Management Director
- Dwayne Gilman, Pembroke Police Department Chief
- James Boisvert, Pembroke Public Works Department Director
- Alan Topliff, Pembroke Planning Board Member
- Everett Hodge, Pembroke Building Inspector/Code Enforcement Officer
- Stephanie Verdile, Pembroke Town Planner
- Matthew Gagne, Pembroke Water Works Supervisor
- Christopher Gamache, Tri Town-Ambulance Rescue Chief
- Vincent Greco, Pembroke Board of Selectmen member
- Ammy Heiser, Pembroke Conservation Commission Chair
- Paulette Malo, Pembroke Sewer Department Supervisor

The following Central NH Regional Planning Commission staff contributed to the development of the Hazard Mitigation Plan Update:

- Stephanie Alexander, CNHRPC Senior Planner
- Craig Tufts, CNHRPC Principal Planner (GIS mapping)

Members of the public* and other individuals attended one or more Committee meetings and/or contributed information to the content of the Plan:

- Chris Addison, Pembroke Public Works Department Secretary
- Betty St. Germain, Pembroke Water Works Secretary
- Ruth Hobbs, Pembroke Engaged Citizen*
- Paul Famulari, Pembroke Academy Headmaster*
- Timothy Hebert, Pembroke Academy Dean of Students*
- Bruce Courtois, Associated Grocers of New England*
- Jim Gaudet, Associated Grocers of New England*
- Alan Cote, Associated Grocers of New England*
- Cindy Caldwell, Associated Grocers of New England*
- Brian Seaworth, State Representative*
- Craig Beaulac, NH Homeland Security and Emergency Management (NHHSEM)

* member of the public

Authority

In 2000, the President enacted the Disaster Mitigation Act 2000 (DMA) which requires states and municipalities to have local natural hazard mitigation plans in place in order to be eligible for disaster and mitigation funding programs such as the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) programs, including Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. New Hampshire is awarded funds based upon the completeness of its State Plan and upon the number of local plans in place.

As a result of the DMA, funding was provided to state offices of emergency management, including the New Hampshire Homeland Security and Emergency Management, to produce local (municipal) hazard mitigation plans. To remain in compliance with the DMA, the Town of Pembroke is required to submit for FEMA approval a revised **Hazard Mitigation Plan Update** every five years.

The New Hampshire Homeland Security and Emergency Management (NH HSEM) produced its latest *State of New Hampshire Hazard Mitigation Plan 2013*. The development of the State's Plan allows for New Hampshire to receive funding programs to provide to communities in the event of disasters or for mitigation.

Prior versions of Pembroke's **Hazard Mitigation Plan** are noted in the **Final Plan Dates** section.

This **Pembroke Hazard Mitigation Plan Update 2017** has been developed in accordance with the Disaster Mitigation Act of 2000 and the FEMA *Local Mitigation Plan Review Guide* dated October 1, 2011 and effective one year later. The most recent Plan development standards provided by FEMA Region I have also been incorporated. The planning effort of the Town is a regular process and this Plan is considered to be a "living document."

The 2017 Pembroke Hazard Mitigation Committee was established by the Board of Selectmen in 2015 and guided the development of the Plan. The Committee consisted of the Town's Fire Department, Emergency Management Director, Town Administrator, Police Department Chief, Public Works Department Director, Town Planner, Board of Selectmen representative, Building Inspector/Code Enforcement Officer, Planning Board representative, Pembroke Water Works, and the Tri-Town Ambulance Service.

The attendees of the meeting process, including several members of the public, are noted in the **Acknowledgements**. The Central NH Regional Planning Commission, of which Pembroke is a member, contributed to the development of this Plan by facilitating the meeting and technical processes, working with the Committee and its members to obtain information, preparing the document, and handling the submissions to NH Homeland Security and Emergency Management and FEMA.

Methodology

The **Pembroke Hazard Mitigation Plan Update 2017** was developed over a six-month period, with a group of Town staff members and volunteers and the CNHRPC comprising the majority of the Hazard Mitigation Committee. The 2017 methodology for Plan development is summarized in this section. This Hazard Mitigation Plan is designed differently from the **2010 Plan** with the intent to section the Plan for utility purposes, with easier updating and implementation while meeting FEMA's requirements. The Plan roughly follows the ***FEMA Local Mitigation Planning Handbook, 2013*** by using its terminology and some of its tasks, ensuring **Pembroke's Plan Update 2017** begins to follow a standardized approach to Plan construction and content endorsed by FEMA. Many of the vital sections of the **2017 Plan Update** will be contained in the **10 APPENDICES** for easier display, usage, sharing, and update.

Meetings and Duties

The meetings and tasks of the Hazard Mitigation Committee were dictated by Agendas and how much the Committee was able to complete for each Agenda is displayed in **Table 1.** Work Sessions were designed to accomplish what could not be completed at meetings due to time constraints.

Table 1

Meeting Schedule and Agenda Activities

Meeting	Date	Tasks - See Agendas in Appendix C
Meeting 1	9/22/2015	Discuss Process and Schedule, Hazard Risk Assessment, Critical and Community Facilities Vulnerability Assessment, Review & Revise Maps 1-2-3, Schedule Meetings
Work Session 1	10/13/2015	Hazard Risk Assessment, Critical and Community Facilities Vulnerability Assessment, Review & Revise Maps 1-2-3
Meeting 2	10/27/2015	Review & Update Goals and Objectives, Critical and Community Facilities Vulnerability Assessment, Review Former Existing Measures -> Now Capability Assessment, Develop List of Existing Mitigation Plans and Documents
Work Session 2	----	Finish Agenda for Meeting 2 via email assignments
Meeting 3	12/8/2015	Review & Revise 2010 Actions, Develop New Actions from Problem Statements (Community Vulnerability Assessment) and Capability Assessment's Future Improvements, Determine 2010 Actions' Status, Determine Action Timeframe
Work Session 3	1/12/2016	Complete Meeting 3 Agenda
Work Session 3.2	1/26/2016	Determine Action Timeframe for Each Action, Prioritize Actions using STAPLEE

Table 1, continued

Meeting Schedule and Agenda Activities

Meeting	Date	Tasks - See Agendas in Appendix C
Meeting 4	3/1/2016	Develop New Actions from Soucook and Suncook River Fluvial Geomorphic Assessments, Review Draft Hazard Mitigation Plan Components (onscreen), Schedule Work Session 4 and Public Information Meeting, Potential Future Hazards
Work Session 4	3/22/2016	Review Entire Draft Hazard Mitigation Plan, Appendices, and Maps, Rate Hazard Severity of Recent Hazard Events, Prepare for Public Information Meeting, Review Plan Approval Process
Public Information Meeting	4/11/2016	HMC members present sections of the Plan to members of the public in a question and answer format. Maps will be available.

Source: Pembroke Hazard Mitigation Committee Agendas, 2015-2016

For each meeting, all meeting attendees signed attendance sheets and meeting match timesheets, documenting their time at the meetings. Members of the public assisted with completing the Agendas, including developing the **Hazard Risk Assessment**, **Critical and Community Facilities Vulnerability Assessment**, **Capability Assessment**, and **Mitigation Action Plan**, completing the **STAPLEE Action Prioritization**, etc. along with the Committee members. The agendas and attendance sheets are included in **APPENDIX C** of the Plan.

The specific meeting tasks are described in detail on the Agendas in **APPENDIX C**. CNHRPC staff facilitated the Committee meetings and Work Sessions. Information needed on the Agenda Tasks indicated above was collected from any attendees present, including any members of the public, by CNHRPC, during discussions among attendees. The new and updated information was described in each Chapter under the **2017 Plan Update** section. Maps were reviewed and updated by the Committee and guests and revised in a GIS by CNHRPC.

In between meetings, Town staff and volunteers and CNHRPC staff researched and collected information for the Chapters. CNHRPC updated and rewrote Chapters, tables, and sections as appropriate. The Chapters were also updated by revising the document to the current FEMA standards.

Opportunity for Public Participation

Public Input from the Hazard Mitigation Committee Meetings

The public extensive notification is described in the Public Outreach Strategy sidebar. However, one member of the public attended the meetings as indicated in the **Acknowledgements** and by the Attendance Sheets in **APPENDIX C Meeting Information**. In this instance, "the public" means "a

person who is not a Town, School, state, or federal government staff member or other staff person paid for by local tax dollars, or who is not a current Town volunteer." The public had the opportunity to attend and participate in the **8** posted meetings or to contact the Town Administrator for more information.

Public Input from the Public Information Meeting

The **Public Information Meeting (PIM)** was held on April 11, 2016. The Hazard Mitigation Committee members presented portions of the Plan and had the Maps available for display. The agenda and attendance sheet are included in **APPENDIX C**. No member of the public attended the Public Information Meeting despite advertising.

Public Input from the Board of Selectmen Adoption Meeting

The Board of Selectmen meeting to adopt the **Hazard Mitigation Plan** was held on January 17, 2017. Although the Plan's APA had been received, the Board permitted public comment prior to adoption although Plan changes could not be made at this time. *More to be included as necessary*

Completion of the Plan Steps and Dates

On April 11, 2016, the Committee held a **Public Information Meeting.** The same extensive public notification described in the Public Outreach Strategy sidebar occurred to obtain review and comment from the public for the Plan.

Public Outreach Strategy

The Pembroke School District, Associated Grocers of New England, engaged Town citizens, and the local State Representative were specifically invited by the Town of Pembroke's Emergency Management Director to fully participate in the Committee discussions and guide the Plan directions. These members of the public attended and participated in most of the meetings. The NH Homeland Security and Emergency Management (NHHSEM) Field Representative was also invited and attended some of the meetings.

Other direct invitees included the Emergency Management Directors of the neighboring communities of Epsom, Allenstown, Bow, and Concord, and Loudon, Clean Energy (a local business), Carlucci Electrical (a local business), and other citizen representatives who opted not to attend or participate.

The Hazard Mitigation Committee itself was comprised of all Town Departments, and included Pembroke Water Works and Tri-Town Ambulance Service.

The public process for this Plan included sending out media releases to the Union Leader newspaper (a state-wide newspaper), the Concord Monitor (a regional newspaper serving 39 communities around the Concord area) and the Concord Patch (a popular online local news source). All interested parties were invited to participate, including media, residents, businesses, organizations, local communities, non-profits, and State agencies. The colorful public meeting notice flyers were posted on the Town's website at www.pembroke-nh.com and in the Town Hall, Town Safety Center, Town Library, and Kimball's Cavern (a local business). All local interests had an opportunity to attend and participate in the meetings. Copies of publicity for the Plan are included in **APPENDIX C**.

The Central NH Regional Planning Commission, a quasi-governmental regional organization of which Pembroke is a member, contributed to the development of this Plan by facilitating the meetings and guiding the planning process, and preparing the document and maps. As a final attempt to obtain additional public input, a specially noticed Public Information Meeting was held April, 11 2016. All of these meetings were publicly noticed as described.

The attendees and publicity of the public planning process are noted in the **Acknowledgements**.

On April 25, 2016, this Plan, Appendices and Maps were submitted to the NH Homeland Security and Emergency Management (NHHSEM) for their review and revision. Clarification and content revisions were required, and CNHRPC and Committee members provided additional and amended information. The Plan was resubmitted to HSEM on June 10, 2016. In late July and August, NHHSEM provided additional content and format revisions to streamline the Plan to conform to FEMA Region 1's new review requirements. When deemed compliant, the Plan was subsequently transmitted by NHHSEM to FEMA for FEMA's approval of the **Pembroke Hazard Mitigation Plan Update 2017**.

On December 14, 2016, Pembroke received an **Approvable Pending Adoption (APA)** notification from FEMA, stating the Plan will be approved by FEMA after proof of adoption by the local governing body, which is the Board of Selectmen, is submitted.

On January 17, 2017, the Board of Selectmen **adopted the Hazard Mitigation Plan Update** for the Town at a duly noticed public meeting. Copies had been made available at the Town Hall and Library for public review on January 6. Copies of the public notice and flyers are included in **10 APPENDIX C.** The signed Certificate of Adoption was sent to NHHSEM/FEMA.

On [Month/day], 2017, Pembroke received a **Letter of Approval** from FEMA, with the Plan approval granted on [Month/day], 2017. The next Hazard Mitigation Plan update is due five (5) years from this date of approval, on [Month/day], 2022.

Final Plan Dates

The following is a summary of the required dates which guide the adoption and update of the **Pembroke Hazard Mitigation Plan**. Included is the history of the Plan approvals and expiration dates as shown in **Table 2**.

Table 2
Plan Adoption History

Year of FEMA-Approved Hazard Mitigation Plan	Adoption by Pembroke Board of Selectmen	FEMA's Formal Approval	Plan Expiration
Original 2004	February 23, 2004	May 4, 2004	May 4, 2009
Update 2010	June 7, 2010	June 7, 2010	June 7, 2015
Update 2017	January 17, 2017	date, 2017	date, 2022

2 COMMUNITY PROFILE

It has been over five years since the last Plan was written, with the new decennial Census 2010 having been taken. The best available new data has been used in this Chapter to portray the population, housing, and overall demographic picture of present day Pembroke. The former **Relation to Natural Hazards** section has been updated within **4 HAZARD RISK ASSESSMENT**. The tables clearly identify the facilities in Town and which natural, human, and technological hazard events could most likely occur in those areas, as described in **5 COMMUNITY VULNERABILITY ASSESSMENT AND LOSS ESTIMATION**.

A simplified description of how the Town's population and housing have grown within the last four decades follows. Relationships of the locations of people and buildings to natural hazard events are generally explored. Examination of this information will allow the Town to better understand the land use and demographic trends within its borders and how emergency and preventative services can best serve the growing and changing population and landscape.

Geographic Context

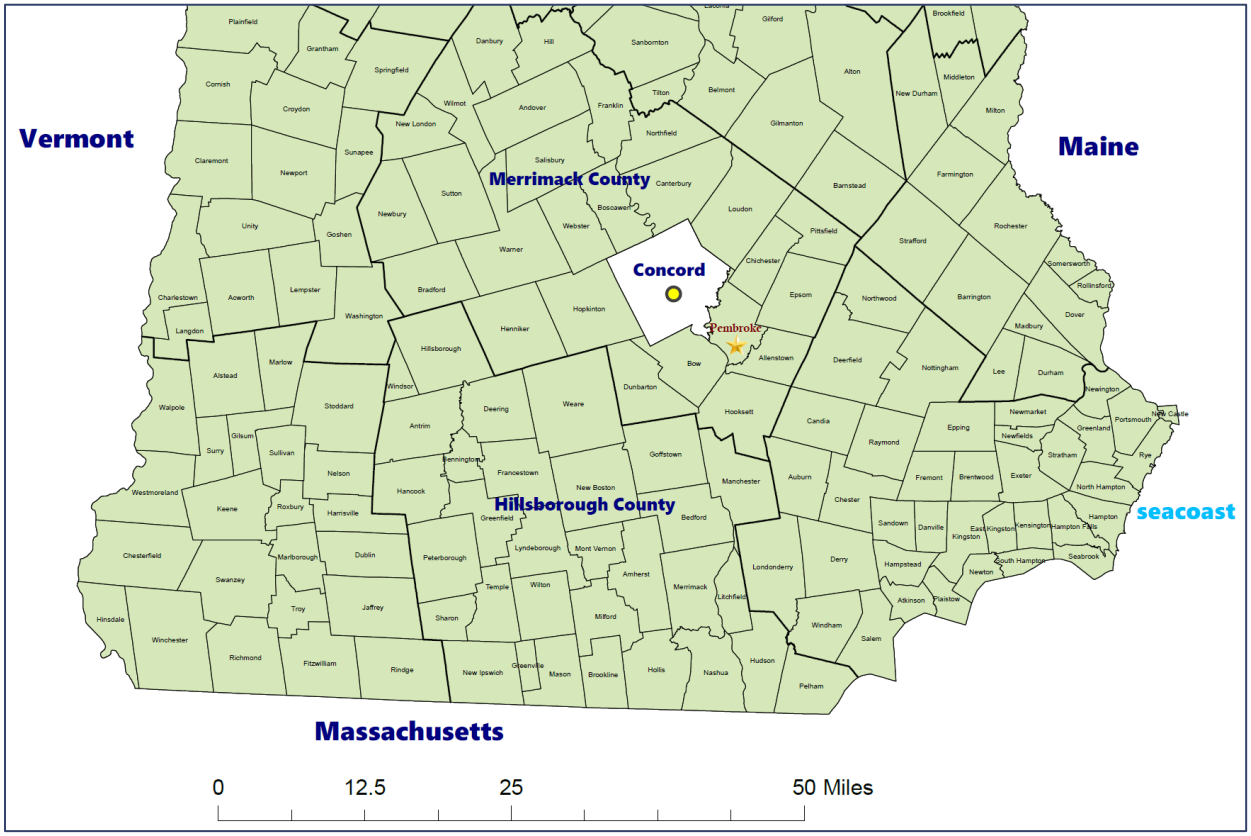
The Town of Pembroke is located in Central New Hampshire within Merrimack County. It is bordered by the communities of Chichester to the north, Epsom to the northeast, Allenstown to the east and southeast, Bow to the south, and Concord to the northwest. The State's capital City of Concord abuts the Town along their shared Soucook River boundary. US Route 3 is a significant travel corridor for commuters and those driving south through Hooksett into Manchester or north through Pembroke into Concord and to Interstate 93.

Merrimack County in which Pembroke resides is often referred to as a valley as its borders are higher in elevation than its middle communities. Concord is the only City in the County. Merrimack County is surrounded on all sides by other NH Counties, including Pembroke, Sullivan, Belknap, Rockingham, Strafford, and Grafton. Most, but not all, communities in Merrimack County comprise the majority of the Central NH Planning Region joined by two communities from Hillsborough County. Hillsborough County borders Massachusetts and includes the cities of Manchester and Nashua.

Concord and Pembroke are about 50 miles from the Massachusetts state border, the Vermont state border and the Maine state border traveling along New Hampshire's Interstates, US Routes, NH Routes, and local roadways. Pembroke's context within Merrimack County and the State of New Hampshire are shown in **Figure 1**.

Figure 1

Pembroke in the State

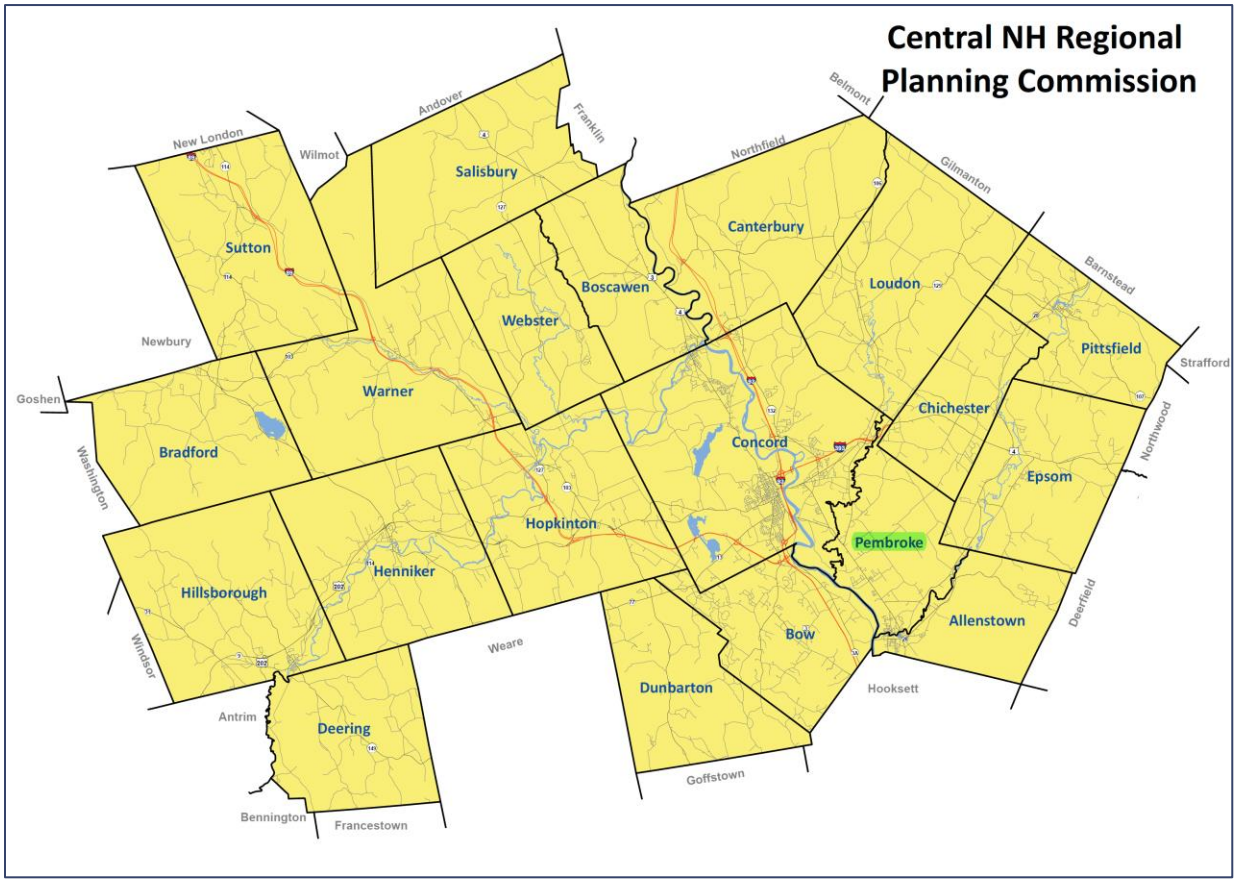


Source: Central NH Regional Planning Commission

Pembroke is closely associated with the Central NH Region, one of nine planning regions in the State. The Town is a voluntary member of the Central New Hampshire Regional Planning Commission. The **19** Towns and **1** City comprising the Central NH Region contain several rivers and important highways. The Blackwater River and Warner River flow into the Contoocook River which then converges with the Merrimack River in Boscawen and Penacook. The Contoocook and the Merrimack Rivers effectively bisect the region into three sections. The Soucook River and Suncook River also converge into the Merrimack. Pembroke is bordered by all three Rivers.

Interstates 89, 93 and 393 stretch in north, northwest, east, and south directions, meeting in Concord and Bow. Major traffic routes of US Route 3 travels north-south and US Routes 4/202 traverse in an east-west direction. Pembroke is located on US Route 3. Dozens of state highways crisscross the region. In Pembroke, NH Route 106 and NH Route 28 travel through Town. A map of the Central NH Region is displayed in **Figure 2**.

Figure 2
Pembroke in the Region



Source: Central NH Regional Planning Commission

Population and Housing Growth

Pembroke completed its latest Master Plan in 2004. The Planning Board began discussing funding and staffing options in 2016 for the Master Plan's update, but no decisions have been made. The 2004 Chapters include information and maps on Goals and Objectives, History and Culture, Population and Economics, Housing, Natural Features, Community and Recreational Facilities and Utilities, Transportation, Existing and Future Land Use, Regional Concerns, and Implementation.

The following tables in contain the newest available data on housing and population growth which depict development trends over time. Pembroke's population and housing have declined slightly over the last decade (2000-2010), but the Town had previously enjoyed a large growth boom between 1980-1990.

The estimated 2014 population and housing units, based off the 2010 Census, counted **7,077** people and **2,890** housing units in Pembroke.

Table 3

Overall Population and Housing Growth Trends in Pembroke, 1970-2014

Growth	Population	Net Change #	Net Change %	Housing Units	Net Change #	Net Change %
1970 Census	**4,261**	N/A	0	**1,386**	N/A	0
1980 Census	**4,861**	600	14.1%	**1,828**	442	31.9%
1990 Census	**6,561**	1,700	35.0%	**2,536**	708	38.7%
2000 Census	**6,897**	336	5.1%	**2,734**	198	7.8%
2010 Census	**7,115**	218	3.2%	**2,872**	138	5.0%
2014 Population & Housing Estimates*	**7,077**	-38	-0.5%	**2,890**	18	0.6%
Total Change from 1970 – 2014	**---**	**2,854**	**67.0%**	**---**	**1,486**	**107.2%**
	44 years of increase		**+ Population**			**+ Housing**

Sources: 1970-1990 US Census CPH-2-31 Table 9 Population and Housing Unit Counts;
*US Census 2000 & 2010 Data *includes all housing units, including vacant and seasonal*
NH Office of Energy and Planning Population Estimates 2014, 08-15 and NHOEP Housing Estimates 2010-2014

In **Table 3**, Pembroke's 2010 Census population of **7,115** shows an overall increase of about **67%** in population over the previous four decades, from **4,261** in 1970. Between 2000 and 2010, the Town's population increased by **3.2%** (**218** people) and housing by **5%** (**138** units). In the Central NH region, a community abutting Pembroke experienced a population and housing decline of **11%** and **4%** respectively over the same period, much of which was due to excessive flooding damages.

The number of housing units in Pembroke increased by a significant rate since 1970, growing from **1,386** units in 1970 to over double that number to total **2,872** in 2010, an overall growth rate of **107%.** This housing rate is comparable to other mid-sized communities in the Central NH region.

The number of people per housing unit has continued to shrink from its high of **3.1** people in 1970 to its low of **2.5** people per housing unit in 2010. Pembroke's overall population growth since 1970 has increased by **2,854** people and **1,486** homes by 2014.

Table 4

Population Density in Pembroke, 1970-2014

Municipality Size		Persons per Square Mile					
Land Acreage	Land Area in Square Miles	1970	1980	1990	2000	2010	2014
14,487	**22.63**	188	215	290	305	314	**313**

*Sources: **Table 3**, Office of Energy and Planning's GIS acreage calculations, 2014*

A good measurement of community population and housing change is population density, or how many people in a square mile. As displayed in **Table 4**, the overall population density has increased about **66%,** from **188** people per square mile in 1970 to **290** people in 1990 and to **313** people in 2014. Between the 2000-2010 Census, the increase of only **9** people per square mile indicates a significant slowing in growth. Pembroke is a relatively small community, with only **22.6** square miles in size and development opportunities are limited of the existing built environment and the highly forested area north of Route 3.

Table 5

New Construction Permits Issued by Building Type, 2010 – 2015

Building Type	2010	2011	2012	2013	2014	2015	6-Year Totals
Single Family Homes	2	2	6	3	8	2	**23**
Multi-family Homes	0	0	1	0	1	0	**2**
Manufactured Homes	0	0	0	0	0	0	**0**
Non-Residential Buildings	32	9	15	14	11	14	**95**
Totals	**34**	**11**	**22**	**17**	**20**	**16**	**120**

Source: Town of Pembroke building permits files

In **Table 5,** Pembroke's new construction permits have ranged from a high of **34** in 2010 to a low of **11** permits the following year in 2011. Within the 2010-2015 timespan, **23** single family home permits, **2**

multi-family home permits, and **95** non-residential building permits were issued for new construction. The large number of non-residential permits should be considered an indicator of economic growth. New construction permits issued between 2010-2015 totaled **120**.

Land Use and Zoning

According to NH Office of Energy and Planning'2 2013 geographic information system (GIS) calculations, Pembroke has a total land area of **14,487** acres, or **22.6** square land miles. An additional **110** acres is water. The acreage figure is moderately comparable to the Vision Appraisal System's calculation of **13,797** acres for the Town. This difference between the actual taxable land calculations from the assessing records and the acreage from the basic GIS calculations is not unusual.

For New Hampshire and specifically the Central NH Region, Pembroke is considered a medium-sized community in terms of population but is a small-sized community in terms of land area. However, the proportion of residential to forested to commercial land remains about the same as any town in the region.

From **Table 6**, forested land is the predominant land use type, comprising over **51%** of the Town's land area. Residential land (**26%**) follows as the next highest acreage of land use, followed by public/ institutional and agriculture, both at **7%**. Pembroke has a hearty commercial and industrial base, but their land area is relatively small at about **3%** each. The remaining land uses of wetlands (**2%**) and transportation and utilities (**1%**) round out the categories of assessed land in Town.

Table 6

Land Use

Land Use Category	Acres	% of Town
Residential	3,634	26.3%
Commercial and Services	463	3.4%
Industrial	390	2.8%
Transportation, Communications, and Utilities	80	0.6%
Public/Institutional	1,002	7.3%
Agriculture	966	7.0%
Forested	7,048	51.1%
Wetlands	213	1.5%
Total	**13,797**	**100.0%**

Source: Vision Appraisal System accessed 02-19-16

The perspective of the Town's Zoning Districts offers another way to view how the land is utilized within Pembroke in **Table 7**. A full table of uses is available within the Zoning Ordinance which states which uses are allowed within each district. A table of dimensional and density regulations pertaining to water and sewer, lot frontages and lot sizes, and minimum pervious surfaces complement the table of uses.

Table 7

Zoning Districts, 2015

Zoning District	Abbreviation
Medium Density-Residential	R1
Rural/Agricultural-Residential	R3
Business/Residential District	B1
Central Business District	B2
Commercial/Light Industrial	C1
Limited Office District	LO
Soucook River Development District	SR
Overlay District	**Abbreviation**
Architectural Design District	AD
Aquifer Conservation District	AC
Floodplain Development District	FD
Shoreland Protection District	SP
Suncook Business District	SB
Wetlands Protection District	WP

Source: Town of Pembroke Zoning Ordinance

The overlay districts are superimposed upon the zoning districts so additional regulations shall apply. For any conflicting regulation, the more restrictive shall apply. The Zoning Ordinance has sections amended every year at the annual March Town Meeting and is vigorously used and applied by the Land Use Department.

The community's **Relation to Natural Hazards** describing how and where the community has grown and to which hazards vulnerable areas as susceptible will be described in **4 HAZARD RISK ASSESSMENT**.

3 GOALS AND OBJECTIVES

The overall purpose of this Plan is to reduce future life and property losses caused by hazard events before they occur by the identification of appropriate **Actions** that are implemented during the five-year duration of this Plan.

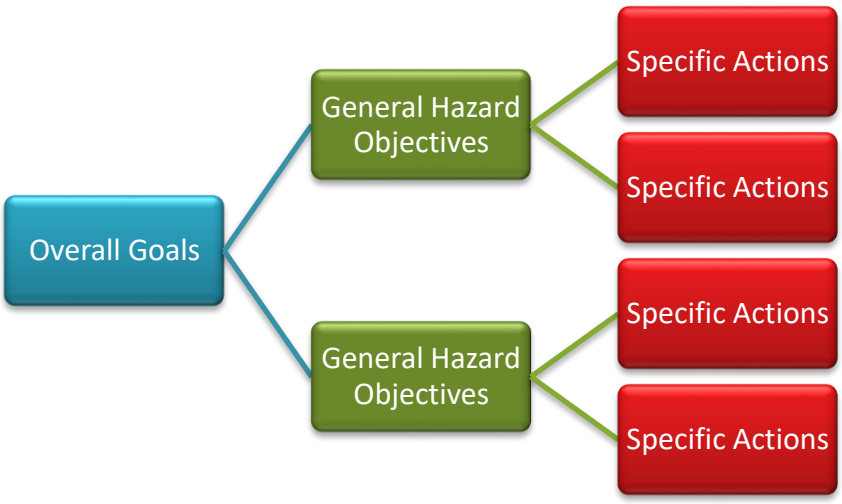
Inspired by the *State of New Hampshire Hazard Mitigation Plan*, the following **Goals** were initially developed in a previous Plan version and thus were reviewed and updated as applicable by the Hazard Mitigation Committee during a public meeting. While the hazard incidents have remained essentially the same as from the **2010 Plan** with a few disaster additions over the course of the last five years, it was important to reassess the continued relevancy of **Goals** and **Objectives** to influence the development of the best and most relevant hazard mitigation Actions.

What Are Goals, Objectives and Actions

Goals, Objectives and Actions are used in the Hazard Mitigation Plan to define different levels of meaning. Their relationship is displayed in **Figure 3**.

The overall **Goals** of this Hazard Mitigation Plan provide a macro-level view of what emergency managers want to accomplish to keep the Town's life, property and infrastructure safer from natural disasters. Statements of overall **Goals**, beginning with "To", describe the desired vision of mitigation and safety for the community. **Goals** enable the development of thoughtful hazard **Objectives** designed to generally fulfill those **Goals**.

Figure 3
Relationship of Goals, Objectives and Actions



Objectives begin to narrow down the focus of the overall **Goals** into hazard minimization statements. Main hazard categories of **Flood**, **Fire**, **Severe Wind**, **Extreme Temperature (Cold-Hot)**, **Human**, and

Technological guide the direction of mitigation efforts. These hazard **Objective** statements, beginning with "Minimize", state Town's desired outcome for each hazard category. The **Objectives** support the overall **Goals** by placing a focus on hazard mitigation or minimization.

Finally, **Actions** are the specific activities or projects which can be undertaken to accomplish an **Objective**. **Actions** begin with a verb to portray a direction for accomplishment. The **Action** is the target to reach to help mitigate hazards in the community. The completed **Action** fulfills the associated **Objectives**. The Actions will be listed and reviewed later in the **Potential Action Evaluation** and **Mitigation Action Plan** tables.

Overall Hazard Mitigation Plan Goals

The following **3** Goals for the **Hazard Mitigation Plan 2017** were developed by the Hazard Mitigation Committee as the vision for the community with respect to the declared disaster declarations, general hazard events, seasonal weather events and changing climate patterns resulting in unexpected events. Collectively, the **Goals** guided the formulation of **Objectives** for each of the main hazard categories. These **Goals** were revised from the **2010 Plan** to emphasize hazard mitigation instead of preparedness, response and recovery which are covered in the ***Emergency Operations Plan***.

Overall Hazard Mitigation Plan Goals

1. **To improve the protection of people in the Town from all natural hazards and disasters and impacts from secondary hazards.**
2. **To reduce the potential damages in Town to public and private property, infrastructure, historic resources and the natural environment by natural-hazards and disasters.**
3. **To identify and promote resources on natural disaster awareness and activities to the Town's residents, visitors, and businesses.**

General Hazard Mitigation Objectives

Main hazard event categories, such as Flooding, are intended to encompass the full sub-hazards range described in this Plan. The general Objectives are developed by addressing the primary hazard events that could impact Pembroke. They focus on minimizing or mitigating the hazard events to support the overall Goals while driving the direction of Action development later in the Plan.

General Hazard Mitigation Objectives

FLOOD HAZARDS

1. **Minimize the damages a flood or erosion from the Suncook River and its floodplains, Soucook River and its floodplains, the Merrimack River and it floodplains, and other ponds and streams in Pembroke could have on life, property, and infrastructure.**
2. **Minimize the damages caused by flooded roads, culvert washouts, dam failures, or debris impacted infrastructure.**

FIRE HAZARDS

3. **Minimize the damages from fire, lightning, and wildfire to life, property, and infrastructure.**

SEVERE WIND HAZARDS

4. **Minimize the damages from severe wind events, including thunderstorms, downbursts, hurricanes and tropical storms, and tornadoes, to life, property, and infrastructure.**

EXTREME TEMPERATURE (COLD-HOT) HAZARDS

5. **Minimize the damages from both severe winter weather, including storms, snow, ice, and wind chill events and from excessive heat events such as heat waves, drought, energy consumption, air and water quality, and climate warming, to life, property and infrastructure.**
6. **Minimize the threat of public health events from the cold and warm weather seasons (communicable illnesses, Lyme disease, West Nile Virus, influenza, hypothermia, heat exhaustion, asthma, etc) to the public, especially those in close quarters.**

Although human and technological hazards are not natural disasters, many technological hazards in particular are secondary to (caused by) natural hazards such as **Thunderstorms, Flooding** or **Severe Winter Weather** causing **Power Failure** or **Debris Impacted Infrastructure**.

HUMAN HAZARDS

7. **Minimize the damages from human threats such as sabotage/vandalism, terrorism, hostage situations, arson and drug overdose, to life, property and infrastructure.**

TECHNOLOGICAL (INFRASTRUCTURE AND SECONDARY) HAZARDS

8. **Minimize the threat to the operational efficiency of all communications systems, underground water and sewer utilities, dams, bridges and roadways.**
9. **Minimize the damages caused by power failure to all sections of Pembroke, both its rural and built environments.**
10. **Minimize the damages from hazardous materials exposure to life, property, and infrastructure.**

4 HAZARD RISK ASSESSMENT

Natural disasters and technological, and human hazards that have occurred in Pembroke or have the potential to occur in the Town were assessed in a **Hazard Risk Assessment** to determine their **Overall Risk** to the community. The major disasters declarations covering the Central NH Region (Merrimack County and Hillsborough County) have been inventoried and additional hazard events occurring in Pembroke and the area have been described. FEMA Public Assistance funding to the Town is detailed for each disaster declaration. A review of climate changes is provided for region to provide perspective on how the weather may change over time.

The ***State of New Hampshire Hazard Mitigation Plan 2013*** recommends that municipalities examine multiple natural hazards. Two hazards, **coastal flooding** and **snow avalanche**, are not discussed in Pembroke's Plan because they have no relevance to the Town. **Radon** has been removed because it is no longer addressed in the State Plan. Within the **Hazard Mitigation Plan 2017**, natural hazards under these basic categories have been incorporated:

- **Flooding Hazards**
- **Wind Hazards**
- **Fire Hazards**
- **Extreme Temperature (Cold-Hot) Hazards**
- **Earth Hazards**
- **Technological (Secondary) Hazards**
- **Human Hazards**

Within these basic hazard categories are numerous related subcategories, all of which are detailed in a **Hazard Risk Assessment.** This Assessment provides a measure of **Probability**, **Impact to the Town** and **Overall Risk** for each hazard in a numerical format as determined by the Hazard Mitigation Committee. Scale definitions and the process to define hazards are discussed.

Many of these examined hazards discussed may pose little threat to the Town. The Hazard Mitigation Committee wanted to acknowledge their possibility as opposed to simply focusing on a handful of top hazards which will certainly occur in the community. Using this broad vision allows Pembroke to contemplate the impact of a variety of hazards and to develop mitigation actions and design emergency planning programs as appropriate. Only the most predominant hazards, or even multiple hazards, will have mitigation actions developed to try to reduce the hazards' impact. These are later discussed in **Potential Mitigation Actions** and prioritized in the **Mitigation Action Plan**.

Hazard Risk Assessment Rankings

Twenty-nine (**29**) natural, technological, and human hazards are evaluated within this Plan. The **17** natural hazards (including the technological hazard **Dam Failure** because of its close association with flooding) are ranked within in a **Hazard Risk Assessment**. Some hazards may be more likely to occur in the community than others based on past events and current conditions, and some hazards may have a greater impact than other hazards. How vulnerable Pembroke could be to natural hazards can be measured in terms of **Overall Risk**.

The location of where each hazard has occurred either in the past or may be prone to future hazard occurrences is noted in the **Hazard Locations in Town** column.

Knowing where events may be likely to occur, the 2017 Hazard Mitigation Committee examined each potential hazard for its **Probability of Occurrence** and its potential **Impact to the Town** affecting people, services/infrastructure and property based on past personal recollections and community hazard trends to determine the **Overall Risk** to the community.

The Committee identified each hazard's **Probability of Occurrence** score on a **1-2-3-4** scale from **Unlikely/1** (0-25% chance of occurring in 10 years, which is **2** Hazard Mitigation Plan cycles) to **Highly Likely/4** (76-100% chance in 10 years) as shown below.

Probability of Occurrence

1	**Unlikely=**	**0 - 25% chance**	**in 10 years**
2	**Possible=**	**25 - 50% chance**	**in 10 years**
3	**Likely=**	**51 - 75% chance**	**in 10 years**
4	**Highly Likely=**	**76 - 100% chance**	**in 10 years**

The Committee determined the likely **Impact to the Town** of an event based on a **1-2-3-4** scale for **3 Impact** characteristics – Human injuries, the length of time Critical Services/Infrastructure are shut down, and Property damage. Not all of these characteristics have to be expected as each hazard differs. The scale runs from **Limited/1** to **Catastrophic/4** and the more specific definitions are described below.

The **Probability of Occurrence** score was multiplied by the average of each **Impact to the Town** (Human, Critical Services/Infrastructure and Property) score to obtain the **Overall Risk** score.

The technological and human hazards were not scored to ensure the natural hazards retained the focus of the **Hazard Mitigation Plan Update 2017.** However, **Dam Failure** was rated because of its close correlation to **Flooding**.

Impact to the Town: Human, Critical Facilities/Infrastructure/Services, Property

1	Limited=	**Human:** Injuries treatable with first aid. **Critical Facilities/Infrastructure/Services:** Minor inconvenience; Shutdown for 3 days or less. **Property:** Damaged less than 10%.
2	Significant=	**Human:** Significant injuries or illnesses result in no permanent disability. **Critical Facilities/Infrastructure/Services:** Shutdown for up to 2 weeks. **Property:** Damaged 10% to 25%.
3	Critical=	**Human:** Significant injuries or illnesses result in permanent disability. **Critical Facilities/Infrastructure/Services:** Complete shutdown for at least 2 weeks. **Property:** Damaged 25% to 50%.
4	Catastrophic=	**Human:** At least 1 to multiple deaths. **Critical Facilities/Infrastructure/Services:** Complete shutdown for 30 days or more. **Property:** Damaged greater than 50%.

OVERALL RISK ASSESSMENT SCORES

The highest possible **Overall Risk** score a natural hazard could be ranked using this **Hazard Risk Assessment** system is **16** while the lowest score a hazard could be ranked is **1**. The **Overall Risk** numeric score is one which can help the community weigh the hazards against one another to determine which hazards are most detrimental to the community and which hazards should have the most Actions developed to try to mitigate those hazards. The **Overall Risk** is calculated simply by adding the two scores of **Probability of Occurrence** and **Impact to the Town**. **The full results of the Hazard Risk Assessment are displayed in Table 8**.

Out of the **17** ranked natural hazards, Pembroke's highest ranking hazards scored an ***Overall Risk*** between **4** - **9** (out of a possible score of **16**):

Highest Overall Risk Hazards Scored 4-9:

- **Drought 9.0**
- **Tornadoes 6.0**
- **Downbursts 6.0**
- **Severe Winds, Rainstorms and Thunder Storms 6.0**
- **Severe Winter Weather and Ice Storms 6.0**
- **Wildfire 4.0**
- **Dam Failure 4.0**

Table 8

Hazard Risk Assessment

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Flooding	Floods and Flash Floods	**Floodplains, roadways of Town.** Areas particularly prone to flooding in the Town include: Floodplains of the Merrimack, Soucook, or Suncook Rivers result in expanded flooding. Runoff from roadways or heavy rain can cause floods over the Entire Town.	2	1	1	2	1.33	**2.67**
Flooding	Rapid Snow Pack Melt	**Entire Town.** Areas and roads particularly susceptible: Melt runoff from impervious surfaces and roadways or from tree cover and fields can cause floods over the Entire Town. Road washouts and/or culvert failure locations include: Nadine Road, Ross Road, Michol Road, Pembroke Hill Road, Cross Country Road, Buck Street (Evergreen Cemetery), Borough Road, Littlefield Condominiums, Bachelder Road, Fourth Range Road.	2	1	1	2	1.33	**2.67**
Flooding	River Ice Jams	**Rivers and crossing infrastructure.** Areas and sites particularly susceptible: An ice jam at the double decker bridge at Upper Turnpike Street over the Suncook would be most serious. The River has had ice jams in the past.	2	1	1	1	1.00	**2.00**
Flooding	Suncook Riverine Scouring, Erosion, Channel Movement	**Floodplains.** Suncook River hazard location susceptibility: Webster Dam erosion. Bachelder Road flooding. Farmland flooding. Undercutting of Pembroke, China Mills and Webster Mills Dams. See Suncook River Fluvial Geomorphic Assessment for locations of erosion, channel movement.	2	1	1	1	1.00	**2.00**
Flooding	Soucook Riverine Scouring, Erosion, Channel Movement	**Floodplains**. Soucook River hazard location susceptibility: North Pembroke bridge flood damage (Soucook). Memorial Field erosion (Merrimack). Major ice jam & flooding at Silva's manufactured home park in late 1970s on Soucook. See Soucook River Fluvial Geomorphic Assessment for locations of features.	2	1	1	1	1.00	**2.00**
Wind	Tornadoes	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Manufactured housing communities and vulnerable populations. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down.	2	3	3	3	3.00	**6.00**

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Wind	**Downbursts**	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down.	2	3	3	3	3.00	**6.00**
Wind	**Hurricanes and Tropical Storms**	**Entire Town**. Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage to debris impacted infrastructure.	2	1	1	1	1.00	**2.00**
Wind	**Severe Winds, Rainstorms and Thunder Storms**	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Damage to Town Hall and Fire Station from hail. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage to debris impacted infrastructure.	3	2	2	2	2.00	**6.00**
Fire	**Lightning**	**Entire Town.** Areas most susceptible include: North Pembroke, densely packed residential neighborhoods, other forested and conservation areas, open recreation fields, remove locations difficult to access by vehicle such as the Range Roads, points of higher elevation than surrounding area. Susceptible structures include: aboveground utilities: transformers, telecommunications towers, water towers; churches and tall buildings.	3	1	1	1	1.00	**3.00**

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Fire	**Wildfire**	**Entire Town**. Areas most susceptible include: North Pembroke, densely packed residential neighborhoods, other forested and conservation areas, open recreation fields, locations difficult to access by vehicle such as the Range Roads, points of higher elevation than surrounding area. Susceptible structures include: aboveground utilities: transformers, telecommunications towers, water towers; churches and tall buildings.	2	2	2	2	2.00	**4.00**
Extreme Temp	**Severe Winter Weather, Cold and Ice Storms**	**Entire Town.** Areas of particular concern include North Pembroke Road, First Range Road, The Pines. Dams, bridges, vulnerable populations, Schools, manufactured housing communities. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage. Particular roof collapse concerns of older or historic buildings. Remote areas in the Town may be more difficult to access and/or without power (including heat) for a longer period of time. Most vulnerable populations may be subject to cold temperature, snow isolation, transportation accidents, power failure and communications failure.	3	2	2	2	2.00	**6.00**
Extreme Temp	**Drought**	**Entire Town / Region.** Areas susceptible include farms, orchards. Also vulnerable are those residences with private dug wells and Town water supplies/ Drought means increased risk of brush fire with dry vegetation (see Wildfire for areas).	3	3	3	3	3.00	**9.00**
Extreme	**Excessive Heat**	**Entire Town.** Vulnerable populations most susceptible to extreme heat include over 55+ housing facilities, assisted living facilities, Schools, daycare facilities. Shelters may need to be opened for cooling centers during extended heat conditions.	2	3	1	1	1.67	**3.33**
Earth	**Earthquake**	**Entire Town.** The Central NH Region is seismically active and earthquakes are regularly felt from area epicenters. Damage to utility poles and wires, roadways and infrastructure (waste water treatment facility in Allenstown, Pembroke Water Works, bridges, dams) could be significant. Areas with underground utilities, community water systems, cisterns, old buildings such as those in Suncook Village are particularly susceptible.	1	1	1	1	1.00	**1.00**

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Earth	**Landslide**	**Slopes greater than 25%.** These areas include erosion along 3 Rivers School, roads with steep ditching or embankments. River and brook banks can also slide, usually known as erosion: Soucook River, Suncook River, Merrimack River locations noted in fluvial geomorphic maps.	1	1	1	1	1.00	**1.00**
Technological	**Dam Failure**	**Suncook River Dams most significant**: Pembroke Dam (High Hazard), Webster Mill Dam (Significant Hazard), China Mill Dam (Low Hazard) are all along the Suncook River. Suncook Village would need to be evacuated. Undercutting of Pembroke, China Mills and Webster Mills Dams.	2	2	2	2	2.00	**4.00**
Technological	**Power/ Utility Failure**	**Entire Town.** Areas and sites particularly susceptible: All utilities, Allenstown Waste Water Treatment Facilities, 55+ older living facilities, other vulnerable populations. Wooded, forested and more remote sections of Town such as North Pembroke and Range Roads would be difficult to access, with trees and power lines down. Route 3, Route 106 and Route 28, residential roads.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Technological	**Communi-cations Systems Failure**	**Entire Town.** Areas and sites particularly susceptible: All utilities, Allenstown Waste Water Treatment Facilities, 55+ older living facilities, other vulnerable populations. Telecommunications Tower. Telephone lines often go down with power. Communications failure would be worse if it occurred at the Fire and Police Depts, Public Works Department or Town Offices, especially during a holiday, or if failure inhibited emergency dispatch and EOC operations.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Technological	**Debris Impacted Infrastruc-ture**	**Dams, bridges, culverts, roadways.** Most susceptible or dangerous locations experiencing debris impacted infrastructure: Route 3 double-decker bridge (Suncook River) would be most serious. Dams and bridges in Appendix A. Culverts flowing into Merrimack River. Roads or culverts that regularly washout (including those in need of upgrade) include: Nadine Road, Ross Road, Michol Road, Pembroke Hill Road, Cross Country Road, Buck Street (Evergreen Cemetery), Borough Road, Littlefield Condominiums, Bachelder Road, Fourth Range Road. Other state routes (Route 3, Route 106, Route 28), local commuter roadways or residential roads that are commonly blocked or would impact the greatest number of people if blocked by downed trees or power/utility lines.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Technologic	Transportation Accidents	**Roadways.** NH Route 106, US Route 3, intersection of Routes 106/3, NH Route 28, local Class V roads. Certain local intersections with Route 3, curves, straightaways, hills.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Technological	Fire (Vehicle, Structure, Arson)	**Entire Town.** Areas most susceptible include: vacant buildings, foreclosure homes or seasonal buildings in the Town. Buildings in densely populated areas such as Suncook Village or residential manufactured home communities. Vehicle fires could occur anywhere, parking lots, driveways, roadways.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Technological	Hazardous Materials Spills	**Route 3, Route 106, Route 28 and railroad at Bow Eversource Electric Plant.** These are the most significant routes of vehicular transport of hazardous materials. The railroad transports anhydrous ammonia (fear of vapor cloud to Suncook Village). Largest or most dangerous stationary sites that store and/or handle haz mat on site include those that have fertilizer, pesticides, fuel, etc. Occupational haz mat sites where spills could occur include: Schools, health or veterinary clinics, manufacturing facilities, etc.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Human	Public Health Epidemics	**Most susceptible transfer sites:** Schools, health clinics, eating establishments, populated areas, large employers, 55+ living facilities, stores, churches and public assembly venues - all of these locations increase the risk of exposure to and transfer of illness. Also, programs with public outreach such as recreation, senior groups, Meals-on-Wheels, VNA, Seniors-Helping-Seniors, etc.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Human	Drug Overdose Epidemic	**Entire Town.** Vulnerable populations include most demographics, but more susceptible sites and locations could be the Middle School, Pembroke Academy, apartment buildings, middle class neighborhoods.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Human	Terrorism	**None anticipated.** Most susceptible sites could include: Town Hall, Schools, Post Office, Safety Center, State facilities (NHDOT shed, etc), all governmental facilities. Other facilities and locations could include Route 3 double-decker bridge, telecommunication towers, major employers (especially those large quantities of haz materials), health clinics, grocery or convenience stores, restaurants, high volume roadways, water supply infrastructure or dams, political offices or rallies, churches, etc	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Natural, Technological, Human Hazard Events		Susceptible (Existing) Hazard Locations in the Town	Probability of Occurrence	Human Injury Impact	Critical Services and Infrastructure Impact	Property Damage Impact	Severity of Impact	OVERALL RISK
Human	**Sabotage/ Vandalism**	**Town systems or facilities.** Sabotage would be most likely to occur: within Town computer systems & website, Town buildings, Schools, technological systems (water supplies, waste water treatment facilities), cemeteries, vacant buildings, under bridges.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Human	**Hostage Situation**	**Entire Town, but isolated incident.** Locations where hostages could be taken include: Town Hall and other public buildings, Schools, banks, Post Office, workplaces, grocery and convenience stores, restaurants, high density population areas (Suncook Village, manufactured housing communities, apartment buildings), courthouse, domestic home situations.	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Human	**Civil Disturbance / Public Unrest**	**None** as locations where civil disturbance could occur should be limited. Locations and occasions include: Town Meetings, voting day, during visits from political candidates, Old Home Day and other Town events, School graduation. Locations include Schools, at sporting events, Town Hall, Safety Center, convenience stores, restaurants and establishments serving alcohol, high density population areas (Suncook Village, manufactured housing communities apartment buildings).	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Source: Pembroke Hazard Mitigation Committee 2017

Central NH Region Major Disaster Declarations, 1973-2016

The Central NH region, which encompasses parts of Merrimack County (**18** communities) and Hillsborough County (**2** communities), has been damaged by **21** multiple presidentially-declared major disasters in the last **43** years, between **1973-2016**.

While a natural disaster typically befalls multiple counties in New Hampshire, only those damaging either Merrimack County or Hillsborough County were identified in this section. Over the last **11** years (**2005-2016**), the number of presidentially-declared natural major disasters have increased significantly compared to the first severe storm and floods of **1973** to the **1998** ice storm (**25** years).

Between **2005-2016**, the most recent round of major disasters afflicting the Central NH Region, **12** natural disasters within **11** years were declared for Merrimack and/or Hillsborough Counties, **5** of which were floods, **5** snow/ice storms, and **2** rain/wind storms. No other major disasters were declared between **1998-2005** in the Central NH Region, bringing the total number of disaster declarations to **12** disasters within **18** years (**1998-2016**).

Emergency declarations are often proclaimed for counties in New Hampshire to help communities receive funding for less serious hazard events that may have caused more damage in nearby declared declaration counties or states. Emergency declarations that occurred between **2005-2016** are not counted within the **12** declared disasters and were not recognized unless the community applied for and received FEMA Public Assistance funding, such as Hurricane Sandy in 2012. Snow emergencies from the early 2000s are not included here.

However, the last declared disaster in Merrimack County, in which Pembroke is located, was in **February 2013**; as of **June 2016**, no new major disasters have been declared here. These details are displayed in **Table 9**. Most of these disasters will be described within the following **Recent Disaster Events Summary** section.

Table 9

Central NH Region Major Disaster Declarations, 1973 to 2016

FEMA DR-	Local Disaster Name	Incident Period	FEMA Disaster Name	Includes County*	
				Merr	Hill
4209	**2015** January Blizzard	Jan 26-28, **2015**	Severe Winter Storm and Snowstorm	---	H
4105	**2013** Snowstorm NEMO	Feb 8-10, **2013**	Severe Winter Storm and Snowstorm	M	H
4095 EM-3360	**2012** Hurricane Sandy	Oct 26-Nov 8, **2012**	Hurricane Sandy *emergency declaration only for Merr and Hill Cty*	M	H
4049	**2011** Halloween Snow Storm	Oct 29-30, **2011**	Severe Storm and Snowstorm	---	H
4026	**2011** Tropical Storm Irene	Aug 26-Sep 6, **2011**	Tropical Storm Irene	M	---
1913	**2010** March Flooding & Winds	Mar 14-31, **2010**	Severe Storms and Flooding	M	H
1892	**2010** Winter Storm	Feb 23-Mar 3, **2010**	High Winds, Rain, Snow	M	H
1812	**2008** December Ice Storm	Dec 11-23, **2008**	Severe Winter Storm	M	H
1799	**2008** Patriot's Day Flood	Sep 6-7, **2008**	Heavy Rains and Floods	M	H
1782	**2008** July Tornado	Jul 24, **2008**	Tornado, Severe Winds, Heavy Rains	M	---
1695	**2007** April Spring Flood	Apr 15-23, **2007**	Severe Storms and Flooding	M	H
1643	**2006** Mother's Day Flood	May 12-23, **2006**	Severe Storms and Flooding	M	H
1610	**2005** Columbus Day Flood	Oct 7-18, **2005**	Severe Storms and Flooding	M	H
EM-3207	**2005** Snow Emergency	Jan 22-23, **2005**	Snowstorm	M	H
EM-3193	**2003** Snow Emergency	Dec 6-7, **2003**	Snowstorm	M	H
EM-3177	**2003** Snow Emergency	Feb 17-18, **2003**	Snowstorm	M	H
EM-3166	**2001** Snow Emergency	Mar 5-7, **2001**	Snowstorm	M	H
1231	**1998** Flooding	Jun 12-Jul 2, **1998**	Severe Storms and Flooding	M	H
1199	**1998** December Ice Storm	Jan 7-25, **1998**	Ice Storms	M	H
1144	**1996** Severe Storms and Flooding	Oct 20-23, **1996**	Severe Storms and Flooding	M	H
1077	**1995** Flood	Oct 20-Nov 15, **1995**	Storms and Floods	M	---
917	**1991** Hurricane Bob	Aug 18-20, **1991**	Severe Storm	---	H
876	**1990** Flooding and Severe Storm	Aug 7-11, **1990**	Flooding and Severe Storm	M	H
789	**1987** Severe Storms and Flooding	Mar 30-Apr 11, **1987**	Severe Storms and Flooding	M	H
771	**1986** Severe Storms and Flooding	Jul 29-Aug 10, **1986**	Severe Storms and Flooding	---	H
399	**1973** Severe Storms and Flooding	Jul 11, **1973**	Severe Storms and Flooding	M	H

Source: http://www.fema.gov/disasters/grid/state/33?field_disaster_type_term_tid_1=All

*M = Merrimack County (18 towns in CNH region) H = Hillsborough County (2 towns in CNH region)

Recent Disaster Events Summary

The Town of Pembroke has been affected by several significant natural disasters within the last decade, whether or not disaster funding was applied for and received. Natural hazard events are now occurring more frequently than in the past, even here in Merrimack County. While these events on occasion disrupted the flow of the community and isolated residents for days, the disaster impacts were relatively mild as few injuries were reported. FEMA provided Public Assistance funding to the Town for tasks such as cleanup, road repairs, tree and brush cutting, and culvert replacement.

The Hazard Mitigation Committee helped provide anecdotal descriptions of how the recently declared natural disasters or emergency declarations for the Central NH Region affected Pembroke and its residents. Public Assistance disaster funding opportunities open to communities when a disaster is declared within a county. The Town of Pembroke applied for and received this funding for several recently declared disasters, and the amount for each disaster is recorded along with a description of the event in **Table 10**. Also identified were numerous hazard events that occurred locally in the community and within the area. The disaster event listing dates from the 1936 floods to present day.

PUBLIC ASSISTANCE GRANT FUNDING

To help reclaim some of the costs these disasters wrought on town property and infrastructure, Pembroke applied for and received FEMA Public Assistance (PA) funds, Categories A-G, a 75% grant and 25% match program for several declared Merrimack County disasters. These PA funds have been used for overtime wages for Town employees, equipment rentals, snow removal, washout repair, road reconstruction, bridge repair, debris removal, and more.

The database where the Public Assistance funding information resides is available from **1993** to present (**2016**). The funding was sought for and received by Pembroke for **7** of the **15** declared disasters (including Hurricane Sandy, which was an emergency declaration) in Merrimack County during this timeframe. In addition, Emergency Management declarations provided funding to Pembroke for **1** snowstorm emergency in **2005**. This data is available through FEMA at https://www.fema.gov/openfema-dataset-public-assistance-funded-projects-details-v1.

The most expensive disaster for Pembroke in terms of FEMA Public Assistance funds received for recovery was the **Feb-Mar 2010 Winter Storm** for which Pembroke received about **$83,800** for **12** projects. Over time, Public Assistance funding has been used to help repair Memorial Field, roads, and bridges and culverts, for traffic control, debris removal and protective measures. The last time the Town was awarded funding was for Protective Measures for snow removal during the **February 2013 Blizzard** (**$14,700**). This was also the last major disaster declaration for Merrimack County as of June 2016 in which funds were eligible for application. All funding to date, from **1993** to **June 2016** totals the **$277,400**. This detail is displayed in **Table 10**.

COLOR KEY for Table 10:

Declared Disasters in Merrimack County	PA funding Received	Other Pembroke Local Hazard Event

Table 10

Local and Area Hazard Event and Disaster History

Event	Declared Disaster DR-	Year	Date	FEMA Public Assistance	Area Effects Surrounding Pembroke	Local Effects Occurring in Pembroke	Hazard Category	Source
Pembroke Drought Emergency 2016	No	2016	15-Sep	No	Extreme Drought (D3) intensities are found in northern Hillsborough and southern Merrimack Counties. Some of the communities in the Central NH Region are experiencing Severe Drought (D2) or Moderate Drought (D1) conditions. The NH DES has issued a series of statements and tips for homeowner water conservation. As of September 2016, residents and municipalities are requested to voluntarily conserve water. Some communities or water precincts have enacted water restrictions or bans for certain water usage. More restrictions may be enacted or may be eventually required by the State if conditions remain the same or worsen.	In response to the Extreme Drought (D3) conditions as of 09/15/16 which cover the entire community, Pembroke Water Works is requesting residents to conserve water and voluntarily reduce water usage.	Earth, Drought	US Drought Monitor NH, Town of Pembroke website, NH DES
Earthquake 2.9M 2016 Warner Epicenter	No	2016	21-Mar	N/A	Epicenter in Warner/Hopkinton area, 2.8 magnitude. Felt in the Central NH Region/most of Merrimack County, light in Hillsborough County. Felt most strongly in Hopkinton, Henniker, Warner, Webster, Salisbury, Franklin, Canterbury, Concord, and Hillsborough	Reports were made to the USGS from Pembroke residents feeling the earthquake as a rumble or loud noise.	Earth, Earthquake	USGS
Pembroke Town Website Sabotage	No	2016	Jan		N/A	Town website recently 01-16, many subpages not available, links to lead to ad pages	Sabotage, Human	Pembroke Hazard Mitigation Committee
Pembroke Drug Overdoses	No	2014	through 2016	N/A	The State of NH is in the news in 2015/2016 regarding an opioid/heroin epidemic.	See Table in Plan that contains recent Tri-Town Ambulance overdosing records	Human	Pembroke Hazard Mitigation Committee
Earthquake 2.2M 2015 Epsom Epicenter	No	2015	2-Aug	N/A	Epicenter around Epsom in the Central NH Region in Merrimack County, felt in nearby locations including Concord, Pembroke, Allenstown, Loudon Chichester and Pittsfield	Reports were made to the USGS from Pembroke residents feeling the earthquake.	Earth, Earthquake	Earthquaketrack.com

Tornado, Severe Thunderstorms	No	2015	31-Jul	N/A	In Warner, NWS confirmed an EF-0 tornado touched down in the evening. It had a maximum wind speed of 75 mph and was 100 yards wide. Town officials said the tornado ripped the roof off a barn, but there were no injuries reported.	N/A, Warner is several towns to the west of Pembroke, but it is in the Central NH Region	Wind, Tornado	WMUR
Severe Winter Storm and Snowstorm - January Blizzard 2015	**4209**	**2015**	**Jan 26-28**	**No**	The closest reporting weather station, Concord Airport (CON), had accumulated 29" of heavy snow, 50 mph whiteout wind conditions in the region	Pembroke did not apply for and/or receive Public Assistance funding. The Town likely experienced power failures, debris impacted infrastructure (trees and power lines fallen on roads) and a great amount of snow.	Extreme Temp, Snow, Wind	FEMA, CNHRPC
Severe Winter Storm and Snowstorm - Winter Storm NEMO	**4105**	**2013**	**Feb 8-10**	**$14,700**	Winter Storm "Nemo". FEMA-3360-DR. Blizzard conditions with winds gust of 50-60 MPH and over 20 inches snow hit New Hampshire and the New England area. Disaster declaration received for emergency protective measures in eight counties of the State.	**Pembroke received $14,700** in FEMA Public Assistance funding for protective measures. Without power for several days. Up to 20" of heavy wet snow, trees downed. North Pembroke Road, The Pines had lots of trees down.	Severe Winter Weather, Extreme Temp, Snow, Ice, Wind	FEMA, Pembroke Hazard Mitigation Committee
Thanksgiving Day Snowstorm	No	2014	27-Nov	N/A	Large amount of snowfall fell in a very short period of time ahead of typical seasonal expectations. Power outages were prolific, with a peak of About 200,000 power outages in NH, the 4th largest blackout in history. large amount of snowfall in very short time period. Merrimack County has about 6-12" of snow, far less than other counties. Extreme wind gusts reached 110 mph in Concord.	Power outages throughout Town. First Range Rd out 5 days.	Extreme Temp, Snow, Wind	Concord Monitor, Washington Post, WMUR, NHPR, Pembroke Hazard Mitigation Committee
Hopkinton Public Health EEE in Human	No	2014	Fall	N/A	The New Hampshire Department of Health and Human Services (DHHS) is announcing the second human case of Eastern Equine Encephalitis (EEE) this season in New Hampshire, in an adult from Hopkinton. The first human case of EEE in New Hampshire this season was confirmed on August 22nd in Conway, NH. Other EEE positive tests this year include 6 mosquito batches and a mule; there have been no positive test results so far for West Nile Virus (WNV).	N/A, although Hopkinton is 2 communities to the west of Pembroke. Due to this human case of mosquito-transmitted EEE, the risk level for human illness in Hopkinton was raised to high, and the immediate area designated a moderate risk by NHDHHS.	Extreme Temp, Public Health, Epidemic	Hopkinton Town website, Hopkinton Hazard Mitigation Committee, NH DHHS
Pembroke 2013 Fires	No	2013	---	N/A	Although it did not seem to occur in Pembroke in 2013, wildfires can cross community borders.	A total of 1 structure fire and 3 vehicle fires were reported in Pembroke in 2013 (4 total)	Fire, Human	National Reporting System, NH Department of Safety, Pembroke Fire Department

Earthquake 2.6M 2013 Warner Epicenter	No	2013	11-Oct	N/A	Epicenter in Warner, 2.6 magnitude. Felt in the Central NH Region/northern Merrimack County, most strongly in Hopkinton, Henniker, Warner, Webster, Concord, Salisbury, Franklin	No reports were made to the USGS from Pembroke although neighboring towns reported shaking.	Earthquake	USGS
Hurricane - Hurricane Sandy	**4095 EM-3360**	**2012**	**Oct 26-Nov 8**	**No**	Merrimack County and Hillsborough County received a disaster declaration for Emergency Protective Measures. Five counties experienced severe damage from heavy winds and moderate flooding, 218,000 customers without power. Fallen trees and debris closed roads, building and vehicle damage.	Pembroke did not apply for and/or receive Public Assistance funding. The storm did not greatly affect Pembroke, only moderate rains experienced.	Wind, Flood, Severe Storm, Hurricane	Pembroke Hazard Mitigation Committee, FEMA, Nashua Telegraph
Pembroke 2012 Fires	No	2012	---	N/A	Although it did not seem to occur in Pembroke in 2012, wildfires can cross community borders.	Eight structure fires, 4 vehicle fires, 2 debris fires, and 2 wildfires were reported in Pembroke in 2012 (21 total)	Wildfire, Fire, Human	National Reporting System, NH Department of Safety, Pembroke Fire Department
Allenstown Chemical Bombs	No	2012	Feb	N/A	Six chemical bombs (made with common household chemicals) were found at a NH DOT shed, and others at houses. No damage of consequence occurred.	N/A, although Allenstown abuts Pembroke to the east	Human	Allenstown Hazard Mitigation Committee 2013
Earthquake 4.0M 2012 Hollis ME Epicenter	No	2012	16-Oct	N/A	With the epicenter near Hollis Center, Maine, a 4.0 earthquake was measured and felt not only in Central NH, but throughout New England. Reportedly sounding like a jumbo jet and lasting for 10 seconds, calls came in to local Fire Departments inquiring about the event. By two hours later, no calls reporting damages or injuries had been received.	Reports were made to the USGS from Pembroke with an earthquake of this magnitude as it was felt around the Central NH Region.	Earthquake	Concord Monitor, Earthquaketrack.com
Regional Rainstorm and Microburst	No	2012	Jul 17	N/A	About 20,000 electric customers lost power during this summer wind and rain storm. Power lines down & failure for several days. Trees and debris along roadways required clean up. Four main roads in Hopkinton were blocked for 2-3 days, including South Road, College Hill Road, Hatfield Road, and Thain Road. The 60-80 mph microburst traveled in a north-south direction crossing Route 127 and US Route 4/202. Property damage occurred.	Pembroke likely experienced heavy rains and winds and perhaps some fallen tree limbs.	Wind, Downburst, Thunderstorm	Hopkinton Hazard Mitigation Committee, WMUR, CNHRPC
Pembroke 2011 Fires	No	2012	---	N/A	Although it did not seem to occur in Pembroke in 2011, wildfires can cross community borders.	One structure fires and 1 vehicle fire were reported in Pembroke in 2011 (2 total)	Fire, Human	National Reporting System, NH Department of Safety, Pembroke Fire Department

Snowstorm- Halloween Snow Storm	**4049 (not Merrimack County)**	**2011**	**Oct 29-30**	**N/A**	FEMA-4049-DR. Towns in Central NH were impacted by this shocking, early severe snowstorm, although a major disaster declaration was not declared in Merrimack County. Halloween festivities were cancelled in most communities, to the heartbreak of young children. In Hillsborough County, damages were at the equivalent of $5.11 per capita (400,721 people in 2010). The storm was also declared in Rockingham County.	Pembroke experienced similar effects with deep, unexpected snow but no particular issues.	Snow, Extreme Temp	CNHRPC, Pembroke Hazard Mitigation Committee
Tropical Storm- Tropical Storm Irene	**4026**	**2011**	**Aug 26-Sep 6**	**$6,600**	Carroll, Coos, Grafton, and Merrimack Counties suffered severe impacts to roads and bridges as a result of flooding from Tropical Storm Irene, which also caused power outages. Merrimack County reimbursement to towns was $4.29 per capita (146,455 people in 2010), a total of $11m was allocated. Disaster was not declared for Hillsborough County.	**Pembroke received $6,600** in FEMA Public Assistance funding for debris removal of fallen trees and limbs.	Wind, Flood, Severe Storm, Rainstorm, Tropical Storm	FEMA, Pembroke Hazard Mitigation Committee
Bow Route 3A Downburst	**4026**	**2011**	**Sep 5**	**N/A**	In nearby Bow, a 60mph microburst damaged or destroyed a dozen campers in the area of Route 3A between Grandview and Down Road. No injuries were reported. Telephone service at the Town's Police dispatch center was also disrupted.	Bow is on the other side of the Merrimack River from Pembroke	Wind, Downburst, Debris Impacted Infrastructure	Union Leader
April Fool's Snowstorm	No	2011	1-Apr	N/A	A Nor'easter snowstorm impacted the State, causing over 30,000 power outages, most by PSNH. Snow fell in depths of up to 8", but stopped by noon. Although dozens of accidents were reported, no serious injuries were reported.	N/A, but Pembroke likely experienced some snow and inconvenience	Extreme Temp, Snow	wmur.com
Pembroke 2010 Fires	No	2012	---	N/A	Although it did not seem to occur in Pembroke in 2010, wildfires can cross community borders.	Seven structure fires, 2 vehicle fires, 1 debris fire, 1 special outside fire and 5 wildfires were reported in Pembroke in 2010 (16 total)	Wildfire, Fire, Human	National Reporting System, NH Department of Safety, Pembroke Fire Department
Concord Hospital Bomb Threats	No	2010	1-Oct	N/A	A bomb threat was called in to Concord Hospital as a result of a child custody issue and the group known as the "Oathkeepers." The FBI was contacted, but nothing was found in the Hospital during a bomb sweep. Phone lines were flooded with calls by the Oathkeepers to inhibit using the landlines. The incident was determined to be harassment instead of an actual event.	N/A, although Concord abuts Pembroke the west	Human, Terrorism	Concord Hazard Mitigation Task Force 2011

Earthquake 3.4M 2010 Boscawen Epicenter	No	2010	26-Sep	N/A	"A magnitude 3.4 earthquake rattled buildings and nerves across much of New Hampshire Saturday night. The quake occurred at 11:28 p.m. and was centered about 10 miles north of Concord, according to the U.S. Geological Survey. State police said they received reports from residents across the state who reported what they thought was an explosion. The quake was felt in places like Fremont, Derry, Durham, Henniker, Penacook and Raymond. There were no reports of damage." The quake was felt all over the state, Southern Maine and Massachusetts, but most reports were received from the Central NH region.	Reports were made to the USGS from Pembroke, with the epicenter about 10 miles to the northwest in Boscawen.	Earth, Earthquake	Union Leader, USGS
Loudon Pleasant View Greenhouse Fire	No	2010	21-Jan	N/A	Pleasant View Gardens suffered a fire which destroyed about 30,000 square feet of greenhouses, plus a building. The cause is undetermined. This was a significant commercial fire.	N/A, although Loudon abuts Pembroke to the north. Pleasant View Gardens also has a greenhouse location in Pembroke.	Fire	Loudon Hazard Mitigation Committee, Pembroke Hazard Mitigation Committee
Severe Storms and Flooding	**1913**	**2010**	**Mar 14-31**	**No**	Severe storms and flooding occurred over two weeks and damaged roads and bridges. Merrimack County reimbursement to towns for repair was $0.28 per capita (146,455 people in 2010), and in Hillsborough County reimbursements were $1.80 per capita (400,721 people in 2010)	No funding applied for/received. The Suncook River caused moderate flood damage to residences, but was not as extensive as the 2006 and 2007 floods.	Flood, Wind	FEMA, Pembroke Hazard Mitigation Committee
Severe Winter Storm	**1892**	**2010**	**Feb 23-Mar 3**	**$83,800**	High winds, rain, and snow over a week-long period. Primary impact was debris removal and repair reimbursement for fallen trees and powerlines. In the Concord area, 21,000 Unitil customers were out of power.	**Pembroke received $83,800** in FEMA Public Assistance funding for roads and bridges, debris removal, protective measures and recreational projects. Power outages, with trees down on wires, roads, cars, and buildings. The flooding from this storm was worse than the snow and ice damage.	Severe Winter Weather, Snow, Extreme Temp, Wind, Flood	FEMA, Unitil, Pembroke Hazard Mitigation Committee
Severe Winter Storm - December 2008 Ice Storm	**1812**	**2008**	**Dec 11-23**	**$32,100**	Accumulating ice, snow, rain, and strong winds caused downed trees and power lines, with power outages and traffic accidents resulting. In Merrimack County, debris removal and repair cost reimbursement FEMA the equivalent of $10.07 per capita (146,455 people in 2010). In Hillsborough County, debris removal costs were $6.35 per capita	**Pembroke received $32,100** in FEMA Public Assistance funding for debris removal and protective measures. Pembroke went 6 days without electricity and communications. Numerous roads were closed due to downed trees and power lines. Shelter was offered in neighboring Town of Hooksett. Pembroke police and fire officials conducted	Ice Storm, Severe Winter Weather, Extreme Temp, Wind	FEMA, Concord Monitor, Unitil, Pembroke Hazard Mitigation Committee

					(400,721 people in 2010). The major disaster was declared in all 10 counties. New England was blanketed with ice and snow during the winter storm. The weight of the ice caused branches to snap, and trees to either snap or uproot, and brought down power lines and poles across the region. About 400 thousand utility customers lost power during the event, with some customers without power for two weeks. Property damage across northern, central and southeastern New Hampshire was estimated at over $5 million. Event was the largest power outage in New Hampshire's history.	door-to-door notifications to homeowners to assess their needs and offer assistance.		
Severe Storms and Flooding - Patriot's Day Flood	**1799**	**2008**	**Sep 6-7**	**$7,700**	In Merrimack County, damage to road systems totaled the equivalent of $1.48 per capita (146,455 people in 2010) for town reimbursement. Hillsborough County's damage was much higher at $6.90 per capita (400,721 people in 2010)	**Pembroke received $7,700** in FEMA Public Assistance funding for protective measures, debris removal and work on North Pembroke Road. Road washouts were the major problem during this event.	Flood	FEMA, Pembroke Hazard Mitigation Committee
Epsom Cumberland Farms Explosion	No	2008	Jul	N/A	Cumberland Farms propane explosion of July 2008 resulted in the closure of Route 4.	N/A, Epsom abuts Pembroke to the east	Fire, Explosion, Technological	Epsom Hazard Mitigation Committee 2009
Tornado, Severe Winds, Heavy Rains	**1782**	**2008**	**Jul 24**	**N/A**	An F2-F1 tornado touched down in Rockingham County then proceeded into another county. Then in Merrimack County, the tornado was rated up to an F-3 and killed a woman in Deerfield trapped in a collapsed house. In the county, there was substantial damage totaled the equivalent of $1.12 per capita (146,455 people in 2010) for the towns' debris removal reimbursement costs. A total of 123 residences statewide were affected, with 17 destroyed and another 37 suffering major damage. Damage was estimated to exceed $10 million.	No funding applied for/received. The path did not travel through Pembroke but tree damage may have occurred. In abutting Epsom, 84,000 acres were destroyed and there was significant damage to personal property, destroying or damaging 9 homes. Pembroke Public Works assisted Epsom with clean-up duties during the recovery phase	Wind, Tornado	FEMA
Regional Severe Thunderstorm	No	2007	25-Aug	N/A	Severe thunderstorm downed trees in nearby Allenstown. Numerous severe thunderstorms developed in NH. Wind damage was widespread with these storms along with a few reports of large hail.	Pembroke likely experienced similar issues as Allenstown is an abutting town.	Thunderstorm, Rain, Wind, Hail	Allenstown Hazard Mitigation Committee

Pembroke Severe Thunderstorm	No	2007	15-Jul	N/A	Similar effects may have been experienced by area communities.	A severe thunderstorm downed trees in Pembroke. Severe thunderstorms produced large hail and damaging winds across portions of southern New Hampshire during the early afternoon of July 15th.	Thunderstorm, Wind, Hail	Pembroke Hazard Mitigation Committee
Severe Storms and Flooding - April Spring Floods	**1695**	**2007**	**Apr 15-23**	**$54,500**	Extensive flooding caused by severe storms impacted seven counties, including Merrimack and Hillsborough. Across the region, indirect peak discharge measurements on stream gages on the Suncook River at Short Falls Road in Epsom were 14,100 ft3, which was determined to be greater than 100-year flood discharge levels. Over land, the strong winds downed numerous trees. The downed trees caused widespread power outages, especially near the coast, and numerous road closures. The storm also brought heavy rain to the region which, when combined with snow melt, produced widespread flooding across much of the region. Power outages persisted, and stream and river flooding continued across the region.	**Pembroke received $54,500** in FEMA Public Assistance funding. Projects were for roads and bridges, repairing Memorial Field's boat ramp and access road, water control facilities, debris removal and repairing washed out culverts. In Pembroke, North Pembroke Road was impacted the most. North Pembroke Bridge was closed.	Flood, Wind, Debris Impacted Infrastructure	FEMA, USGS Flood of 2007, Pembroke Hazard Mitigation Committee
Webster Pillsbury Lake Dam Breach	**1643**	**2006**	**May 15**	**N/A**	The Pillsbury Lake Dam in Webster, holding back an artificial lake of about 70 acres, was breached by flooding due to heavy rains. Floodwaters punched out a 20-foot breach in the dam. The dam created the Pillsbury Lake District with about 180 households. The Lake's level fell from 15 feet at its deepest point to about 2 feet at that same point following the event.	N/A, although Webster is 2 communities to the northwest of Pembroke	Flood	Concord Monitor
Bow Landslide During Mother's Day Floods	**1643**	**2006**	**May 14-17**	**N/A**	Backyard material slid toward a Bow home on Mother's Day catching a family, with one young child and expecting another, by surprise. No one was injured by the mudslide but thousands of dollars of property damage were caused. The debris and mud that slid and caused the damage came from land that didn't belong to the family. They had to move out for 10 days until a contractor deemed the property safe.	N/A, although Bow abuts Pembroke to the south	Earth, Landslide, Erosion	WMUR News

Suncook River Avulsion in Epsom	**1643**	**2006**	**May 14-17**	**N/A**	The Suncook River through Epsom changed its course during this recent heavy rain event and its resultant flooding. The River shifted hundreds of meters, flowing around two dams, creating about a mile of new river through a sand pit a half mile from its original course, and leaving a similar length of dry riverbed. The water carved through peat bogs and tore away a corner of a sand excavation pit. Local communities of Epsom, Allenstown, and Hillsborough later dealt with siltation and erosion issues from the new river course	After the Suncook River avulsion occurred, the confluence of the Suncook and the Merrimack contained so much sand that sandbars have developed and people could often walk across areas. The after-effects of the avulsion is a long-term problem for Pembroke and other communities along the Suncook and Merrimack Rivers.	Flood, Channel Movement	Concord Monitor, Pembroke Hazard Mitigation Committee
Severe Storms and Flooding – Mother's Day Flood	**1643**	**2006**	**May 12-23**	**$71,400**	Extensive flooding caused by severe storms impacted seven counties including Merrimack and Hillsborough. The USGS recorded the highest flows on record for several rivers including the Contoocook River in Davisville village, Soucook in Concord, and Piscataquog in Goffstown.	**Pembroke received $71,400** in FEMA Public Assistance funding for Memorial Field, town roads, road erosion, and traffic control/evacuations. Erosion around the Webster Dam was occurring, had to fix with emergency measures. Evacuated condos Emerson Mills. A lot of undercutting of the Pembroke, China Mills and Webster Mills dams occurred.	Flood, Wind	FEMA, Pembroke Hazard Mitigation Committee
Regional Train Wildfire	No	2006	29-Apr	N/A	A freight train sparked brush fires along tracks in Bow, Hooksett and Manchester. In Bow, a 50' by 350' fire was spreading toward the woods when officials arrived on the scene. Concord Fire Chief said that fires sparked by trains are not unusual and they are typically caused by exhaust coming out of the stack.	N/A, although Bow abuts Pembroke to the south and the railroad line travels past Eversource, the location of anhydrous ammonia concern.	Fire, Technological	WMUR News
Concord Statehouse Iraq Public Unrest	No	2006	18-Mar	N/A	A reported 400 citizens marched in Concord to recognize the 3-year anniversary of the beginning of the war in Iraq. The protestors marched around downtown Concord and finished in front of the statehouse.	N/A, although Concord abuts Pembroke to the west	Human, Public Unrest, Civil Disturbance	NH Independent Media Center
Region-Wide Power Failure and Wind Chill	No	2006	18-Feb	N/A	55 mph wind gusts, resulting from a cold front in the region, felled trees which blocked roads and downed power lines. 80,00 homes and businesses in the state reportedly lost power. Unitil had outages in every town it serves. A reported 25,000 customers in the Concord area lost power.	Pembroke experienced power failure.	Wind Chill, Extreme Temps, Power Failure, Heavy Winds	Concord Monitor, Pembroke Hazard Mitigation Committee

Severe Storms and Flooding - Columbus Day Flood	**1610**	**2005**	**Oct 7-18**	**No**	Extensive flooding caused by severe storms impacted five counties. Alstead had several fatalities as the result of dam failure.	Town did not apply for / receive Public Assistance funding. Many residences on Bachelder Road were flooded by the Suncook River.	Flood, Wind, Debris Impacted Infrastructure	FEMA, Pembroke Hazard Mitigation Committee
Regional Thunderstorms and Lightning 2005	No	2005	12-Jun	N/A	During a thunderstorm, lightning struck and severely damaged the historic Loudon Town Hall on Clough Hill Road. Winds from a severe thunderstorm knocked down trees and power lines down in the towns of Warner, Hopkinton, Concord, Bow, Loudon, and Pembroke in Merrimack County.	Pembroke is one of those communities that experienced the thunderstorm and lightning event	Thunderstorm, Lightning, Severe Winds	CNHRPC, Pembroke Hazard Mitigation Committee, Loudon Hazard Mitigation Committee
Canterbury Explosion at Gold Star Sod Farm	No	2005	23-Jan	N/A	A near-fatal explosion occurred at the Gold Star sod farm in Canterbury. Gasoline fumes ignited a propane heater, triggering a fiery explosion and fire that consumed a large workshop and part of the main storage building. Fire crews from several departments battled the fire and laid sand down as a buffer between a nearby river in order to prevent contamination as pesticides and other chemicals burned.	N/A, although Canterbury is 2 communities to the north of Pembroke	Fire, Explosion, Technological, Hazardous Materials	Concord Monitor
Snow Emergency	**EM-3207**	**2005**	**Jan 22-23**	**$6,600**	Area snow fall	**Pembroke received $6,600** in FEMA Public Assistance protective measures funding for snow removal.	Severe Winter Weather, Snow	FEMA, Pembroke Hazard Mitigation Committee
Earthquake 2.2M 2004 Henniker-Hopkinton Epicenter	No	2004	20-Jan	N/A	An earthquake measuring 2.2 on the Richter Scale was centered in the Henniker-Hopkinton area. Shaking and noise were reported, but no damage occurred.	Pembroke is in the Central NH region were the quake was experienced but no reports came from the eastern direction of the event.	Earth, Earthquake	Concord Monitor, January 2004, USGS, Pembroke Hazard Mitigation Committee
Snow Emergency	**EM-3193**	**2003**	**Dec 6-7**	**No**	Record snow fall event impacting much of New England. In NH, 8 counties received emergency protective measures, including Merrimack and Hillsborough.	Pembroke didn't apply for/receive funding for this snow emergency.	Extreme Temp	FEMA
Snow Emergency	**EM-3177**	**2003**	**Feb 17-18**	**No**	Record and near record snowstorm for 5 NH counties including Merrimack and Hillsborough. Emergency protective measures declared for reimbursement.	Pembroke didn't apply for/receive funding for this snow emergency.	Extreme Temp	FEMA
Drought Emergency 2002	No	2002	Aug	N/A	All counties in the State of NH except Coos County. One of the hottest Augusts on record in Concord along with drought conditions since March made for a high fire danger in New Hampshire. Numerous forest fires were reported, including a 30-acre blaze in New Durham.	In Pembroke, wells went dry for about 2 weeks. Wells affected were mostly dug wells.	Drought, Extreme Temperature, Earth, Fire	Concord Monitor 8/20/02, Pembroke Hazard Mitigation Committee

Snow Emergency	**EM-3166**	**2001**	**Mar 5-7**	**No**	Record and near-record snowfall from late winter storm, emergency declaration was issued for protective measures. Merrimack, Hillsborough and 5 other counties were declared eligible.	Pembroke didn't apply for/receive funding for this snow emergency.	Extreme Temp	FEMA
Central NH Macroburst 1999	No	1999	July	N/A	A downburst impacted three counties in New Hampshire, including Merrimack County and the Central NH Region. It resulted in 2 deaths. Also, two roofs were blown off a tall building in Concord and widespread power outages occurred. The downburst was designated a macroburst (at least 2.5 miles in diameter).	Pembroke may have experienced some downburst activity. The macroburst swept through Concord which abuts Pembroke.	Wind, Macroburst	NH HSEM, CNHRPC
Concord Library and NHTI Bombs	No	1998	Oct	N/A	The lit fuse of a bomb left in the Concord Library stacks set off smoke alarms that may have saved the lives of many people. The individual allegedly responsible for the bomb scare left notes complaining about state government. About a dozen buildings were evacuated after the New Hampshire Technical Institute in Concord received an anonymous call warning that three bombs had been placed on campus. This event followed the bomb scares at the Concord Library.	N/A, although Concord abuts Pembroke to the west	Human, Terrorism	AP Online 11/01/98, NH Homeland Security and Emergency Management
Lightning Strikes	No	1998	Aug	N/A	In abutting Allenstown, lightning struck the antenna on the roof of the Town Hall, started a fire, and blew out several computers inside. The same thing happened to the Fire Station.	N/A, Allenstown abuts Pembroke to the east	Lightning, Fire	Allenstown Hazard Mitigation Committee
Severe Storms and Flooding	**1231**	**1998**	**Jun 12-Jul 2**	**No**	Heavy flooding in six counties, including Merrimack and Hillsborough Counties. Damages of $3.4m for all counties.	Pembroke didn't apply for/receive funding**.** As the Town is within Merrimack County, it is likely experienced heavy rains and possibly some flooding.	Flood, Wind	FEMA
Ice Storm of 1998	**1199**	**1998**	**Jan 7-25**	**No**	This ice storm was the first to test our statewide and local emergency management systems and utility providers. Tree and infrastructure damage was extensive and power failures lasted up to two weeks in some parts of the state. In The Central NH Region, many lost power for over a week. This ice storm had severe impacts throughout most of the State, with 52 communities impacted. FEMA Disaster Declaration #1199, Six injuries and one death resulted.	Pembroke didn't apply for/receive funding. Power outages occurred for a few hours. In addition, there was some limb damage to trees.	Extreme Temp, Ice Storm, Power Failure	FEMA, US Army Corps of Engineers NH Storms database, Pembroke Hazard Mitigation Committee

					Damage totaled $12,446,202. In addition, there were 20 major road closures, 67,586 people left without electricity, and 2,310 people without phone service.			
Pembroke Snowstorm	No	1996	Feb	No	Snow, ice, bitter temperatures throughout central NH	Snow, ice, bitter temperatures	Extreme Temp, Severe Winter Weather, Wind Chill, Snow	Pembroke Hazard Mitigation Committee
Severe Storms and Flooding	**1144**	**1996**	**Oct 20-23**	**No**	Heavy rains caused flooding in six counties, including Merrimack and Hillsborough Counties. Damage totaled $2.3m for all counties.	Pembroke didn't apply for/receive funding. As the Town is within Merrimack County, it is likely experienced heavy rains and possibly some flooding.	Flood	FEMA, NH HSEM
Storms and Floods	**1077**	**1995**	**Oct 20-Nov 15**	**N/A**	Four NH counties were damaged by excessive rain, high winds and flooding, including Merrimack (not Hillsborough).	No information available	Flood	FEMA, Federal Register
Severe Storm-Hurricane Bob	**917**	**1991**	**Aug 18-20**	**No data available**	Public assistance was available for Hillsborough County and 2 other counties (not Merrimack) as a result of damages caused by Hurricane Bob. The 2 seacoast counties fared the worst.	As the Town is within Merrimack County, it is likely experienced heavy rains, tree debris, power outages and possibly some flooding.	Wind, Hurricane	FEMA
Flooding and Severe Storm	**876**	**1990**	**Aug 7-11**	**No data available**	Moderate to heavy rains caused flooding in eight counties, including Merrimack and Hillsborough Counties. Damage totaled $2.3m for all counties	It is likely Pembroke experienced some damages.	Flood, Wind	FEMA, NH HSEM
Pembroke Severe Hail Storm	No	1990	Circa Jul	N/A	N/A, but it is reasonable to assume the region's communities experienced some of these issues	A severe hailstorm caused damage in Town, including damage to the Town Hall and Fire Station. The storm started out in the west side of Pembroke and moved to east of Pembroke Street to the Epsom town line, where a hail pile lasted 3 days. Hail broke windows, stripped leaves off trees and broke branches, and caused damage to widow unit air conditioners. In addition, siding on a home on Church Street had to be replaced as a result of the storm.	Wind, Hail, Thunderstorm	Pembroke Hazard Mitigation Committee
Severe Storms and Flooding	**789**	**1987**	**Mar 30-Apr 11**	**No data available**	Flooding caused by snowmelt and intense rain was felt in seven counties, including Merrimack and Hillsborough Counties. Nearly $5m in damages.	Heavy showers resulted in flooding along the Suncook River. The River was 7-8 feet higher than its normal level. Farmland and tomato crops were flooded.	Flood, Wind	FEMA, Pembroke Hazard Mitigation Committee

Severe Storms and Flooding	**771**	**1986**	**Jul 29-Aug 10**	**No data available**	Severe summer storms with heavy rains, tornadoes, flash floods, and severe winds, damaged the road network statewide. Disaster declared in Cheshire, Sullivan and Hillsborough Counties (not Merrimack).	It is likely Pembroke experienced some damages.	Flood, Wind	FEMA, NH HSEM
Pembroke Hurricane Gloria 1985	No	1985	27-Sep	N/A	The hurricane was experienced across NH and Merrimack and Hillsborough Counties.	On September 27, 1985 Hurricane Gloria was responsible for one fatality in Pembroke. A woman was struck and killed by windblown debris.	Hurricane, Severe Wind, Debris	Pembroke Hazard Mitigation Committee
Earthquake 4.5M Sanbornton	No	1982	18-Jan-82	N/A	An earthquake originating near in Sanborton in Belknap County measured 4.5M and was felt in various locations throughout the State. The area it was felt includes all of northern Merrimack County including the Concord area communities in Central NH.	With a quake of this size, it is highly likely Pembroke experienced some strong shaking and noise	Earthquake	Earthquaketrack.com
Concord Beaver Meadow Tornado	No	1979	Jul 27	N/A	In Concord, a small twister was sighted at Beaver Meadow, where 13 trees were toppled, including a 100-foot tall pine. The duration was about 15-20 seconds.	N/A, although Concord abuts Pembroke to the west	Wind, Tornado	Concord Monitor
Blizzard of 1978	No	1978	Feb 5-7	N/A	RSI Index of Category 5 (Extreme). This snowstorm is described as "a natural disaster of major proportions" and stunned all of New England. The storm was caused by an intense coastal Nor'easter that produced winds in excess of hurricane force and very high snow totals. Most of southern New England received more than three feet of snow, 25-33" in NH and higher throughout New England. Abandoned cars along roadways immobilized infrastructure and blocked major interstates. For over a week, New England remained paralyzed by the storm. All of New Hampshire was impacted. Governor Meldrim Thomson Jr. declared a state of emergency.	Although it is unknown what Pembroke experienced, it is likely many of the same depths and effects occurred across the Town.	Extreme Temperatures, Severe Snow Storms, Windchill, Power Failure	American Meteorological Society, Northeast States Emergency Consortium
Pembroke Suncook River Ice Jam 1977	No	1977	14-Mar	N/A	Ice break-up caused a major jam in the Suncook River, causing flooding both in Allenstown and Pembroke. Homes and roads were flooded, & more than 100 buildings were evacuated.	Silver's Trailer Park, on North Pembroke Road was flooded by the Suncook at the Concord Town Line.	Ice Jam, Flood, Severe Winter Weather	US Army Corps of Engineers NH Ice Jams Database, Pembroke Hazard Mitigation Committee
Severe Storms and Flooding	**399**	**1973**	**Jul 11**	**No data available**	All counties in the State of NH experienced storm damage and were declared disaster areas, including Merrimack and Hillsborough Counties.	No information available	Flood, Wind	FEMA

Pembroke Suncook River Ice Jams 1970	No	1970	12-Feb	N/A	Three separate jam sites on the Suncook River - at an abandoned dam located close to the Route 28 bridge, causing evacuation of 5 homes and 50 trailers. The second jam near the Route 3 bridge, flooded roads and 40 families were forced to evacuate. Last ice jam was at the Webster Dam and resulted in eight flooded basements	Pembroke shares its border at the Suncook River with Allenstown. Two of these jams may have affected Pembroke.	Ice Jam, Flood, Severe Winter Weather	US Army Corps of Engineers NH Ice Jams Database
Pembroke Soucook River Ice Jam 1959	No	1959	3-Apr	N/A	Reported by the US Army Corps of Engineers, "Maximum annual gage height of 12.03 feet, affected by backwater from ice, reported at USGS gage Soucook River near Concord, on April 3, 1959."	Ice jam recorded on the Soucook River. Pembroke's Soucook River border is shared with Concord. Gage is just north of the North Pembroke Bridge.	Ice Jam, Flood, Severe Winter Weather	US Army Corps of Engineers NH Ice Jams Database
Pembroke Soucook River Ice Jam 1958	No	1958	19-Mar	N/A	Reported by the US Army Corps of Engineers, "Maximum annual gage height, 10.48 feet due to an ice jam recorded at USGS gage Soucook River near Concord, New Hampshire on March 19, 1968."	Ice jam recorded on the Soucook River. Pembroke's Soucook River border is shared with Concord. Gage is just north of the North Pembroke Bridge.	Ice Jam, Flood, Severe Winter Weather	US Army Corps of Engineers NH Ice Jams Database
Older Hurricanes	No	1954	to 1991	N/A	Many older hurricanes have impacted New Hampshire including the 1954 – 1991 Hurricanes: Carol on August 31, 1954 (tree and crop damage), Edna on September 11, 1954, Donna on April 12, 1960 (heavy flooding), Doria on August 28, 1971, Bell on August 10, 1976, Gloria on September 27, 1985, and Bob in 1991.	Downed trees, wind damage, and flooding was likely experienced in Pembroke during many of these hurricanes. Hurricane Carol (1954) did not cause nearly as much damage as the Hurricane of 1938; however, some damage was done to roads. Several other hurricanes have impacted NH and may have impacted Pembroke, including Donna (September 1960), Gloria (September 1985), and Bob (August 1991), but their impact was not severe. Some heavy rains most likely occurred during these events.	Wind, Flood, Power Failure	NH Homeland Security and Emergency Management, Pembroke Hazard Mitigation Committee
10 Severe Snowstorms, mid 1900s	No	1940	to 1978	N/A	Ten severe snowstorms are documented in south-central New Hampshire during this time span, February 14-15, 1940 (depths over 30" and high winds), February 14-17, 1958 (20-33"), March 18-21, 1958 (22-24"), March 2-5, 1960 (up to 25"), January 18-20, 1961 (up to 25", blizzard conditions), January 11-14, 1964 (up to 12"), January 29-31, 1966 (up to 10"), February 22-28, 1969 (24-98", slow-moving storm), December 25-28, 1969 (12-18"), January 19-21, 1978 (up to 16").	Although it is unknown what Pembroke experienced, it is likely many of the same depths occurred for some of these storms.	Extreme Temperatures, Severe Snow Storms, Ice, Windchill, Power Failure	American Meteorological Society

Pembroke Hurricane of 1938	No	1938	Sep 21	N/A	Hurricane made landfall as a 3 on the Saffir-Simpson Scale, killed about 682 people and damaged or destroyed over 57,000 homes. Most deadly New England hurricane. Central New Hampshire was inundated with water. Downed trees caused extensive damage to homes, businesses and community infrastructure. President Roosevelt ordered emergency aid be sent to NH, including Merrimack County	The hurricane of September, 1938 impacted Pembroke with some flooding and winds (Town Historians). Thirteen people died in New Hampshire; no deaths occurred in Pembroke. This was the worst hurricane to ever strike New England, resulting in 564 deaths and over 1700 injuries. Like the rest of the state, Pembroke sustained tree damage, resulting in a great loss of lumber. In Pembroke, areas along the Merrimack River experienced heavy flooding. The area where Carlson's dealership in Concord on Route 3 is located now had 11 ft of water in the hollow. This made travel difficult and cut off Pembroke from Concord. Along the Suncook River, the Emerson Mill, Webster Mill, and Route 3 bridge experienced high, flowing water. Several pictures were taken of these and other locations to document the conditions which have not reoccurred since the 1938 hurricane.	Wind, Flood	Wikipedia, Concord Monitor, Freak Winds of New Hampshire, Pembroke Hazard Mitigation Committee & Town Historians
Pembroke Flood of 1936	No	1936	Mar 11-21	N/A	Simultaneous high snowfall totals, heavy rains, and warm weather combined to hit all of New England. Floods killed 24 people, caused $133,000,000 in damage, and made 77,000 people homeless in New England. The great flooding of 1936 resulted from heavy rains and rapid snow pack melt. Snow north of Concord contributed to the higher waters in the Winnipesaukee, Contoocook and Pemigewasset rivers that were largely responsible for the destruction in Concord and the surrounding area. NH issued boil water warnings to everyone.	In Pembroke, low lands near the Suncook River were flooded. During the March floods of 1936, an ice jam occurred in the Merrimack River and resulted in road flooding and evacuations in Pembroke	Flood, Ice Jams, Rapid Snow Pack Melt	Concord Monitor, Union Leader, Flood Waters, New Hampshire 1936, Army Corps of Engineers Ice Jam Database, Pembroke Hazard Mitigation Committee

Source: Compilation of Events by Pembroke Hazard Mitigation Committee; CNHRPC

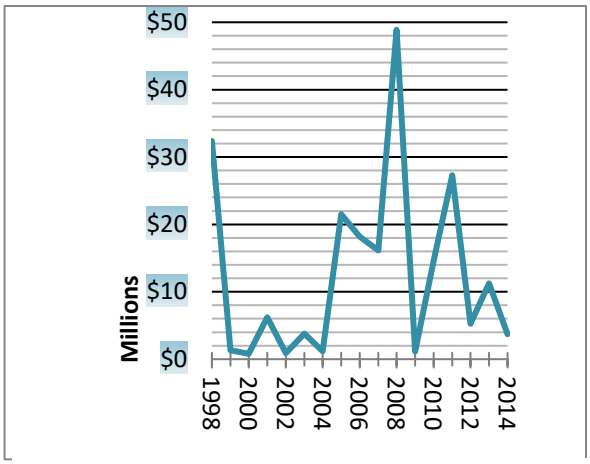
Local Climate Changes and Extreme Weather

In the State and the Central NH Region, like any other areas, exist our own "micro-climate" areas that can be analyzed for future susceptibility to disasters and hazard events. New Hampshire has obtained high costs of damage over time due to hazardous weather and declared disasters. A review of the state and area history can provide a perspective on what Pembroke can expect to see in terms of extreme weather in the future.

Table 11

Summary of Hazardous Weather Fatalities, Injuries, and Damage Costs in NH, 1998-2014

Year	Fatalities	Injuries	Total Damages $
2014	0	2	**$3,700,000**
2013	0	30	**$11,250,000**
2012	1	4	**$5,280,000**
2011	1	2	**$27,280,000**
2010	1	6	**$14,630,000**
2009	1	0	**$1,130,000**
2008	2	5	**$48,890,000**
2007	0	3	**$16,150,000**
2006	1	9	**$18,200,000**
2005	4	9	**$21,500,000**
2004	0	11	**$1,200,000**
2003	2	29	**$3,800,000**
2002	0	7	**$900,000**
2001	0	2	**$6,200,000**
2000	2	6	**$800,000**
1999	3	17	**$1,300,000**
1998	1	23	**$32,400,000**



1 Annual Hazardous Weather Damages in NH

Source: National Oceanic and Atmospheric Administration, last accessed 2/10/16 http://www.nws.noaa.gov/om/hazstats.shtml

Injuries to people and the costs of damages in New Hampshire have increased as a result of hazardous weather. These increases of injuries and damages can be generally applied to the major disasters declared in the State. As displayed in **Table 11**, the highest numbers of damage costs correlate to the 1998 (**$32m**) and 2008 (**$49m**) ice storms between 1998 and 2014.

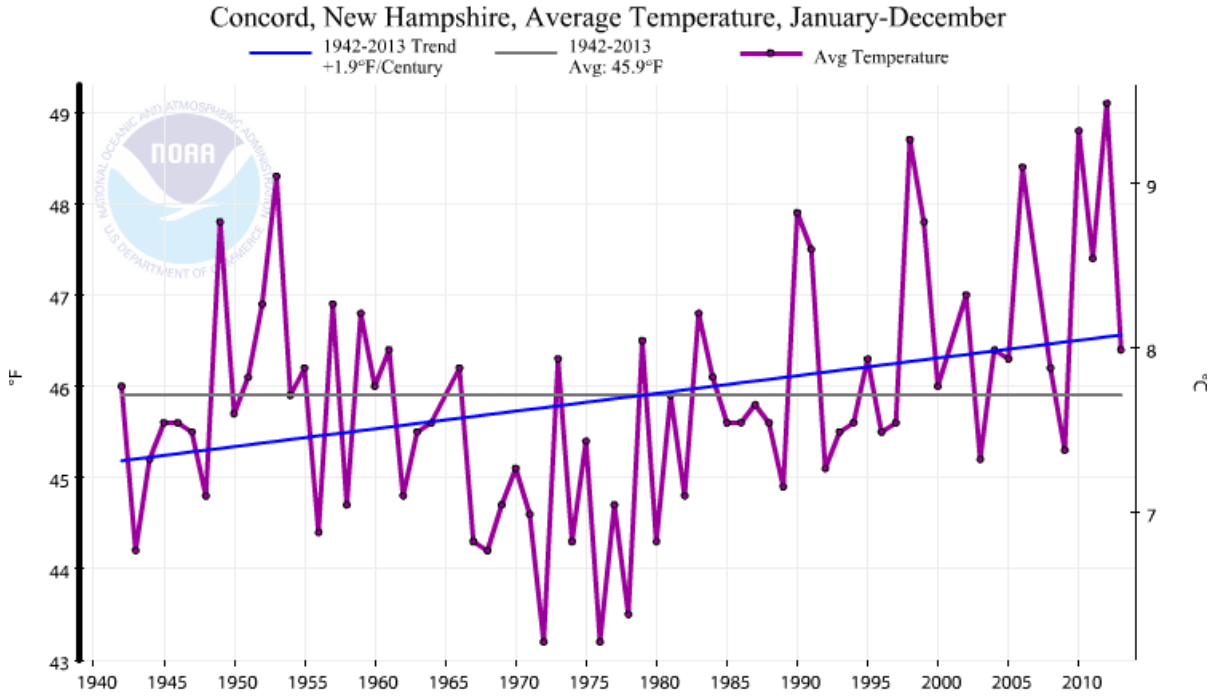
The number of injuries and fatalities have a less distinct association, with the highest numbers shown in 2013 (**30**) and 2003 (**31**). However, the greatest number of fatalities during this time period occurred in 2005 (**4**), likely during the time of the Columbus Day floods that hit the southwestern section of the State very hard.

Much of the rest of the discussion in this section has been directly excerpted or paraphrased from the ***Central NH Regional Plan 2015***. The Central NH Region's weather history is summarized to provide a view of the trends around the Concord area where the weather measurements have taken since 1939 at the Concord Airport. Pembroke abuts the City of Concord, so these measurements should have some reasonable basis in Pembroke.

Figure 4 displays Concord's average annual temperature between 1942 (**46.0°F**) and 2013 (**46.4°F**). Earlier data was not available. As with typical New Hampshire weather, the seasonal temperatures can vary year after year and without obtaining an average, changes are difficult to see. The displayed trend line allows a definitive way of averaging all of the temperatures and illustrates a **+2.8°F** increase in average annual temperature during this 70-year time period.

Figure 4

Average Annual Temperature for Concord, 1942-2013

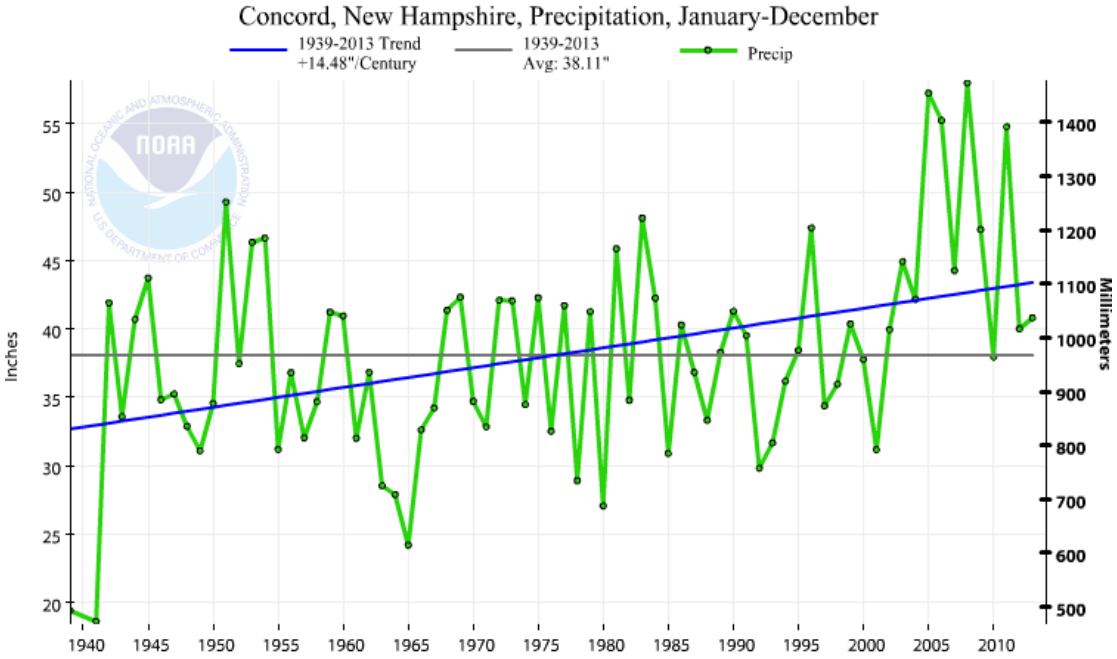


Source: National Oceanic and Atmospheric Administration

For precipitation changes, **Figure 5** displays Concord's average annual precipitation rates between 1939 and 2013. Varying seasonal rainfall amounts continue over the decades. The trend line serves the same purpose to illustrate an overall increase of **+14.48"** in precipitation over the 74-year time period from 1939 to 2013.

Figure 5

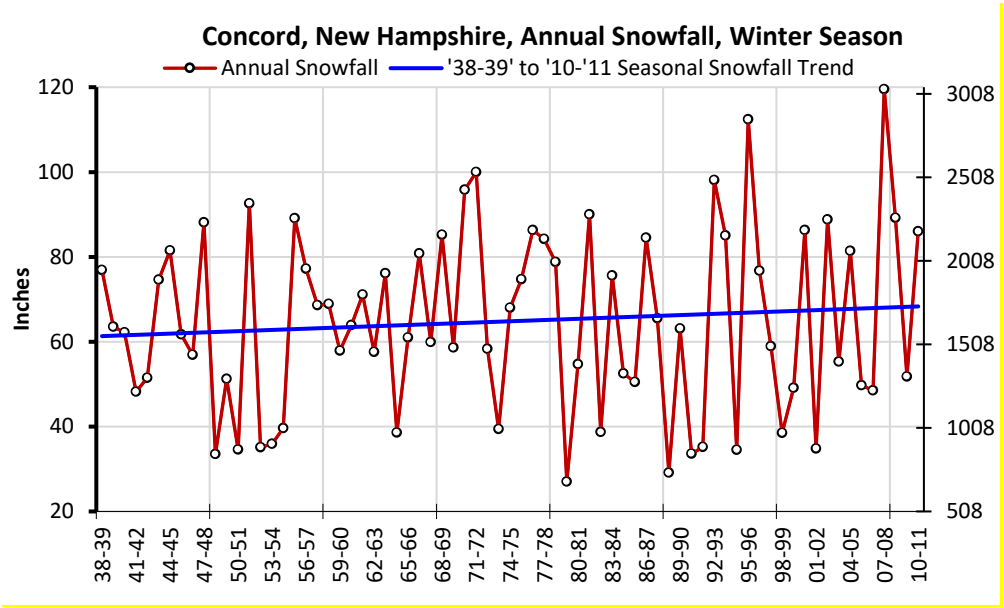
Average Annual Precipitation for Concord, 1939-2013



Source: National Oceanic and Atmospheric Administration

Similar to temperature and precipitation, annual snowfall amounts as reported by NOAA were observed for Concord starting in the **1938-1939** winter season through the **2010-2011** winter season. Snowfall data from **2011-2013** was not available. As displayed in **Figure 6**, the amount annual of snowfall has varied greatly over the past century. Overall, the trend line indicates a slight increase in annual snowfall inches, from about **60"** in the **1938/39** season to about **68"** in **2010/11**, totaling an increase of **+8"** of snowfall over the 72-year time span.

Figure 6
Average Annual Snowfall for Concord, Winter Seasons 1938/39 - 2010/11



Source: NOAA Compiled by: CNHRPC

Pembroke abuts Concord to the southeast, sharing the Soucook River as a border. This climate data may certainly be relevant to the entire Central NH Region which includes the Town. The Central NH region climate summation is that the temperature is getting warmer, the precipitation is increasing, and the snowfall is slightly increasing according to the National Oceanic and Atmospheric Administration's data collection at the Concord airport. There are no indications to see these trend lines reverse although the snowfall varies greatly from one season to the next, almost in an alternating pattern.

The Southern NH Climate Change Assessment, formally entitled ***Climate Change in Southern New Hampshire: Past, Present, and Future, 2014*** by the University of New Hampshire, reviewed current climate conditions and projected future conditions of Southern New Hampshire under potential low and high emission scenarios. Their past and future climate overview is illustrated in **Figure 7**.

Figure 7

Southern NH Climate Assessment Projections

Past Data and Future Climate Overview

SOUTHERN NH CLIMATE ASSESSMENT Projections

TEMPERATURE

What have we seen since 1970?

- → Average maximum temperatures have warmed by 2.0°F (annual) and 2.9°F (winter)
- → Average minimum temperatures have warmed by 3.2°F (annual) and 6.1°F (winter)

What can we expect?

- → Summers will be hotter: 16-47 days above 90°F
- → Winters will be warmer: 20-45 fewer days below 32°F

RAINFALL

What have we seen since 1970?

- → Annual precipitation has increased by 8-22%
- → Frequency and magnitude of extreme events

What can we expect?

- → Precipitation annual average will increase: 15-20%
- → More frequent and severe flooding

SNOW

What have we seen since 1970?

- → Fewer days with snow cover
- → Lake ice-out dates occurring earlier

What can we expect?

- → Significant decrease of 20-50% in number of snow covered days

As a result of anticipated extreme weather continuing and climate changes in Central NH and Pembroke, consideration should be given for potential impacts to the community. A few new issues are considered, although the list is not detailed. For more information on these topics, refer to the **Central NH Regional Plan 2015**.

More Human Health Emergency Events

- ☞ Illnesses such as heatstroke, fainting, and heat exhaustion.
- ☞ Excess heat especially dangerous for the aging population and residents without air conditioning.
- ☞ Increase in greenhouse gas emission, energy demand, and air conditioning use and cost.
- ☞ More favorable conditions for insects carrying viruses and diseases, such as West Nile Virus.
- ☞ Increases risk of waterborne illnesses caused by pollutants entering the town's water supply, commonly through stormwater runoff and sewage overflow.
- ☞ Infrastructure failure by adding additional stress, leading to potential injury or loss of life.
- ☞ More air pollution, leading to asthma and breathing disorders.

Natural Environment Disruption

- ☞ Too much water and/or lack of water can disrupt trees and plants natural growing cycle, potential leading the tree, plant, and surrounding area to die.
- ☞ Additional water and drought conditions affect wetland discharge, stream flow, and water quality, affecting the habitat's quality of life and species' health within the area .
- ☞ Debris will be a result of harsh flooding, including trash and downed trees, polluting waters, harming habitats, and damaging property and infrastructure.

Declining Forest Health

- ☞ Large weather events such as heat stress, drought, and periods of winter thaw followed by intense cold can lead to loss of trees.
- ☞ Become susceptible to invasive species and diseases, such as the Hemlock Wooly Adelgid.
- ☞ Loss of trees can have a direct impact on portions of the region's economic components, including declining tourism.

Fewer Recreation Opportunities

- ☞ Weather Impacts on Recreational Trails such as debris, flooding and erosion.
- ☞ Snowmobiling, ice fishing, snow shoeing, skiing and snowboarding provide numerous sources of winter recreation and winter tourism, enhancing the quality of life and economy, will be affected with shorter seasons.

Risks to the Built Environment

- ☞ Critical infrastructure such as roads, bridges, culverts, stormwater drainage systems, water and wastewater treatment facilities, natural gas lines, electric lines and poles might be at risk of severe damage or failure if the anticipated extreme weather events occur.
- ☞ Damaged infrastructure cannot provide services to homes and businesses, disrupting the economy and may endanger public health.
- ☞ Culverts are at risk to extreme precipitation events, including rain, snow, and ice.
- ☞ Residents who experience damage with flooding to their homes and personal belonging may lack proper flooding insurance, placing the resident in financial hardship.
- ☞ Dams with High Hazard and Significant Hazard classifications are the most likely to cause the largest amount of damage or loss of life.

Increasing Municipal Transportation Systems Maintenance Needs

- ☞ Volume of flooding is expected to increase, potentially closing roads and increasing the travel time for drivers and increasing the cost and energy use.
- ☞ Flooding can also cause damage to pavement and embankments, increasing maintenance, repair, and replacement costs to municipalities.
- ☞ Extreme precipitation will also increase erosion, decreasing certain infrastructure components design life span.

Aging and Inadequate Stormwater Infrastructure

- ☞ Stormwater infrastructure such as catch basins, pipes, discharge points, and culverts that redirect stormwater runoff can impacted by flooding and cannot perform their function.
- ☞ Blocking of water can lead to flooding of the area and roadways, potential leading to the closure of nearby roads.

- ☞ Components of stormwater infrastructure are outdated, and increased flows are added stress to the system, more money to maintain and higher replacement costs.
- ☞ Increased development with increased amounts of impervious surface adds the volume of stormwater runoff within more urban area.

Decreasing Water Resources

- ☞ Water quality and quantity are both threatened by projected changing weather events, with threats of flooding, drought, erosion and stormwater runoff.
- ☞ By preventing groundwater from replenishing, additional runoff and sediments can lead to intensify flows in rivers and streams with higher contamination levels of unwanted nutrients and pathogens.
- ☞ Additional water treatment may be necessary, potentially overloading treatment systems.
- ☞ Contamination can pollute sewage, threatening the performance of wastewater treatment facilities.
- ☞ Increased occurrences in flooding can also intensify flows, causing overloading of treatment system.
- ☞ When the ground is frozen, rapid snow melt from warm days or intense rain is not able to infiltrate the ground, leading to drought conditions.

Changing Food and Agriculture Production

- ☞ Merrimack County is the top county in the State for agriculture sales of higher temperatures will promote a longer growing season for most crops, benefiting a larger number of local crops.
- ☞ Negative impacts can potentially alter the region to a climate not suitable for growing valuable local crops such as apples and blueberries.
- ☞ Temperature are expected to slow weight gain and lower the volume of milk produced by dairy cows.
- ☞ Higher overnight temperatures are anticipated to prevent the dairy cows and cattle from recovering from heat stress.
- ☞ Warmer temperatures and increase in carbon dioxide in the air creates a more ideal environment for pests and weeds, potentially increasing the use of herbicides and pesticides on crop.

This is a sampling of how changing climate and severe weather impacts can affect communities in New Hampshire, in the Central NH Region and in Pembroke. Consideration should be given to applicable items during the development and update of the **Hazard Mitigation Plan**.

Detailed Hazard Events in Pembroke

A compilation of hazards that have occurred in Pembroke and the Central NH Region area is provided in the prior Table of **Local and Area Hazard Events. Hazard Locations in Town** are areas to watch, areas of particular susceptibility and may be vulnerable to future events. **Potential Future Hazards** are determined based on the past hazard events, possibilities, and existing issues in Town to provide focus to future potential problem areas and to help with mitigation action development.

Each hazard is generally described and then is noted how and where it could occur in Pembroke. For all hazards examined in this Plan, a table of the **Hazard Locations in Town** and the **Potential Future Hazards** is provided at the end of this Plan Chapter.

Hazard events were researched using a wide variety of sources for the **original Pembroke Hazard Mitigation Plan 2004** which were the basis for many of the past disaster events and updated to the present. The **Hazard Mitigation Plan Update 2010** provided recent information on many of the extreme disasters experienced between 2005-2008. Sources and techniques included interviewing local townspeople, researching Town Histories and related documents, and collecting information from governmental or non-profit websites. Presidentially declared disasters or other significant hazard events are described for the surrounding area or Merrimack County for the **Hazard Mitigation Plan Update 2017** and some of them may have affected the community. These disasters were also considered by the Committee when determining the risk evaluation.

Committee member experiences, knowledge, and recollections generally comprise the **Local and Area Hazard Events** and **Hazard Locations in Town.** While additional hazards might have occurred in Town, those events in the Plan are what the Committee chose to list, or were familiar with to list, to comprise the hazard events within the in Tables. The same is true for the **Potential Future Hazards** section.

FLOODS AND FLASHS FLOODS

Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, and/or inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage, and water supply contamination. Floods can also disrupt travel routes on roads and bridges. However, floods can be beneficial to the low lying agricultural areas which are used for active farm lands by enriching the soil.

Floodplains are usually located in lowlands near rivers, and flood on a regular basis. The term *100-year flood* does not mean that a flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase *1% annual chance flood*. This phrase means that there is a 1% chance of a flood of that size happening in any year.

Inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow; however, floods can occur at any time of year. A sudden thaw during the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to drain. Flooding is the most common natural disaster to affect New Hampshire, a common and costly hazard.

There are several types of flooding hazards examined in the **Hazard Risk Assessment**:

- **Floods and Flash Floods**
- **Rapid Snow Pack Melt**
- **Ice Jams**
- **Riverine Fluvial Hazard Flooding, Erosion, Channel Movement**

Magnitude of Flooding

Flooding magnitude, or how bad flooding could get in Pembroke, can be measured by the following scale. "Flooding" encompasses all types of flooding including **Floods and Flash Floods**, **Rapid Snow Pack Melt**, **River Ice Jams** and **Fluvial Hazard Erosion and Channel Movement**.

Table 12

Special Flood Hazard Area (SFHA) Zones on 2010 DFIRMS

Special Flood Hazard Areas on Pembroke DFIRMs	
Zone A	**1% annual chance of flooding** • **100-year** floodplains *without* Base Flood Elevations (BFE)
Zone AE *(with or without floodways)*	**1% annual chance of flooding** • **100-year** floodplains *with* Base Flood Elevations (BFE) • some identified as **floodways** with stream channel and/or adjacent floodplain areas • areas must be kept free of encroachment so 1% annual chance of flood will not substantially increase flood height
Zone X	**0.2% annual chance of flooding** • **500-year** floodplain *without* Base Flood Elevations (BFE) • sheet flow flooding less than 1-foot deep • stream flooding where the contributing drainage area is less than 1 square mile • areas protected from 100-year floodplains by levees • OR areas determined to be outside the 0.2% annual chance of flood (see DFIRMs)

Sources: FEMA and NH Geographically Referenced Analysis and Transfer System (NH GRANIT) websites

Pembroke DFIRMs can be viewed online at and downloaded from the NH Geographically Referenced Analysis and Transfer System (NH GRANIT) website. Alternatively, the DFIRMs' respective paper FEMA 2009 Floodplain Maps in the Town Office could be consulted. Should the **Zone A** or **Zone X** or **Zone AE** flood to either the 100-year or 500-year level, the DFIRM areas will help **measure the location of the floodplain and potential magnitude of the flood.**

Flooding in Pembroke

Pembroke is unique in the Central NH Region because it three active rivers forming the Town's borders with Concord (Soucook River), Allenstown (Suncook River) and Bow (Merrimack River). These large watercourses and numerous individual brooks and ponds in Pembroke contribute to flooding these and other areas in Town:

- Watercourses: Suncook River, Soucook River, Merrimack River, Meetinghouse Brook, Hartford Brook, Pettingill Brook, Ames Brook, French's Brook and several unnamed Brooks.

- Waterbodies: Wildlife Pond (dam). Pembroke does not have any significant ponds of note although some wetlands are present.

Roads in Pembroke are occasionally vulnerable to washouts and floods. A listing of past and future potential road washouts is shown on ***Map 1 Potential Hazards*** and ***Map 2 Past Hazards***. A **Table** of undersized Town-owned culverts to be upgraded to ensure their carrying capacity is located in **5 COMMUNITY VULNERABILITY ASSESSMENT**. Bachelder Road, parallel to the Suncook River, has been subject to many flooding events. The Town has been able to acquire most of the private properties of this road to eliminate the flood risk to life and property. Drainage of roads plays a key role in preventing damages. Some key culvert pipes need to be up-sized to address the increased water, and these are listed as Actions in **8 MITIGATION ACTION PLAN**. The Town has been working with the State and FEMA to upgrade culvert pipes.

Many roads in Pembroke are vulnerable to washouts and floods. The most common road washouts have included and/or may include in the future are these:

- Nadine Road
- Ross Road
- Michol Road
- Pembroke Hill Road
- Cross Country Road
- Buck Street (Evergreen Cemetery)
- Borough Road
- Littlefield Condominiums
- Bachelder Road
- Fourth Range Road

Many of the above culvert replacements have been developed into Actions, but the development of a culvert replacement plan would be beneficial. The most serious debris impacted infrastructure could occur at the Route 3 double-decker bridge.

The meandering Soucook River and Suncook River, along with the wide and high-volume Merrimack River make the Town particularly susceptible to flooding. The following areas have been identified by the Hazard Mitigation Committee as being immediately susceptible to the impacts to **flooding**:

- Bachelder Road
- Suncook Village
- Memorial Field Recreation Area

Special Flood Hazard Areas (SHFAs)

Base Flood Elevations (BFEs) in Pembroke are abundant along the Soucook River, Merrimack River, and Suncook River on the Digital Flood Rate Insurance Maps (DFIRMs) of 2010 (FEMA community **#330119**). Since the community is surrounded by different rivers on three sides and is relatively flat at its southern end, many 100-year and 500-year floodplains, or Special Flood Hazard Areas (SFHAs), are present and drain toward the Merrimack River. The Town of Pembroke has a grand total of **14** DFIRMs, **4** of which do not have flood zones or watercourses. As displayed in **Table 13**, most of these panels have important BFE information that emergency personnel will want to become aware of.

Table 13

Locations of Pembroke Special Flood Hazard Areas (SFHA) on 2010 DFIRMS

Merrimack County Panel NH D33013C	Flood Zones	Base Flood Elevations (BFEs) in Community on Panel In Feet	Water Bodies Indicated in Community	Community Location Pembroke 330119
#0552	A, AE with floodway, X	300, 302, 303, 304, 305, 206, 307, 308, 310, 311, 312, 313, 314	**Soucook River, unnamed brook**	Northernmost jagged area of Town, with the border of the Soucook River forming the boundary with Concord, flowing from the abutting northern Town of Loudon and crossing Interstate 393. Shares eastern boundary with Chichester.
#0553	A, AE with floodway, X	233, 234, 235, 236, 237, 238, 239, 241, 244, 245, 246, 248, 249, 240, 253, 255, 257, 259, 260, 261, 262, 263	**Soucook River, unnamed brooks**	Western border of the Soucook River forming the boundary with Concord. Parallel to NH Route 106 (Concord).
#534	A, AE with floodway, X	242	**Soucook River**	Westernmost meander tip of the border of the Soucook River forming the boundary with Concord. Within the Concord Airport complex.
#0542	AE with floodway, X	220, 224	**Soucook River**	Western meander of the Soucook River forming the boundary with Concord.

Merrimack County Panel NH D33013C	Flood Zones	Base Flood Elevations (BFEs) in Community on Panel In Feet	Water Bodies Indicated in Community	Community Location Pembroke 330119
#0561	AE with floodway, X	203, 203- Merrimack River. 203, 204, 205, 206, 207, 208, 210, 211, 212, 213, 215- Soucook River	**Merrimack River, Soucook River, unnamed brooks**	Western border of the Soucook River forming the boundary with Concord, meeting the Merrimack River forming the southern boundary with Bow.
#0563	AE with floodway, X	200, 200, 201	**Merrimack River, Meetinghouse Brook**	Southwestern side across the Merrimack River from Bow.
#0564	AE with floodway, X	198, 199 - Merrimack River. 200, 201, 205, 213, 237, 239, 262, 269, 284, 286, 288- Suncook River	**Suncook River and Merrimack River**	Southern tip, bounded by Merrimack River to west and Suncook River forms the southern boundary. Suncook Village is covered on this panel.
#0568	AE with floodway, X	289, 291, 293, 294	**Suncook River, Hartford Brook and Pettingill Brook**	Southeastern border formed by the Suncook River.
#0566	AE with floodway, X	294, 295, 299	**Suncook River and Pettingill Brook**	Eastern central section where Pembroke forms the border with Epsom at nearly a right angle. Small meander of Suncook River on southeastern section of panel.
#0567	A, AE with floodway, X	295, 299, 302, 303, 304, 306	**Suncook River, Ames Brook**	Eastern border formed by the Suncook River shared with Allenstown, and eastern boundary forming the Epsom border
#0554	none	none	none	Northern central of the Town. Panel not mapped. Large area with no SFHAs delineated.
#0558	none	none	none	Northeastern boundary of the Town shared with Chichester to the north and Epsom to the east. Panel not mapped. Large area with no SFHAs delineated.
#559	none	none	none	Eastern most point of Pembroke border, very small area of Town, shared boundaries with Epsom and Chichester. Panel not mapped. Tiny area with no SFHAs delineated.
#0562	none	none	none	Center middle of Town. Panel not mapped. Large area with no SFHAs delineated.

Sources: FEMA Digital Flood Insurance Rate Maps, April 2010 hosted by the NH Geographically Referenced Analysis and Transfer System (NH GRANIT) website

Soucook River

The DFIRMs identifying floodplains along the **Soucook River**, sharing the boundary with the City of Concord, from north to south are NH (**D33013C**) **#0551**, **#0552**, **#0553**, **#0534**, **#542** and **#0561** which is also shared with the **Merrimack River**. These **6** DFIRMs include regular Base Flood Elevations BFEs along the Soucook River's entire length of Pembroke's western boundary. From north to south, the BFEs begin at their highest with **314'** at the Loudon boundary down and declines significantly in each DFIRMs' lowest BFEs of **300'** and **233**', **242**', **220**', and **203'** as the **Soucook River** converges with the **Merrimack River**, a total decline of **109**'.

Merrimack River

The DFIRMs identifying floodplains along the **Merrimack River**, sharing the boundary with the Town of Bow, from north to south are NH (D33013C) **#0561**, **#0563**, and **#0564** which is also shared with the **Suncook River**. These **3** DFIRMs include BFEs along the **Merrimack River's** southern boundary with Pembroke. From north to south, the BFEs begin at their highest with **215'** at the **Soucook River** down and declines significantly in each DFIRMs' lowest BFEs of **203'**, **200**' and **198**', a total decline of **17'** when the **Suncook River** converges with the **Merrimack River**.

Suncook River

The DFIRMs identifying floodplains along the **Suncook River**, sharing the boundary with the Town of Allenstown, from north to south are NH (**D33013C**) **#0567**, **#0566**, **#0568**,and **#0564** which is also shared with the **Merrimack River**. These **4** DFIRMs include BFEs along the **Suncook River's** eastern boundary with Pembroke. From north to south, the BFEs begin at their highest with **306'** at the **Suncook River** at the northern Epsom boundary and declines slightly in each DFIRMs' lowest BFEs of **295', 294**', **289**' and a steep **198'**, a total decline of **108'** when the **Suncook River** converges with the **Merrimack River**.

These DFIRMs all display the SHFA **Zone AE** (1% annual risk of flooding) with floodways, SHFA **Zone A** (1% annual risk of flooding) and **Zone X** (0.2% annual risk of flooding) locations. These are highlighted gray in **Table 13**.

Four (**4**) additional DFIRM numbered-only panels cover the area of the Town of Pembroke, **#0554**, **#0558**, **#0559**, and **#0552**. As none of these have floodplains, they have not been mapped and no data is available. They also appear in **Table 13** to complete the SFHA portrait of the community.

Figure 8 displays the relative location of each of the DFIRM panels in the community used in **Table 13**. This set of DFIRMs is excerpted from the *Merrimack County Flood Insurance Study (FIS) of 2010*.

Figure 8

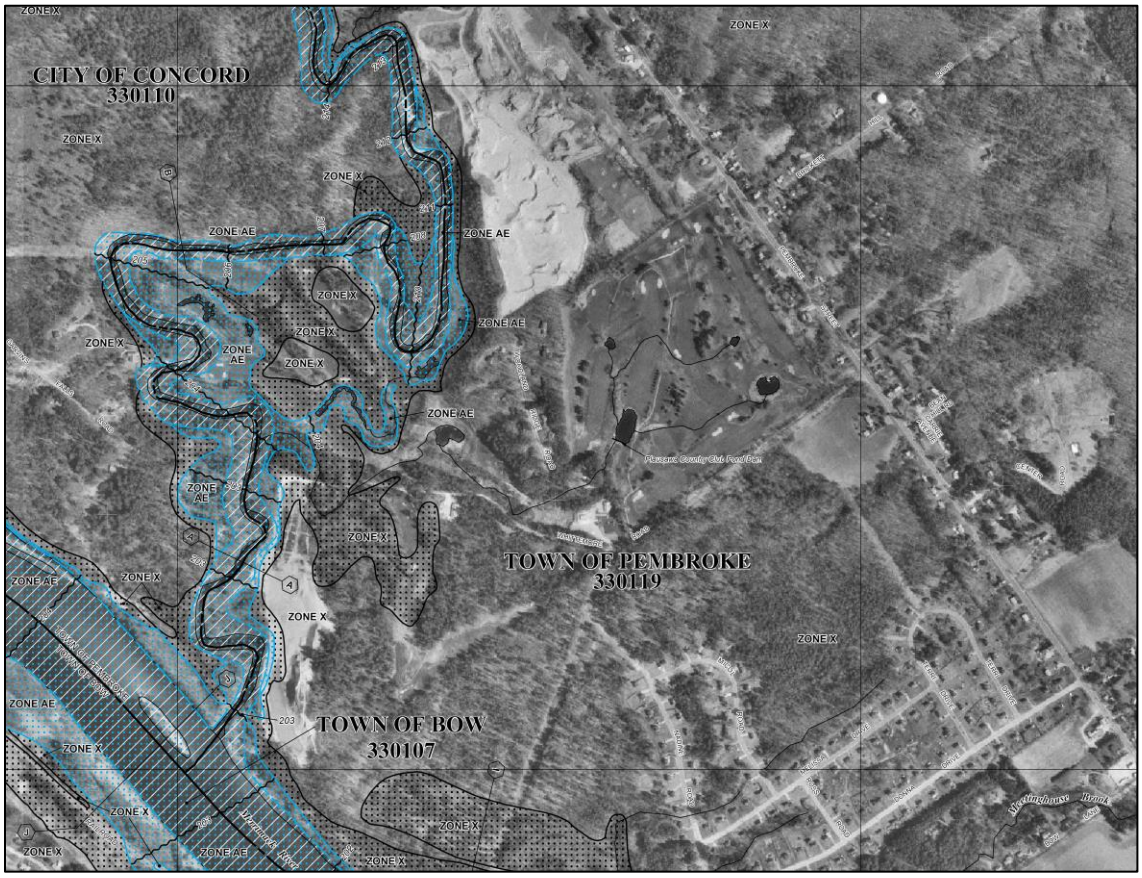
DFIRM Panel Location, 2010

Source: Pembroke DFIRMS can be downloaded at http://www.granit.nh.edu/dfirms/, last accessed 03-18-16

Figure 9 displays an example of a zoomed-in DFIRM view of the area where the Soucook River converges with the Merrimack River to illustrate the DFIRM appearance, a significant upgrade from the previous series of paper maps. The maps are now set on an aerial photography background that displays roads, buildings and forested areas.

Figure 9

Zoom View of Pembroke DFIRM Panel Location #0561



Source: FEMA DFIRMS 2010 for Pembroke NH, Panel #0561

Suncook River Profile

The Suncook River is a tributary of the Merrimack River. The Suncook flows from the Crystal Lake, Upper and Lower Suncook Lakes in Barnstead south through Gilmanton, Pittsfield, Chichester, Epsom, forms the boundary between Allenstown and Pembroke, into the Merrimack River.

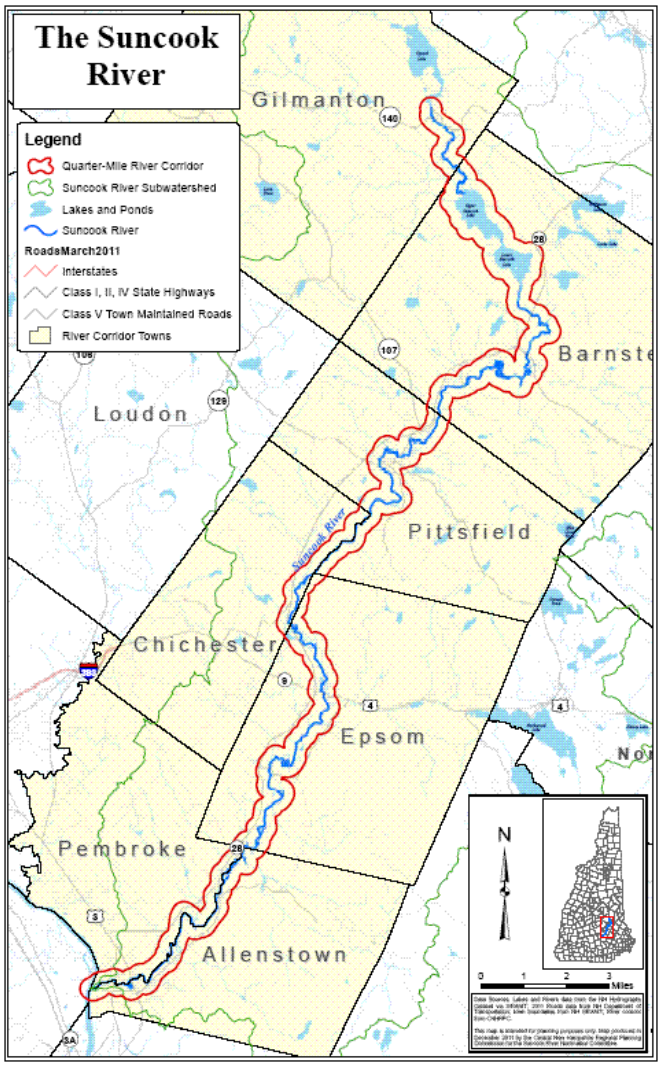
According to the ***USGS Flood Study of the Suncook River in Epsom, Pembroke, and Pembroke, New Hampshire 2009***, the Suncook River is 30 miles long. No major flood control structures are found on the river. The Pittsfield Mill Dam in Pittsfield is standard, and the Webster, Allenstown, and China Mill Dams in Suncook Village are used for hydro-electric power generation. Seven (7.0) miles of the river is located in Pembroke.

Two stream gages are located on Suncook River for local officials and many others to monitor the river heights and to predict floods. The older North Chichester gage in Chichester is tied into the National Weather Service and the US Geological Survey (USGS) and is used for peak flow and height prediction models and real-time data. Much historical river data is available from this gage. The new Allenstown

Route 28 gage installed in July 2011 is monitored by the USGS and specifically by Allenstown emergency management to monitor the real-time river height of the Suncook River flowing through the two towns. A static height gage is placed on the Allenstown/Pembroke Route 28 bridge for on-site monitoring. Both stream gages are available on the internet for anyone to view real-time data.

Figure 10 displays the Suncook River Watershed and the River's relationship to communities both upstream of Pembroke and in relation to the Town's other two rivers, the Soucook and Merrimack.

Figure 10
Suncook River Watershed



Source: Central NH Regional Planning Commission 2010

From the *USGS Analysis of the Transport of Sediment by the Suncook River in Epsom, Pembroke, and Allenstown, New Hampshire* after the May 2006 Flood and other sources, on May 15, 2006, an extreme rain event resulted in state-wide flooding. A 25- to 50-year flood impacted the Suncook River, causing the river to breach its banks and change its course (called an avulsion) in Epsom near the Huckins Mill Dam, upstream of Bear Island. Prior to the avulsion, the Suncook River had split into two channels at the Dam, a main west channel and a smaller secondary east channel. The avulsion caused the river to flow through "Cutter's Pit", a gravel excavation site to the northeast of Bear Island, before rejoining a section of the secondary channel. Nearly two miles of former Suncook River channel was abandoned, including most of the primary channel that had formed Bear Island.

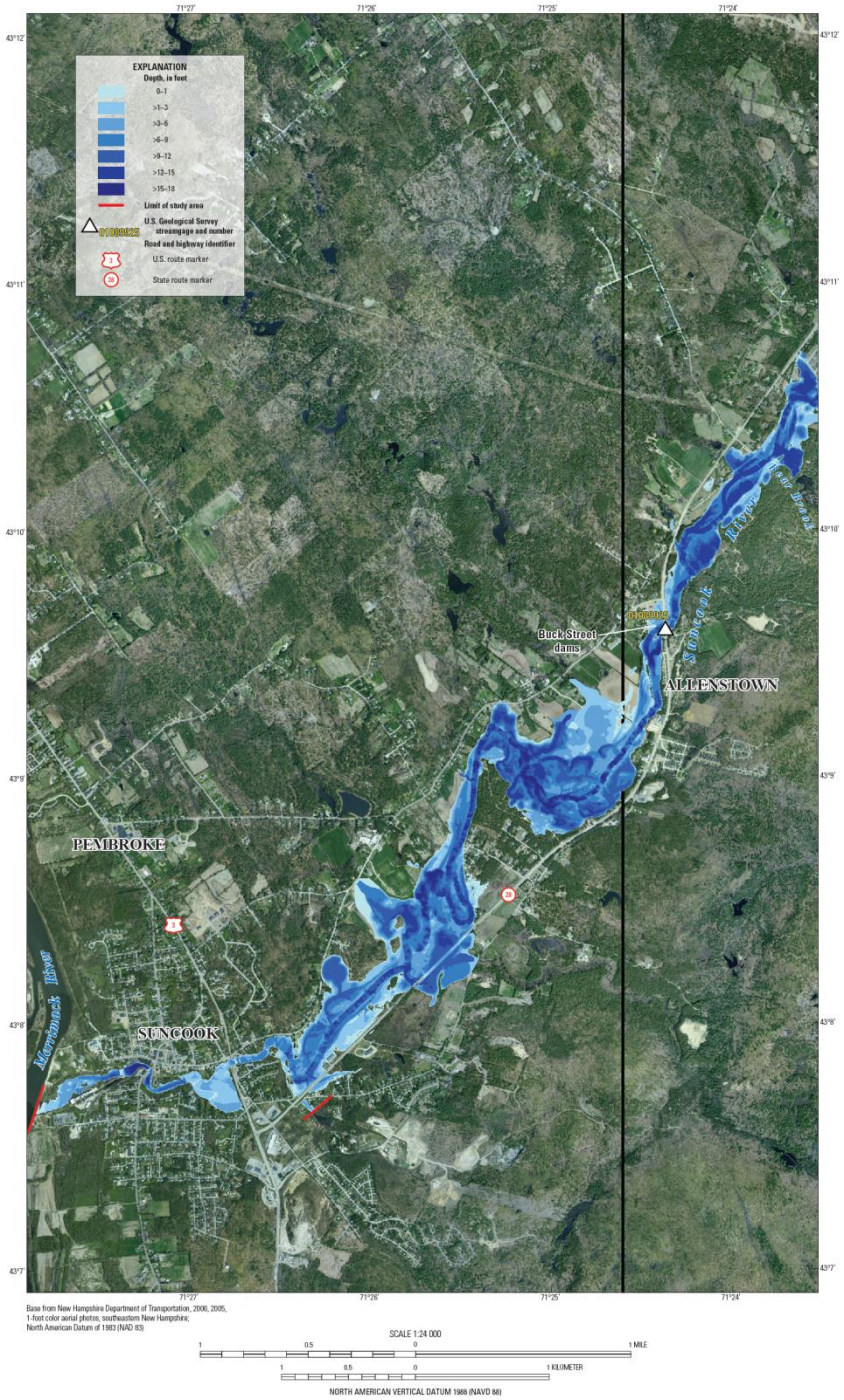
The ***USGS Flood Study 2009*** states the floodplains have shifted as a result of the avulsion and developed a new floodplain map layer which is used in the **Hazard Mitigation Plan**'s Maps. The *USGS Analysis of the Transport of Sediment by the Suncook River in Epsom, Allenstown, and Pembroke, New Hampshire after the May 2006 Flood* models about 100 to 400 tons of sediment per day moving past the Short Falls Road Bridge from Cutter's Pit through Pembroke and into the Merrimack River. Changes in streambed and surface-water elevations are results of this sediment carried downriver from the 2006 avulsion.

The *2015 Fluvial Geomorphic Assessment (FGA) Addendums to the Hazard Mitigation Plan for the Soucook River and the Suncook River* contain a wealth of information about features contained along those rivers. A series of detailed FGA maps is located in the **Hazard Mitigation Plan**. The Addendums are located in **APPENDIX E** and **APPENDIX F**.

The *USGS Flood Inundation Maps for the Suncook River in Epsom, Pembroke, Pembroke, and Chichester, NH 2012* was developed as a result of the intensive flooding in 2006, 2007, 2010, and the 2006 avulsion. Based on the North Chichester stream gage height, the surface water elevation for the **1%** annual exceedance probabilities (**100**-year floodplain) is **15.34** feet. **Figure 11** illustrates the impact of **15.0** feet of water inundation.

Figure 11

15 Feet Inundation Area of the Suncook River (100-Year Flood)

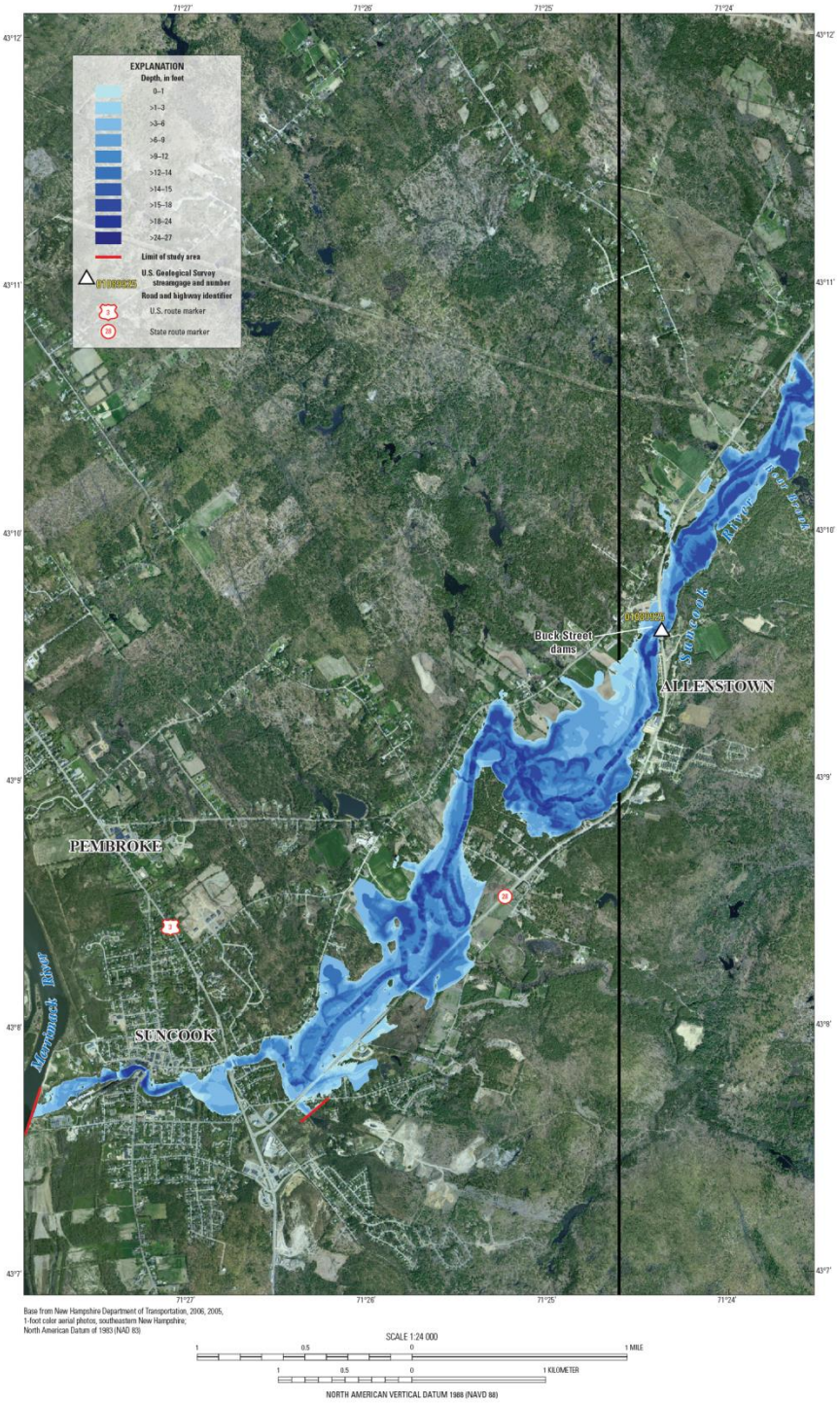


*Source for **Figure 11** and **Figure 12**: USGS Flood Inundation Map at North Chichester Stream Gage, 2012; http://pubs.usgs.gov/sim/3196/*

The surface water elevation for the **0.2%** annual exceedance probabilities (**500**-year floodplain) is **18.0** feet. **Figure 12** illustrates the impact of **18.0** feet of water inundation.

Figure 12

18 Feet Inundation Area of the Suncook River (500-Year Flood)



Rapid Snow Pack Melt

Warm temperatures and heavy rains cause rapid snowmelt. The water cannot seep into the frozen ground in early spring and so it runs off into streets and waterways. Quickly melting snow coupled with moderate to heavy rains are prime conditions for flooding.

There is the possibility of damages from the rapid snow pack melt because of the flooding from the Suncook River and the various streams along the roads, and from the culverts of the various brooks. Locations in Pembroke that may be vulnerable to rapid snow pack melt include undersized or unmaintained culverts, roads, driveways, slopes, yards or fields, or swollen brooks, or any of the Town's fast moving brooks or ditches. Damage to roads is expected.

Magnitude of Rapid Snow Pack Melt

Rapid snow pack melt is a type of flooding. On its own, it has no known magnitude measurement. However, the hazard can share **Flooding's** Special Flood Hazard Areas (SFHAs) table.

Rapid Snow Pack Melt in Pembroke

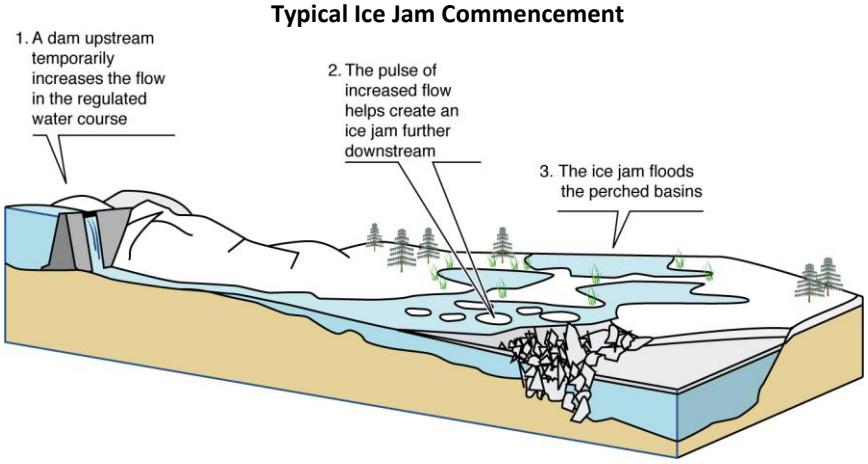
Melt runoff from impervious surfaces and roadways or from tree cover and fields can cause floods over the Entire Town. Road washouts and/or culvert failure locations include: Nadine Road, Ross Road, Michol Road, Pembroke Hill Road, Cross Country Road, Buck Street (Evergreen Cemetery), Borough Road, Littlefield Condominiums, Bachelder Road, Fourth Range Road, North Pembroke Road (Silva), Bachelder Road and Church Road. In these vulnerable areas, the roads may be washed away, preventing traffic from passing. All areas of town could be susceptible to rapid snow pack melt. Based on past flooding events, flooding damage could also occur on Buck Street, Glass Street, Front Street, and Soucook Lane. Specific areas include the Memorial Field, Soucook and Suncook Rivers, and manufactured home parks and waterfront campgrounds on the rivers. Floodplains could become inundated and evacuations might be necessary.

River Ice Jams

Rising waters in early spring often break ice into chunks, which float downstream, pile up and cause flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures presents significant flooding threats to bridges, roads, and the surrounding lands. A visual of how ice jams often form is displayed in **Figure 13**.

Figure 13

Typical Ice Jam Commencement



Source: USGS, Internet Accessed May 2014

Magnitude of River Ice Jams

There is no known widely-used magnitude scale for **river ice jams**. River ice jams can cause debris impacted infrastructure when they apply pressure to bridges and dams.

River Ice Jams in Pembroke

Ice jams have been known to have occurred in the past along the Suncook River. The Soucook and Merrimack Rivers and the larger brooks, such as Meetinghouse Brook and Pettingill Brook, have flow volumes which could have potential ice formation and movement during high water levels in spring and during severe rain fall events after a deep winter freeze. **River ice jams** may have future potential to occur on the Suncook River at Upper Turnpike Street at the double-decker bridge, which is an area of concern. Other bridges and dams as identified in **APPENDIX A Critical and Community Facility Vulnerability Assessment** have the potential for river ice jam damage.

Riverine Fluvial Erosion, Bed Scouring and Channel Movement

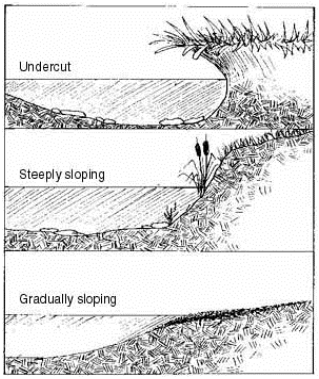
Fluvial erosion is the wearing away of the river/stream bank and floodway. Bed scouring is the wearing away of the bed of the river or stream, typically shown as a pool type formation at downstream culvert outflows. Watercourses with high elevation change (stream gradient) are particularly prone to flash-flooding conditions and most vulnerable to erosion and scouring. During flooding or even high flow events, rivers can erode their banks and migrate into their floodplains. A migrating river, when channel movement is occurring, has the potential to impact nearby structures (berms, dams, buildings, etc.) or infrastructure such as river or stream crossings (culverts and bridges) or transportation features (roads, drainage structures, rail, etc.) in its migration path.

Fluvial geomorphology is the study of how processes of flowing water in rivers work to shape river channels and the land around them. Fluvial assessments are a collection of field data undertaken within

designated river reaches. A **river reach** is a length of stream that has characteristics similar enough that condition data collected within that length is representative of the entire reach.

Figure 14 displays visual bank erosion characteristics.

Figure 14
Bank Erosion Characteristics

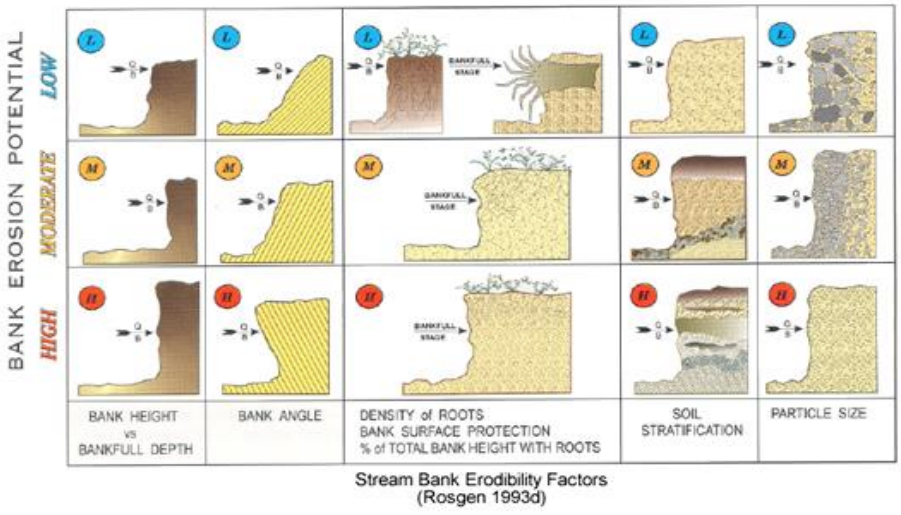


Source: US Geological Survey (USGS)

Magnitude of (Fluvial) River Bank Erosion

River and streambank erosion magnitude can be measured by the US EPA Bank Erosion Prediction Index (BEHI), which is used with the Near Bank Stress (NBS) quantification. Taken into consideration for the BEHI are the bank height versus bankfull depth, bank angle, density of roots, soil stratification, and particle size at a river reach. Figure 15 displays the visual version of the index.

Figure 15
Bank Erosion Prediction Index (BEHI)



Source: US Environmental Protection Agency (US EPA)

Riverine Fluvial Erosion, Bed Scouring and Channel Movement in Pembroke

To identify areas of river and stream erosion that could impact public health and safety in the Suncook River watershed, the New Hampshire Geological Survey (NHGS) at the NH Department of Environmental Services (NHDES) coordinated a **fluvial geomorphology assessment** (FGA) conducted by Field Geology Services who collected field data along the Suncook River in 2013. The lower river assessment covered river reaches in Pembroke/Allenstown and Epsom. North of Chichester and Pittsfield on the river, Barnstead's section of the Suncook was also assessed. There were six (**6**) river reaches along the **Suncook River** in Pembroke, however four (**4**) of the reaches were assessed due to inability to assess ponding features. These **4** reaches totaling **6.5** river miles are the focus of the FGA discussion.

The **Suncook River** data features collected during the fluvial geomorphology assessment are displayed on series ***Maps 5A***, ***5B***, **and** ***5C Fluvial Geomorphic Features***, ***Maps 6A***, ***6B***, **and** ***6C Fluvial Erosion Hazard Meander Belts***, **and** ***Maps 7A***, ***7B***, **and** ***7C Large Woody Material Density***. With this information in the **Hazard Mitigation Plan 2017**, the Town has an opportunity to consider areas of identified potential flooding and erosion risk in future planning efforts. River assessments data can also be utilized to develop fluvial erosion hazard maps. If a community elected to do so, they could use the maps to pursue development limitations through the zoning ordinance amendment process to protect infrastructure and people. The FGA findings and descriptions are discussed in detail in the **Suncook River Addendum** in **APPENDIX E**.

The **Soucook River** data features collected during its assessment are similar in nature to those collected on the Suncook River. Features are displayed on series ***Maps 8A***, ***8B***, *and* ***8C Fluvial Geomorphic Features and series Maps 9A***, ***9B***, *and* ***9C 6C Fluvial Erosion Hazard Meander Belts***. The FGA findings and descriptions are discussed in detail in the **Soucook River Addendum** in **APPENDIX F**.

Erosion along the Soucook River or Suncook could occur at many locations along its banks. The FGA developed projected meander belt locations along key sections of both rivers, some of which have a High or Very High sensitivity to future channel movement. The Town should remain alert for continually eroding sites, using these maps as a basis. Although most of the activity on both rivers appears to be occurring on the Allenstown side of the Suncook River or the Concord side of the Soucook River, **erosion**, **scouring** and **channel movement** may be presently occurring in Pembroke. Depending on the nature of the problem and any coinciding natural disasters such as flooding, homes and businesses may need to be evacuated and/or relocated, particularly in Suncook Village.

The Hazard Mitigation Committee identified the following as existing known locations of minor **fluvial erosion and scouring**:

- **Memorial Field Recreational Area and Access Road (Merrimack River)**
- **Areas denoted on the 2015 Suncook River and Soucook fluvial geomorphic maps**

WIND HAZARDS

Hurricane season begins on June 1 and continues through the end of November. August and September are the most active hurricane months. It is not uncommon for New England to be impacted by a hurricane more than once in a season. River and flooding due to heavy rains is a risk to Pembroke during hurricanes. Numerous hurricane events in recent history have occurred in the State, region, and the local area surrounding Pembroke that may have also had an impact on the Town.

Wind is also found in severe winter snow and ice storms, making this hazard likely to occur during the entire year. Significantly high winds occur especially during hurricanes, tornadoes, winter storms, and thunderstorms any time of the year. Falling objects and downed power lines are dangerous risks associated with high winds. Property damage and downed trees are common during high wind occurrences.

All utilities, including power lines, are at risk and their damage or destruction would create a hazard to the Town. A communications interruption or failure resulting from damage to telecommunications towers could affect the capabilities of emergency personnel to respond to the hazard event.

There are several types of wind hazards examined in the **Hazard Risk Assessment**:

- **Tornadoes**
- **Downbursts**
- **Hurricanes and Tropical Storms**
- **Severe Wind, Rain Storms and Thunderstorms**

Tornadoes

Significantly high winds that occur especially during hurricanes, winter storms, and thunderstorms, but can also exist independent of other storms. Falling objects and downed power lines are dangerous risks associated with high winds. In addition, property damage and downed trees are common during high wind occurrences.

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

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one-mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

Magnitude of Tornadoes

A tornado occurring in Pembroke would cause considerable damage. Roofs could be torn off frame houses; dams could be damaged; large trees snapped or uprooted; and light object missiles would be generated as a result of an EF-2 Tornado. Tornado magnitude is measured by the Enhanced Fujita (EF) Scale, a 2007 update from the original F-scale (Fujita Scale), which are provided in **Table 14**.

Table 14

Enhanced Fujita (EF) Scale

Enhanced Fujita (EF) Scale 2007 – Present	**Fujita (F) Scale *replaced***
F Number with 3-Second Gust mph	**F Number with 3-Second Gust mph**
EF0 65-85 mph	**F0** 45-78 mph
EF1 86-110 mph	**F1** 79-117 mph
EF2 111-135 mph	**F2** 118-161 mph
EF3 136-165 mph	**F3** 162-209 mph
EF4 166-200 mph	**F4** 210-261 mph
EF5 over 200 mph	**F5** 262-317 mph

Source: National Oceanic and Atmospheric Administration (NOAA) Storm Prediction Center

Tornadoes in Pembroke

Although none have yet been reported, the whole Town could be impacted by a **tornado**. Populated areas include the Suncook Village area and manufactured housing communities or vulnerable populations such as the Pembroke Schools, the age 55+ and assisted living facilities and more (see **APPENDIX A Critical and Community Facility Vulnerability Assessment** for a list of sites). The heavily forest North Pembroke and the Range Roads run a risk of isolation through debris impacted infrastructure (trees down on roads and powerlines) resulting in power failure with little emergency access until the way is cleared. A tornado occurring in Pembroke would cause considerable damage. Roofs could be torn off frame houses; manufactured homes demolished; large trees snapped or uprooted; vehicles crushed by trees; and light object missiles would be generated as a result of an EF-2 Tornado.

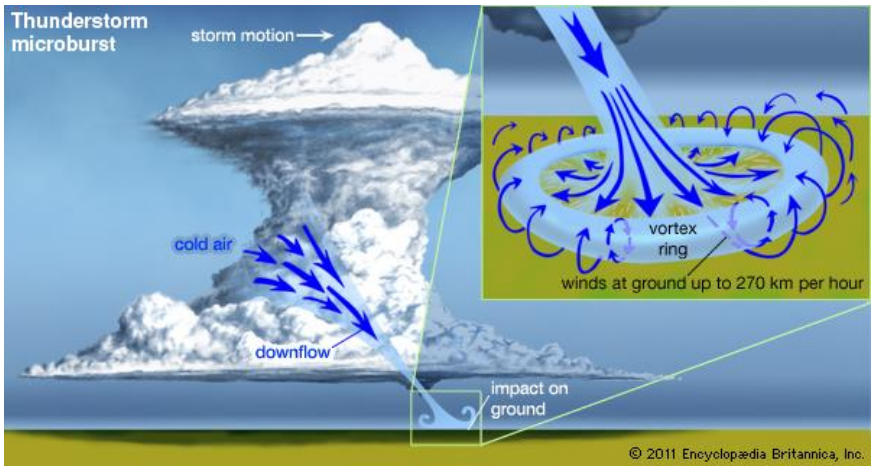
Downbursts

A downburst is a severe localized wind blasting down from a thunderstorm. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris. Downbursts are capable of producing winds of up to 175 mph and are life threatening. Downbursts are quite common during Central NH's hot weather months. Microbursts and macrobursts (wet) have been known to occur here in the region.

Downbursts of both sizes are capable of producing strong wind shear - or large changes in wind speed and direction over a short distance. Trees are regularly snapped off in a singular direction as a result of a macroburst or microburst. Downbursts typically originate from thunderstorm clouds, with air moving in a downward motion until it hits the ground level and then spreads outward in all directions. In fact, the wind pattern of a downburst is the opposite of a tornado's wind pattern, shown in **Figure 16**.

Figure 16

Microburst Forming from Thunderstorm Clouds



Source: Internet (Encyclopedia Brittanica)

Magnitude of Downbursts

Downburst magnitude is rated on the same NOAA Enhanced Fujita (EF) scale as tornadoes. In addition, downbursts fall into two categories:

- microburst, which covers an area less than 2.5 miles in diameter and
- macroburst, which covers an area equal to or greater than 2.5 miles in diameter.

Downbursts in Pembroke

Downbursts are considered a greater threat than tornadoes in Pembroke although none have yet been reported in Town. Populated areas include the Suncook Village area and manufactured housing communities or vulnerable populations such as the Pembroke Schools, the age 55+ and assisted living facilities and more. The heavily forest North Pembroke and the Range Roads run a risk of isolation through debris impacted infrastructure (trees down on roads and powerlines) resulting in power failure

with little emergency access until the way is cleared. Their effects can be similar but in a more targeted area. Historic resources and exposed, taller buildings, communications towers, and utilities could also be affected.

Hurricanes and Tropical Storms

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. Flooding is often caused from the coastal storm surge of the ocean and torrential rains, both of which accompany the storm. The floods and high winds can result in loss of life and property. Hurricanes, high wind and rain events, and thunderstorms can damage Pembroke just like any other community in Central New Hampshire. Forested lands and trees along the transportation infrastructure can be blown down across roads; the above-ground powerlines along the sides of the road can be snapped either by trees or high winds and fall onto the roads or nearby objects; and runoff flooding and stream/brook and river flooding can occur as a result of hurricanes and severe storms.

Magnitude of Hurricanes and Tropical Storms

The Saffir-Simpson Hurricane Wind Scale **measures the magnitude of wind event** on a 1 through 5 rating basis. The definitions of Category 1 through 5 sustained wind miles per hour and their respective threats to people, different types of homes, shopping centers, trees, power lines, water, and more are displayed in **Table 15**.

Table 15

Saffir-Simpson Hurricane Wind Scale

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

Source: National Oceanic and Atmospheric Administration (NOAA

Hurricanes and Tropical Storms in Pembroke

Pembroke has experienced all of the **hurricanes and tropical storms** to have been presidentially declared disaster or emergency declarations, including Tropical Storm Irene (2011) and Hurricane Sandy (2012) and those prior to the 2000s. These high wind and rain events caused many roads to temporarily close while the Public Works Department cleared them of debris. Trees and limbs fell onto the roadways and onto powerlines. If vehicles had been traveling on these roads while the hurricane was in progress, they would have been in danger. See **Power Failure** section for an example of damages.

When **hurricanes or tropical storms** occur in Pembroke, the entire Town's electrical utilities of Eversource (formerly Public Service of NH or PSNH), NH Electric Coop and Unitil will continue to be prone to power outages. The response time to these outages could be several days in the more remote or densely populated areas of Town, depending on where debris has fallen onto roads. Areas particularly vulnerable to the combination of **flooding**, **wind**, **tree debris** and **power failure** include the heavily forested areas such as the North Pembroke or Range Roads areas. Radio operability for emergency communications could be adversely affected. Land line utilities are at risk of failure during severe storm weather.

Severe Wind, Rainstorms and Thunder Storms

More commonly experienced are severe wind storms, rainstorms and thunder storms. The severe wind storms occur during all months of the year while the thunder storms tend to erupt during periods of humidity. On occasion, precipitation in the form of rain or hail is experienced during these storms. Rainstorms bring can flooding and high winds. Thunderstorms can also bring lightning hazards in addition to high winds and flooding.

Magnitude of Severe Wind and Thunder Storms

Many of the severe wind storms Pembroke experiences are not hurricanes but are severe wind storms or thunderstorms. Thunderstorms are common in New Hampshire, particularly during the hot weather months. The Thunderstorm Category Criteria scale in **Table 16** measures the magnitude of thunderstorms with their various weather components, including rain, wind, hail, tornado, and lightning.

Table 16

Thunderstorm Criteria Scale

Thunderstorm Categories	Rainfall Inches per hour	Wind Gust max mph	Hail Size in	Tornado Potential Highest Category	Lightning Frequency per 5 minutes	Darkness Aspect	Overall Thunderstorm Impact
T-1 **Weak Thunderstorms** or **Thundershowers**	0.03" to 0.10"	< 25 mph	None	None	Few strikes during entire storm	**Slightly Dark** Sunlight may be seen after storm	1. No damage. 2. Gusty winds at times.
T-2 **Moderate Thunderstorms**	0.10" to 0.25"	25-40 mph	None	None	Occasional 1 to 10	**Moderately Dark** Heavy downpours might cause the need for car headlights	1. Heavy downpours. 2. Occasional lightning. 3. Gusty winds. 4. Very little damage. 5. Small tree branches might break. 6. Lawn furniture moved around. 7. Power outages are possible.
T-3 **Heavy Thunderstorms** 1. Singular or lines of storms	0.25" to 0.55"	40-57 mph	1/4" to 3/4"	EF0	Occasional to Frequent 10 to 20	**Dark** Car headlights used. Visibility low in heavy rains. Cars might pull off the road.	1. Minor damage. 2. Downpours produce some flooding on streets. 3. Frequent lightning could cause house fires. 4. Hail occurs with the downpours. 5. Small tree branches are broken. 6. Shingles are blown off roofs. 7. Power outages are likely.
T-4 **Intense Thunderstorms** 1.weaker supercells 2. Bow echoes or lines of storms	0.55" to 1.25"	58-70 mph	1" to 1.5"	EF0 to EF2	Frequent 20 to 30	**Very Dark** Car headlights used. Some streetlights come on.	1. Moderate damage. 2. Heavy rains can cause flooding to streams and roadway flooding occurs. 3. Hail can cause dents on cars and cause crop damage. 4. Tornado damage. 5. Power outages will occur.
T-5 **Extreme Thunderstorms** 1. Supercells with family of tornadoes 2. Derecho Windstorms	1.25" to 4"	> 70 mph	1.5" to 4"	EF3 to EF5	Frequent to Continuous > 30	**Pitch Black** Street lights come on. House lights might be used.	1. Severe damage to trees and property. Damage is widespread. 2. Flooding rains. 3. Damaging hail. 4. Damaging wind gusts to trees and buildings. 5. Tornadoes EF3 to EF5 or family of tornadoes can occur. Tornadoes cause total devastation. 6. Widespread power outages.

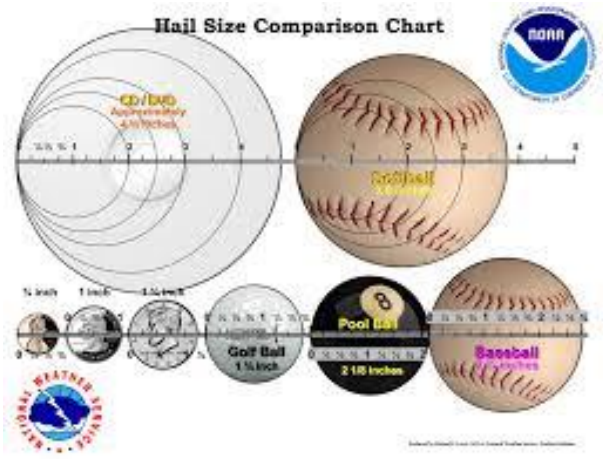
Source: Adapted from Accuweather.com, Henry Margusity, Senior Meteorologist

Incidentally, hail can accompany thunderstorms, hurricanes, or severe wind events. The Hail Size Description Chart describes the potential size of hail during a hurricane or severe storm event, which could occur anywhere in Pembroke. The chart is shown below along with a Hail Size Comparison Chart which is a visual representation of some of the relative sizes of hail (note this chart image is not shown to scale). The **Table 17** hail size description and **Figure 17** size comparison scales measure the magnitude of hailstones that could fall on Pembroke during severe storm events.

Table 17
Hail Size Description

Hailstone Diameter (inches)	Size Description
< 1/4	bb
1/4	**Pea Size**
1/2	Mothball Size
3/4	Penny Size
7/8	Nickel Size
Severe Criteria 1	**Quarter Size**
1 1/4	Half Dollar Size
1 1/2	Walnut or Ping Pong Ball
1 3/4	Golf Ball Size
2	**Hen Egg Size**
2 1/2	Tennis Ball Size
2 3/4	Baseball Size
3	**Teacup Size**
3 4/5	Softball Size
4	**Grapefruit Size**

Figure 17
Hail Size Comparison



Sources: National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS)

Severe Wind, Rainstorms and Thunder Storms in Pembroke

All of Pembroke has experienced **severe wind**, **rainstorms**, and **thunderstorms**. The entire Town's electrical utilities of Eversource (formerly Public Service of NH or PSNH), NH Electric Coop and Unitil will continue to be prone to power outages. The response time to these outages could be several days in the more remote or densely populated areas of Town, depending on where debris has fallen onto roads. Areas particularly vulnerable to the combination of **flooding**, **wind**, **tree debris** and **power failure** include the heavily forested areas such as the North Pembroke or Range Roads areas. Communications failure is likely to be experienced depending on where the event occurred in the community.

FIRE HAZARDS

Fire can be caused by a number of agents and can spread rapidly to consume property and endanger lives. This **2017 Plan** examines **lightning**, and **wildfire** (natural) fire sources and places other **fires (vehicles, structure, arson, explosions**) with **Technological Hazards**.

Wildfire is a significant concern and can quickly get out of control without good infrastructure and procedures. Lightning can cause fire or wildfire. Locations of older narrow graveled roads (Range Roads) or densely packed residential areas (Suncook Village, cul-de-sac neighborhoods) are among the most vulnerable locations for fire and wildfire hazards. Rural, forested areas of the community or recreation and conservation areas are often the most vulnerable to both wildfire and lightning.

There are two types of natural fire hazards examined in the **Hazard Risk Assessment**:

- **Lightning**
- **Wildfire**

Lightning

All thunderstorms contain lightning. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, a shock wave that can damage building walls and break glass. Lightning strikes can cause death, injury, and property damage. Lightning is often referred to as the "underrated killer".

Magnitude of Lightning

Lightning can be measured to determine how likely it may be for starting fires. Using a Level system of **1** to **6** corresponding with storm development and the number of lightning strikes, the Lightning Activity Level (LAL) measures the magnitude of lightning strikes as displayed in **Table 18**.

Table 18

Lightning Activity Level (LAL)

Level	LAL Cloud and Storm Development	Cloud to Ground Strikes per 5 Minutes	Cloud to Ground Strikes per 15 Minutes
LAL 1	No thunderstorms	n/a	n/a
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a 5- minute period.	1 to 5	1 to 8
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5-minute period.	6 to 10	9 to 15
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5-minute period.	11 to 15	16 to 25
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5-minute period.	> 15	> 25
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.	6 to 10	9 to 15

Source: National Weather Service

Lightning in Pembroke

Lightning regularly strikes in Town, including at the Town Hall and Safety Building. Specific sites which would cause the greatest impact if struck by **lightning** include the Town Buildings, electrical utilities, generators, transformers, the Allenstown Wastewater Treatment Facility which serves Pembroke and telecommunication towers. The heavily forested North Pembroke, Range Roads, conservation areas and Town recreation areas are remote and difficult to access by emergency vehicles as are the older, narrow gravel roads.

Wildfire

Wildfire is defined as any unwanted and unplanned fire burning in forest, shrub or grass. Wildfires are frequently referred to as forest fires, shrub fires or grass fires, depending on their location. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. The threat of wildfires is greatest where vegetation patterns have been altered by past land-use practices, fire suppression and fire exclusion. Because fire is a natural process, fire suppression can lead to more severe wildfires due to vegetation buildup.

Increased severity over recent years has decreased capability to extinguish wildfires. Wildfires are unpredictable and usually destructive, causing both personal property damage and damage to community infrastructure and cultural and economic resources.

Magnitude of Wildfire

The standard of measuring wildfire magnitude is by the National Wildfire Coordinating Group (NWCG)'s wildfire classification scale. **Table 19** displays the wildfire classification size according to the number of acres burned.

Table 19

National Wildfire Coordinating Group Wildfire Classification Scale

Fire Class	Sizes in Acres
Class A	1/4 acre or less
Class B	> 1/4 acre to < 10 acres
Class C	10 acres to < 100 acres
Class D	100 acres to < 300 acres
Class E	300 acres to < 1,000 acres
Class F	1,000 acres to < 5,000 acres
Class G	5,000 acres or more

Source: National Wildfire Coordinating Group

Wildfire in Pembroke

Although **wildfire** damage has been kept to a minimum to date, the potential for losing an immense acreage of Pembroke to this natural hazard is possible, particularly with the severe drought conditions currently occurring. The heavily forested North Pembroke area, the Range Roads, conservation areas and Town recreation areas are remote and difficult to access by emergency vehicles. Densely packed residential neighborhoods and recreational fields abut forested lands. Any **debris** left over from **flooding**, **winter storms**, or **wind events** are a **wildfire hazard**. When **droughts** or drier conditions occur, the dry vegetation becomes a significant hazard to the Town Fire Department.

EXTREME TEMPERATURE (COLD-HOT) HAZARDS

Extreme temperature hazards include diverse hazards such as severe cold and snowstorms, excessive heat, drought, and public health. The snow and ice component often results in communications & power failure for a large segment of the Town. This category is meant to encompass all of the hazards which can be influenced by the extreme weather temperatures and climate changes that New England, New Hampshire, the Central NH Region, and Pembroke are experiencing.

There are several types of extreme temperature (cold-hot) hazards examined in the **Hazard Risk Assessment**:

- **Severe Winter Weather, Cold, and Ice Storms**
- **Drought**
- **Excessive Heat**
- **Public Health (Epidemics)**

National Weather Service in Gray, Maine which covers New Hampshire collects and reports climate data in addition to issuing warning and advisories. Winter 2015-2016 was the warmest and one of the least snowy on record in Concord, their most local reporting station. The average temperature this season since 1868 was **30.9** degrees, topping the previous record of **30.4** degrees in the season of 1879-1880. Precipitation was **2.01** inches above normal this winter, totaling **10.53** inches. Total snowfall was **24.7** inches, **20.2** inches below normal. Warmest temperature records were also set during 2015.

Severe Winter Weather, Cold, and Ice Storms

Ice and snow events typically occur during the winter months and can cause loss of life, property damage, and tree damage. Severe winter storms, including Nor'easters, typically occur during January and February. However, winter storms can occur from late September through late May.

A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding, wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

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

A Nor'easter is a large weather system traveling from South to North, passing along or near the seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas from a Northeasterly direction. In the winter months, oftentimes blizzard conditions accompany these events. The added impact of the masses of snow and/or ice upon infrastructure often affects transportation and the delivery of goods and services for extended periods.

Extreme cold temperatures are associated with continental Arctic air masses. The actual temperatures reached depend specifically on the nature of the cold air mass and where it originated. In general, those from the Arctic regions are the coldest. Though cold temperatures are dangerous in their own right, they become more so in conjunction with strong winds. The combination produces a wind-chill factor – heat loss measured in Watts per meter squared (Wm-2). A wind-chill factor of 1400 Wm-2 is equivalent to a temperature of -40 degrees F. At 2700 Wm-2, exposed flesh freezes within a half-minute.

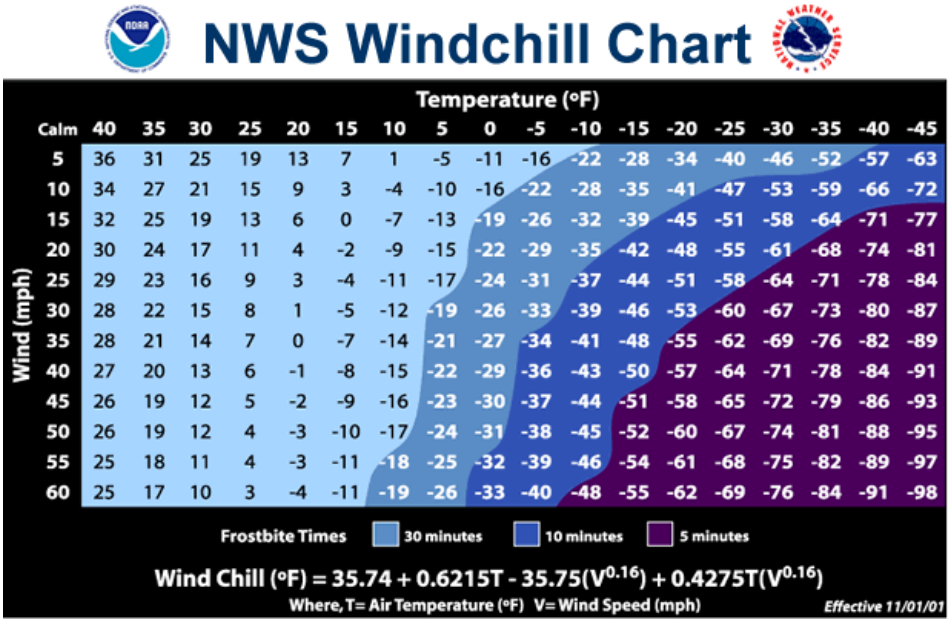
Numerous severe winter events in recent history have occurred in the State, region, and the local area surrounding Pembroke that may have also had an impact on the Town. Unlike the relatively infrequent hurricane, New Hampshire generally experiences at least one or two Nor'easters each year with varying degrees of severity. These storms have the potential to inflict more damage than many hurricanes because the high storm surge and high winds can last from 12 hours to 3 days, while the duration of hurricanes ranges from 6 to 12 hours.

All winter storms make walking and driving extremely dangerous. The elderly and very young are at high risk during winter storms and may be affected by hypothermia and isolation. During winter storms, there is an increased risk of **fire** because people experience **power failure** and use candles, portable gas stoves, and other flammable sources of heat and light.

Magnitude of Severe Winter Weather

Severe Winter Weather magnitude in can be measured for windchill, ice accumulation and snowfall using several different scales and indices including the NWS Windchill Chart, Sperry-Piltz Ice Accumulation Index (SPIA) and NCDC Regional Snowfall Index (RSI) for the Northeast. **Figure 18** displays the Windchill Temperature Index which measures the wind and temperature leading to how quickly frostbite can occur.

Figure 18
Windchill Temperature Index



Source: National Weather Service

Table 20 displays the Sperry-Piltz Ice Accumulation Index (SPIA) which measure the magnitude of ice damage from severe winter weather. The index is compared to the tornado and hurricane scales note above. Storm total rainfall converted to ice accumulation, wind, and temperatures during the storm period are used to develop SPIA.

Table 20

Sperry-Piltz Ice Accumulation Index (SPIA)

Ice Damage Index	Average NWS Ice Amount *in Inches*	Wind Speed *mph*	Ice Damage and Impact Descriptions
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems. No alerts or advisories needed for crews, few outages.
1	0.10 to 0.25	15 to 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges might become slick and hazardous.
	0.25 to 0.50	> 15	
2	0.10 to 0.25	25-35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions might be extremely hazardous due to ice accumulation.
	0.25 to 0.50	15-25	
	0.50 to 0.75	< 15	
3	0.10 to 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1-5 days. Warming sites needed.
	0.25 to 0.50	25 - 35	
	0.50 to 0.75	15 - 25	
	0.75 to 1.00	< 15	
4	0.25 to 0.50	> = 35	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5-10 days. Shelters or warming sites needed.
	0.50 to 0.75	25 - 35	
	0.75 to 1.00	15 - 25	
	1.00 to 1.50	< 15	
5	0.50 to 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 to 1.00	> = 25	
	1.00 to 1.50	> = 15	
	> 1.50	Any	

Source: www.spia-index.com (adapted by CNHRPC)

The Regional Snowfall Index (RSI) for the Northeast is used to categorize significant snowstorms. The RSI ranks snowstorm effects on a scale from **1** to **5**, similar to the Enhanced Fujita Scale for tornadoes or the Saffir-Simpson Hurricane Wind Scale for hurricanes. The RSI differs from these other indices because it includes population, a social component. The RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. The Regional Snowfall Index (RSI) displayed in **Table 21** is a measurement of the magnitude of a snowstorm in the Northeast, which includes New Hampshire.

Table 21
Regional Snowfall Index (RSI) for the Northeast

Storm Category	RSI Value	Snow Description
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

Source: www.ncdc.noaa.gov/snow-and-ice/rsi/ (adapted by CNHRPC)

Severe Winter Weather in Pembroke

Winter weather events are as common in Pembroke as they are in the other areas of Central New Hampshire. The most recent worst storm on record was the December 2008 Ice Storm with wide-spread power outages that lasting for over a week in the remote, forested areas. Pembroke's steep slopes and hills and numerous Class VI and gravel roads, along with its unique water features and main state commuter roadways (Route 3, Route 106, Route 28) suggest a potential for road icing (**transportation accidents**) when ice and storm events hit. **Communications failure**, **power failure**, **extreme cold** and local road impassibility (trees and/or power lines down) occur as well. Areas above 800 feet in elevation and the heavily forested Northern section of Town are particularly vulnerable to the effects of severe winter weather. Areas of particular concern include North Pembroke Road, First Range Road, The Pines, dams, bridges, vulnerable populations, Schools, manufactured housing communities, electrical power utilities, communications network, local government operations, and older or historic buildings (roof collapse).

Drought

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects growing or living conditions. Droughts are rare in New Hampshire. They generally are not as damaging and disruptive as floods and are more difficult to define. The effect of droughts is indicated through measurements of soil moisture, groundwater levels, and streamflow. However, not all of these indicators will be minimal during a drought. For example, frequent minor rainstorms can replenish the soil moisture without raising ground-water levels or increasing streamflow. Low streamflow also correlates with low ground-water levels and commonly cause diminished water supply because ground water discharge to streams and rivers maintains streamflow during extended dry periods.

In the case of drought, residential (dug wells in particular) and town water supplies (Pembroke Water Works) would be threatened. Most homes in Town rely on well water which is not easily replenished during periods of drought. All farms and orchards in town, including the tree farms, would be negatively affected by drought, which also influences the economic situation of the community. Wildfires would have the potential of being more severe and commonplace during periods of drought.

Magnitude of Drought

Table 22 displays overall drought magnitude, measured by the Palmer Hydrological Drought Index (PHDI) the extent of hydrological drought in the form of long-term, cumulative monthly moisture conditions. The indices are developed by algorithms taking into consideration precipitation, temperature data, and the local Available Water Content (AWC) of the soil.

Table 22

Palmer Drought Conditions

Hydrological Drought Classification	
Extremely Moist	+4 and above
Very Moist	+3 to +3.99
Moderately Moist	+2 to +2.99
Mid-Range	-1.99 to +1.99
Moderate Drought	-2 to -2.99
Severe Drought	-3 to -3.99
Extreme Drought	-4 and below

Source: www.ncdc.noaa.gov/sotc/drought (as compiled by CNHRPC)

Drought in Pembroke

Periods of **drought** in Pembroke would occur Town-wide and could cause property damage and economic losses. The lack of water would become a community problem to keep people hydrated and the failure of agricultural crops, products, and farm animals can occur. Failure of tree farms to thrive can result in economic losses. Increased likelihood of wide-spread **brush fire** and **wildfire** will occur with drier vegetation. **Lightning** strikes could contribute to wildfire risk during droughts. Dug wells can dry up during droughts and interrupt personal water supplies. Property damage and personal injuries or death could occur from drought-related fires or dry wells. The municipal water source, Pembroke Water Works, could enact water saving measures to assist with keeping the groundwater table higher. Residents should be encouraged to voluntarily undertake water conservation.

Excessive Heat

A heat wave is a period of abnormally and uncomfortably hot and unusually humid weather that typically lasts two or more days. The National Weather Services' Heat Index is used to measure humidity against temperature to develop a "real feel" temperature. Heat disorders on the body are quick and can be deadly. These now normal hot temperatures in the summer are commonly known as **excessive heat**.

Excessive Heat in Pembroke

Pembroke has experienced **heat waves** where temperatures exceeded 90 degrees for several days. During these times, many specific population sites in Town particularly susceptible to excessive heat, including

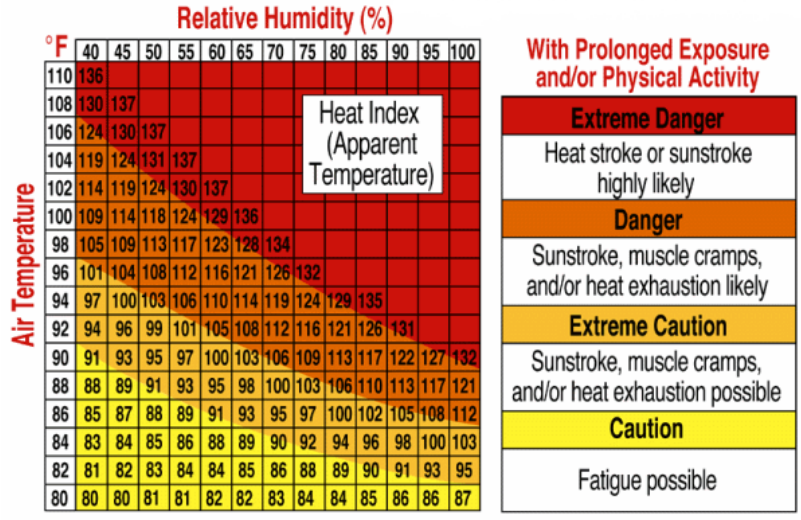
the assisted living facilities, the Schools, and the over 55+ housing communities, should have access to either air conditioning or cooling facilities. **Excessive heat** can cause dehydration, heat exhaustion and more serious illnesses. Other vulnerable facilities are indicated in **APPENDIX A Critical and Community Facilities Vulnerability Assessment**.

Magnitude of Excessive Heat

Excessive heat is measured by the NWS Heat Index and the NWS Excessive Heat Warning Classifications. As both the air temperature and the humidity rise, so will the danger level to people. Heat disorders will become more likely with prolonged exposure or strenuous activity as shown in **Figure 19**.

Figure 19

Heat Index (Temperature and Humidity)



Source: weather.gov

EARTH HAZARDS

Earth hazards include geologic events such as the small earthquake NH residents experience. The Central NH area is seismically active and small earthquakes (less than 2.5 magnitude on the Richter Scale) occur about 1-2 times per year. Landslides can occur as a result of earthquakes, rain, flooding and result in erosion along roadways and watercourses.

Radon is a naturally occurring radioactive gas with carcinogenic properties. The gas is a common problem in many states, including New Hampshire, seeping into homes from basements. Radon may also enter homes dissolved in drinking water from drilled wells. High levels of radon in water from individual drilled wells is a common occurrence in New Hampshire. Radon is no longer being addressed by the State of New Hampshire Hazard Mitigation Plan as no new studies have made specific data available. It is generally known that radon exists throughout in the State and in communities, including the Central NH Region. Arsenic is a new concern that often co-occurs with radon. Radon is known to present through all of New

Hampshire, is addressed on an individual basis and is no longer addressed in the **Hazard Mitigation Plan** because of the lack of state monitoring and available action.

There are two types of earth hazards examined in the **Hazard Risk Assessment**:

- **Earthquake**
- **Landslide**

Earthquake

An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. **Earthquakes** can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause **landslides**, **flash floods**, **fires**, and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale and Mercalli scale. Geologic events are often associated with California, but New England is considered a moderate risk earthquake zone.

Earthquakes in Pembroke

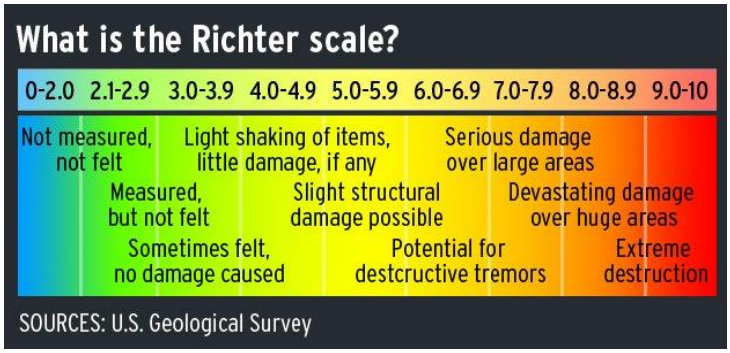
Multiple small scale **earthquakes**, about **1** quake every **1-2** years, have been felt by Pembroke residents, with their epicenters averaging less than **3-15** miles away since 2002 to present day. The Central NH Region is an active seismic area with mild quakes in bedrock. No damages or injuries have been reported from these events. It is likely Pembroke residents will continue to feel earthquakes it the future; close earthquakes with a magnitude greater than 2.5 would be concerning to the Town. Older buildings in Suncook Village or historic buildings along Route 3 could be particularly susceptible to earthquake damage. Underground water and/or electric utilities, stone walls, bridges and historic resources could be susceptible.

Magnitude of Earthquake Hazards

Earthquake hazard magnitude can be measured by the Richter Scale as shown in **Figure 20**. To better place the Richter Scale magnitude in perspective, the Mercalli Scale describes the *intensity* felt at different magnitudes in **Figure 21**.

Figure 20

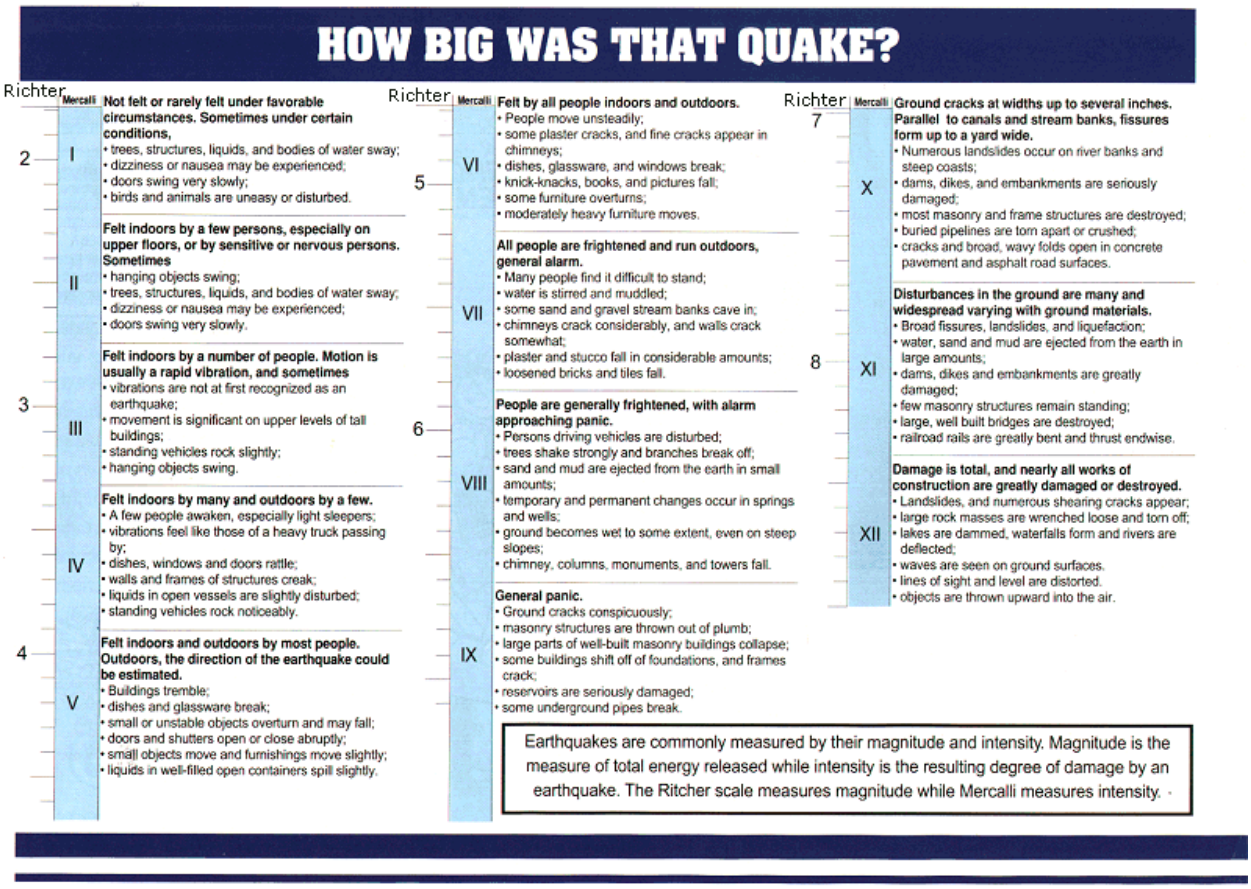
Descriptive Richter Scale



Source: US Geological Survey (USGS)

Figure 21

Earthquake Impacts on the Richter and Modified Mercalli Scales

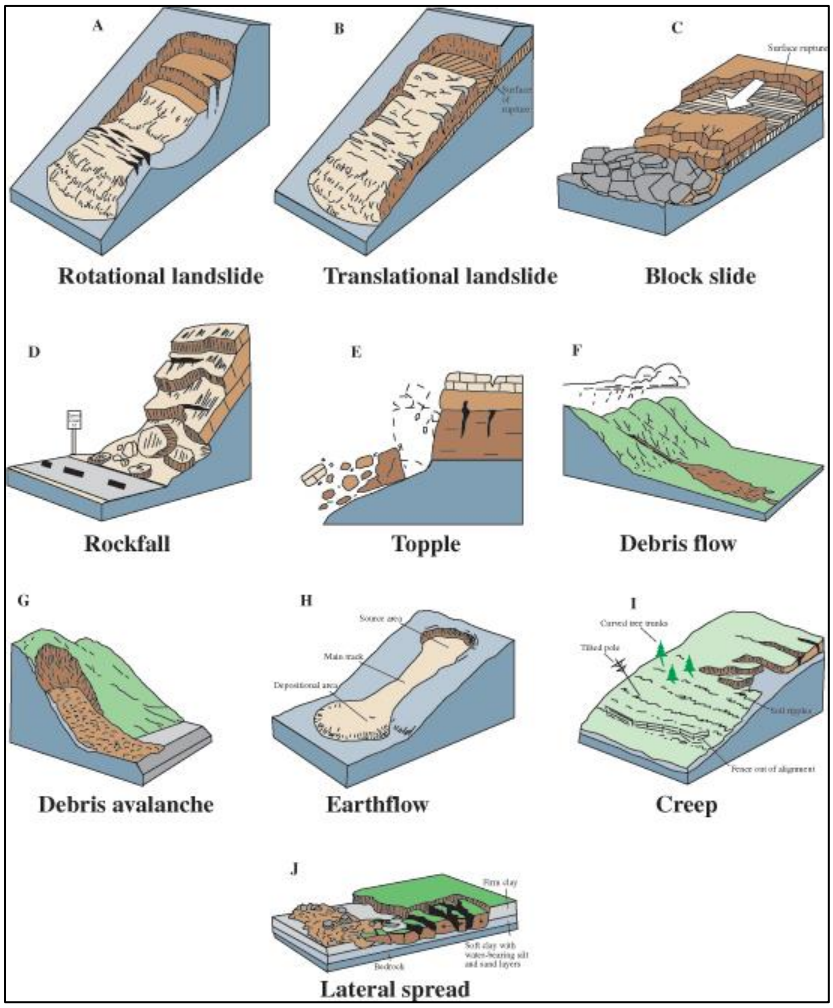


Source: National Oceanic and Atmospheric Administration (NOAA)

Landslide

A landslide is the downward or outward movement of slope-forming materials reacting under the force of gravity including: mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides, and earth flows. Landslides have damaged or destroyed roads, railroads, pipelines, electrical and telephone lines, mines, oil wells buildings, canals, sewers, bridges, dams, seaports, airports, forests, parks, and farms. A display of different types of landslides is shown in **Figure 22**.

Figure 22
Basic Types of Landslides



Source: US Geological Survey (USGS)

Magnitude of Landslide Hazards

There is no known standardized measurement of landslide magnitude available.

Landslides in Pembroke

Landslide is a possibility in limited areas of Pembroke where certain topological conditions are met. Development in close proximity to areas of steep slopes (greater than 15% or 25%) could present a risk to residents. Most potential landslides will be in conjunction with another hazard event, such as flooding, a severe rain event, earthquake, or from the construction of buildings or infrastructure in a topologically vulnerable area. Roads could experience landslide erosion during heavy rain events and a large scale landslide could damage only a limited number of structures, such as during flooding events.

TECHNOLOGICAL HAZARD EVENTS

Many technological hazards could be construed as secondary hazards, as they often occur as the result of a primary (natural) hazard. For example, **power failure** or **transportation accidents** (technological) can result from severe winter weather (natural). Scientific measures of magnitude are generally not available for individual technological hazards, but they are provided for **debris impacted infrastructure** and **dam failure** which are closely related to **flooding** and for **hazardous materials spills** and **radiological incident**.

There are several types of technological hazards examined in the **Hazard Risk Assessment**:

- **Dam Failure**
- **Power/Utility Failure**
- **Communications Systems Failure**
- **Debris Impacted Infrastructure**
- **Transportation Accidents**
- **Fire (Vehicle, Structure, Arson)**
- **Hazardous Materials Spills**

Magnitude of Technological Events

Magnitude of most technological hazards are not addressed in this Plan. The only exception is **Dam Failure** because of its close relationship with flooding using the NH DES Dam Hazard Classifications.

Dam Failure

Dam breach and the resulting failure cause rapid loss of water that is normally impounded by the dam. These kinds of floods are extremely dangerous and pose a significant threat to both life and property as they are quick, unexpected, and if they occur during a flooding event, dam failures can overload an already burdened water channel.

Magnitude of Dam Failures

Although dam failure is considered a **Technological Hazard**, it is often a secondary hazard caused by flooding conditions. Classifications of dams and their magnitude of failure can be measured by the NH DES Dam Hazard Classifications shown in **Table 23**.

Table 23

New Hampshire Dam Hazard Classifications

	NON-MENACE Structure	Inspection
NM	Means a dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is: ❍ Less than six feet in height if it has a storage capacity greater than 50 acre-feet; ❍ Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.	Every 6 years if criteria met
	LOW Hazard Structure	**Inspection**
LH	Means a dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: ❍ No possible loss of life. ❍ Low economic loss to structures or property. ❍ Structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassable or otherwise interrupt public safety services. ❍ The release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than two-acre-feet and is located more than 250 feet from a water body or water course. ❍ Reversible environmental losses to environmentally-sensitive sites.	Every 6 years
	SIGNIFICANT Hazard Structure	**Inspection**
SH	Means a dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following: ❍ No probable loss of lives. ❍ Major economic loss to structures or property. ❍ Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services. ❍ Major environmental or public health losses, including one or more of the following: ♦ Damage to a public water system, as defined by RSA 485:1-a, XV, which will take longer than 48 hours to repair. ♦ The release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more. ♦ Damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.	Every 4 years
	HIGH Hazard Structure	**Inspection**
HH	Means a dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life as a result of: ❍ Water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure, which is occupied under normal conditions. ❍ Water levels rising above the first floor elevation of a habitable residential structure or a commercial or industrial structure, which is occupied under normal conditions when the rise due to dam failure is greater than one foot. ❍ Structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services. ❍ The release of a quantity and concentration of material, which qualify as "hazardous waste" as defined by RSA 147-A:2 VII. ❍ Any other circumstance that would more likely than not cause one or more deaths.	Every 2 years

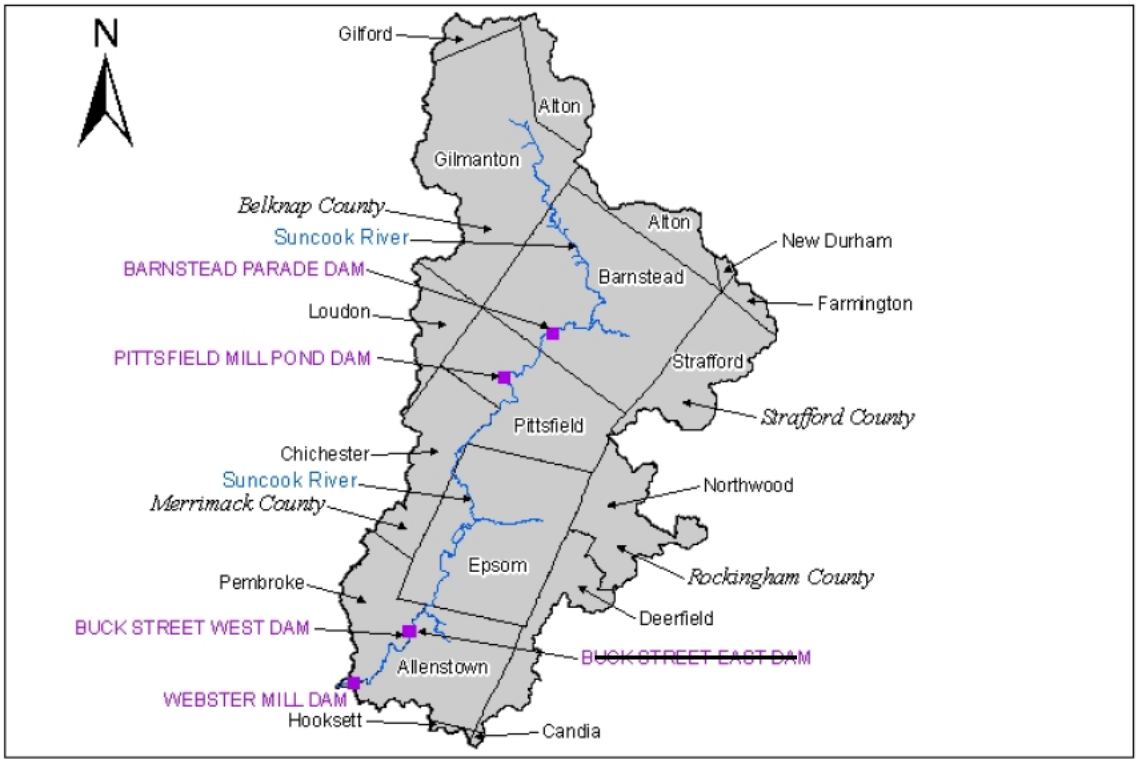
Source: NH Department of Environmental Services (NHDES) Dams Bureau, 2012

Dam Failures in Pembroke

Dam failures, or breaches, are a potential danger to people and property within the dam failure inundation area(s). The **18** active dams in Pembroke are listed in **APPENDIX A**.

River dams in four counties within the Suncook River watershed, covering the eastern half of Pembroke, are displayed in **Figure 23**. The ***USGS April 2007 Flood Study's Appendices B*** contains detailed Suncook River dam information on each of these displayed. As of 2012, the Buck Street Dam East in Allenstown was removed in 2011 although it still appears on this earlier map.

Figure 23
Dams in the Suncook River Watershed



Source: USGS April Flood Study Appendices A, 2007

Dam failure is considered a **Technological Hazard**, a secondary hazard caused by flooding conditions, but it is included because of its close tie to flooding. Dam failures, or breaches, are a potential danger to people and property within the dam failure inundation area(s). Of the **18** active dams in Pembroke, **1** dam, the **Pembroke Dam on the Suncook River at Suncook Village Main Street**, is classified as High Hazard (**H**) dam. This dam has the potential for catastrophic injuries and infrastructure and property damage if it were to failure during a flooding event. One (**1**) dam, **Webster Mill Dam on the Suncook River**, is classified as a Significant Hazard (**S**). The China Mill Dam on the Suncook River, is classified as Low Hazard (**L**). The

remaining **15** dams are classified as Non-Menace (**NM**) or Exempt dams. The High (**H**) and Significant (**S**) Hazard dams located in Pembroke pose a threat to property damage or loss of life if dam failure occurs.

Power/Utility Failure

Utilities systems exist everywhere and are subject to damage from construction work, accidents and extreme weather. Many utilities are protected by back-up generators to prevent failure, whatever the cause may be. Nuclear power plants produce roughly 20% of the nation's power, they exist in nearly all states and 3 million Americans live within 10 miles of a nuclear power plant. The greatest risk to life resulting from a nuclear power plant failure is radiation contamination resulting from radiation release into the environment. People in the immediate vicinity are at greatest risk of radiation contamination. Another common source of energy, coal, can be potentially hazardous because coal power plants emit chemicals such as mercury and sulfur dioxide.

New Hampshire contains nuclear, coal and natural gas power plants. There is only one (**1**) coal power plant in New Hampshire, the Eversource Merrimack Station in Bow. The Merrimack Station is the largest coal-fired electrical generating station owned by Eversource (formerly PSNH) and supplies power to 190,000 households. The greatest health concerns over the Merrimack Plant in Bow are the release of particulates into the air and area water bodies, such as the Merrimack River not more than one-quarter mile away from the Bow facility, and the nearby Bow landfill that receives coal ash from the Merrimack Station on a regular basis.

In the harsh environment that New Hampshire residents are subjected to, power and utility failures on an isolated level are commonplace. During nearly every heavy snow storm, ice storm, or other severe weather event, someone, somewhere, loses power and/or other utilities.

Power Failure in Pembroke

For most storm events, some residents and businesses have experienced **power failure**. Pembroke receive electricity from Eversource. Basic critical facilities that serve residents could be damaged by power failure. The Allenstown Waste Water Treatment Facility Plant used by Pembroke residents and businesses could be severely impacted by a power outage. However, the nearby Allenstown Elementary School is set up to provide shelter to Pembroke residents able to leave their homes. Residents should be able to shelter in place, gathering needed supplies and water ahead of time, for up to three days.

Power failure can cause inconvenience, loss of economy, extra Town expenditures, restrict emergency and response because the typical power failure is a secondary hazard caused by a severe wind or severe winter weather event. As an example, during Hurricane Sandy (not a declared disaster for Pembroke), at least **13** reports of roads closed and/or trees down on power lines is shown in the Town records in **Figure 24**. This problem is applicable to the **Hurricanes and Tropical Storms, Downbursts**, **Tornadoes**, and **Severe Winter Weather, Cold, and Ice Storms** hazard events described earlier as well as **Debris Impacted Infrastructure** and **Transportation Accident** hazard events in the following sections.

Although **Figure 24** provides a specific and practical public listing of trees down on roads and power lines, in all the storms occurring in Pembroke, the roads damaged are not exclusive to this list. **Power Failure** due to a secondary disaster has occurred on all Town roads during different events.

Figure 24

Example of Road Closure Impacts Due to Hurricane Sandy 2012

Town of Pembroke

Department of Public Works

8 Exchange Street, Pembroke, NH 03275
Phone: (603) 485-4422 Fax: (603) 485-2613

10/29/12 – 10/31/12 Trees on wires/Roads Closed

1. **252 Brickett Hill Road -** Dead tree on third wire down. Road is passable Amanda called Comcast (2 Pictures)
2. **574 North Pembroke Road** – Road Closed (tree and wires across the road, signs placed at Cross Country Road & Borough Road) **ROAD OPEN AS OF 10:56 AM 10/30/12**
3. **339 North Pembroke Road** – Tree limb burning on primary, one lane coned off **ROAD OPEN AS OF 11:55 AM 10/30/12**
4. **212 Fourth Range Road** – Tree and wires across the road **ROAD OPEN 1:07 AM on 10/31/12**
5. **710 Borough Road** – Large tree involving wires across road, cones and signs are in the process of being placed as of 2011 hours **ROAD OPEN AS OF 11:20 AM ON 10/30/12**
6. **460 Sixth Range Road** "Quinzani" – two big pine trees down, primary is down, 7 houses with no power and no egress. Annette called PSNH. Some leaners need attention too. **ROAD OPEN 1:07 AM on 10/31/12** PSNH said okay for the Town to clean
7. **729 Cross Country Road** – Big branch in road (Everett)
8. **653 Cross Country Road** – Big hanger branch needs attention with loader and a chain
9. **Dearborn Road at Barker Residence** – Branches in road **DONE**
10. **213 Pembroke Hill Road** – Broken branches on two trees hanging over the road
11. **3 Pheasant Run** – Tree on the line road is passable (Amanda emailed Bob at 1:58 PM 10/30/12)

10/31/12 No power yet, trees still on wires

12. **829 Bachelder Road – 1:50 pm 10/30/12** Line down snapping and flaming up on the road. Black Cadillac with PSNH employee sitting in car since 9:30 am monitoring it? Amanda called 911
13. **Thompson Road:** Trees down

As of 1:07 AM on 10/31/12 all town roads open but power not totally restored yet

Source: Pembroke Public Works Department, October 2012

Communications Systems Failure

Communications systems, like utilities, are found everywhere and are subject to damage by construction work, severe weather and traffic accidents. Because communications systems depend on electricity, any power outage may cause an interruption in a communications system. In addition, many communications systems have buried cables which are particularly vulnerable to being cut. Communications systems interruptions can negatively impact a region, town, neighborhood or household in the case of a natural disaster, catastrophe or other emergency. Power lines often share cables and poles with communications systems. When power fails, cable, telephone and radio services frequently fail as well.

Communications Systems Failure in Pembroke

Any **communications failure** can mean lack of emergency services or delayed emergency services. Police/Fire use digital service and are members of the effective Central NH Mutual Aid Compact Dispatch service. However, for residents, services can be disrupted easily. Those at greatest risk are the same as those for **power/utility failure**. There has been a steady migration to cell phone use only with people dropping their landline telephones. A few individuals in Town who require oxygen and power would comprise the most vulnerable populations. The power could not be offline for more than two or three days without causing losses. Over the last few years, standby generators have been installed at the Fire Station and the Town Hall.

Debris Impacted Infrastructure

Debris impacted infrastructure regularly occurs along the Central NH Region's rivers and streams and also along roadways. Rivers or brooks flowing under bridges or through culverts could get clogged or damaged by woody material or leaves in the watercourse. Culvert maintenance is particularly important before and during heavy rainfall and floods. Tree limbs falling onto power lines and onto roadways, disrupting both electricity and the roadway, occur during wind or winter storms.

Debris Impacted Infrastructure in Pembroke

Pembroke's watercourses, including the Soucook River, Suncook River, Merrimack River, brooks, drainage swales, ditches and detention ponds have a tendency to **flood** their banks, **overflow culverts**, or **washout roads** during certain conditions. Trees and limbs falling on roads and power lines cause **power failure** or **road blockage**. Infrastructure in Pembroke can refer to roadways, powerlines, utility lines, culverts, water towers, bridges or dams. These features inventoried in **APPENDIX A Critical and Community Vulnerability Assessment** are those which should be watched carefully before and after storms and should be checked and maintained regularly to reduce the risk of significant **debris impacted infrastructure** events**.** The Public Works Department has been forced to monitor the public drainage areas not just for debris but because the public has been regularly caught filling in these critical areas. In the event of a flood, there will be no safe place for water to flow in these locations where drainage has been compromised.

Transportation Accidents

Automobile accidents could occur on any roadway in the Central NH region. A major accident would have the greatest impact for travelers on I-89, I-93 and I-393, as these roads experience high traffic volume and vehicles travel at high speeds. In addition, several rail lines create the potential for a transportation accident. Many motor vehicle accidents occur at train crossings. Trains could potentially derail, causing injuries or fatalities and hazardous materials spills. In the Central NH Region, the Concord-Lincoln Line runs 73 miles between Concord and Lincoln. The New Hampshire Maine Line runs between Concord, Nashua and Lowell, MA. Several communities through which these lines travel have expressed the concern about hazardous material spills due to transportation accidents or sabotage.

Transportation Accidents in Pembroke

Traffic accidents may be the most likely future transportation hazard in Pembroke on US Route 3, NH Route 106 and NH Route 28 or at difficult intersections, hills, curves or straightaways with the potential for deadly accidents. Much of the Town's business is situated on these three routes. As vehicular traffic increases or as the weather turns bad, there is the likelihood that **transportation accidents** will occur in these and other areas.

Fire (Arson, Vehicle, Structure)

Fires which are not natural hazards are often associated with vehicles, structures or hazardous materials spills, or sometimes an explosion. These are considered **Technological Hazards**. Arson, the deliberate setting of a fire as an act of sabotage or mischief, is a **Human Hazard** but is described in this section for convenience. No magnitude scales were defined for these types of non-natural fires.

Fire in Pembroke

The Fire Department annually reports all fires to the NH Fire Marshal's office. Over the four-year period of **2010** to **2013**, a total of **45** fires were reported in Pembroke. Fires included wildfires, vehicle fires, structure fires, debris fires, and other types. The majority experienced were structure fires. A list of hazardous materials facilities which could cause fire or explosions in Town is available in **APPENDIX A Critical and Community Facility Vulnerability Assessment**. Also available from these **APPENDIX A** tables are a listing of vulnerable populations that are living in close quarters.

Hazardous Materials Spills

Hazardous materials and hazardous wastes contain properties that make them potentially dangerous or harmful to humans. They can be liquids, solids, contained gases or sludge. Hazardous wastes can be the by-product of manufacturing, as well as discarded commercial products. Most households contain cleaning agents that become hazardous waste when disposed of improperly. Chemicals have numerous benefits but can also cause hazards during their production, storage, transportation, use or disposal.

Hazardous materials can have adverse health related effects and may even cause death in certain cases. In addition, hazardous materials may damage homes, businesses and other property, as well as natural ecosystems. Chemical accidents in plants or chemical spills during transportation may often release hazardous chemicals.

The risk from hazardous materials spills or releases into groundwater is present as long as consumers and homeowners make irresponsible decisions regarding the disposal of household chemicals. These household chemicals can contaminate drinking water in wells and cause damage to various ecosystems. Most people contaminate without being aware that they are doing so. Further education may be needed in order to reduce hazardous waste contamination.

Hazardous Materials Spills in Pembroke

Transportation of hazardous materials on US Route 3, Route 28 and Route 106 is likely an everyday occurrence. These trucks could rollover and spill their contents onto these significant roadways. The forthcoming ***Draft New Hampshire Hazardous Material Commodity Flow Study 2015*** and its accompanying maps may provide some enlightening data the Town can use to help protect the community from spills.

There are several health care, school, manufacturing and occupational facilities in Town that handle, store, or use hazardous materials. Any of these facilities could have a spill or an incident at their location. A listing of known facilities which store or could use hazardous materials has been inventoried in **APPENDIX A Critical and Community Vulnerability Assessment**.

HUMAN HAZARD EVENTS

Events of human nature include terrorism (ecological, cyber and chemical), sabotage/vandalism, hostage situations, and civil unrest. These are often "behind the scenes" hazards that local Police Departments handle on a regular basis. These events are all caused by direct human action.

There are several types of human hazards examined in the **Hazard Risk Assessment**:

- **Public Health Epidemics**
- **Drug Overdose Epidemic**
- **Terrorism**
- **Sabotage/Vandalism**
- **Hostage Situation**
- **Civil Disturbance/Public Unrest**

Human Hazards are examined by descriptions of the types of human hazards and in the **Potential Future Hazards**. Scientific measures of magnitude are not available for individual human hazards.

Public Health Epidemics

Public health issues can be measured in many different ways. Students and the elderly are vulnerable to seasonal health outbreaks as they tend to congregate in large numbers and in shared environments where physical contact is common. Large groups can make bioterrorism more effective.

It is difficult to predict where an epidemic would occur due to human, mosquito and wildlife mobility. Commonly occurring epidemics following extreme heat or cold can include influenza, rotovirus, Lyme disease, EEE, West Nile, and any could occur in Pembroke. The Town has swampy areas around its wetlands and brooks which are prime breeding ground for **mosquitoes**. Large deer herds that can be present do carry **deer ticks** in the Town's heavily forested Northern section and into State Forests.

Public Health Epidemics in Pembroke

Although to date there have not been any reported widespread **public health** issues in Pembroke, the same populations identified as particularly susceptible to **Excessive Heat** would be most vulnerable to public health issues and epidemics. In addition, Pembroke Schools, daycare facilities, the many restaurants and gathering places (see **APPENDIX A**) are prime locations for pick up or transfer of diseases and illnesses.

To help combat local and area public health issues, Pembroke is nearby a regional Point of Distribution (POD) site at the NH Technical College in Concord, a location where vaccines or other medicines are provided to people during an emergency.

Drug Overdose Epidemic

New Hampshire has seen a rise in the number of heroin and opioid deaths over the last few years. Even Pembroke has been subject to additional calls for service for overdose. Along with the use of these substances can arise the buying and/or making of illegal drugs. The State has made national headlines in 2014, 2015 and 2016 for its problems with overdoses and its public recognition of the problem.

Drug Overdose Epidemic in Pembroke

A particular concern to Pembroke officials and Tri-Town Ambulance workers is the illegal drug usage and overdosing that is occurring in the community. **Table 24** provides a comparison of State and Pembroke overdose and fatality data.

Table 24

Summary of Drug Overdoses in "Heroin/Opioid Epidemic," 2014-2016

Year	NH Fatalities	Tri-Town Ambulance Runs Dispatched for Overdose	Overdose % of Dispatch Tri-Town Runs	Number of Tri-Town Narcan Treatments	Narcan % of All Treatments During Tri-Town Runs
Pembroke & Allenstown Tri-Town Monthly and Annual Report Totals (not all report months were available)					
State of NH Annual Totals					
2016 (through July)	196				
16-May		4	4.00%	4	4.00%
16-Apr		1	1.37%	1	1.37%
16-Mar		6	6.98%	0	0.00%
16-Feb		4	5.48%	1	1.37%
16-Jan		5	5.95%	0	0.00%
2015	439				
Annual	2015	32	3.02%	15	1.42%
15-Dec		5	5.05%	1	1.01%
15-Nov		4	4.82%	0	0.00%
15-Oct		1	1.15%	2	2.30%
15-Sep		4	4.71%	3	3.53%
15-Aug		2	1.96%	1	0.98%
15-Jul		*Rpt N/A*	*Rpt N/A*	*Rpt N/A*	*Rpt N/A*
15-Jun		1	1.12%	0	0.00%
15-May		*Rpt N/A*	*Rpt N/A*	*Rpt N/A*	*Rpt N/A*
15-Apr		3	3.95%	1	1.32%
15-Mar		2	2.44%	2	2.44%
15-Feb		3	4.76%	0	0.00%
15-Jan		*Rpt N/A*	*Rpt N/A*	*Rpt N/A*	*Rpt N/A*
2014	326				
Annual	2014	19	1.83%	11	0.87%
14-Dec		1	1.10%	0	0.00%
2013	192				
2012	163				
2011	201				
2010	177				

Source: Tri-Town Ambulance Annual Report 2014, Monthly Directors Reports 2016, NH DHS NH Drug Monitoring Initiative Drug Environment Report, July 2016

New Hampshire overdose deaths rose from **177** in 2010 to **439** in 2015. As of July 2016, **196** overdose deaths have been reported for the year. The Tri-Town Ambulance serving Pembroke and Allenstown (two

communities, not three) saw **19** calls for overdose in 2014, **32** calls in 2015, and **20** calls for Jan-May in 2016. Part of the increase is explained by standardization of the coding system used to identify opioid overdose patients.

Tri-Town Ambulance is seeing the rising overdose problem in NH in Pembroke and Allenstown during their increased number of ambulance calls for service for overdoses. When available, Narcan is used to treat the overdoses until the victim is brought to Concord Hospital.

Terrorism

The use of force or violence against people in order to create fear, cause physical harm and/or intimidation or for reasons of ransom. Terrorists often make threats in order to create fear and change public opinion. Cyber terrorism consists of hackers who threaten the economy by attacking the intricate computer infrastructure, affecting business and communication. Biological and chemical terrorism refers to those infectious microbes or toxins used to produce illness or death in people or animals. Terrorists may contaminate food or water, thus threatening an unprotected civilian population. Eco-terrorism refers to the destruction of property by persons who are generally opposed to the destruction of the environment or to make a visible argument against forms of technology that may be destructive to the environment.

Terrorism in Pembroke

It is unlikely that the Town would be the target of any act of international **terrorism**. Domestic terrorism has not occurred in Pembroke although it had occurred elsewhere in the Central NH Region in the 2000s. Possible targets could be the Town Hall, the Pembroke Schools, Post Office, the Safety Center, all governmental facilities, State facilities (such as the NHDOT shed), or churches.

Sabotage/Vandalism

Sabotage is a deliberate action aimed at someone or some institution in order to weaken that person's or institution's integrity and reputation through subversion, destruction, obstruction or disruption. Sabotage may occur in war, a workplace, in the natural environment, as a crime, in politics or as a direct attack against an individual.

Sabotage /Vandalism in Pembroke

Acts of **sabotage** have occurred in Town, including exploitation of the Town Office phone system in 2008 to make thousands of international phone calls. Any incident of **sabotage** in Pembroke could come from within Pembroke or any nearby Town, or outside of the State or country, but some sabotage efforts would require perpetrators to be on site. Technological systems such as computer systems at the Town Hall, utilities, telecommunications towers or the municipal water (Pembroke Water Works) and wastewater systems (Allenstown Wastewater Treatment Facility) could be vulnerable. Many other significant facilities

in Pembroke could be subject to sabotage. These include the major powerlines, the high pressure Tennessee gasline running parallel to the Merrimack River, and public well fields and aquifers in North Pembroke.

Vandalism can also be present at cemeteries, vacant buildings, under bridges. While a nuisance, vandalism has a lower potential to harm than sabotage.

Hostage Situation

A hostage situation is an incident where an innocent civilian is held by someone or some group of persons demanding something from another person or group of persons not related to the person or persons being held hostage. The person or persons held are done so pending the fulfillment of certain terms.

Hostage Situations in Pembroke

Hostage situations can occur anywhere, are isolated events and are nearly impossible to predict; none have been reported for this Plan. The Pembroke sites where hostages could be taken include the Town Hall and other public buildings, Schools, day care facilities, banks, Post Office, workplaces, grocery and convenience stores, restaurants, high density population areas (Suncook Village, manufactured housing communities and in particular, domestic home situations.

Civil Disturbance/Public Unrest

This hazard refers to types of disturbances that are caused by a group of people, often in protest against major socio-political problems including sit-ins or protests against wars and any general and public expression of outrage against a political establishment or policy. Many instances of civil disturbance and public unrest are quelled by a use of force from police. Participants may be victims of personal injury in severe cases.

The most probable locations of larger civil disturbance and/or protest in New Hampshire are at the State House in Concord and at the universities and colleges. They have also occurred at political locations, such as feminist health centers or political party headquarters.

Civil Disturbance/Public Unrest in Pembroke

Although none have been reported, large scale incidents of civil disturbance and public unrest are unlikely in Pembroke. Locally, the highest potential for **public unrest** could take place during Town Meetings and School Meetings, on voting day or during visits from political candidates, or at large events such as Old Home Day, Veteran's Parades or School graduations. Locations where civil unrest could occur include the Schools, at sporting events, Town Hall, restaurants and establishments serving alcohol, high density population areas (Suncook Village, manufactured housing communities, residential neighborhoods), the Safety Center.

Existing and Potential Future Hazards

After the inventory of hazards types and past hazards in Town, hazards that currently exist or that need to be monitored in Pembroke has been completed along with potential future hazards that could occur in other areas. This unique listing of **Existing and Potential Future Hazards** was compiled so the Town can be aware of areas that might need to be watched for recurring hazardous problems or that may experience some of these hazards for the first time. The listing was developed by knowledge of the Hazard Mitigation Committee and past experiences of hazards. Past locations of hazard events, where they exist for each hazard, are listed under the individual hazard narratives in the previous section. The existing and susceptible hazard locations are taken from the **Hazard Risk Assessment**. With this existing and potential future knowledge listed side by side, it becomes easier for a community to plan mitigation measures for the most prominent hazard events in Town.

Included in **Table 25** is the **Overall Risk** score between **1-16** from the **Hazard Risk Assessment** for **17** natural hazards. The name of the magnitude or extent scale of the natural hazard is represented for ease of reference. Technological and human hazards were not rated for their **Overall Risk** to retain the importance of maintaining a natural hazard perspective for the **Hazard Mitigation Plan 2017**.

Table 25

Existing and Potential Future Hazards

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Flooding	**Floods and Flash Floods**	2.67	**Floodplains, roadways of Town.** Areas particularly prone to flooding in the Town include: Floodplains of the Merrimack, Soucook, or Suncook Rivers result in expanded flooding. Runoff from roadways or heavy rain can cause floods over the Entire Town.	In vulnerable areas, the roads may be washed away, preventing traffic from passing, due to flooding events. These include North Pembroke Road, Bachelder Road, and Church Road. Based on past flooding events, flooding damage could also occur on Buck Street, Glass Street, Front Street, and Soucook Lane. Other potentially vulnerable areas include Memorial Field, Soucook River at 823 North Pembroke Road (Silva Manufactured Housing Park), Suncook River at Mills Falls, and the Batchelder Road residential dwellings may also be at risk. Property damage and personal injuries or death could occur.	Special Flood Hazard Areas (SFHAs) on 2009 Digital Flood Rate Insurance Maps (Zones A, AE, X)
Flooding	**Rapid Snow Pack Melt**	2.67	**Entire Town.** Areas and roads particularly susceptible: Melt runoff from impervious surfaces and roadways or from tree cover and fields can cause floods over the Entire Town. Road washouts and/or culvert failure locations include: Nadine Road, Ross Road, Michol Road, Pembroke Hill Road, Cross Country Road, Buck Street (Evergreen Cemetery), Borough Road, Littlefield Condominiums, Bachelder Road, Fourth Range Road.	In vulnerable areas, the roads may be washed away, preventing traffic from passing due to rapid snow pack melt. These include North Pembroke Road (Silva), Bachelder Road, and Church Road. All areas of town could be susceptible to rapid snow pack melt. Based on past flooding events, flooding damage could also occur on Buck Street, Glass Street, Front Street, and Soucook Lane. Specific areas include the Memorial Field, Soucook and Suncook Rivers, and manufactured home parks and waterfront campgrounds on the rivers. Floodplains could become inundated and evacuations might be necessary. Property damage and personal injuries or death could occur.	None specific known but can use SFHAs

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Flooding	**River Ice Jams**	2.00	**Rivers and crossing infrastructure.** Areas and sites particularly susceptible: An ice jam at the double decker bridge at Upper Turnpike Street over the Suncook would be most serious. The River has had ice jams in the past.	River ice jams, which have not yet occurred in the community, may have future potential to occur on Bachelder Road, Buck Street, Glass Street, Front Street, and Soucook Lane, and Memorial Field, and Soucook River at North Pembroke Road (Silva). A jam on the Suncook River could severely impact the double-decker bridge between Allenstown and Pembroke on Route 3. Floodplains could become inundated and evacuations might be necessary. Property damage and personal injuries or death could occur.	No known widely-used scale measuring the magnitude of river ice jams
Flooding	**Suncook Riverine Scouring, Erosion, Channel Movement**	2.00	**Floodplains Suncook River hazard location susceptibility:** Webster Dam erosion. Bachelder Road flooding. Farmland flooding. Undercutting of Pembroke, China Mills and Webster Mills Dams. See Suncook River Fluvial Geomorphic Assessment for locations of erosion, channel movement.	The Suncook River forms the 7-mile eastern border of Pembroke. Flooding, erosion, and channel movement has the potential to occur on Bachelder Road, Buck Street, Glass Street, Front Street, and at Memorial Field. Property damage and personal injuries could occur. Irish Pond better, known as Suncook Pond, in back of Post Office is quickly filling with sediment. Locations particularly vulnerable to this hazard include the Suncook River at Mills Falls and the Suncook River at Maple Grove Campground. The Town has been able to acquire most of the private properties of Bachelder Road to eliminate the flood risk to life and property. Flooding can cause property damage and personal injuries to occur.	EPA Bank Erosion Risk Index
Flooding	**Soucook Riverine Scouring, Erosion, Channel Movement**	2.00	**Floodplains Soucook River hazard location susceptibility:** North Pembroke bridge flood damage (Soucook). Memorial Field erosion (Merrimack). Major ice jam & flooding at Silva's manufactured home park in late 1970s on Soucook. See Soucook River Fluvial Geomorphic Assessment for locations of erosion, channel movement.	The Soucook River forms the western border of Pembroke. Flooding, erosion, and channel movement may the potential to occur on Soucook Lane, 823 North Pembroke Road (Silva), Bachelder Road, Buck Street, Soucook Lane, and Memorial Field. Flooding of the Soucook could overtake the sewer pumping station at Route 3, causing a possible raw sewage release. Property damage and personal injuries or death could occur.	EPA Bank Erosion Risk Index
Wind	**Tornadoes**	6.00	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Manufactured housing communities and vulnerable populations. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down.	In the event of a tornado, which has never struck Pembroke, Town-wide property damage and possible personal injuries could occur. The rural nature of the Town makes downed trees a concern, which could block roads and bring down power lines Town-wide and restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance. If a tornado struck open area recreational fields in use, this would be considered a significant community tragedy.	Enhanced Fujita (EF) Tornado Scale
Wind	**Downbursts**	6.00	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down.	In the event of a downburst, areas of property damage and possible personal injuries could occur Town-wide. The rural nature of the Town makes downed trees a concern, which could block roads and bring down power lines Town-wide and restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance. If a downburst struck an area recreational field in use, this would be considered an isolated community issue.	Enhanced Fujita (EF) Tornado Scale

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Wind	**Hurricanes and Tropical Storms**	2.00	**Entire Town. Areas and sites particularly susceptible:** Schools, Suncook Village, Route 3 and populated areas. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage to debris impacted infrastructure.	In the event of a hurricane or tropical storm, areas of property damage could occur Town-wide. The rural nature of the Town makes downed trees a concern, which could block roads and bring down power lines Town-wide and restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance. A hurricane or tropical storm in the community could become a full-scale emergency, with power failure, communications failure, loss of heat or air conditioning, and damaged housing.	Saffir-Simpson Hurricane Wind Scale
Wind	**Severe Winds, Rainstorms and Thunder Storms**	6.00	**Entire Town.** Areas and sites particularly susceptible: Schools, Suncook Village, Route 3 and populated areas. Damage to Town Hall and Fire Station from hail. Vulnerable populations such as manufactured housing communities. Taller buildings, telecommunications towers, aboveground utilities, historic resources. Wooded and forested sections of North Pembroke would be difficult to access with trees and power lines down. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage to debris impacted infrastructure.	In the event of severe wind and thunder storms, areas of property damage could occur Town-wide. The rural nature of the Town makes downed trees a concern, which could block roads and bring down power lines Town-wide and restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance. A severe wind or thunderstorm in the community could become an emergency, with power failure, potential communications failure, and loss of heat or air conditioning.	Accuweather Thunderstorm Criteria Scale, Hail Size Scale
Fire	**Lightning**	3.00	**Entire Town.** Areas most susceptible include: North Pembroke, densely packed residential neighborhoods, other forested and conservation areas, open recreation fields, remove locations difficult to access by vehicle such as the Range Roads, points of higher elevation than surrounding area. Susceptible structures include: aboveground utilities: transformers, telecommunications towers, water towers; churches and tall buildings.	A lightning strike in Pembroke could occur anywhere in the community and result in property damage. Particularly vulnerable areas would include open area recreational fields in use. The potential for power failure and communications failure exists. Fire could result from a lightning strike, including structure fires. Historic wood buildings, tall buildings, or structures at a higher elevation, or a structure in a flat open area could attract lightning.	Lightning Activity Level (LAL)

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Fire	**Wildfire**	4.00	**Entire Town.** Areas most susceptible include: North Pembroke, densely packed residential neighborhoods, other forested and conservation areas, open recreation fields, locations difficult to access by vehicle such as the Range Roads, points of higher elevation than surrounding area. Susceptible structures include: aboveground utilities: transformers, telecommunications towers, water towers; churches and tall buildings.	Wildfire in the community is Town-wide, although the northern half of Pembroke would be the most vulnerable due to its rural, forested nature. The North Pembroke area, the more rural areas of the R-3 Zoning District, and Range Roads that are not easily accessible to emergency vehicles could sustain the most damage from wildfire. Because a large number of the Town's population lives in the North Pembroke area, wildfire could result in property damage and personal injuries. If structures are damaged and are inhabitable from wildfire, the Town's tax base will decline.	NWCG Wildfire Classification
Extreme Temperature	**Severe Winter Weather, Cold and Ice Storms**	6.00	**Entire Town.** Areas of particular concern include North Pembroke Road, First Range Road, The Pines. Dams, bridges, vulnerable populations, Schools, manufactured housing communities. Roadways (fallen trees), electrical power utilities, communications network, local government operations are susceptible to damage. Particular roof collapse concerns of older or historic buildings. Remote areas in the Town may be more difficult to access and/or without power (including heat) for a longer period of time. Most vulnerable populations may be subject to cold temperature, snow isolation, transportation accidents, power failure and communications failure.	Severe winter weather, ice storms, wind chill occur in Town-wide in Pembroke. All areas of the Town are susceptible to property damage. Additional storms and ice put a strain on Public Works Department personnel, equipment and supplies of sand and salt above budgeted funding available. Deliveries of sand and salt from the suppliers could be hampered by the road conditions. There can also be a problem relocating the over-abundance of snow in order to keep the roads clear for traffic. All roadways would be affected. A severe winter weather event in the community could become an emergency, with isolated residents, power failure, communications failure, and loss of heating for a number of days. In extreme situations, personal injuries or death could occur.	NWS Windchill Index, Sperry-Piltz Ice Accumulation (SPIA), NCDC Regional Snowfall Index (RSI) for Northeast
Extreme Temp	**Drought**	9.00	**Entire Town / Region.** Areas susceptible include farms, orchards. Also vulnerable are those residences with private dug wells and Town water supplies/ Drought means increased risk of brush fire with dry vegetation (see Wildfire for areas).	Periods of drought in Pembroke would occur Town-wide and could cause property damage and economic damage. The lack of water would become a community problem to keep people hydrated and the failure of agricultural crops, products, and farm animals can occur. Increased likelihood of wildfire will occur with drier vegetation. Lightning strikes could contribute to wildfire risk during droughts.	Palmer Hydrological Drought Index (PHDI)
Extreme Temp	**Excessive Heat**	3.33	**Entire Town.** Vulnerable populations most susceptible to extreme heat include over 55+ housing facilities, assisted living facilities, Schools, daycare facilities. Shelters may need to be opened for cooling centers during extended heat conditions.	Excessive heat events in Pembroke would occur Town-wide and could cause property damage, personal injury, and economic damage. The increased use of air conditioning puts pressure on the electrical grid. The severe heat would become a community problem to keep people hydrated and cool, and the failure of agricultural crops, products, and death of farm animals could occur. Excessive heat is responsible for heat cramps, heat exhaustion, heat stroke, heat rash, and sunburn. The most vulnerable populations include persons over age 65, infants and young children, pregnant women, people with chronic illnesses or are mobility restricted. In extreme situations, personal injuries or death could occur.	NWS Heat Index
Earth Hazards	**Earthquake**	1.00	**Entire Town.** The Central NH Region is seismically active and earthquakes are regularly felt from area epicenters. Damage to utility poles and wires, roadways and infrastructure (waste water	An earthquake reaching Pembroke would be felt Town-wide and could cause property damage and property injury or death in extreme situations. Any area of Town could be susceptible. A strong earthquake would be a region-wide event, depending on the location of its epicenter. In Pembroke, the most vulnerable could	Richter Magnitude Scale

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
			treatment facility in Allenstown, Pembroke Water Works, bridges, dams) could be significant. Areas with underground utilities, community water systems, cisterns, old buildings such as those in Suncook Village are particularly susceptible.	include historic buildings, underground utilities, and buildings where large numbers of people congregate.	
Earth	**Landslide**	1.00	**Slopes greater than 25%.** These areas include erosion along 3 Rivers School, roads with steep ditching or embankments. River and brook banks can also slide, usually known as erosion: Soucook River, Suncook River, Merrimack River locations noted in fluvial geomorphic maps.	Landslides could be caused by rain, erosion, or geologic movement. Steep slopes and ledges along highways would be particularly susceptible. In Pembroke, Clough Mill Road and North Pembroke Road might be susceptible.	No known widely-used scale measuring the magnitude of landslides
Technological	**Dam Failure**	4.00	**Suncook River Dams most significant:** Pembroke Dam (High Hazard), Webster Mill Dam (Significant Hazard), China Mill Dam (Low Hazard) are all along the Suncook River. Suncook Village would need to be evacuated. Undercutting of Pembroke, China Mills and Webster Mills Dams.	There are many dams along the rivers in Pembroke. If a dam failure occurred, the Mills Falls or Suncook Village area could experience sudden flooding damage to infrastructure and destruction of property. Other areas vulnerable to dam failure include Bachelder Road, Buck Street, Front Street and Memorial Field. Flooding could occur at Irish Pond and Canal Street if the dam were breached. Overall flooding in the floodplain could place Soucook and Suncook River residents and property at risk. Personal injury or death could occur.	NHDES Dam Hazard Classification *either/or criteria* **Dam Failure causes flooding and therefore is included as natural in this instance*
Technological	**Power/ Utility Failure**	NR	**Entire Town.** Areas and sites particularly susceptible: All utilities, Allenstown Waste Water Treatment Facilities, 55+ older living facilities, other vulnerable populations. Wooded, forested and more remote sections of Town such as North Pembroke and Range Roads would be difficult to access, with trees and power lines down. Route 3, Route 106 and Route 28, residential roads.	Power failure is typically a secondary hazard to a natural hazard event, such as severe wind or severe winter weather. All areas of Pembroke are susceptible to power failures. Utility companies are now responding to outages in a more organized, faster manner. Power failure is often the result of downed trees and the poles are shared by telephone land lines which can also be disrupted. The Public Works Department no longer has an independent fuel supply and if the local gas stations are without power, PWD cannot refuel vehicles to service the Town. Communications failure is also likely with power failure. A public safety issue arises if the Town is without power for a long period of time. The loss of heat during the severe winter weather is a concern for isolated or vulnerable populations. Other utility failures such as gas, water or sewer might be more localized events and have less of an impact on the Town.	N/A

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Technological	**Communications Systems Failure**	NR	**Entire Town.** Areas and sites particularly susceptible: All utilities, Allenstown Waste Water Treatment Facilities, 55+ older living facilities, other vulnerable populations. Telecommunications Tower. Telephone lines often go down with power. Communications failure would be worse if it occurred at the Fire and Police Depts, Public Works Department or Town Offices, especially during a holiday, or if failure inhibited emergency dispatch and EOC operations.	A communications systems failure is typically a secondary hazard to a natural hazard event, such as severe wind or severe winter weather, and would usually accompany power failure. Communications in Pembroke would be disrupted Town-wide, and public safety becomes a concern because the 911 system could be unavailable to residents and could delay emergency response to those in need. In rare situations, emergency communications may be limited if telecommunications towers are damaged, as Town vehicle radios and cell phones could be compromised. Radios with better range or that work off other towers might be needed.	N/A
Technological	**Debris Impacted Infrastructure**	NR	**Dams, bridges, roadways.** Most susceptible or dangerous locations experiencing debris impacted infrastructure: Route 3 double-decker bridge (Suncook River) would be most serious. Dams and bridges in Appendix A. Culverts flowing into Merrimack River. Roads or culverts that regularly washout (including those in need of upgrade) include: Nadine Road, Ross Road, Michol Road, Pembroke Hill Road, Cross Country Road, Buck Street (Evergreen Cemetery), Borough Road, Littlefield Condominiums, Bachelder Road, Fourth Range Road. Other state routes (Route 3, Route 106, Route 28), local commuter roadways or residential roads that are commonly blocked or would impact the greatest number of people if blocked by downed trees or power/utility lines.	As a secondary hazard, floating debris down rivers and streams such as leaves and woody materials can block culverts, or very large items such as trees could flow up against bridge abutments during periods of high flooding. Since the community is surrounded on three sides by the Merrimack River, Soucook River, and Suncook River and have multiple brooks such as Ames Brook and countless drainage areas, debris impacted infrastructure can occur Town-wide and potentially cause property damage. Trees or branches fallen onto power lines or onto roadways are also debris impacted infrastructure. Any trees downed by storms or leaf debris could block roads and/or culverts causing possible water diversion onto roads and additional travel hazards. This flooding cancan restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance. Debris impacted infrastructure events could occur over the entire community during periods of high flooding.	N/A
Technological	**Transportation Accidents**	NR	**Roadways.** NH Route 106, US Route 3, intersection of Routes 106/3, NH Route 28, local Class V roads. Certain local intersections with Route 3, curves, straightaways, hills.	Transportation accidents are often secondary hazards to a natural hazard event, such as a snowstorm. With roadways covering the entire community, accidents can occur Town-wide and cause personal injury and property damage. Locations particularly prone to vehicle accidents include Pembroke Street, North Pembroke Road, Fourth Range Road, and Pembroke Hill Road. When an accident blocks the roadway and traffic is diverted, it can restrict the ability of emergency vehicles to reach people in need, resulting in a delay of assistance.	N/A
Technological	**Fire (Vehicle, Structure, Arson)**	NR	**Entire Town.** Areas most susceptible include: vacant buildings, foreclosure homes or seasonal buildings in the Town. Buildings in densely populated areas such as Suncook Village or residential manufactured home communities. Vehicle fires could occur anywhere, parking lots, driveways, roadways.	While a fire resulting from an explosion, arson or is limited to a structure or vehicle can occur anywhere in Pembroke, property damage would occur. Fire is an isolated problem in a certain area, so a minimal number of people would be at risk. Depending on the location of the fire, personal injury or death could occur.	N/A

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Technological	**Hazardous Materials Spills**	NR	**Most significant routes** where vehicular traffic transports hazardous waste include: Route 3 & Route 106, railroad at Bow Eversource Electric Plant that transports anhydrous ammonia (fear of vapor cloud to Suncook Village). L**argest or most dangerous stationary sites** that store and/or handle haz mat on site include those that have fertilizer, pesticides, fuel, etc. **Occupational haz mat sites** where spills could occur include: Schools, health or veterinary clinics, manufacturing facilities, etc.	Hazardous materials spills can occur Town-wide on roadways, rail lines in neighboring towns, or in businesses which can result in property damage and possible personal injury. Route 3, Route 28, Route 106 and Town Roads traverse the entire community, and travel routes of transport trucks will typically stay to the state Routes. Any haz mat spill requires containment and cleanup, can have a negative effect on public health, and may require the services of the Central NH Haz Mat Team. Hazardous materials spills can have long-term consequences to the environment and to the health of people in the area.	N/A
Human	**Public Health Epidemics**	NR	**Most susceptible transfer sites:** Schools, health clinics, eating establishments, populated areas, large employers, 55+ living facilities, stores, churches and public assembly venues - all of these locations increase the risk of exposure to and transfer of illness. Also, programs with public outreach such as recreation, senior groups, Meals-on-Wheels, VNA, Seniors-Helping-Seniors, etc.	Public health is a community issue and can occur Town-wide particularly in the cold and hot months of the year. People can become sick through cold-and heat-influenced epidemics such as influenza, West Nile Virus, Lyme Disease, and more. Property damage could also occur as a result, such as the growth of mold and mildew after a flood in the hotter months. Those most vulnerable to public health epidemics include people in close quarters, including schools, daycares, churches, assisted living facilities, and other public assembly venues all of which increase the risk of exposure to illness.	N/A
Human	**Drug Overdose Epidemic**	NE	**Entire Town.** Vulnerable populations include most demographics, but more susceptible sites and locations could be the Middle School, Pembroke Academy, apartment buildings, middle class neighborhoods.	The state of NH is currently having a drug overdose epidemic and Pembroke is similarly has these issues in the community. Drug overdose calls for ambulance service and treatment have been on the rise. So far, this problem has remained in isolated, individual incidents within Town. There is a potential danger to the schools in Town if adult drug use and overdose begins seeping into the culture of the community.	N/A
Human	**Terrorism**	NR	**None anticipated.** Most susceptible sites could include: Town Hall, Schools, Post Office, Safety Center, State facilities (NHDOT shed, etc), all governmental facilities. Other facilities and locations could include Route 3 double-decker bridge, telecommunication towers, major employers (especially those large quantities of haz materials), health clinics, grocery or convenience stores, restaurants, high volume roadways, water supply infrastructure or dams, political offices or rallies, churches, etc	Terrorism may be a rare incident, but if it were to occur in Pembroke the likely areas would be public facilities or the gas facilities in Town. Gathering locations where large numbers of people are congregated are prime locations for terrorism. Rymes Fueling Station, Soucook Lane, Clean Energy Natural Gas, Air Gas, and other local facilities have the means for terrorists to tamper with tanks. Terrorism incidents could cause property damage and personal injury or death.	N/A

Hazard Risk Assessment Hazards		Overall Risk	Hazard Locations in Town – Existing (Susceptible) From Hazard Risk Assessment	Potential Future Hazards	Magnitude/ Extent Measure-ment Scale
Human	**Sabotage/ Vandalism**	NR	**Town systems or facilities.** Sabotage would be most likely to occur: within Town computer systems & website, Town buildings, Schools, technological systems (water supplies, waste water treatment facilities), cemeteries, vacant buildings, under bridges.	Sabotage can take many forms, including the intent to make mischief, hurt someone, or destroy property. Potential locations for sabotage include public buildings, computer systems/networks, the schools, cemeteries, public water supplies or the numerous gas facilities in Pembroke. Depending on the type of sabotage event, this could be a community concern. Sabotage to infrastructure could result in property damage and personal injury or death.	N/A
Human	**Hostage Situation**	NR	**Entire Town, but isolated incident.** Locations where hostages could be taken include: Town Hall and other public buildings, Schools, banks, Post Office, workplaces, grocery and convenience stores, restaurants, high density population areas (Suncook Village, manufactured housing communities, apartment buildings), courthouse, domestic home situations.	A hostage situation would be the worst hazard event or disaster scenario emergency officials in Pembroke could encounter. There is a greater likelihood for personal injury or death. Locations in Pembroke where hostages could be taken include the Pembroke Schools, public buildings, Post Office, workplaces, and homes. A hostage situation could realistically occur anywhere within the Town and would continue to negatively affect the overall morale and feelings of well-being and safety within the community after the situation was resolved.	N/A
Human	**Civil Disturbance/ Public Unrest**	NR	**None as locations where civil disturbance could occur should be limited.** Locations and occasions include: Town Meetings, voting day, during visits from political candidates, Old Home Day and other Town events, School graduation. Locations include Schools, at sporting events, Town Hall, Safety Center, convenience stores, restaurants and establishments serving alcohol, high density population areas (Suncook Village, manufactured housing communities apartment buildings).	If they were to occur in Pembroke, civil disturbances or public unrest would be most likely to occur at the Pembroke Schools, Town Office, Library, or locations where demonstrations or political events could occur.	N/A

Source: Pembroke Hazard Mitigation Committee

Although there are many potential hazards in Pembroke's future, the community has a handle on where some of the worst occurrences might result with this descriptive **Potential Future Hazards** inventory. A comprehensive, specific community location inventory that indicates each site's ***Primary Hazard Vulnerabilities*** is found next in **5 COMMUNITY VULNERABILITY ASSESSMENT**.

Pembroke's Built Environment Changes Since the 2010 Plan

The locations of where people and buildings are concentrated now or where new lands may be developed should be compared to the changing locations of potential natural hazards in order to best mitigate potential property damage, personal injury or loss of life. The overall vulnerability of the Town to natural disasters is believed to have increased with the population and development increases.

AREAS OF HIGHEST DENSITIES

The highest density of population in Pembroke is located in Suncook Village. This area contains a small business center and single family homes, multi-family homes and apartment buildings. Many businesses, homes, and community facilities line US Route 3/Pembroke Street at the bottom of the community, spanning a northwestern to southeastern direction. US Route 3 roughly parallels the Merrimack River and is the main travel way for commuters traveling to/from Concord, Hooksett and Manchester. Route 106 harbors much of Pembroke's economic development opportunities and leads straight into Concord, crossing the Soucook River, and is used from points north to reach Interstate 93 when Route 106 intersects with US Route 3. To the north of Suncook Village and to the east of Route 106, Pembroke's population becomes much more spread out and much of the land is undeveloped and difficult to access.

Changes from the 2010 Plan

The areas of highest density in the community at large have seen some expansion. Suncook Village, Route 3/Pembroke Street, and areas along Route 106 have remained the same. Although businesses may change, they often reuse the existing buildings and locations which is more common than completely new facilities or use in-fill development in appropriate areas.

However, US Route 3/Pembroke Street is experiencing more traffic with an enhanced intersection at Pembroke Hill Road resulting in smoother, safer traffic flow. Pembroke Farms Independent Living community on Route 3 finished building out its 40 units on Pembroke Street. Existing development communities finished building their remaining units to complete neighborhoods in Suncook Village and north of Route 3 once the economy picked up after 2010. These areas are most susceptible to fire, power/utility failure, severe wind, severe winter weather, traffic accidents, public health issues, and evacuation difficulties as US Route 3 is the only main roadway for most local residents.

Also along Route 3/Pembroke Street spanning to Suncook Village, a design review application in fall 2015 for a 110-lot subdivision located across from Pembroke Academy was reviewed by the Planning Board. With proposed road access at the top of Broadway and in between the traffic light at Academy Road and Riverview Way (Littlefield Condominiums) along Pembroke Street, at build-out the homes could add 2,000+ more cars a day to Broadway and Pembroke Streets. Many homes would lie in or near the Merrimack River floodplain. The developer intends to return to the Planning Board for a formal approval, phased development over 10 years. Along with the evacuation problems and other hazards mentioned

previously for the Route 3 area, severe flooding could become a significant problem. Population density would increase immensely. These new homes along with other Suncook Village homes may have to shelter in place from the Bow Eversource Power Plant's possible future anhydrous ammonia leak and vapor cloud carrying over the Merrimack River by wind currents, generated by hazardous materials spills.

Along the moderately commercial-industrial developed Route 106, the new National Guard facility will very soon begin its operations. The facilities and buildings lie directly adjacent to the Soucook River floodplain, with severe flooding a potential problem. The potential air traffic incidents such as helicopter crashes at this training facility may increase. Adding more people and vehicles to Route 106 that could add to the Town's overall evacuation problems and an increase of traffic accidents. The Town has experienced some new construction and expansion and continued reuse of existing commercial buildings. Some commercial lots have sold recently which will most likely bring more commercial development proposals to the town.

VULNERABLE POPULATIONS

As mentioned, Pembroke is bordered by the Merrimack River to the south, Soucook River to the west and Suncook River to the east. Since much of Pembroke's overall compact development is located in from south of Route 3 at the western border too Suncook Village at the confluence of the Merrimack and Suncook Rivers, it is particularly vulnerable to the impacts of flooding although not many homes or businesses here are located in the floodplain due to higher elevations. All of those in Suncook Village could be considered a vulnerable population to the effects of high density hazards noted above.

Development along Route 3, and any Village populations attempting to exit, is vulnerable because Route 3 is the primary means of travel out of town. Transportation accidents on any major travel route would inhibit the ability of people to travel. Route 3, NH Route 106 and NH 28 all cross rivers along the Towns borders over the Soucook, Suncook and Merrimack Rivers. Route 106, although not in any particular hazard area, is also an evacuation route but it too relies on the ability to cross the Soucook River out of Pembroke. Residents in North Pembroke must rely on the North Pembroke Bridge crossing the Soucook River to exit the community. A number of large commercial/industrial businesses are situated along Route 106.

Changes from the 2010 Plan

The Suncook River runs through Pembroke in a north-south direction. Since much of Pembroke's overall compact development is located in Suncook Village, it is more vulnerable to the impacts of **flooding** and many of the homes here are located in the floodplain. With the completion of approved housing developments on Route 3 and off the feeder roads that exit onto Route 3 came the realization that most developments have only one egress if **evacuation** needed to occur.

People living in North Pembroke who are not located on main travel routes or are susceptible to **flooding** have the potential to be isolated from emergency services due to **traffic blockages, ice**, **heavy snow**, or

fire. The development of the ***Soucook River Fluvial Geomorphic Assessment and Maps 2015*** enabled the Town to notice Silva's Manufactured Housing Park on Route 106 could be in danger of **erosion** or **flooding** from the Soucook River.

Across the Merrimack River from Suncook Village lies the Eversource Coal Power Station in Bow. The active cargo transport railroad carries railcars with substances that support the facility's use, including anhydrous ammonia. The Town of Pembroke has concerns about any potential **hazardous materials** accidents that could spill railcar contents, which could enable a **vapor cloud of anhydrous ammonia or other chemicals** to cross the River to the Suncook Village area by wind currents. Also along the Merrimack River, Memorial Field recreation area has experienced nearly all of the **erosion** and **flooding** the Town park can handle without professional intervention.

FUTURE DEVELOPMENT IN PEMBROKE

Development in Town has been growing over the last five years, a change from the low-growth period of the late 2000s. Future development occurring in the undeveloped, rural areas of Town away from the Suncook River or Soucook River may need to build new roadways to specifications that should be less vulnerable to flooding but more vulnerable to **ice**, **wind** and **snow events** damage. The secondary technological hazards of **power failures** and **communications failures** often accompany these primary hazards. However, even though more growth can be expected, it will not be at levels high enough to create areas of relatively high density or new commercial centers. The primary concern for new development in rural areas is potential **isolation** in emergency situations and the **inability to evacuate.**

Changes from the 2010 Plan

Since the economy has improved, the Planning Board has seen more requests for residential land development and has seen previously approved commercial and residential developments built. The Future Development Table in **APPENDIX A Critical and Community Vulnerability Assessment** displays some of the most prominent developments that were previously approved but have not yet been built. In response to a possible forthcoming building boom, the Town needs to ensure stronger regulations, policies and ordinances are written to support safe new development, such as ensuring more than 1 egress in a development, updating the Sewer Use ordinance, developing stormwater regulations, using earthquake standards for construction and prime wetlands designation for flood storage. The Town also needs to update Plans that support the community, such as a culvert replacement plan, Master Plan, Capital Improvements Plan. and Critical Infrastructure Protection Plan.

Mentioned previously is the long-term 110 lot residential subdivision phased over a 10-year period in the Route 3/Pembroke Street and Suncook Village area along the Merrimack River. The recent completion of Loop Road will increase the commercial development and population/traffic density at the end of Route 3 and NH Route 106 intersection area.

The possibility for severe wind events, winter weather, fire, hazardous materials spills (including shelter in place procedures), transportation accidents, evacuation issues, and stormwater drainage or floodplain flooding hazard events can be present for future development. With land use planning and diligence of the Conservation Commission to purchase development rights to key parcels or to purchase key parcels outright, the Town can better protect its incoming populations and help provide more safety to those already living or doing business in Pembroke. The Planning Board and Code Enforcement Officer will ensure any new developments meet the ordinances and regulations to maximize safety and mitigate some of these hazards.

5 COMMUNITY VULNERABILITY ASSESSMENT AND LOSS ESTIMATION

The Hazard Mitigation Committee developed and/or updated as needed each of the assets tables within this Chapter. Sites were added or removed, and contact information was revised. Modifications were made to the ***Primary Hazard Vulnerability*** column to reflect changes over the last five years. Revisions were made to the future development section, which now includes a clear table. The Plan's maps were also updated from the original **Pembroke Hazard Mitigation Plan 2004**.

The identification of Critical and Community Facilities within Pembroke is integral to determining what facilities may be at risk from a natural disaster. Every Critical and Community Facility can be damaged by multiple hazards listed in **4 HAZARD RISK ASSESSMENT**. A tabular inventory of facilities in Pembroke is provided in **APPENDIX A Critical and Community Facilities Vulnerability Assessment**. The ***911 Street Address*** and ***Phone*** number of each facility is supplied, the assessed ***Structure Replacement Value $***, and the ***Primary Hazard Vulnerabilities*** to which the facility is most susceptible are listed. The hazards identified are primarily natural disasters but regularly include the technological (and secondary disasters) such as power failure and communications systems failure as well as human hazards such as vandalism/sabotage.

The majority of the sites appear on ***Map 3: Critical and Community Facilities*** and ***Map 4: Potential Hazards and Losses.***

Potential dollar losses for each of the facilities' ***Structure Replacement Value $*** (not land) have been obtained through the February 2016 Vision Appraisal System assessments to provide a starting point of the financial loss possible should these structures become damaged or require replacement. These community facility losses are estimated for the value of structure and does not include land (unless indicated), contents, or infrastructure.

Problem Statements were then generated for each type of facility when issues were identified by the Hazard Mitigation Committee during discussion of the facility characteristics and ***Primary Hazard Vulnerabilities.*** These **Problem Statements** are listed here.

Potential dollar losses to buildings in the Pembroke from flooding and other natural hazards are provided using the methods described in the chapter. The Town's participation in the National Flood Insurance Program (NFIP) offers a way for individuals to obtain insurance coverage for flooding. The Town's history with NFIP claims and repetitive losses are examined.

The Chapter provides an inventory of the community facilities and critical facilities and the most prevalent hazards to which they are vulnerable. Potential structure damage loss is also provided. The detailed information for this Chapter is available in **APPENDIX A**:

A Critical and Community Facilities Vulnerability Assessment

Facility Name	Street Address (911)	Phone	Structure Replacement Value* $	Primary Hazard Vulnerabilities

Critical Facilities

Critical facilities are categorized as those town or state buildings or services that are first-responders in a disaster. The Fire Department, Police Department, Highway Department, and Town Offices are crucial in providing and coordinating the emergency services. Other critical facilities would include educational facilities, hospitals, and emergency shelters. Utilities or utility features, such as cisterns, culverts, dry hydrants, pump stations, water and sewer lines, and electric transmission lines are included because of communication and power/water services provided.

Many such facilities are located in Pembroke. The assessed structure/building only value is provided for each facility where available, otherwise estimates are provided to help ascertain the financial impact a disaster can have on the community. To view the detailed Critical Facilities sites and tables, see **APPENDIX A**. Most of these critical facilities sites appear on ***Map 3 Community and Critical Facilities***.

Essential Facilities include: Town Hall, Safety Center, Public Works and Transfer Station, Salt Shed, Tri-Town Ambulance. Assessed structure (only) replacement values for these essential facilities total **$6.7m**.

Utilities include: Water Works Office, Pump Stations, and Wells; Wastewater Treatment Plan and Pump Stations; Telecommunications towers; Tennessee Gas, Liberty Natural Gas, Unitil Electric lines; and Comcast Cable, Eversource, Fairpoint Telephone lines and offices. Assessed values for all utilities in Pembroke total **$31.4m**.

Dams include: High Hazard Pembroke Dam on the Suncook River at Main Street, Significant Hazard Webster Mill Dam on the Suncook River, and Low Hazard China Mill Dam on the Suncook River. Many other bridges located in both the Town and abutting Allenstown or Concord that are integral to Pembroke's roadway system and ability to evacuate are included. These shared bridges included North Pembroke Road owned by Concord, several over the Soucook River into Concord owned by the State, and the new double decker bridge shared with Allenstown over the Suncook River. Estimated structure (only) repair values for these dams total **$9m**.

Bridges include: State highway bridges for I-393 and US 4/202; State Route 3 over the Suncook River; Town Buck Street bridge. Estimated structure (only) rehabilitation values for these bridges total **$38m**.

Shelters, Schools, and Medical Facilities include: Pembroke Academy, Three Rivers School, Village School, and Pembroke Hill School; private schools (Green Valley and Strong Foundations); medical facilities such as Family Physicians of Pembroke, Pembroke Wellness Center, Suncook Family Dentistry, Pembroke Animal Hospital; and the Town shelter in Allenstown, the Allenstown Elementary School. Assessed structure (only) replacement values for these schools, medical facilities and shelters total **$29.7m**.

PROBLEM STATEMENTS

During discussion of these Critical Facilities, the Hazard Mitigation Committee identified specific issues or problems that could be further evaluated. **Problem Statements** were developed after ascertaining the ***Primary Hazard Vulnerabilities*** to the sites and known existing issues. These potential hazards were typically those from the **Hazard Risk Assessment**.

- There is no municipal fuel available for Town emergency response vehicles in the event of power failure.
- If the Town Salt Shed is compromised by an event, the 15% of the salt and sand mixture will become unusable.
- Public Works Facility structure experiences foundation movement and is item to repair in the CIP (low priority now). Equipment may not be retrievable if wall(s) fall. Structure is reviewed by an engineer regularly.
- Bow Lane Sewer Pump Station is old and needs to be upgraded else sewer will be dumped directly into the Merrimack River.
- Generators for public/private radio traffic on 2 cell towers are not always filled with fuel, an outside company is responsible for task. Towers are a critical radio site for state communications
- The aging Tennessee Gas Pipeline under federal control is located in environmentally sensitive area over aquifers. Reactionary measures only for fixing problems, emergency phone line to call.
- Suncook River is infiltrating dam abutments next to the Emerson Mills Apartments.
- Webster Mill Dam finds erosion closer to Mills Falls Condos after each flood.
- People will have difficulty accessing any of the bridges impacted by flooding, particularly Route 9 on the Soucook River (State bridge). People have to detour longer way around.
- Hold discussions with Concord to address the North Pembroke Bridge - to be replaced in 2017, last known date. State, Pembroke & Concord worked to repair cement & steel bridge after 2007 flood. Business access is more important than residential.
- There is only 1 way in and out of Strong Foundations. National Guard controls the second gate for deliveries only. The school has evacuation issues.
- Pembroke shares sheltering with Allenstown Elementary School on Main Street.

Many of these problem statements were developed into Actions discussed later in **7 POTENTIAL ACTION EVALUATION** and **8 MITIGATION ACTION PLAN**.
A table of culverts which are in need of upgrade does not appear with the **Community Facility Vulnerability Assessment** but is included here within this section. Culverts are responsible for carrying

volumes of water safely under roadways, and with the prior severe flooding events it is necessary to keep Town infrastructure in adequate condition. Table 26 display the condition of culverts in need of upgrade and approximately when the upgrades can occur. The approximate cost for replacement of all these culverts is **$1m**.

Table 26

Town-Owned Culverts in Need of Upgrade

Road Name of Culvert(s)	Number of Culverts	Intersecting Water	Issue(s)	Estimated Upgrade Year	Total Approx. $ Cost for All
Nadine Road	2	flows into Merrimack River	deteriorating	2018	$240,000
Ross Road	1	flows into Merrimack River	deteriorating	2016 paving project	$30,000
Micol Road	1	flows into Merrimack River	deteriorating	2016	$40,000
255 Pembroke Hill Rd	1	storm drainage	deteriorating	2018	$15,000
747 Cross Country Rd	1	brook with beaver pond	deteriorating	2018	$30,000
Buck Street at Evergreen Cemetery	1	Ames Brook	deteriorating	2019	$25,000
766 Borough Rd	1	Brook with ponds on both sides	deteriorating	2019	$22,000
Littlefield Condos	?	flows into Merrimack River	drainage system too small, failure	2020	$100,000
Bachelder Road	1	flows into Merrimack River	Undermined granite culvert under bridge	2022	$400,000
Fourth Range Road	1	flows into Merrimack River eventually	deteriorating	2022	$17,000
Totals	**10**				**$919,000**

Source: Public Works Department 2016

A listing of the necessary upgrades to culverts in the community can help begin formulation of a culvert upgrade and maintenance plan. Knowing the location and condition of all culverts to help guide their replacement, maintenance, and monitoring regularly will help alleviate some of the run-off and overtop flooding conditions in Pembroke, particularly those related to washouts.

Some of the culverts listed in Table 26 have been developed into **Mitigation Action Plan** items in **8 MITIGATION ACTION PLAN**.

Community Facilities

The Community Facilities inventoried in **APPENDIX A** generally vulnerable to disasters and in need of careful consideration. Some facilities are vulnerable populations, places where people gather, the economic assets of the community, contain the history of the town, or could release hazardous materials during hazard or disaster events. While Critical Facilities are strong with emergency preparedness and mitigation measures, Community Facilities are typically not as well attuned to these issues and would require more emergency services during a hazard event disaster.

Vulnerable Populations include: manufactured housing parks: Ashley Park Cooperative, Sun Briar Knoll, Silver Fox Estates, Sheetz, Tanglewood, and Silva's; day care facilities: and Small Steps, First Choice for Children, Hurney; group living facilities: Pembroke Pines Rooming House, Taylor Communities Independent Living, and Pembroke Farms Independent Living; and Krazy Kids Indoor Play and Party Center. Assessed structure (only) replacement values for these vulnerable populations total **$7.2m**.

Economic Assets include: those businesses and services that employ a large number of people or contribute to the local economy. They include TD Bank, Pitco, A&B Limber, Northeast Logistics, Associated Grocers, Union Street Business Building, JBI Helicopter, US Geological Survey, Heat and Control, Epoch Homes, and American Yeast Industrial Building. Assessed structure (only) replacement values for these economic assets total **$56.3m**.

Cemeteries and Churches include: Hillside Baptist, Pembroke Congregational, Grace Capital, First Presbyterian, and Suncook Methodist Churches; ten cemeteries were identified including Pembroke Street, Buck Street, Abbott, North Pembroke, Blueberry Hill, Evergreen, Pembroke Hill, and Richardson Cemeteries; private cemeteries included French Family and French-Dearborn cemeteries. As cemeteries do not contain structures, the land value was provided instead. Assessed structure replacement or land values for these cemeteries and churches total **$6.1m**.

Hazardous Materials Facilities, which are also economic assets to the community, include: Rymes Oil, Route 3 Getty service Center, Lavallee Oil Company, Nortrax Equipment, Howard P Fairfield, Pembroke Mobil, Mike Gove Auto, Clean Energy, Airgas USA, Dandy Automotive, Pleasant View Gardens, Lavoie Pools, and Continental Paving. Assessed structure (only) replacement values for these hazardous material facilities total **$11.5m**.

Historic Sites and Buildings include: Pembroke Water Works Historic Building, Old Buck Street Schoolhouse/Historical Society, Pembroke Town Pound, Downtown Suncook Village Area, Clock Tower Langmaid Monument, and Whittemore Homestead. Not including Suncook Village, assessed structure (only) replacement values for these historic sites total **$1.2m**.

Recreational and Gathering Sites of both land and buildings include: Maple Grove Campground, Pembroke Town Library, Pembroke Hill School Fields, Pembroke Academy Sports Fields, Bragfield Pond

Conservation Area, Memorial Field Facilities, Pembroke Village School Sports Fields, Three Rivers School Sports Fields, Plausawa Valley Golf Course, Pehaugun Men's Club, New Hampshire Soccer Association, White Sands Conservation Area, Whittemore Conservation Easement, and 14 other easements. Including the assessed structure (only) replacement values for the Town Library and Memorial Field Facilities, the assessed structure and land value for these recreational facilities total **$6m**.

Future Development includes: mostly commercial or residential developments the Pembroke Planning Board has approved but have either not been built or have yet to be built out to completion such as Pembroke Meadows, Poirier Subdivision, DASAI Group, Silver Hills Business Park, Continental Paving, Pitco Co, Pembroke AG Holdings, Pembroke 600, and Clean Energy; and vacant lots which could in the future be built upon, such as for expanding the Commercial Zone and Residential Development; and the National Guard site. Assessed vacant land not yet built for these locations totals **$38.6m**.

PROBLEM STATEMENTS

During discussion of these Community Facilities, the Hazard Mitigation Committee identified specific issues or problems that could be further evaluated. **Problem Statements** were developed after ascertaining the ***Primary Hazard Vulnerabilities*** to the sites and known existing issues. These potential hazards were typically those from the **Hazard Risk Assessment**.

- Silva's manufactured home park on the Soucook River is eroding and low-lying, a danger to residents.
- Many vulnerable pops have limited access or only 1 egress which can cause evacuation issues.
- There is no accountability for the number or names of residents in independent living buildings by the building managers and no evacuations plans.
- Worst case scenario has Town businesses within 2.2 miles subject to anhydrous ammonia exposure at Eversource across the Merrimack River if there's an event.
- There are no true costs as to what the total financial impact would be on the cemeteries for their monuments if damaged or vandalized.
- Investigate hazardous waste barrels on 6th Range Road by Fire Department & NHDES to determine substances, who may have left them. Potential contamination of aquifers can occur.
- Severe traffic impact on I-393 and Route 4/9 if Rymes facility on Horse Corner Rd suffers any leakage. No E/W highway alternative.
- Decision making problem with hazardous material operational consideration - let burn to consume contaminants or extinguish for competing reasons (could be in an aquifer area).
- Unoccupied, historic properties such as Main Street Pembroke Water Works, Old Buck St School House and the Whittemore Homestead are more vulnerable to fire, vandalism and other damage.

- Natural weather disasters, limited security, and limited access at Town recreational facilities can cause issues.
- Severe weather, sabotage, and egress issues can be present with all developments.
- Public health and earth hazards (radon, arsenic) issues with are found residential and commercial development.
  Town infrastructure and services are not able to keep up with amount of development.

Many of these problem statements were developed into Actions discussed later in **7 POTENTIAL ACTION EVALUATION** and **8 MITIGATION ACTION PLAN**.

Potential Losses from Natural Disasters

Natural disasters, including floods, wind events, severe winter storms and ice storms, secondary disasters as a result of the natural disasters (such as power loss) and to a lesser degree, human and technological hazards as documented in **4 HAZARD RISK ASSESSMENT** have occurred in Pembroke This section estimates Town-wide structure/building damage in Town from natural hazard events. It is difficult to ascertain the amount of damage caused by a hazard because the damage will depend on the hazard's location and magnitude, making each hazard event somewhat unique. Human and technological hazards are typically even more incalculable. Human loss of life was not included in the potential loss estimates for natural hazards, but could be expected to occur, depending on the severity of the hazard.

While this Plan focuses on being pro-active in those geographic areas of Pembroke most prone to recurring hazards (like flooding), some initial estimates of measurable property damage and building damage have been discussed by utilizing simple techniques such as the numbers of structures and assessed valuation. This two-dimensional approach of calculating dollar losses from tangible structures offers a basic yet insightful tool to begin further loss estimation analyses.

TOOLS FOR COMMUNITIES WITH GIS

For gauging more three-dimensional estimation of damages, FEMA has developed a software program entitled HAZUS-MH (for multi-hazard), which is a powerful risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH, current scientific and engineering knowledge is coupled with the latest Geographic Information Systems (GIS) technology to produce estimates of hazard related damage before, or after, a disaster occurs. Developed for ARCGIS which produced the ***Maps*** for this Plan, HAZUS-MH takes into account various effects of a hazard event such as:

- Physical damage: damage to residential and commercial buildings, schools, critical facilities, and infrastructure;

- Economic loss: lost jobs, business interruptions, repair and reconstruction costs; and
- Social impacts: impacts to people, including requirements for shelters and medical aid.

Federal, State and local government agencies and the private sector can order HAZUS-MH free-of-charge from the FEMA Distribution Center. Pembroke should first ascertain whether a municipal geographic information system (GIS) of hardware and software is appropriate, and if so, consider training staff to perform models. With many Town existing and under-development infrastructure GIS data layers available, HAZUS-MH could prove very helpful for estimating losses for the community on a disaster-specific basis. However, much staff time is necessary to train staff and maintain a GIS system. Official map generation is typically subcontracted out to other agencies at this time, including Avitar Assessing and the Central NH Regional Planning Commission.

METHODS OF POTENTIAL DOLLAR LOSSES BY NATURAL HAZARDS

A more manageable technique was used for loss estimation for the purposes of this **Hazard Mitigation Plan Update**. Natural hazard losses are calculated based on dollar damage ranges over the entire community, or in the case of flooding, buildings in the Special Flood Hazard Areas (SFHAs) are counted and their value is collected. The number of total parcels in the community as of February 2016 is **2,934**. **Using February 2016 Vision Appraisal System assessment data, the total assessed value of all residential and non-residential structures in Pembroke (**$393,275,250**) is the basis for loss estimation calculations.**

Potential Building Dollar Losses by SFHA Flooding

Parcels within the floodplain were identified using Pembroke's 2015 tax maps concurrently with the 2010 FEMA Digital Flood Insurance Rate Maps (DFIRMs). Next, parcels containing buildings were identified using the Town tax assessor's database for the Town. Building type was characterized into one of four categories. The categories are single-family homes, multi-family homes, manufactured homes, and non-residential buildings. Building value was taken from the assessing database. ***Land value and building content value were not considered in these calculations.***

Table 27

Building Value in the Special Flood Hazard Areas (SFHAs)

Building Type	Number of Buildings	Total Value of Buildings	Average Replacement Value
Single Family Homes	34	$3,258,800	$95,847
Multi-family Homes	13	$2,280,000	$175,385
Manufactured Homes	26	$78,400	$3,015
Non-Residential Buildings	7	$673,900	$96,271
Totals	**80**	**$6,291,100**	-----

Sources: Town of Pembroke Vision Appraisal System 02/16 Assessing Database; 2010 DFIRMs

In Table 27, **34** single family residential homes, **13** multi-family homes, **26** manufactured homes, and **7** non-residential buildings were considered to be situated the Special Flood Hazard Areas (SFHAs). The average replacement value is **$95,800** for a single-family home and **$175,400** for a multi-family home. Non-residential buildings average **$96,300**. The total value of all buildings in the Special Flood Hazard Areas is about **$6.3 million** for the **80** structures.

In the following calculations, the average replacement value was calculated by adding the assessed values of all structures in the special flood hazard areas and dividing by the number of structures. The Federal Emergency Management Agency (FEMA) has developed a process to calculate potential loss for structures during flooding. The potential loss was calculated by multiplying the average replacement value by the percent of damage expected from the hazard event, and then by multiplying that figure by the number of structures.

The costs for repairing or replacing infrastructure such as bridges, railroads, power lines, roads, drainage systems, telephone lines, or natural gas pipelines, and land value and the contents of structures have not been included in these estimates in the following figures.

Table 28

Dollar Damage Ranges for Total Buildings in Special Flood Hazard Areas (SFHA)

Building Type	Total Value of Buildings in SFHA	Total Value of Potential Damages in SFHAs by Respective Building Type		
		Eight-Foot Flood 49% Damage	Four-Foot Flood 28% Damage	Two-Foot Flood 20% Damage
Single Family Homes	**$3,258,800**	$1,596,812	$912,464	$651,760
Multi-Family Homes	**$2,280,000**	$1,117,200	$638,400	$456,000
Manufactured Homes	**$78,400**	$38,416	$21,952	$15,680
Non-Residential Buildings	**$673,900**	$330,211	$188,692	$134,780

Sources: Town of Pembroke Vision Appraisal System 02/16 Assessing Database; (See Table 27)

Table 28 represents the worst case scenario of *all* single-family homes, multi-family homes, manufactured homes, and non-residential buildings within the Special Flood Hazard Area that are damaged by a flood hazard event.

If all of the **34** single family homes were damaged by a ***Two-Foot Flood (20% Damage)***, the dollar damage to the buildings *only* could be **$650,000** while an ***Eight-Foot Flood (49% Damage)*** could yield over **$1.5 million** in damage. Although there are only **9** non–residential buildings in the SFHA, all non-residential buildings damaged in the same ***Two-Foot Flood (20% Damage)*** could total **$135,000** versus an ***Eight-Foot Flood (49% Damage)*** of **$330,000** in damage. Dollar damage estimations vary according to the standard percentages of damage levels associated with flooding levels set by FEMA.

Table 29

Dollar Damage Ranges for Individual Buildings in Special Flood Hazard Areas (SFHA)

Building Type	Average Value of Individual Buildings in SFHA	Individual Value of Potential Damages in SFHAs by Respective Building Type		
		Eight-Foot Flood 49% Damage	Four-Foot Flood 28% Damage	Two-Foot Flood 20% Damage
Single Family Homes	**$95,847**	$46,965	$26,837	$19,169
Multi-Family Homes	**$175,385**	$85,938	$49,108	$35,077
Manufactured Homes	**$3,015**	$1,478	$844	$603
Non-Residential Buildings	**$96,271**	$47,173	$26,956	$19,254

Sources: Town of Pembroke Vision Appraisal System 02/16 Assessing Database; (See Table 27)

Table 29 also represents the worst case scenario, but of *individual* single-family homes, multi-family homes, manufactured houses, and non-residential buildings within the Special Flood Hazard Area that are damaged by a flood hazard event.

If one single family home was damaged by a ***Two-Foot Flood (20% Damage)***, the projected dollar damage to the building *only* could be about **$19,200** while an ***Eight-Foot Flood (49% Damage)*** could yield over **$47,000** in damage. If damage was sustained to one non-residential building, the projected dollar damage could be **$195,300** from a ***Two-Foot Flood (20% Damage)*** but **$47,200** for an ***Eight-Foot Flood (49% Damage).***

Potential Building Dollar Losses by Other Natural Hazards

Flooding is often associated with heavy rains and flash floods, hurricanes, ice jams, rapid snow melting in the spring, and culvert washouts. These are all types of flooding hazards discussed or evaluated previously but can also occur outside of the SHFA.

Building damage by natural disasters in New Hampshire is not limited to SFHA flooding alone, which is easier to quantify and predict. Simple calculations can be made based upon generalizations of a disaster impacting a certain percentage of the number of buildings in the Town. **The assessed value of all residential, commercial, and industrial structures in Pembroke is $393,275,250 (no land).** Disaster damages are often illustrated in the following section utilizing a percentage range of town-wide building damage. At **2,872** housing units in Pembroke from the US Census 2010, disaster impact to **10%** of them would yield **287** damaged units.

The inventory of Town sites or buildings in **APPENDIX A Critical and Community Facilities Vulnerability Assessment** indicates which hazards each site is most susceptible to and provides its assessed valuation. This dollar value can be used as a damage estimate from the natural hazard events listed below. Yet the potential losses discussed in this section involve all buildings across the community to provide a more distinct portrait of potential losses using the assessed valuation of all town buildings. Damages from natural hazards to anything other than buildings, such as infrastructure, land, humans or building contents, are not examined here. Specific individual studies would be needed to assess more detailed scenarios.

Wind Events

Damage caused by wind events such as hurricanes, downbursts, and rain and thunderstorms can be both excessive and expensive. The assessed value of all residential, commercial, and industrial structures in Pembroke is **$393,275,250** (no land).

With a scenario range of **1%** to **5%** of buildings damaged by wind events throughout the Town, a wind event could potentially cause up to **$3,932,753 (for more localized downburst, high winds, or tornadoes)** to **$19,663,763 (for more damaging and widespread tropical storms and hurricanes)** in building-only damage costs alone, not including contents, infrastructure, or land.

Severe Winter Weather

Power outages, extreme cold, and impacts to infrastructure are all effects of winter storms that have been felt in Pembroke in the past. All of these impacts are a risk to the community, including isolation, especially of the elderly, and increased traffic accidents. Damage caused as a result of this type of hazard varies according to wind velocity, snow accumulation, and duration.

With a scenario range of **1%** to **5%** of buildings damaged throughout the Town, severe winter storms could potentially cause up to **$3,932,753** to **$19,663,763** in building-only damage costs.

Rapid Snow Pack Melt

Flooding caused by rapid snow pack melt is often found along roadways and from watercourses such as rivers like the Merrimack River, Suncook River, Ames Brook, and the Soucook River. Those locations which

are particularly susceptible would be the floodplain and along roadways, but anywhere the water cannot yet percolate into the frozen ground could be vulnerable.

With a scenario of **0.5%** of buildings flooded throughout the Town, rapid snow pack melt flooding could potentially cause up to **$1,966,376** in building-only damage costs.

River Ice Jams and Debris Impacted Infrastructure

Although it would be unusual, ice jams on the Merrimack River, Suncook River or Soucook River would be the major causes of ice jam flooding and debris impacted infrastructure in Pembroke. Multiple bridges on Route 3, Route 106, and other state and local roads that rest on top of these watercourses were identified previously. Multiple additional small streams culverts and drainage systems abound. The ***2017-2026 NH Department of Transportation Ten Year Plan (TYP)*** provides many examples of basic cost estimates bridge replacement and rehabilitation. Within or near the Central NH Region rehabilitation of small local bridges can average **$450,000** while replacement of small local bridges can average over **$600,000**.

This average figure of **$600,000** can be used for one (**1**) local bridge replacement in Pembroke due to the physical damage caused by river ice jams or debris impacted infrastructure. The same bridge damaged by ice or debris which only requires rehabilitation could cost **$450,000**.

Or, if half of the **34** (**17**) single family homes in the floodplain were damaged as a result ***of two-foot flooding*** resulting from river ice jams or debris impacted infrastructure, there could be up to **$325,000** in building damage costs.

Earthquake

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric, and phone lines and are often associated with landslides and flash floods. Buildings that are not built to a high seismic design level could be susceptible to structural damage. Suncook Village could be more vulnerable as buildings are older, closer together, and the area is heavily populated.

With a scenario of **0.5%** of buildings damaged throughout the Town, an earthquake could potentially cause up to **$1,966,376** in building-only damage costs.

Wildfire

The risk of fire is difficult to predict based on location. Forest fires are more likely to occur during years of drought. In addition, areas and structures that are surrounded by dry vegetation that has not been suitably cleared are at high risk. However, fire danger is generally universal and can occur practically at any time. Dollar damage would depend on the extent of the fire, the number and type of buildings burned, and the amount of contents destroyed within the buildings.

With a scenario of **1.0%** of buildings damaged in the Town, a wildfire could potentially cause up to **$3,932,753** in building-only damage costs.

Lightning

Damage caused by lightning would not be Town-wide because it typically strikes in smaller areas. Few places in Pembroke are at specific risk but lightning strikes can cause fires. In the future, damages will vary according to the value of the structure and home and the contents inside, and dollar amounts would depend on if the hazard hit an area with a high density of buildings.

With a scenario of **0.5%** of buildings damaged throughout the Town, a lightning could potentially cause up to **$1,966,376** in building-only damage costs through fire spreading.

Drought

Drought is often declared on state-wide or region-wide basis, and sometimes by individual town. Dollar damage caused by drought would be difficult to quantify, but would most likely impact the agricultural and economic base of a community. Although everyone could be charged to conserve water, orchards, farms, and nurseries would be most affected.

As physical damage is usually isolated to specific locations, the effects of potential disasters at certain facilities could be researched utilizing the Town's assessor's database for valuation on targeted land. Agricultural land may be among the most affected by drought. People who rely on well water, which is all of North Pembroke, might find their wells running dry. The Town has **966** acres, or **7.0%** of its land in agricultural use which could be damaged by a drought.

Critical Facilities Buildings

These dozens of essential facilities, utilities, dams, bridges, and shelters and medical facilities inventoried in **APPENDIX A Critical and Community Facilities Vulnerability Assessment** provide the **Structure Only Value $** from the Vision Appraisal System. Multiple hazards are identified which may damage each inventoried building. Therefore, if the Town wanted to ascertain the damage cost from any natural hazard to an individual critical facility, this dollar value is available for evaluation.

Community Facilities Buildings

Dozens of community facilities such as vulnerable populations, recreation and gathering sites, historic sites, economic assets, hazardous materials facilities, and more are inventoried in **APPENDIX A Critical and Community Facilities Vulnerability Assessment** provide the **Structure Only Value $** from the Vision Appraisal System. Multiple hazards are identified which may damage each inventoried building. Therefore, if the Town wanted to ascertain the damage cost from any natural hazard to an individual critical facility, this dollar value is available for evaluation.

National Flood Insurance Program (NFIP)

In 1968, Congress created the National Flood Insurance Program (NFIP) to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities such as Pembroke agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. For more information on the National Flood Insurance Program, visit https://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp.

Pembroke has been a participant in the National Flood Insurance Program since **April 2, 1979**, the date of the Town's first effective National Flood Insurance Rate Maps (FIRMs). The original Flood Insurance Study (FIS) was dated **October 1978**.

In the present day, Pembroke's effective FIRMs are digital (DFIRMS) dated **April 19, 1010** as is the Merrimack County Flood Insurance Study (FIS) which includes Pembroke (community **#330119**); individual community FIS are not being developed. These newest documents were adopted by the Board of Selectmen and supercede all previous FIRMs and FISs. **Table 30** summarizes the historical background of the Town's NFIP effective dates.

Table 30

NFIP History of Pembroke – Effective Dates

Flood Insurance Study (FIS)	Flood Insurance Rate Maps
October 1978	April 2, 1979
April 19, 2010	April 19, 2010

Source: Merrimack County Flood Insurance Study (FIS) Table 7, 2010

PEMBROKE'S NFIP STATISTICS

In **Table 31** is a cumulative history of the trends and overall totals of flood insurance policies and losses of those property owners utilizing the NFIP insurance in Town. Three snapshots in time, one from each of Pembroke's **Hazard Mitigation Plan** versions, display the number of NFIP policies in force and paid loss statistics between December 2002 and December 2015.

In December 2002, the number of NFIP flood insurance policies in force was **13**, which nearly doubled to **25** in 2009, then fell slightly to **22** by November 2015. The increases between 2002 and 2009 can be explained by the significant flooding events damaging properties in Pembroke between **2005-2008**. The lack of further purchase could be influenced by the recent changes is flood insurance regulation and policy cost or the lack of public awareness of the NFIP.

Over this same period of time, the number of paid losses to individuals through the NFIP since 1979 rose from **4** (**$18,000**) by 2002 to **28** by 2009 when over **$860,000** in claims had been paid to Pembroke

property owners. An additional **10** claims (and about **$160,000**) were filed after 2009 to reach **38** total paid losses (and **$1m** in claims paid) by November 2015.

Table 31

History of NFIP Policy and Paid Loss Statistics

Date	NFIP Policies in Force	Flood Insurance Coverage in Force	Number of Paid Losses Since 01-01-78	Total Flood Losses Paid Since 01-01-78
December 2002	13	$1,726,500	4	$18,010
2009 Plan	25	$3,967,400	28	$862,947
November 2015	22	$4,573,400	38	$1,028,418

Source: Pembroke Hazard Mitigation Plans 2004 & 2009, FEMA last accessed 01-31-16

Table 31 also illustrates that while the entire Town of Pembroke is eligible to purchase flood insurance, only **22** parcels out of the **2,934** total parcels in the community are insured against flooding. As described previously, a total of **80** homes and non-residential buildings are approximated to be situated in the Special Flood Hazard Areas. This leaves many uninsured for when the next flooding event occurs in Pembroke.

REPETITIVE LOSS PROPERTIES

A specific target group of properties is identified and serviced separately from other NFIP policies when repetitive losses occur on the same properties. The group includes every NFIP-insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced four or more paid flood losses of more than $5,000 each or two or more separate claim payments (building payments only) where the total of the exceeds the current value of the property. Two of the claim payments must have occurred within 10 years of each other. The loss history includes all flood claims paid on an insured property, regardless of any changes of ownership, since the building's construction or back to 1978.

Pembroke had a total of **8** repetitive loss properties after the last round of heavy flooding in 2010 as shown in **Table 32**. The Town of Pembroke was able to purchase **3** of these dangerous parcels, and **1** was mitigated by elevating the house and utilities. Five (**5**) repetitive loss properties were left in the community after December 2012.

Table 32
Number of Repetitive Loss Properties

Building Type	Number of Repetitive Loss Properties	Number of Buildings Acquired by Town	Remaining Repetitive Loss Buildings
Single Family	7	3	4
Multi-Family	1	0	1
Non-Residential	0	0	0
Total Properties	**8**	**3**	**5**

Source: NH Office of Energy and Planning on behalf of FEMA, December 2012

FLOODPLAIN ORDINANCE

A major objective for floodplain management is to continue participation in the National Flood Insurance Program. Communities that agree to manage Special Flood Hazard Areas shown on NFIP maps participate in the NFIP by adopting minimum standards. The minimum requirements are the adoption of the Floodplain Ordinance and Subdivision Regulation / Site Plan Review requirements for land designated as Special Flood Hazard Areas (SFHAs). Flood insurance is available to any property owner located in a community participating in the NFIP.

Community Assistance Visits in Pembroke

A Community Assistance Visit (CAV) is a process required by the National Flood Insurance Program (NFIP) as a way of reviewing a town's compliance with established floodplain regulations to be sure that they meet NFIP requirements. If the Town is not in compliance with regulations in any way, the officials that conduct the CAV provide assistance and guidance to assist with correcting any violations.

If the NH Office of Energy and Planning (NHOEP) identifies Pembroke as a repetitive loss community, which is based upon **Table 32** data, a new CAV will be undertaken every five years or if there is a severe flooding event. In past years, Pembroke has had knowledgeable Land Use Department planning staff who were experienced with NFIP policies.

Recently, a **2008** CAV by NHOEP staff identified a number of necessary ordinance changes which passed at Town Meeting. The last CAV in Pembroke was conducted in **2012** by NHOEP staff; no changes to procedures or to the Floodplain Ordinance were necessary. Although the Town seems to be currently in compliance with the NFIP, another CAV is anticipated to be scheduled for in **2017**.

Floodplain Ordinance Amendments

The Town of Pembroke has a Floodplain Development District and has adopted all the required FEMA revisions to its ordinance, the last of which were **March 2008** to correct language and in **2010**, when the Town adopted the new FEMA effective Digital Flood Insurance Rate (DFIRM) maps dated **April 19, 2010.** In

March 2010, the Town also adopted the amended Floodplain Development Ordinance incorporating the necessary FEMA revisions.

NFIP Familiarity in Pembroke

According to NFIP policies, when an applicant files a request for a building permit in the floodplain, the applicant must include an elevation certificate in order to be in compliance. In addition, if an applicant intends to fill onsite, a letter of map of revision must be submitted along with the application. According to NFIP requirements in the Floodplain Ordinance, building permits should be reviewed to assure sites are reasonably safe from flooding and require anchoring to prevent flotation, collapse, or lateral movement and construction out of flood resistant materials.

Ongoing attention and familiarity with the NFIP will keep Town staff and volunteers in top form. In order to reduce flood risks, Land Use Department, including the Code Enforcement Officer and Planning Director and other Town staff whose duties include review/inspection of development or construction, should be familiar with the Floodplain Ordinance and the NFIP.

Because of their unique position to ensure development conforms with ordinances prior to approval, the Planning Board should be familiar with NFIP policies, especially those regulations that are required to be incorporated into the Subdivision and Site Plan Review regulations. A workshop sponsored by the NH Homeland Security and Emergency Management (NHHSEM) or the NH Office of Energy and Planning (NHOEP) would be appropriate to educate current staff and volunteers. Or, for online training taken at the convenience of the individual, see the ***FEMA Emergency Management Institute's*** current training course index for flooding: **https://www.training.fema.gov/is/searchis.aspx?search=Flood&all=true.**

An essential step in mitigating flood damage is Town and property owner participation in the NFIP. Pembroke should work to consistently enforce NFIP compliant policies to continue its participation in this program. Currently, Town staff are fielding many property owners who are asking for assistance because their mortgage lenders are asking for proof that the properties in question are not located in a Special Flood Hazard Area to determine whether NFIP flood insurance is required. The only way to rectify this growing problem is to have a survey done of the property to complete a Certificate of Elevation to keep on file at the Town Office. If the property is shown to be located out of the floodplain, a Letter of Map Amendment should be completed by the owner or by the Town to ensure future flood maps are corrected.

This time of interaction with property owners is emotional and intense and may therefore not be the best time to advertise the availability of flood insurance. When possible, Town staff should try promote flood insurance to property owners in Town; only **22** properties out of the **2,934** parcels in Pembroke are protected by flood insurance and currently take advantage of the NFIP insurance opportunity.

6 CAPABILITY ASSESSMENT

Local mitigation capabilities are existing authorities, plans, ordinances, policies, mutual aid, programs, staffing, technical skills and assets, funding, outreach, public education, and resources that reduce hazard impacts or that could be used to help implement hazard mitigation activities. These capabilities were inventoried for the **Pembroke Hazard Mitigation Plan Update 2017**.

The **Capability Assessment** contains an inventory of locally-important existing mitigation support activities, or capabilities, which have a positive impact on the way hazard events are handled within the community. Most capabilities are not hazard mitigation Actions but support the Action Plan and help decrease the community's hazard risk. These community-strengthening capabilities are not STAPLEE-rated (Social Technical Administrative Political Legal Environmental and Economics questions) like the Actions**,** but instead the capabilities serve to sustain and assist the community to maintain and accomplish its hazard mitigation Actions and priorities. Selected ***Future Improvements*** to some of these capabilities were able to be later considered as Actions in **7 POTENTIAL ACTION EVALUATION** and **8 MITIGATION ACTION PLAN**.

Capability Assessment Types
Planning & Regulatory
Administrative and Technical
Financial Resources
Education and Outreach

There are four overall Capabilities considered for which an inventory of mitigation support items was identified by the Hazard Mitigation Committee, **Planning & Regulatory**, **Administrative and Technical**, **Financial Resources**, and **Education and Outreach**.

Each Capability had inventoried the latest version or adoption Date; a Description of the item; the location of the capability in Town; the Level of Effectiveness of the Capability; which Department, Board or other has Responsibility for the capability; what Changes were made to the capability since the **2010 Hazard Mitigation Plan**; and Future Improvements to the Capability.

Town Capabilities

A summary of the items within the four Capability tables is provided here to offer a portrait of resources Pembroke has at hand to assist with mitigation. Careful consideration of each Capability's ***Level of Effectiveness*** helped the Departments to determine any clear ***Future Improvements*** to undertake. Many of the Town's Capabilities involved existing plans, procedures, reports, policies, regulations, and resource documents from individual Departments. These plans and documents were reviewed and incorporated into the **Capability Assessment**. ***Future Improvements*** to these documents were identified and many later became Action items in **8 MITIGATION ACTION PLAN**. Capabilities of all Town Departments and the School District as related to hazard mitigation are detailed within the following tables.

Level of Effectiveness	Description
High	Capability is working well and is regularly followed
Moderate	Capability could use some revisions but is followed
Low	Capability is not working and needs revisions

PLANNING AND REGULATORY CAPABILITIES

The planning and regulatory capabilities displayed in **Table 33** are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. There are 3 categories: Plans, Codes, and Regulations. Most of the documents listed below are the Town's documents, but others are School, local, regional, state and federal which support the Town's the hazard mitigation goals, objectives, and/or Actions.

Table 33

Planning and Regulatory Capabilities

Latest Adoption or Version Date	Capability Assessment: Planning and Regulatory Resources	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
	PLANS						
June 2010	**Hazard Mitigation Plan Update**	Latest FEMA approved Haz Mit Plan has expired (June 2015), currently updating as of 12-15	Entire Town	Moderate	Emergency Management	Some actions completed – Flood-prone properties acquired	Continue completing Actions and updating when becomes outdated
May 2009	**Emergency Operations Plan**	Sets Dept responsibilities, establishes EOC	Entire Town	Moderate	Emergency Management	Implemented procedures more	Update 2009 EOP
August 2015	**Capital Improvements Program**	Can contain haz mit Actions funded in CIP, infrastructure improvements	Entire Town	High	CIP Committee	Have acquired equipment needed	Continue to add haz mit Actions to 2017 Plan
2004	**Master Plan**	Improve Town infrastructure, protect environmental, guideline	Entire Town	Moderate	Planning Board	Used by ZBA, NRI completed by	Update to current regulations

Latest Adoption or Version Date	Capability Assessment: Planning and Regulatory Resources	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effectiveness	Responsibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
		for Depts, basis for ordinances and regulations 2004				Conservation Commission	
2008	**Critical Infrastructure Protection Plan**	To protect critical infrastructure in town, including Associated Grocers - designated ci for transportation and food	Entire Town	High	Emergency Management	Had tabletop for airplane disaster, grant for generators and radios	Keep inventory up to date, take template and apply to clean energy, etc.
2015	**Public Works Department Procedure of Yearly Culverts Review**	Annual field review, have pricing for replacements of 4 culverts as of 12-15	Roadways, Culverts	Moderate	Public Works Department	Some smaller culverts have been replaced	Culverts are expensive, need to find funding, place into CIP
December 2015	**Town Natural Resource Inventory**	Evaluates water, wildlife habitat, soil, aquifer, bedrock, flora, etc resources in Pembroke and provides maps of resources and evaluates wetlands by importance	Entire Town	N/A	Conservation Commission	Development in progress, to be completed by December 2015	Encourage PB adoption of NRI, encourage designation of 17 prime wetlands for further protection, and help PB and ZBA increase awareness of resources in areas being considered for development
December 2014	**Tri-Town Ambulance Operations**	Pembroke and Allenstown share one ambulance service. They provide mutual aid service to nearby communities	Entire Town and Allenstown, nearby towns	High	Tri-Town Ambulance	2 towns have taken over ambulance service	Complete process of revising personnel policy and procedures, response, training - SOGs
Spring 2015	**Pembroke School District Emergency Planning Guide (School)**	Emergency response plan is a School District guide, covers all schools: Three Rivers, Village School, Hill School, and Pembroke Academy. Each building has specific plan of evacuation routes, etc.	Three Rivers, Village School, Hill School, and Pembroke Academy	High	School District (School)	Completely revised spring 2015	Incorporate reactions to building intruders, lock down vs. other means (School)
unknown (Private)	**Green Valley School Emergency Management Plan (Private)**	Private school has plan but not realistic to current needs/standards.	Green Valley School	Low	Green Valley School (Private)	Newly added (private) capability	PD & FD need to meet with Green Valley School to assist in rewriting
unknown (Private)	**Strong Foundations School Emergency Management Plan (Private)**	Private school has a realistic plan in place	Strong Foundations School	High	Strong Foundations School (Private)	Newly added (private) capability	PD & FD should obtain and Strong Foundations EMP and review with school
Fall 2015	**Pembroke Academy Crisis Management Plan (School)**	Guides reaction to any untimely student or staff death or accident	Pembroke Academy	Moderate	School District (School)	Revised in fall 2015	Revisions to be made, could be adapted to other schools, could dispatch crisis team to other schools (School)
February 2014	**Associated Grocers of New**	Business has about 380 employees, evacuation	Associated Grocers of	High	AGNE (Private)	Building expansion, new	Currently revising workplace violence

Latest Adoption or Version Date	Capability Assessment: Planning and Regulatory Resources	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
	England (AGNE) Evacuation Plan (Private)	plans for all shifts. AG recently expanded building.	New England (AGNE)			evacuation assembly fire area, upgraded to digital radio, added repeater, added multiple warning lights for ammonia system	protocols, may make changes based on assessment (Private)
February 2014	**Associated Grocers of NE Reverse Evacuation Plan (Private)**	Fire Drills, get to practice it, shelter in place for anhydrous ammonia response	Associated Grocers of New England (AGNE)	High	AGNE (Private)	Added additional strobe lights	Will review plan to prepare response submittal for state (Private)
February 2014	**Associated Grocers of NE Emergency Management Plan (Private)**	Internal document on several dozen potential incidents with plans in place to continue business	Associated Grocers of New England (AGNE)	Moderate	AGNE (Private)	Added other modules for new technology, new expansion	Reviewed on a regular basis, federal food safety guidelines to be reviewed 2015 (Private)
March 2010	**Town Open Space Plan**	Developed with CNHRPC and a Town Committee, created a green infrastructure with maps, alternative way to protect Town's resources, not yet adopted	Entire Town	Low	Conservation Commission	Plan was completed but not adopted	Revisit the Open Space Plan, update, and adopt by the PB so can implement some of the regulatory actions
March 2015	**Pembroke Water Works Emergency Response Plan**	This Plan is designed to provide information and guidance in an emergency situation.	Entire Town, especially water service areas	High	Water Works Department	Revised every 6 years	Continue to follow NHDES Requirements, provide temporary water or boil water order if needed
BUILDING CODES,		**PERMITTING,**	**INSPECTIONS**				
2009	**State Building Code 2009**	Suite of residential, commercial, plumbing, electrical, mechanical, energy, and existing buildings	Entire Town	High	Code Enforcement	Continues to use the codes	Adopt the current code with state changes; NH 2015 code to be adopted in a couple years via legislation (spring 2017)
2009	**State NFPA Commercial Sprinkler Code**	Adopted through the State Fire Marshal, residential 1-family and 2-family removed	Entire Town	High	Fire Department	Continues to use the codes	May be adopting 2015 code noted below
Septembe r 2012	**Site Plan Review Regulation Requirements**	Latest overhaul 1994, minor changes needed per uses	Entire Town	Moderate	Planning Board	Updated last 3--4 years to accommodate RSA changes and policy changes	Create more distinction between the 2 sets of regulations, too much overlap
July 2011	**Subdivision Regulation Requirements**	Latest overhaul 1994, revised in 2011	Entire Town	Moderate	Planning Board	Nearly annual changes to match RSAs, interpretation improvements	Revise Subdivision Regs for current trends, have new NRI implemented in regs
January 2010	**FEMA Flood Insurance Rate Maps**	April 2010 Merrimack County FIRMSs, new Flood Insurance Study, DFIRMs also available	Entire Town	High	Board of Selectmen	Ratings of different flood zones	Continue to review and implement federal policy

Latest Adoption or Version Date	Capability Assessment: Planning and Regulatory Resources	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
2015	**State Fire Code**	Sets construction standards related to life safety, fire prevention, fuel, and gas by NH Depart of Safety and National Fire Protection Assn.	Entire Town	High	Fire Department	Changes continuously made by State, Town followed code	Town adopt the current code with state amendments, Fire Marshal Office may adopt some NFPA codes in 2015
LAND USE	PLANNING,	ORDINANCES,	REGULATORY				
March 2013	**Zoning Ordinance Height Standards (Zoning)**	Contains 35' maximum structure height. Makes it easier to control fires.	Entire Town	Moderate	Planning Board	Height changes for split level homes	Adopt horizontal building buffer accessibility to structures
January 2010	**Floodplain Development District Ordinance (Zoning)**	Complies with NFIP, updated 2010, building in FP is permitted	Floodplains	High	Planning Board	Adopted by Selectmen in 2010	Continue to follow Federal guidelines
March 2011	**Wetlands Ordinance (Zoning)**	Protects delineated wetlands from encroachment of septic systems.	Wetlands	High	Planning Board	Use for subdivision and site plans setbacks	17 wetlands in NRI as high level wetlands, designate some as Prime wetlands
March 2015	**Aquifer Conservation Overlay District (Zoning)**	Protects identified aquifers and drinking water sources	Aquifer areas	High	Planning Board	Updated annually	Continue to follow NHDES requirements
March-May 2013	**Wellhead Protection Area**	Best Management Practices	Wellhead Protection Areas (WPA)	High	Pembroke Water Works	Triennially update	Locate the wellhead protection areas on the Town Tax Maps
March 2013	**Open Space Ordinance (Zoning)**	Encourage preservation of open spaces through planning principles.	Entire Town	Moderate	Planning Board	Amendments in 2013	Continue to review annually for possible improvements
April 2012	**Seasonal Restrictions on Class VI Highways**	Permits Selectmen to post roads to restrict access during vulnerable times	Class VI Roads	High	Board of Selectmen	Continued to follow	Continue to review periodically for possible improvements
March 1995	**Shoreland Protection District Ordinance (Zoning)**	Protect land located within 125' of Merrimack, Suncook, and Soucook Rivers	Shorelines of Merrimack, Suncook, and Soucook Rivers	High	Planning Board	Continued to follow	Revise Zoning and adopt the State Shoreland Protection Act
2009	**Road Construction Standards**	Specifies method of construction and materials. Contains NH DOT roadway and drainage standards.	Roadways	High	Public Works Department	Was under review 2009	Continue to review annually for possible improvements
March 1946	**911 Street Address System (Chapter 60 Number of Buildings) Ordinance**	Permits Selectmen to number buildings on all streets	Entire Town	High	Board of Selectmen	Continued to follow	Continue to review periodically for possible improvements
July 2011	**Storm Water Drainage Standards**	Adopted NHDES and NHDOT standards, in subdivision regulations	Entire Town, MS4 area	High	Public Works Department	Developing local MS4 EPA regulations from 2012	Monitor regulations for effectiveness and develop new as needed

Latest Adoption or Version Date	Capability Assessment: Planning and Regulatory Resources	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
March 2002	**Suncook River Development TIF District (Zoning)**	Combines commercial/ industrial and enviro/ agricultural goals through more intensive development and financial return on public infrastructure	SRD Zoning District	Moderate	Planning Board	Continued to follow	Continue to review periodically for possible improvements
December 1994	**Sewer Use Ordinance**	Follows NHDES & EPA rules & regulations	Entire Town, especially sewer service areas	High	Sewer Department	Currently under review	Needs updating, will be updated in 2016

Source: Pembroke Hazard Mitigation Committee

ADMINISTRATIVE AND TECHNICAL CAPABILITIES

The administrative and technical capabilities in Table 34 include staff, volunteers, and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. Smaller jurisdictions without local staff resources often rely on public or shared resources. There are 3 categories: Admin Programs, Staffing, and Technical Capabilities.

Table 34

Administrative and Technical Capabilities

Latest Adoption or Version Date	Capability Assessment: Administrative and Technical	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
	ADMINISTRATIVE PROGRAMS AND POLICIES						
2015	**Pembroke Fire & Rescue Mutual Aid Agreement**	Member of Capital Area Fire Compact	Entire Town, area of Capital Area Fire Compact	High	Fire Department	Procedures of Compact change continuously	Make changes as needed, continue participation
2015	**Pembroke Fire Department Standard Operating Guidelines (SOGs)**	SOGs covered in meetings and training sessions	Entire Town	Moderate	Fire Department	modified continuously	Produce memos of changes, goal to have all SOGs in a manual- need personnel
2015	**Pembroke Police Department Standard Operating Procedures (SOPs)**	Procedures for responding to incidents, calls, cruiser operation, etc. baseline of PD operations, electronic copy and manual if needed	Entire Town	Moderate	Police Department	Regularly reviewed, annually and changed if needed	Make changes responding to School emergency response, other response

Latest Adoption or Version Date	Capability Assessment: Administrative and Technical	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
2015	**Pembroke Police Department Mutual Aid Agreements**	MUA with all abutting towns & Bow, Hooksett, review when new Chiefs are hired	Entire Town, MUA towns	High	Police Department	Hooksett was added, new chief redo	Continue participation
February 2015	**NH Public Works Mutual Aid Agreement Member**	PWD is dues paying member. Sewer not currently member, WW not presently. Book yearly provided of what's available	Entire Town, MUA towns	High	Fire Department	yearly, towns, equipment, etc	Water Works could be a member in the future
February 2015	**Procedure on Tree or Limb Reporting to Utility Companies**	PWD handles it electronically to utility companies. FD dispatch center will automatically notify for electric lines	Entire Town	High- Electric. Low- Internet, phone & other	Public Works Department	Regularly participate	Continue using procedure
2015	**Central NH Hazardous Materials Team Member**	Hazardous spills response, FDs trained to operations level, call CNH Haz Mat to handle	Entire Town	High	Fire Department	Use service perhaps annually	Continue calling dispatch center for haz mat needs
Currently and Regularly in Use (12-15)	**Communication Among Town Departments**	Depts work cooperatively during emergencies	Entire Town	Moderate	Emergency Management	Needed to add PWD and Schools	Ensure all Depts, Schools, and AGNE have communication capabilities
April 2014	**Culvert and Storm Drain Maintenance**	Maintains systems and identifies areas that need improvement reactively.	Drainage Systems	Low	Public Works Department	None	Upgrade culverts and storm drainage areas
2015	**Memorial Field's Merrimack River Bank Stabilization**	Situation monitored for further action annually, began in 1990s	Memorial Field	Moderate	Public Works Department	Annual visits and stabilization efforts	Continue annual stabilization until a current engineering study can be produced for more permanent methods
November 16, 2015	**Public Works Department Snow and Ice Control Policy**	Currently updating 2013 policy, more routes, addressing obstructions on sidewalks	Roadways	High	Public Works Department	Continuously followed, updating Nov-Dec 2015	Revise to add more plowing routes to the policy, address obstructions on sidewalks
November 2014	**Conservation Commission Acquisition of Easements**	Since 2011 Hilman, had 1 piece donated and acquired 2 others, used LUTC funds. Last was Beacon Hill, now Town-owned. Only 4% of land is in conservation	Entire Town	High	Conservation Commission	continues to seek parcels for conservation or purchase	Finding funding sources to find and acquire more parcels or easements
Feb 2015	**Sewer Department Capacity, Management, Operation, and Maintenance (CMOM) Program**	Maintains systems and identifies areas that need improvement reactively.	Entire Town, especially sewer line areas	High	Sewer Department	New	Must be updated yearly for NHDES & EPA

Latest Adoption or Version Date	Capability Assessment: Administrative and Technical	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
February 2014	**Associated Grocers of New England (AGNE) Business Continuity Plan (private)**	Emergency procedures part of AG business continuity plans, never really tested	Associated Grocers of New England (AGNE)	Moderate	AGNE (private)	Newly developed	Consider AGNE's volunteer capabilities during disaster preparations or response
TOWN STAFF AND VOLUNTEERS							
Staff	**Administration and Finance Department**	4 staff in Dept	Town Hall	Moderate	Town Administration	Newly added capability	Continue to monitor the effectiveness and review status
Staff	**Planning and Land Use Department**	3 FT, M-F 8-4, + 1 PT Tax Assessor responsible for Planning, Building, zoning, and assessing.	Town Hall	Moderate	Town Administration	New planner since 2012.	Continue to monitor the effectiveness and review status
Volunteer	**Volunteer Planning Board**	9 volunteer Planning Board members	Town Hall	Moderate	Planning Board	Some changes to the Planning Board members	Get more people involved in Planning Board
Staff	**Police Department Chief**	1 Chief who over sees Department	Safety Center	Moderate	Police Department	New Chief, instituted new or updated policies	Update and keep fresh all policies and Protocols for department
Staff	**Police Officers**	11 Officers	Safety Center	Moderate	Police Department	Newly added capability	Continue Job descriptions and responses
Staff	**Fire Department Chief**	1 PT, 10 hrs/week	Safety Center	Moderate	Fire Department	Added hours	Continue to monitor the effectiveness and review status
Volunteer	**Fire Fighters - Structural and Support**	30 on-call volunteers, Capital Area Mutual Aid Compact member	Safety Center	Moderate	Fire Department	Newly added capability	Need more daytime people
Staff	**Public Works Department Supervisor**	1, available 24/7	Safety Center	Moderate	Public Works Department	Newly added capability	Continue to monitor the effectiveness and review status
Staff	**Public Works Road Crew**	9, available on call	Safety Center	Moderate	Public Works Department	Fewer personnel now	With the MS4 requirements, consider adding staff
Staff	**Emergency Management Director**	1, filled by the PT Fire Chief	Safety Center	Moderate	Fire Department	Newly added capability	Continue to monitor the effectiveness and review status
Staff	**Rescue Chief**	1 staff in Dept	Safety Center	Moderate	Fire Department	Newly added capability	Continue to monitor the effectiveness and review status
Volunteer	**Tri-Town Ambulance EMTs**	4 FT & Balance P/T	Safety Center	Moderate	TTEMS Board of Directors	Newly added capability	Continue to monitor the effectiveness and review status
Staff	**Health Officer**	2 P/T staff. Oversees licensing for daycares and schools, records all communicable and health	Town Hall	Moderate	Town Administration	Added 1 PT officer for emergency	Continue to monitor the effectiveness and review status

Latest Adoption or Version Date	Capability Assessment: Administrative and Technical	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
		issues. Inspections of any health complaints.					
Volunteer & Staff	**Hazard Mitigation Committee**	Staff & around 20 volunteers meet to update Plan	Safety Center	Moderate	Emergency Management	Newly added capability	Continue to monitor the effectiveness and review status
Staff	**Joint Loss Committee**	8 staff members on Committee	Town Hall	Moderate	Town Administration	Newly added capability	Continue to monitor the effectiveness and review status
Volunteer	**Conservation Commission**	5 members, 1 alternate, 1 PB rep and 1 ex-offico BOS rep, very active Commission and discussions, monitor properties annually, review NHDES and PB apps	Town Hall	Moderate	Conservation Commission	Members remain the same after many accomplishments	Need to establish subcommittees, establish school visits to educate kids, need younger members for Cons Comm, get other people involved, have joint meetings of CC, PB, BOS, ZBA to share issues & information, need more Town staff support
Staff	**Technical Review Committee (TRC)**	Meets to review and discuss Planning Boar development applications. Includes heads of all Depts, Boards & Commissions	Town Hall	High	Town Administration	Newly added capability	Determine whether an enhanced role could be designed for the TRC related to mitigation
TECHNICAL SKILLS AND RESOURCES							
9	**Public Works Training on Use of Chain Saws**	Taught safety and operation of chain saws (by professional loggers)	Entire Town, Roadways	High	Public Works Department	Upgraded chain saws	Continue to send employees to chain saw training
Volunteer	**AGNE Loss Prevention Dept Training (private)**	2 Loss Prevention officers from 1999-2015 have current training: First Responder, AED, law enforcement, NIMS and ICS, emergency operations, etc	Associated Grocers of New England (AGNE)	High	AGNE (private)	Training has continued	Consider AGNE's volunteer capabilities during disaster preparations or response
9	**Public Works Department Employee Training**	Crew trained in Roads Scholar, UNH T2 and Primex. Training greatly appreciated by staff	PWD Garage	Moderate	Public Works Department	Training has continued	Continue to send crew to updated training courses
All	**Fire Department Training**	Members trained in multitude of disciplines	Safety Center	High	Fire Department	Modified in-house training to eliminate dependence on state courses	Continue to train members in various firefighting topics
N/A	**Fire, Police, Highway, and Land Use Depts Trained in ICS and NIMS**	Few are trained, need all Dept staff/ volunteers trained in basic, Dept Heads in advanced ICS & NIMS	Safety Center	Low	Emergency Management	Training has continued	Train all employees in basic ICS and NIMS, Dept heads should receive advance training
9	**Barricades**	Used for traffic control, safety regulations enforced	PWD Garage	High	Public Works Department	Continued use of barricades	New equipment would be helpful

Latest Adoption or Version Date	Capability Assessment: Administrative and Technical	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
N/A	**Cartographic Associates Mapping of Tax Parcels**	Company is paid to revise tax map yearly after April 1	Town Hall, Offsite	High	Planning and Land Use Department	Annual revision of tax maps	Locate the wellhead protection areas on the Town Tax Maps
N/A	**Digital Radios**	Set up for both analog and digital communication by Police Dept	Safety Center	High	Police Department	Radios used regularly by all Departments	Upgrade radios as needed
9	**Public Works Department Digital Radios**	Radios in vehicles	PWD Garage	High	Public Works Department	New radios year 2013 installed in vehicles	Update radios to digital standards
N/A	**Sewer Department Training on Use of Chain Saws**	Taught safety and operation of chain saws (by professional loggers).	Entire Town	High	Sewer Department	Training has continued	Continue to send employees to chain saw training
N/A	**Sewer Department Training in Confined Space**	Taught safety in a confined space and use of safety equipment for confined spaces	Entire Town	High	Sewer Department	Training has continued	Continue to send employees to confined space training
N/A	**Associated Grocers of NE 24/7 Power Capability (private)**	Generators run plant during power outages	Associated Grocers of New England (AGNE)	High	AGNE (private)	Now using diesel fuel, have heat	Consider AGNE's volunteer capabilities during disaster preparations or response
1	**FD and AGNE Two-Way Radio Communication**	AGNE gave the FD a portable radio in 2012 with their frequencies for communication capabilities during emergencies	Associated Grocers of New England (AGNE)	Moderate	Fire Department & AGNE (private)	Frequency checks	Continue ensuring working radio communications. AGNE wants to look into BDA system or other signal booster for emergency personnel
N/A	**Common Telephone System**	Link all municipal phone systems even in different areas of Town	Town Facilities	High	Town Administration	Maintenance of system	Continue to monitor the effectiveness of the phone system and review status

Source: Pembroke Hazard Mitigation Committee

FINANCIAL CAPABILITIES

The financial resources in **Table 35** available for hazard mitigation projects are those the Town has access to, has used in the past, or may be eligible to use in the future for hazard mitigation projects. These often include FEMA Public Assistance Grants (Disaster Recovery Costs), Warrant Articles, Town Capital Improvements Program (CIP) 2016 Project Funding, Department Operating Budgets, Bonds and FEMA and NH Department of Transportation grants.

Table 35

Financial Capabilities

Latest Adoption or Version Date	Capability Assessment: Financial	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
FINANCIAL	PROGRAM OR	FUNDING RESOURCE FOR	HAZARD	MITIGATION			
2015	**CIP Project Funding**	Sets aside funds for large equipment	Entire Town	High	CIP Committee	Capital reserve fund set aside yearly, used for all singular items/programs	Use for water and sewer infrastructure
Yes, 2011	**FEMA Public Assistance Grants**	PWD applied for recovery funding, used after disasters	Entire Town	High	Public Works Department	Received funding for 2011 TS Irene	Continue grant writing for disaster recovery projects
Yes, in July 2015	**FEMA Hazard Mitigation Assistance Grants**	High competition for $, can fund mitigation projects	Entire Town	High	Emergency Management	Funded Haz Mit Plan Update 2015 through HMGP	Continue grant writing for hazard mitigation projects
Yes, 2014	**FEMA Assistance to Firefighters Grants**	Annual competitive grant program	Entire Town	Low	Fire Department	Apply annually	Continue grant writing for fire prevention and safety projects
Yes, in May 2011	**USDA Farm and Ranch Protection Program**	50% match, protected Hilman agricultural dairy farm property 1,500' along the Suncook River, 46-acre easement to Five Rivers Trust, 2.5 year project completed by Town volunteers on Cons Comm	Entire Town	High	Conservation Commission	Took two years to complete easement acquisition, 2008-2011	Consider using the program for future easements, need a grant writer and someone to organize and work on future projects
PROGRAMS	WHICH COULD	POTENTIALLY BE USED BY	THE TOWN	FOR FUTURE	PROJECTS		
Not Yet Used	**FEMA Emergency Management Performance Grant**	High competition for $, can fund mitigation projects	Entire Town	High	Emergency Management	New potential financial program	Continue grant writing for hazard mitigation projects
Not Yet Used	**Warrant Articles**	Could be used for structural projects	Entire Town	N/A	Board of Selectmen	New potential financial program	Consider using warrant articles to fund mitigation projects
Not Yet Used	**NH Department of Transportation Bridge Program**	North Pembroke Rd bridge red listed for many years	Bridges	Moderate	Public Works Department	New potential financial program	Continue funding of Town bridge program
Not Yet Used	**NH Conservation "Moose Plate" Grant**	Supports land conservation, conservation planning, BMPs, soil conservation and flooding, wildlife habitat, and water quality	Entire Town	N/A	Conservation Commission	New potential financial program	Consider using for conserving Suncook or Soucook River shoreline properties

Latest Adoption or Version Date	Capability Assessment: Financial	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
Not Yet Used	**Water Works Department Budget**	Water lines and infrastructure funded in annual budget and user fees	Entire Town, especially water line areas	N/A	Water Works	New potential financial program	Consider future Water Dept mitigation projects
Not Yet Used	**User Fees for Water, Sewer, Gas, or Electric**	Portions of water and sewer user fees could be set aside to upgrade infrastructure	Entire Town, especially existing water, sewer areas	N/A	Board of Selectmen (Sewer, Gas, Electric), Water Commission	New potential financial program	Consider using portions of user fees for upgrading water and sewer infrastructure
Not Yet Used	**Impact Fees for New Development**	PB is authorized to develop and implement, but currently have no documentation in place to implement	Entire Town	N/A	Planning Board	2013 amended zoning to adopt RSA 674:21.	Undertake facilities and/or economic studies to obtain background information for setting fees
Not Yet Used	**Municipal Bonds to Incur Haz Mit Project Debt**	Could be used for structural projects or land conservation projects. Bonds are for expensive mitigation strategies, pay over time	Entire Town	N/A	Board of Selectmen	New potential financial program	Consider using bonds to fund significant mitigation projects

Source: Pembroke Hazard Mitigation Committee

EDUCATION AND OUTREACH CAPABILITIES

In **Table 36**, identifying Town Department education and outreach programs and methods already in place or those which could be implemented can supplement or encourage mitigation activities and communicate hazard-related information to residents, businesses and the general public.

Table 36

Education and Outreach Capabilities

Latest Adoption or Version Date	Capability Assessment: Education and Outreach Programs	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effective-ness	Respons-ibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
PUBLIC	OUTREACH	PROGRAM					
Fall 2015	**Fire Department Annual Open House**	Open House each fall, introduce fire safety to the community	Fire Station	High	Fire Department	Continued the program	Needs better publicity
October 2015	**Fire Department School Safety Program**	Visit all public & private schools and daycare facilities	All public and private schools	High	Fire Department	Continued the program	Continue the program
2015	**NIXLE**	People choose to receive calls. Town has advertised	Entire Town	Moderate	Emergency Management	Continued the program	Needs to become more successful in public

Latest Adoption or Version Date	Capability Assessment: Education and Outreach Programs	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effectiveness	Responsibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
		for people to join, used by PD, PWD, FD					
Currently and Regularly in Use (12-15)	**Police Department DARE**	Educational tool not only for drugs but safety protocol for children	Entire Town	**Medium**	Police Department	New program, developed Curriculum as well as training for other instructors	Continue to keep using and to implement new / fresh ideas
Currently and Regularly in Use (12-15)	**Police Department Safe Routes to School Program**	Grant funded program to allow children a route to travel safely to their school	Three Rivers, Village School, Hill School, and Pembroke Academy	**Medium**	Police Department	Construction Phase completed	Evaluate travel as kids use it, modify any changes that need to be made
2013	**Police Department Bicycle Safety Rodeo**	Safety training for kids to ride safely and be aware of surroundings	Three Rivers, Village School, Hill School, and Pembroke Academy	**Medium**	Police Department	In the past, handed out Ice Cream certificates when observing safe operation	Needs to be more of a priority for the department and not something that is relaxed year to year
Currently and Regularly in Use (12-15)	**Police Department Facebook page**	Source of information and notifications of time sensitive or public information	Entire Town	**High**	Police Department	Extended the use of site to include assistance in Investigations	For PD to use the site more each day for information and to reach as many people as we can
Currently and Regularly in Use (12-15)	**Police Department Drug Take Back Box**	Procedure to assist residents with disposal of outdated prescription drugs	Safety Center	**High**	Police Department	Installed a Drug Take Back container with 24/7 monitoring	Continue to use the container and publish its existence to increase its usage.
2014	**Public Works Department Bi-Annual Hazardous Waste Day**	Held at Transfer Station every 2 years to collect household hazardous waste	PWD Garage	**Moderate**	Public Works Department	Continued the program every 2 years	More public relations and newsletters to residents, better participation to the program
October 2012	**Conservation Commission Tire Clean Up Day**	Collected 150 tires on Range Roads	Entire Town	**Moderate**	Conservation Commission	This was a 1-time project	Advertise the clean up to encourage people to stop dumping on conservation lands
Currently and Regularly in Use (12-15)	**Town Website**	Used by multiple town Depts, including zoning amendment changes	Entire Town	**High**	Town Administration	Updated almost daily	Continue to use webpage as an outreach tool, allow Depts to manage their own sites
May 28, 2015	**Conservation Commission Facebook page**	Site hosts photos of wildlife in town	Entire Town	**Low**	Conservation Commission	Periodic updates to site	Need regular updates on current conservation issues, documents for review, ask questions or hold survey to

Latest Adoption or Version Date	Capability Assessment: Education and Outreach Programs	Description Related to hazard mitigation planning and coordination	Location of Capability Entire Town or Selected Areas	Level of Effectiveness	Responsibility	Changes Since Last Haz Mit Plan (2010)	Future Improvements to Plans
							determine major Town conservation projects
March 2015	**Water Works Annual Water Quality Report**	Up to date Water Analysis reported to NHDES, customers informed of where they can obtain report	Entire Town, especially water precinct district	High	Water Works	Updated Yearly	Continue to meet NHDES requirements and produce annual report
Currently and Regularly in Use (12-15)	**Safety Center Message Board**	Changeable signboard outside Safety Center.	Safety Center	High	Fire Department	Purchased more letters to increase message ability on each side	To continue to use the message board, and maintain its appearance
Currently and Regularly in Use (12-15)	**Pembroke Academy Message Board (School)**	Electronic that changes regularly, on Route 3 for passing traffic to view. Complies with Zoning Article VIII Signs § 143-63: Special conditions for specific types of signs X (Electronic Changing Signs)	Pembroke Academy	Moderate	School District (School)	Regular sign changes (School)	Consider partnering with PA for sign information of preparedness & disaster events
Currently and Regularly in Use (12-15)	**Transfer Station Message Board**	Changeable letter signs signboard	Transfer Station	Moderate	Public Works Department	New message board at transfer station	More message boards needed different locations of town
Currently and Regularly in Use (12-15)	**Associated Grocers User Groups (private)**	Internally, Intranet, Facebook, Email, Electronic sign in Café	Associated Grocers of New England	High	AGNE (private)	Continuous use	Consider discussions with AGNE to determine whether public information partnership would be useful
October 2014	**Conservation Commission Acorn Planting at Three Rivers Middle School**	5&6 graders planted acorns in Ames Brook Conservation Area to get oak trees to grow in open areas	Three Rivers Middle School	Moderate	Conservation Commission	This was a 1-time project	More school outreach to set up a junior Cons Comm with Town projects
Currently and Regularly in Use (12-15)	**Three Rivers School (School)**	Message Board (Manual) that changes regularly	Three Rivers Middle School	Moderate	School District (School)	Regular sign changes	Consider partnering with school for sign information of preparedness & disaster events
2015	**School District One Call Now (School)**	Automated phone, text, email service to parents for alert	Three Rivers, Village School, Hill School, and Pembroke Academy	High	School District (School)	Messaging system used	Continue to use system (school) for alerts (School)

Source: Pembroke Hazard Mitigation Committee

Review of Existing Plans

As described above, during the Hazard Mitigation process and the identification of existing mitigation **Capabilities**, the Hazard Mitigation Committee used their knowledge of the existing plans, policies, procedures and other documents utilized for their Department duties to develop Capability ***Future Improvements***. However, a number of additional documents not listed in the **Capability Assessment** are also utilized by the community and have a positive relationship to the **Hazard Mitigation Plan 2017**. Most of the documents below are not the Town's documents, but the hazard mitigation goals, objectives, and/or Actions in this Plan are in agreement with the **Mitigation Support and Resource Documents** listed below in **Table 37**.

Table 37

Mitigation Support and Resource Documents

Latest Adoption or Version Date	Mitigation Support and Resource Documents Not Listed within Capability Assessment Tables
April 2010	FEMA Flood Insurance Study for Merrimack County
October 2011	USGS Analysis of the Transport of Sediment by the Suncook River in Epsom, Pembroke, and Allenstown New Hampshire, after the May 2006 Flood
2012	USGS Flood Inundation Maps for the Suncook River in Epsom, Pembroke, Allenstown, and Chichester New Hampshire 2012
2008	USGS Flood of April 2007 in New Hampshire
2007	USGS Flood of May 2006 in New Hampshire
2009	USGS Flood Study of the Suncook River in Epsom, Pembroke, and Allenstown NH 2009
May 28, 2008	Vanasse Hangen Brustlin, Inc. (VHB) Geomorphology-based Restoration Alternatives Suncook River, Epsom, New Hampshire, (with Appendix A)
July 2008	FEMA Independent Evaluation of Recent Flooding in New Hampshire, (with Appendix A & B)
Spring 2015	NH Geological Survey Suncook River Fluvial Geomorphic Assessment Discussion Guide
2012 2012-2015	Central NH Regional Planning Commission's Natural Resource Maps USGS Documents and Information available (Bedrock Aquifers, etc)
2015	NHOEP Easement Monitoring Guidelines
November 2015	NH Association of Conservation Commissions website documents (regularly updated)
February 2015	Central NH Regional Plan
October 2013	State of NH Multi-Hazard Mitigation Plan Update
April 2014	CNHREPC Central New Hampshire Regional Emergency Planning Committee Regional Hazardous Materials Emergency Plan
June 2010	CAPHN Capital Area Public Health Network Public Health Emergency Preparedness and Response Plan for the Capital Area

Source: Pembroke Hazard Mitigation Committee 2017

7 POTENTIAL ACTION EVALUATION

With the completion of the inventory of the ***Overall Risks*** of hazards in the **Hazard Risk Assessment,** the historical recording of hazard events and declared disasters occurring in Pembroke and what could happen in the future documented in the **Potential Future Hazards**, and the Town's evaluation of its mitigation and support activities in the **Capability Assessment** have all provided the opportunity to develop mitigation Actions. These mitigation Actions can be evaluated using these tools to develop the **Potential Action Evaluation.** Mitigation Actions developed emphasize both new and existing buildings and infrastructure to better protect populations of Pembroke.

The **Hazard Mitigation Plan Update 2010** provided a basis to begin Action development. A review of the 2010 Actions is provided by the Hazard Mitigation Committee, determining which Actions have been **Completed**, **Deleted**, or **Deferred** to the **2017 Plan**.

New Actions were evaluated using the **Problem Statements** discovered during discussion of critical facility and community facility sites' potential vulnerability to hazards in the **Critical Facility and Community Facility Vulnerability Assessment**. Many of these problems were evaluated and later developed into mitigation Actions.

The **Capability Assessment** yielded a wealth of information from the ***Future Improvements*** of the plans, programs, ordinances, policies, agreements, technical skills, financial resources, and other resources the Town Departments, School District, and Stakeholders had available. Many of these were also evaluated and later developed into **New** Mitigation Actions.

The Chapter provides a summary discussion of the Actions the community can consider taking to help mitigate the effects of hazard events.

Action Status Determination

The status of all Hazard Mitigation Plan Actions varies. Priorities over the previous five years can change, budgets are uncertain, and staff are allocated time for certain tasks. To accommodate the **2010 Plan's 14** overall Actions in addition to the **New** Actions from the **2017 Plan**, there are **4** designated Action types to describe the detailed Actions following within the **7 POTENTIAL ACTION EVALUATION** and/or **8 MITIGATION ACTION PLAN**:

- **Completed**
- **Deleted**
- **Deferred**
- **New**

Actions which were **Completed** from the 2010 Plan are listed in **Table 38**. The date of completion is provided.

Actions which were **Deleted** from the 2010 might have been no longer necessary or a priority to the Town, no longer relevant to the Town's situation or objectives, could not realistically be undertaken, were not financially feasible, were modified and incorporated into other existing Actions, or duplicated existing efforts of Pembroke's activities. Deleted Actions are listed in **Table 39.**

Actions which were **Deferred** from 2010 are still important to the Town but were not completed because they did not have the staff capability or the funding to undertake them, other Actions took higher priority, more time was required for completion, or they may need to be repeated in order to be effective. These **Deferred** Actions are located in **Table 40** and have been re-prioritized with the **New** Actions in the **Mitigation Action Plan.**

Changes in priority of the 2010 Actions occurred over the last five years. The **2010 Plan** also used the **12-36 Priority Score STAPLEE** system while the **2017 Plan** included both a ***Ranking Score*** and an ***Action Timeframe*** to determine priorities. Both methods are described.

DEFINITIONS

The following definitions were used to ascertain which Actions should be considered *mitigation* Actions versus which should be considered *preparedness or related short-term* Actions more suitable for incorporation into the ***Town Emergency Operations Plan***. The mitigation Actions are those which are carried forth in this **2017 Plan** into the **Mitigation Action Plan**.

Action Type	Time Frame	Definition or Characteristics
Mitigation	Long Term	Action supports sustained risk prevention or reduces long-term risk to people, property and infrastructure. ↪ Best suited for Town Hazard Mitigation Plan.
Preparedness	Short Term	Actions assist/support planning, protection, training/exercise, and response personnel. ↪ Best suited for Town Emergency Operations Plan.
Response, Recovery, Other Related	Short Term	Other Actions support preventative, response, recovery-related, repeated or deferred maintenance activities. ↪ Best suited for Town Emergency Operations Plan.

Review of 2010 Actions

The **2010 Hazard Mitigation Plan** was written in a different format and its content had to comply with less specific review guidelines before the ***Local Mitigation Plan Review Guide (FEMA), 2011*** became standardized and tailored by each FEMA Region over the years.

Pembroke's **14** Actions from 2010 were given **Action Numbers** and each **Project**'s status was determined by the Hazard Mitigation Committee as either **Completed**, **Deleted** or **Deferred**.

From the **2010 Plan**, the definitions of High, Medium, and Low were not specifically provided, they but did relate to how many of the projects were voted on by the Hazard Mitigation Committee members of 2010. Those projects receiving the most support were awarded a High priority while those receiving the least support were awarded a Low Priority.

Out of these **14** Actions, **2** were **Completed** as shown in **Table 38**. Nine (**9**) Actions were **Deleted** as shown in **Table 39**. The remaining **3** were **Deferred** in **Table 40** and appear within the **Mitigation Action Plan**.

Table 38
Completed Mitigation Actions

Priority Score	Action Number	Action	Completed By Date	Who is Responsible	Approx. Cost	Hazards Addressed
High	**#03- 2010**	**Purchase and install a generator at the Highway Department for emergency fuel.**	2010	Public Works Director	EMPG Grant	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure
Medium	**#07- 2010**	**Develop GIS mapping of sewer, culverts and catch basin systems.**	February 2014, updated annually	Public Works Director	Staff Time / Regional Planning Commission,	Flooding, Rapid Snow Pack Melt, Hurricane, Severe Wind, Winter Weather, Debris

Priority Score	Action Number	Action	Completed By Date	Who is Responsible	Approx. Cost	Hazards Addressed
					Tax Parcel Updates	Impacted Infrastructure

Source: Pembroke Hazard Mitigation Committee

The pink highlighted rows indicate the **9 Deleted** Actions in **Table 39**. Many of the Actions were deleted because they were preparedness items and more appropriately belonged in the Town's ***Emergency Operations Plan.***

Table 39

Deleted Mitigation Actions

Priority Score	Action Number	Action	Deleted Date	Who is Responsible	Approx. Cost	Why Deleted? The Action…	Hazards Addressed
Medium	**#01-2010**	**Conduct exercises and drills that test the capabilities of the Town's Emergency Operations Center and the Emergency Operations Plan.**	03-16	Emergency Management Director (EMD)	Homeland Security Exercise Evaluation Program (HSEEP) Grant	This is a preparedness activity	All Hazards
High	**#02-2010**	**Purchase and install generators at the Shelter (at which School is to be determined).**	03-16	Emergency Management Director (EMD)	Emergency Management Performance Grant (EMPG)	Was no longer relevant to the Town's situation	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure
High	**#04-2010**	**Develop a Memorandum of Understanding (MOU) between the town and the school district for use of school buildings for shelter.**	03-16	Selectmen / School Board	In-kind Staff time	Was no longer relevant to the Town's situation	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure
High	**#05-2010**	**Install centralized phone lines at EOC for town & school phone lines.**	03-16	Emergency Management Director (EMD)	Emergency Management Performance Grant (EMPG)	Was Modified and incorporated into another Action	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure, Communications Failure
Medium	**#08-2010**	**Conduct drills and mock emergency exercises with**	03-16	Emergency Management Director (EMD)	Homeland Security Exercise Evaluation	This is a preparedness activity	All natural, human and technological hazards

Priority Score	Action Number	Action	Deleted Date	Who is Responsible	Approx. Cost	Why Deleted? The Action…	Hazards Addressed
		Pembroke's four public schools.			Program (HSEEP) Grant		
Medium	**#09-2010**	**Purchase and install generators at the Town Hall to be utilized as a secondary EOC.**	03-16	Emergency Management Director (EMD)	Emergency Management Performance Grant (EMPG)	This is a preparedness activity	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure
Low	**#10-2010**	**Develop rotation schedule for vehicle and equipment replacement that can guide the CIP.**	03-16	Department Heads	In-kind Staff time	This is a preparedness activity	All natural, human and technological hazards
Low	**#13-2010**	**Purchase a culvert vacuum and sweeper truck for DPW.**	03-16	Public Works Director	In-kind Staff time	This is a preparedness activity	Flooding, Rapid Snow Pack Melt, Debris Impacted Infrastructure
Low	**#14-2010**	**Educate public on capabilities and use of Shelters (i.e. update town website).**	03-16	Emergency Management Director (EMD)	In-kind Staff time	Duplicates existing efforts	Severe Winter Weather, Extreme Heat, Hurricanes, Severe Storms, Power Failure

Source: Pembroke Hazard Mitigation Committee

The tan highlighted rows in Table 40 indicate the **3 Deferred mitigation** Actions which also appear in the forthcoming **Mitigation Action Plan** for 2017. The Action titles were revised to reflect the new focus on mitigation although the principle for each remains the same.

Table 40

Deferred Mitigation Actions

Priority Score	Action Number	Action	Deferred Date	Who is Responsible	Approx. Cost	Why Deferred? Because…	Hazards Addressed
Medium	**#06-2010**	**Remove Hazardous Trees or Limbs Along Town Roadways**	Public Works Director	Annually	Staff Time	Hurricane, Severe Wind, Winter Weather	It needs to be repeated at regular intervals in order to be effective
Low	**#11-2010**	**Reduce the Risk of Fire Injury by Requiring Sprinklers and Fire Protection Systems in all New Single Family Homes**	Planning Board	3 Years	Staff Time	Drought, Wildfire	Other actions took higher priority; ordinance adopting NFPA 1501

Priority Score	Action Number	Action	Deferred Date	Who is Responsible	Approx. Cost	Why Deferred? Because…	Hazards Addressed
Low	**#12-2010**	**Reduce Flooding, Erosion and Overflow Damage by Upgrading the Failing Culverts on Nadine Drive**	Public Works Director	2 Years	PDM Grant	Flood	The Town did not have the funding to undertake it

Source: Pembroke Hazard Mitigation Committee

New Actions from Community Vulnerability and Capability Assessments

After determining the status of the existing Actions, **New** Actions can be determined. The Hazard Mitigation Committee reviewed the ***Problem Statements*** from the **Community Vulnerability Assessment** and developed Actions out of them. The Committee also reviewed the **Capability Assessment's *Future Improvements*** and developed Actions out of those requested by Departments.

All of these new (and the existing **Deferred** Actions from 2010) were assessed in **Potential Action Evaluation Tables**.

MITIGATION ACTION CATEGORIES

The **2010 Plan** used the following 5 Action categories when developing and categorizing their Actions. This grouping followed the general pattern of usage within the Central NH Region:

- **Prevention**
- **Property Protection**
- **Structural Protection**
- **Emergency Services**
- **Public Information and Involvement**

However, the **2017 Plan** utilizes are more standardized set of Action categories that follow FEMA's own usage recommendation within mitigation handbooks:

Local Planning and Regulation
Structure and Infrastructure Projects
Natural Systems Protection
Education and Awareness

Preparedness and response activities are important to the community. They assist Departments with the procedures, training, regional coordination, and purchases needed to perform their duties effectively. These activities in turn increase the capability for mitigating hazard events. However, most of these non-mitigation Actions were not placed into the **Hazard Mitigation Plan** as they are more appropriate for the Town's ***Emergency Operations Plan*** activities.

The previous Pembroke Actions and its new Actions translate well over to these new Action categories which will be used for the **Potential Action Evaluation** and **Mitigation Action Plan**.

Potential Action Evaluation

A listing of **3** **Deferred** mitigation Actions from 2010 and **12** **New** mitigation Actions from 2017 important to the Town of Pembroke was developed for evaluation. Each Potential Action is affiliated with at least one ***Hazard Specific Objective***, a short ***Description*** is provided, and the ***Affected Location*** is provided to ensure easier understanding and reassessment of the Actions in the future during implementation.

The **Potential Action Evaluation** yields **15** mitigation Actions for the **Hazard Mitigation Plan 2017**. These are displayed in **Table 41**, **Table 42**, **Table 43** and **Table 44**.

Table 41

Evaluation of Local Planning and Regulation Actions

Fulfills Hazard Objectives	Action Number	Name of Potential Action	Description of Potential Action	Affected Location
Fire, Wildfire, Power/Utility Failure, Public Health	**#11-2010**	**Reduce the Risk of Fire Injury by Requiring Sprinklers and Fire Protection Systems in all New Single Family Homes**	A new State law prohibits using NFPA requirements to require sprinkler or other fire protection systems in new homes. A Zoning Ordinance would be appropriate to get this life-saving infrastructure in place	New Single Family Homes
Wind Hazards, Flood Hazards, Fire, Wildfire, Severe Winter Weather, Evacuations	**#15-2017**	**Reduce the Impact of Injury from Natural Hazards by Requiring New Road Elevation and/or More than 1 Egress for New Developments**	Revising the Site Plan Review and Subdivision Regulations can reduce the impact of injury from fire, severe winter weather, flooding, or isolation due to the inability to safely evacuate newly built residential developments. Many existing vulnerable populations have limited access, a low roadway prone to washout, or only 1 egress which can cause evacuation issues.	Any New Building on Cul de Sacs and Dead Ends (Hammer-heads)
Hazardous Materials Spills, Public Health, Transportation Accidents, Debris Impacted Infrastructure, Civil Disturbance/Public Unrest	**#16-2017**	**Prohibit Future Hazardous Materials Facilities Located at Major Intersections by Revising Site Plan Review Regulations**	Reduce the likelihood of damages to life and property from hazardous materials spills along heavily traveled areas by revising Site Plan Regulations to eliminate these facilities along major roadways. There would be severe traffic impacts on I-393 and Route 4/9 if the Rymes facility on Horse Corner Road suffers any leakage. The Town has no east-west highway alternative.	Horse Corner Road, Other Intersections
Flood Hazards, Debris Impacted Infrastructure	**#17-2017**	**Prioritize the Upgrade of Most Problematic Culverts and Drainage Facilities by Developing an Annual Culvert Replacement Program**	Replacing 1 culvert this year, Roads Committee discussion to be held on how to categorize the others to move forward.	Entire Town, roadways

Fulfills Hazard Objectives	Action Number	Name of Potential Action	Description of Potential Action	Affected Location
Flood Hazards, Fluvial Erosion	**#18-2017**	**Update and Enforce the Floodplain Ordinance to Comply with Federal NFIP Requirements**	To reduce the likelihood for injury and property loss, the Zoning Ordinance needs to be updated as new requirements to the National Flood Insurance Program are necessary for retention of NFIP participation. The Floodplain Ordinance protects life and property by regulating distance of structures to flood hazard areas, regulating elevation, clarifying definitions, regulating new structures and encroachments, stating duties of the Code Enforcement Officer, etc. The 2010 Floodplain Ordinance does not prevent construction in the in the floodplains and does not apply to non-substantial improvement.	Floodplain areas
Flood Hazards, Fluvial Erosion, Human Hazards, Debris Impacted Infrastructure	**#19-2017**	**Prevent Further Human Encroachment onto and Reduce Further Erosion of the Merrimack, Suncook and Soucook Rivers Shorelands by Regulating More Stringent Setbacks and Buffers from the Shoreland Areas (FGA)**	To help reduce the effects of flooding and erosion, revising the Zoning Ordinance and Overlay Districts for SWQPA compliance and more stringent restrictions. Review the ordinance sections and obtain legal review of new regulation language or consultant assistance.	Shoreland areas-Soucook, Suncook and Merrimack Rivers

Source: Pembroke Hazard Mitigation Committee

Table 42

Evaluation of Structure and Infrastructure Projects

Fulfills Hazard Objectives	Action Number	Name of Potential Action	Description of Potential Action	Affected Location
Flood Hazards, Rapid Snow Pack Melt, Erosion, Debris Impacted Infrastructure	**#12-2010**	**Reduce Flooding, Erosion and Overflow Damage by Upgrading the Failing Culverts on Nadine Drive**	The culverts on Nadine Drive are in need of upgrade because of drainage problems.	Nadine Drive
Earthquake, Heavy Snow and Ice, Severe Wind Hazards, Transportation Accident	**#20-2017**	**Protect the PWD Employees and Equipment by Underpinning the Public Works Facility Foundation to Prevent Movement**	Public Works Facility structure (SE corner) experiences foundation movement and is an item to repair in the CIP (low priority now). The wall and/or roof could collapse with excessive snow load or severe winds and personnel would be at risk. Equipment may not be retrievable if wall(s) fall. Structure is reviewed by an engineer regularly. ($80,000)	Public Works Garage
Flood Hazards, Transportation Accidents, Severe Winter Weather, Severe Wind Hazards, River Ice Jams	**#21-2017**	**Reduce the Risk of Floodwater Susceptibility by Rehabilitating the North Pembroke Road Bridge with the City of Concord**	The North Pembroke Road Bridge shared with Concord over the Soucook River is a redlisted bridge and in need of rehabilitation. It has been damaged by prior floods. The Town and City will undertake a cost-share agreement to fix the bridge in 2017 using NHDOT 80/20 funding. The Bridge is at a key location in terms of evacuating people out of North Pembroke and providing access to goods and services. The Soucook River gage is just upriver from the bridge.	North Pembroke Road Bridge
Flood Hazards, Rapid Snow Pack Melt, Erosion, Debris Impacted Infrastructure	**#22-2017**	**Reduce Flooding, Erosion and Overflow Damage by Upgrading the Micol and Ross Roads Culverts**	The many culverts on Micol and Ross Roads will be upgraded in 2016. Drainage is a problem.	Micol and Ross Roads
Flood Hazards, Fluvial Erosion, Public Safety	**#23-2017**	**Eliminate the Potential Danger to Life and Property by Acquiring the Silva Manufactured Housing Park on 823 N Route 106 Along the Soucook River (FGA)**	This small manufactured housing park rests at the shore of the Suncook River and the bank erodes more each year. It has become necessary to attempt to acquire the parcel and the 5 mobile homes and 1 camp to ensure people are safe.	Suncook River at 823 N Pembroke Road

Source: Pembroke Hazard Mitigation Committee

Table 43

Evaluation of Natural Systems Protection Actions

Fulfills Hazard Objectives	Action Number	Name of Potential Action	Description of Potential Action	Affected Location
Power Failure, Utility Failure, Wind Hazards, Severe Winter Weather, Transportation Accidents, Debris Impacted Infrastructure	**#06-2010**	**Remove Hazardous Trees or Limbs Along Town Roadways**	The Highway Department regularly removes hazardous limbs and trees during their road work and drive-throughs every year.	Entire Town, Roadways
Flood Hazards, Debris Impacted Infrastructure, Fluvial Erosion	**#24-2017**	**Eliminate the Erosion of the Merrimack River Bank at Memorial Field's Boat Launch by Obtain the Necessary Permitting (FGA)**	Merrimack River has been eroding at Town owned Memorial Field and boat launch for over 2 decades. The PWD make small repairs annually. The access road is currently being eroded away. Need a contractor to perform permanent work to fix the erosion problem.	Merrimack River at Memorial Field's Boat Launch

Source: Pembroke Hazard Mitigation Committee

Table 44

Evaluation of Education and Awareness Actions

Fulfills Hazard Objectives	Action Number	Name of Potential Action	Description of Potential Action	Affected Location
Drug Overdose Epidemic, Public Health, Transportation Accidents	**#25-2017**	**Reduce the Risk of Drug Overdose by Advertising the Police Department's Drug Take Back Container**	Drug overdose (public Health epidemic) is a large problem in the Pembroke/Allenstown area according to local officials. Getting the word out about the existence of the Drug Take Back Box can help eliminate some of the accidental overdose incidents. Advertise on Facebook, Town Website, message sign boards, newsletters, newspapers, etc.	Police Department
Hazardous Materials Spills, Public Health, Water Quality, Fire	**#26-2017**	**Reduce the Risk of Public Dumping of Household Hazardous Waste to Protect Groundwater Supplies by Advertising the Collection Program**	There are aquifers in Pembroke that feed directly into people's municipal and private water supply. If people are not aware of the repercussions of dumping HHW, public and environmental health could be compromised. The Transfer Station's Household Hazardous Waste Program should be better utilized. It is held the 3rd week Sept, Town web, Town Hall, handouts at Transfer Station. Could include schools for advertising.	Held at Transfer Station but Entire Town can participate

Source: Pembroke Hazard Mitigation Committee

Natural Hazards Evaluated for Which Specific Actions Were Not Identified

The Hazard Mitigation Committee assessed each of hazards and made determinations whether to specifically develop mitigation Actions for all natural hazards. Nearly all of the potential Actions can be applied to multiple natural or other hazards based upon the generality of the Action's effect. Still, there could be no solutions or mitigation Actions developed for some of the more difficult to mitigate natural hazards. Many possible reasons are taken into account such as feasibility, prohibitive cost, jurisdiction, staff availability to develop and administer the project, lack of local support, unrealistic favorable outcome for the effort and more, all resulting in the point that for some natural hazards, potential Actions would not have worked for the Town. Those hazards for which no specific or feasible Action was identified are displayed in **Table 45**.

Table 45

Committee Assessment of Natural Hazards with No Mitigation Actions

Natural Hazard	Committee Assessment
Tornadoes	The Committee felt Tornadoes would be an unlikely hazard event. Although if a Tornado were to occur, existing activities of the State Building Code, current Public Works Department's removal of hazardous trees and notification of PSNH are in place. Several of the Severe Wind-related Actions could also apply to Tornadoes. They felt no specific Actions would be within the scope of their jurisdiction at this time.
Downbursts	The Committee's assessment of Downbursts is the same as Tornadoes. They did not feel specific mitigation Actions could be pursued.
Hurricanes and Tropical Storms	Hurricanes and Tropical Storms often carry heavy rains, debris, and flooding along with high winds. The Committee's assessment looks to the other wind and flood hazards and felt they could not further mitigate these hazards beyond what was being proposed for Severe Wind-related hazards.
Lightning	The Committee did not feel they could pursue specific mitigation Actions for Lightning, although it could benefit from Wildfire mitigation Actions. Some buildings have Lightning rods, the Fire Department is aware of lightning fire danger in the Suncook Village, North Pembroke and Town Buildings and the Capital Area Fire Compact Mutual Aid could offer support if needed.
Drought	The Committee felt Drought is a wide-spread, long-term hazard for which no specific mitigations Actions could be proposed for the Town. The Pembroke Water Works District as of September 2016 is calling for a voluntary water usage restriction for an indefinite time period to help the Town conserve water.
Excessive Heat	The Committee feels similar concerns to Excessive Heat that they do with Winter Storms. The Fire Department is considering opening a "cooling shelter" and/or checking on residents in need as well as congregate care facilities. The Committee did not feel additional mitigation Actions could be proposed beyond those which generally cover other the hazards noted.
Landslide	The Committee feels Landslide (and/or Erosion) is not a significant hazard in Town except along riverbanks. Other than the Actions proposed for Erosion, at this time, the Committee felt no mitigation Actions for Landslide could be proposed.
Dam Failure	The Committee recognizes that although Dam Failure is a technological hazard, its end result would be significant flooding, particularly of the Suncook Village Dam. Other than the general Flooding mitigation Actions and public education, the Committee felt no specific mitigation Action for Dam Failure would be feasible within the scope of their jurisdiction.

Source: Pembroke Hazard Mitigation Committee

8 MITIGATION ACTION PLAN

The **Mitigation Action Plan** is the culmination of the work of the previous Assessments, inventories, and evaluations from the previous Chapters. Actions to help Pembroke mitigate the damages causes by disasters have been developed and prioritized by Hazard Mitigation consensus in consideration of both existing and new development.

As noted in **7 POTENTIAL ACTION EVALUATION**, each Action falls into (at least) one of these 4 mitigation Action categories:

Local Planning and Regulation
Structure and Infrastructure Projects
Natural Systems Protection
Education and Awareness

Each Action, including the **Deferred** 2010 Actions and the **New** 2017 Actions, is evaluated by the relative ease of completion using a numeric ***Ranking Score*** generated by the STAPLEE prioritization, by the ***Action Timeframe*** by which the Hazard Mitigation Committee would like to see the Action implemented, and by a basic **Cost to Benefit Analysis** as contained within the STAPLEE.

All of the Actions are numbered for easier tracking. The 2010 Actions received the designation of **#1-2010** through **#14- 2010**. The 2017 Actions picked up where the prior Actions left off, beginning with **#15- 2017** through to **#26- 2017**. Over time, the Actions can be tracked to see which have been **Deferred** and to notice, with the missing numbers, how many have been **Completed** or **Deleted**.

The **Responsible Department** is indicated for each Action as the party who will ensure the Action gets completed. An **Approximate Cost** is provided, although no definitive cost estimates or quotes have been obtained at this time. Ways the Action can be **Funded** is identified and offered as an avenue to explore during implementation. The purpose is to offer an idea of how much funding is provided for each Action and how it may be paid for.

Pembroke's Mitigation Action Plan 2017

At the meetings, the Hazard Mitigation Committee identified by consensus these mitigation Actions from all of the **Assessments** and evaluations conducted. The process for Action development has been described in previous Chapters and sections. Combined with the visual Maps of the **Hazard Mitigation Plan 2017**, the **Mitigation Action Plan** should be able to guide future hazard mitigation efforts in the Town through an annual implementation process. Actions derived from one of the Fluvial Geomorphic Assessments of 2015 are denoted by a (FGA) suffix and their cells are highlighted in light blue.

Three (**3**) **Deferred** Actions from 2010 and **12** **New** Actions from 2017 combine to develop the **15** Actions of the 2017 **Mitigation Action Plan**. The Deferred Actions' cells are highlighted in tan.

Table 46

Local Planning and Regulation Actions

Action Number	Action	Action Timeframe	Ranking Score	Who is Responsible	Approximate Cost to Town	What Cost Will Pay For	How Funded
#11-2010	**Reduce the Risk of Fire Injury by Requiring Sprinklers and Fire Protection Systems in all New Single Family Homes**	**Short Term 1-2 Years**	**34**	**Building Department**	$5,000	Legal review of new regulation language	General Legal Expense Operating Budget
#15-2017	**Reduce the Impact of Injury from Natural Hazards by Requiring New Road Elevation and/or More than 1 Egress for New Developments**	**Short Term 1-2 Years**	**32**	**Planning Board with Town Planner**	$5,000	Legal review of new regulation language	General Legal Expense Operating Budget
#16-2017	**Prohibit Future Hazardous Materials Facilities Located at Major Intersections by Revising Site Plan Review Regulations**	**Medium Term 3-4 Years**	**31**	**Planning Board with Town Planner**	$5,000	Legal review of new regulation language	General Legal Expense Operating Budget
#17-2017	**Prioritize the Upgrade of Most Problematic Culverts and Drainage Facilities by Developing an Annual Culvert Replacement Program**	**Long Term 4-5 Years**	**35**	**Public Works Department**	$0	Staff and volunteer labor is in-kind ($0)	N/A
#18-2017	**Update and Enforce the Floodplain Ordinance to Comply with Federal NFIP Requirements**	**Ongoing (as needed to Enforce/ Update Ordinance)**	**36**	**Building Department**	$0	Staff and volunteer labor is in-kind ($0)	N/A
#19-2017	**Prevent Further Human Encroachment onto and Reduce Further Erosion of the Merrimack, Suncook and Soucook Rivers Shorelands by Regulating More Stringent Setbacks and Buffers from the Shoreland Areas (FGA)**	**Medium Term 3-4 Years**	**27**	**Planning Board with Town Planner and Code Enforcement Officer**	$5,000	Legal review of new regulation language or consultant assistance	General Legal Expense Operating Budget, Planning Board Consultant Line Budget

Source: Pembroke Hazard Mitigation Committee

Table 47

Structure and Infrastructure Projects

Action Number	Action	Action Timeframe	Ranking Score	Who is Responsible	Approximate Cost to Town	What Cost Will Pay For	How Funded
#12-2010	**Reduce Flooding, Erosion and Overflow Damage by Upgrading the Failing Culverts on Nadine Drive**	**Medium Term 3-4 Years**	**35**	**Public Works Department**	$180,000	contractor to install new upgraded culverts or relining existing pipes	Public Works Major Road Repairs Operating Budget or Insert into CIP for Culvert Improvements
#20-2017	**Protect the PWD Employees and Equipment by Underpinning the Public Works Facility Foundation to Prevent Movement**	**Short Term 1-2 Years**	**24**	**Board of Selectmen**	$92,000	Contractual agreement will be made with a contractor to perform project work and provide materials	Warrant Article, Some from CIP Town Building CRF Fund
#21-2017	**Reduce the Risk of Floodwater Susceptibility by Rehabilitating the North Pembroke Road Bridge with the City of Concord**	**Short Term 1-2 Years**	**34**	**Board of Selectmen**	$317,000	Pembroke's portion of bridge replacement and upgrade to 3 lanes (Concord's is $92,000)	NH DOT Bridge Program 80/20% match
#22-2017	**Reduce Flooding, Erosion and Overflow Damage by Upgrading the Micol and Ross Roads Culverts**	**Short Term 1-2 Years**	**36**	**Public Works Department**	$65,000	Contractor will perform project work and provide materials, either replacement or lining existing culverts	Public Works Major Road Repairs Operating Budget
#23-2017	**Eliminate the Potential Danger to Life and Property by Acquiring the Silva Manufactured Housing Park on 823 N Route 106 Along the Soucook River (FGA)**	**Long Term 4-5 Years**	**33**	**Emergency Manage-ment with Board of Selectmen**	$350,000	Acquiring the parcel (Land Value $212,184) and buying out the 5 mobile homes and 1 camp (Structures Value $112,100)	Conservation Fund, Warrant Article, CIP Item, Capital Outlay Budget

Source: Pembroke Hazard Mitigation Committee

Table 48

Natural Systems Protection Actions

Action Number	Action	Action Timeframe	Ranking Score	Who is Responsible	Approximate Cost to Town	What Cost Will Pay For	How Funded
#06-2010	Remove Hazardous Trees or Limbs Along Town Roadways	Short Term 1-2 Years then Ongoing	36	Public Works Department	$0	Staff and volunteer labor is in-kind ($0)	N/A
#24-2017	Eliminate the Erosion of the Merrimack River Bank at Memorial Field's Boat Launch by Obtain the Necessary Permitting (FGA)	Short Term 1-2 Years	35	Public Works Department	$20,000	Permitting, legal fees, materials, and possibly a contractor to perform work	Recreation Department Budget or Capital Reserve Fund (CIP), Public Works Capital Reserve Fund (CIP)

Source: Pembroke Hazard Mitigation Committee

Table 49

Education and Awareness Actions

Action Number	Action	Action Timeframe	Ranking Score	Who is Responsible	Approximate Cost to Town	What Cost Will Pay For	How Funded
#25-2017	Reduce the Risk of Drug Overdose by Advertising the Police Department's Drug Take Back Container	Short Term 1-2 Years then Ongoing	36	Police Department	$0	Staff and volunteer labor is in-kind ($0)	N/A
#26-2017	Reduce the Risk of Public Dumping of Household Hazardous Waste to Protect Groundwater Supplies by Advertising the Collection Program	Short Term 1-2 Years then Ongoing	36	Public Works Department	$0	Staff and volunteer labor is in-kind ($0)	N/A

Source: Pembroke Hazard Mitigation Committee

Great Projects…. And the Realities of Project Implementation in New Hampshire

These important but costly and/or time consuming mitigation projects identified in the **Mitigation Action Plan** represent the best case scenarios (or to some, "wish-list" items) for completion. There are many barriers to successful implementation of any project which is outside the typical duties of a Town staff member. The annual struggle to obtain municipal funding at Town Meetings and the uncertainty of political & local support needed for hazard mitigation projects, the limited staff time available to administer and complete the projects, and dwindling volunteer support to help locate grants and work on the Action Plan items all reduce the Town's ability to complete successful hazard mitigation projects within the Plan's 5-year lifespan. Town staff and volunteers are usually forced to be reactive to their numerous daily duties or annual processes and have little availability to be proactive. This is especially true for the Central NH region's smaller communities that rely on voter support for staff hiring and/or hazard mitigation project budget funding, which is 19 out of 20 municipalities.

Therefore, mitigation and other projects are generally completed on an "as-needed basis" or on an "as-available basis" despite the different ways of evaluation and prioritization shown within the **Hazard Mitigation Plan 2017**. Small New Hampshire communities do the best they can with the resources available to them to make ends meet, particularly in times of economic duress or hardship and our aging population. Town Meeting voters decide whether to approve new zoning ordinances which can help mitigate hazards, vote to approve Department Budgets which usually are sustainable and do not allow enough flexibility to plan ahead, and vote to approve Warrant Articles for a hazard mitigation project. Town Volunteers are relied upon to do much of the hazard mitigation work as Town staff are already engaged in real-time, constant public engagement issues and have little additional time available for planning. Few younger people are stepping up to the plate of community volunteering when our existing volunteers are retiring. Indeed, many staff or volunteers have dual or triple roles in the community to fill vacancies, such as a Town Administrator serving as Health Officer and Human Services Officer and a volunteer Fire Chief serving as Emergency Management Director also in a volunteer capacity.

NH communities are used to "toughing it out" and will try to accomplish all they can with the time, funding and resources available to them. However, many of these **2017** Actions may end up **Deferred** to **2022** simply because of the unique nature of our proud, independent State and community culture.

Action Evaluation and Prioritization Methods

A variety of methods were utilized to evaluate and prioritize the Actions. These methods include the enhanced STAPLEE (Social Technical Administrative Political Legal Environmental and Economics) criteria, designating the Action to be completed within a certain timeframe, and completing a basic **Cost to Benefits Analysis**, a later section. These prioritization methods are meant to enable the community to better identify which Actions are more important and are more feasible than others.

STAPLEE METHOD

The Hazard Mitigation Committee ranked each of the mitigation Actions derived from the evaluation process. The total ***Ranking Score*** serves as a guide to the **relative** ease of Action completion by scoring numerous societal and ethical impact questions and does not represent the Town's Action *importance* priority. Instead, the STAPLEE process evaluates each Action and attempts to identify some potential barriers to its success. A score of **36** would indicate that the mitigation strategy, or Action, would be relatively among the easiest Actions to complete from a social and ethical standpoint.

All STAPLEE answers are subjective and depend on the opinions of the Committee members discussing them. The Committee answered these 12 questions with a numeric score of "**1**" (indicating a **NO** response), "**2**" (indicating a **MAYBE/PARTIALLY** response), or "**3**" (indicating a **YES** response).

- Does the action reduce damage and human losses?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Can the action be implemented quickly?
- Is the action socially acceptable?
- Is the action technically feasible?
- Is the action administratively possible?
- Is the action politically acceptable?
- Is the action legal?
- Does the action offer reasonable benefits compared to its cost in implementing?
- Is the action environmentally sound?

STAPLEE Method	
Range of Ranking Scores	Action Ranking Relative Ease of Completion
36 - 30	Easiest to Complete
29 - 13	Harder to Complete
12 - 1	Most Difficult to Complete

The STAPLEE scores ranged from a high of **36** to a low of **24** as shown in **Figure 25**, all of which fell into the **Easiest to Complete** Action ranking category.

Figure 25
STAPLEE Ranking of Mitigation Actions

Action Number	Does/Is the Action..... Action	Reduce Damage?	Contribute to Town Objectives?	Meet Regu-lations?	Protect Sensitive Structures?	Implemen-ted Quickly?	Socially Acceptable ?	Technically Feasible?	Admini-stratively Realistic?	Politically Accept-able?	Legal?	Have a Reason-able Cost to Benefits?	Environ-mentally Sound?	Ranking Score
#06- 2010	Remove Hazardous Trees or Limbs Along Town Roadways	3	3	3	3	3	3	3	3	3	3	3	3	36
#18- 2016	Update and Enforce the Floodplain Ordinance to Comply with Federal NFIP Requirements	3	3	3	3	3	3	3	3	3	3	3	3	36
#22- 2016	Reduce Flooding, Erosion and Overflow Damage by Upgrading the Micol and Ross Roads Culverts	3	3	3	3	3	3	3	3	3	3	3	3	36
#25- 2016	Reduce the Risk of Drug Overdose by Advertising the Police Department's Drug Take Back Container	3	3	3	3	3	3	3	3	3	3	3	3	36
#26- 2016	Reduce the Risk of Public Dumping of Household Hazardous Waste to Protect Groundwater Supplies by Advertising the Collection Program	3	3	3	3	3	3	3	3	3	3	3	3	36
#12-2010	Reduce Flooding, Erosion and Overflow Damage by Upgrading the Failing Culverts on Nadine Drive	3	3	3	3	2	3	3	3	3	3	3	3	35
#17- 2016	Prioritize the Upgrade of Most Problematic Culverts and Drainage Facilities by Developing an Annual Culvert Replacement Program	3	3	3	3	3	3	3	2	3	3	3	3	35
#24- 2016	Eliminate the Erosion of the Merrimack River Bank at Memorial Field's Boat Launch by Obtain the Necessary Permitting (FGA)	3	3	3	3	2	3	3	3	3	3	3	3	35
#11-2010	Reduce the Risk of Fire Injury by Requiring Sprinklers and Fire Protection Systems in all New Single Family Homes	3	3	3	3	3	2	3	3	2	3	3	3	34
#21- 2016	Reduce the Risk of Floodwater Susceptibility by Rehabilitating the North Pembroke Road Bridge with the City of Concord	3	3	3	3	3	2	3	3	2	3	3	3	34
#23- 2016	Eliminate the Potential Danger to Life and Property by Acquiring the Silva Manufactured Housing Park on 823 N Route 106 Along the Soucook River (FGA)	3	3	3	3	2	2	3	3	2	3	3	3	33
#15- 2016	Reduce the Impact of Injury from Natural Hazards by Requiring New Road Elevation and/or More than 1 Egress for New Developments	3	3	3	3	2	2	3	3	2	3	3	2	32
#16- 2016	Prohibit Future Hazardous Materials Facilities Located at Major Intersections by Revising Site Plan Review Regulations	3	3	1	3	2	2	3	3	2	3	3	3	31
#19- 2016	Prevent Further Human Encroachment onto and Reduce Further Erosion of the Merrimack, Suncook and Soucook Rivers Shorelands by Regulating More Stringent Setbacks and Buffers from the Shoreland Areas (FGA)	3	3	3	3	2	2	1	3	2	3	1	1	27
#20- 2016	Protect the PWD Employees and Equipment by Underpinning the Public Works Facility Foundation to Prevent Movement	3	3	2	2	1	2	2	3	1	3	1	1	24
														0

Source: Pembroke Hazard Mitigation Committee

ACTION TIMEFRAMES

The Actions are also prioritized by an estimated ***Action Timeframe*** for completion based upon the other Town activities (hazard mitigation-related or not), funding potential for the Action, the need for the Action project, and possible staff time and volunteers available to complete the Action. This **relative** Action importance priority is measured by the time indicated for project completion. All Action projects within the **Mitigation Action Plan** have been assigned an ***Action Timeframe***.

Action Timeframe	Description of Timeframe
Ongoing	Action undertaken throughout the life of the 5-year Plan
Short Term	Action should be undertaken during Years 1-2 of the Plan
Medium Term	Action should be undertaken during Years 3-4 of the Plan
Long Term	Action should be undertaken during Years 4-5 of the Plan

Those projects which are designated as **Ongoing** mean the Action should be undertaken on a regular basis throughout the five-year lifespan of the Plan. Actions that could qualify as **Ongoing** include public education, zoning ordinance or regulation revisions, essential mitigation maintenance and more.

Short Term projects are those which are the more important Actions and should be undertaken during **Years 1-2** of the Plan's lifespan if possible. **Medium Term** Actions are recommended by the Hazard Mitigation Committee to be undertaken during **Years 3-4** of the Plan's lifespan, while **Long Term** Actions are those which should wait until last, with suggested implementation undertaken during Plan **Years 4-5**. It is important to remember the ***Action Timeframes*** are relative to each other and are another an indication of Action importance. If an Action cannot be completed within the ***Action Timeframe***, it may still be a higher priority than other Actions but was unable to be implemented for some reason.

Both the ***Action Timeframe*** and the ***Ranking Score*** are incorporated into the **Mitigation Action Plan** to assist the Town with implementing the hazard mitigation Actions. The Actions can be sorted within their Action Category by either priority for easy display of the desired characteristic; Actions can also be sorted by **Responsible Department** to keep them all together for ease of completion.

COST TO BENEFIT ANALYSIS

A simple **Cost to Benefit Analysis** ranking is contained within the STAPLEE criteria.

9 ANNUAL IMPLEMENTATION AND EVALUATION

The Town received FEMA approval for the prior **Hazard Mitigation Plan** in **November 2010**. The completion of a planning document is merely the first step in its life as an evolving tool. The **Hazard Mitigation Plan Update** is a dynamic document that should be considered by all Town Departments, Boards, and Committees within their normal working environments. While evaluating the effectiveness of Actions in its everyday implementation, everyone should be able to contribute to the relevancy and usefulness of the Plan and to communicate with the Hazard Mitigation Committee where changes should be made. An annual effort will be undertaken to complete Actions and add new Actions as old tasks are completed and new situations arise. This Chapter will discuss the methods by which the Town of Pembroke will review, monitor, and update its new **Pembroke Hazard Mitigation Plan Update 2017**.

Annual Monitoring and Update of the Mitigation Action Plan

The Board of Selectmen should vote to establish a permanent Hazard Mitigation Committee in **Summer 2016**, or shortly after the FEMA **Letter of Approval** has been received as indicated in **1 PLANNING PROCESS**. The purpose is to meet on a regular basis to ensure the **Hazard Mitigation Plan's** Actions are being actively worked on.

The Emergency Management Director or designee should continue to serve as Chair of the Committee for Hazard Mitigation meetings, and should be appointed in such a capacity by the Board of Selectmen. Current Hazard Mitigation Committee members can be appointed to continue to participate as members of the permanent Committee. Committee membership should include the Emergency Management Director, a Town Staff Coordinator to develop Agendas/handle meeting logistics/update the Plan components, Town Administrator, Fire Chief, Rescue Chief, Police Chief, Public Works Director, Building Inspector, Health Officer, 1 (one) Selectman, 1 (one) Planning Board member, 1 (one) School District Representative, Business Community members, Non-profits, local State or Federal agency representatives, and Citizen Members at large. This provides a wide spectrum of potential interests and opportunities for partnership to accomplish Actions.

This Committee will **aim to meet formally at least twice per year in April and September** to update the **Mitigation Action Plan**, to ensure Actions are budgeted and/or undertaken, and to complete the Plan's annual evaluation as displayed in **Table 50**.

Table 50

Hazard Mitigation Committee Preliminary Annual Future Meeting Activities

Month	Preliminary Interim Activities and/or Meeting Agenda Items
April **HMC Meeting**	Committee finds out how much funding from the annual **March Town Meeting** has been provided and for which projects. Committee updates the **Mitigation Action Plan** with the previous year's accomplishments. Committee determines Action Plan items to pursue for forthcoming year, including $0 cost items. Committee informs Department Heads of Action priorities so they can begin work.
June ***In between meetings***	In June, the Committee members prepare funding for projects to be placed into the August 1 **Capital Improvements Program** preparation and prepare funding for projects in **Department Operating Budgets** for September 1.
September **HMC Meeting**	Committee assists **Board of Selectmen** and **Budget Committee** with getting their mitigation projects funded and written into Department budgets. Action implementation continues. **Annual Plan Evaluation** is completed.

Sources: Pembroke Hazard Mitigation Committee 2017

Annually and independent of the Town's budget cycle, a simpler listing of the Hazard Mitigation Committee's tasks should include:

- **Document New Hazard Events that Occurred in Town**
  - Hazard Risk Assessment
  - Local and Area History of Disaster and Hazard Events
- **Coordinate Completion of Annual Mitigation Actions by Assigning to Departments**
  - Appendix B Mitigation Action **Progress Report**
- **Seek and Help Departments Acquire Funding for Actions & Fill in Tracking File**
  - Appendix B Mitigation **Action/Project Status Tracking**
- **Evaluate Effectiveness of the Plan and Its Actions Yearly**
  - Appendix B Plan **Evaluation Worksheet**
- **Obtain Semi-Annual Progress Reports from Departments & Update Tracking File**
  - Appendix B Mitigation **Action/Project Status Tracking**
- **Update & Reprioritize Mitigation Action Plan and Update Supporting Plan Document Sections**
  - Mitigation Action Plan
  - Enhanced STAPLEE Prioritization
  - Hazard Mitigation Plan Update 2017 sections as needed (make a note of the new information added/changed)
- **Repeat**

For each Hazard Mitigation Committee meeting, the Emergency Management Director (or Staff Coordinator) will invite other Department members, Board and Committee members, Town Staff, Pembroke School District Staff, and other participants of the **2017 Plan** Committee meetings. Members of the public will also be invited. Everyone's purpose is to attend and participate in the meetings as full participants, providing input and assisting with decision making. Public notice will be given as press releases in local papers, will be posted in the public places in Pembroke, and will be posted on the Town of Pembroke website at www.pembroke-nh.com.

The **Hazard Mitigation Plan's Mitigation Action Plan** will be updated and evaluated annually generally following the suggestions outlined within the Chapter. All publicity information, Agendas, and Attendance Sheets, should be retained and compiled for inclusion into **APPENDIX C**.

The Emergency Management Director and Department heads will work with the Board of Selectmen to discuss the funding of Action projects as part of the budget process cycle in the fall of each year. The

projects identified will be placed into the following fiscal year's budget request if needed, including the Capital Improvements Program (CIP), Town Operating Budgets, and other funding methods.

The Federal Emergency Management Agency (FEMA) encourages communities to upload their Hazard Mitigation Plan Actions into an online database. The **Mitigation Action Tracker** follows municipal Actions through their completion. This added attention to the Town's Actions could enable additional support for grant opportunities when it is shown the Town can complete its mitigation projects. The Town would need to set up an account to enter their Actions into the **FEMA Mitigation Action Tracker** at https://mat.msc.fema.gov.

Tasks of the Plan Update

A number of tasks will be accomplished for the complete (five-year, FEMA approved) update to the Hazard Mitigation Plan. Note that information from many Chapters will be used or referenced by other Chapters. The annual **Mitigation Action Plan** update tasks for the Hazard Mitigation Committee are indicated in bulleted list above and are noted below under the brief instructions for chapter updates.

1 PLANNING PROCESS

Add the new Hazard Mitigation Committee members, contributors, and the public who participated in meetings. Add any new Agendas to the Table. Retain all meeting, attendance, publicity and invitation documents in updated **APPENDIX C Meeting Information**.

2 COMMUNITY PROFILE

Revise the Tables with new demographic and housing information as it becomes available. Update the building permit figures. Revise land use data from the Avitar Appraisal System and compare to previous years' data. Update any zoning changes. The text analysis will need to be revised to reflect all changes.

3 GOALS AND OBJECTIVES

Review and update the general and hazard-specific objectives (Flood, Wind, Fire, Extreme Temperature, Earth, Technological, Human) to ensure their continued relevance.

4 HAZARD RISK ASSESSMENT

Review and update the **Hazard Risk Assessment**. Add new disasters, new Public Assistance funding received, and significant new hazard events since the last Plan into the Tables and Appendices**.** Determine the magnitude of new declared disasters. Add any specific narrative dialogue about new hazard events occurring in Pembroke. Update **Local and Area Hazard Event History** with new disasters or hazard events and review the **Hazard Risk Assessment** for necessary changes. Update **Potential Future Hazards** to document the possible new hazards that could occur in Town based on historic or current evidence.

5 COMMUNITY VULNERABILITY AND LOSS ESTIMATION

Review and update the **APPENDIX A Critical and Community Facility Vulnerability Assessment** Tables to ensure accuracy. Update the Structure Valuation cost when new Avitar assessing data becomes available. Generate additional Problem Statements that arise on account of the facilities. Update the Culvert Upgrade Table. Revise the number and type of buildings in the Special Flood Hazard Areas (floodplains) including new structure valuation and recalculate the discussion values. Once the new structure assessments are available, recalculate the building dollar losses by the other natural hazards. Update the NFIP Tables and changes to the Floodplain Ordinance.

6 CAPABILITY ASSESSMENT

Review and update the **Capability Assessment** for adoption date revisions, changes since the last plan, or future improvements. List additional example capabilities in the Chapter. Add additional mitigation support resource documents to the Table.

7 POTENTIAL ACTION EVALUATION

Review the Actions for validity and revise as needed to place them in different categories: Completed, Deferred or Deleted. Explain why each Action was Deleted or Deferred and indicate when each Action was Completed. Determine any new Actions can be developed from new Problem or new Capability Assessment Future Improvements. List some examples of each type of the 5 actions in the Plan. Revise the **Potential Action Evaluation** to accommodate the Action changes.

8 MITIGATION ACTION PLAN - ANNUAL UPDATE

Remove Completed and Deleted Actions and move to **7 POTENTIAL ACTION EVALUATION.** Add New Actions to the **Mitigation Action Plan 2017** and ensure they are reviewed in the previous Chapter, listed above. Reevaluate Actions not yet completed, remove the Deleted, and evaluate any New Actions utilizing the enhanced **STAPLEE Mitigation Action Prioritization** matrix. Modify the approximate cost, date for completion, and funding changes as needed.

9 ANNUAL PLAN IMPLEMENTATION AND EVALUATING - ANNUAL ACTIVITY

The Hazard Mitigation Committee (HMC) should be permanently appointed by the Board of Selectmen to hold up to 6 meetings yearly to review, implement, and evaluate the Plan. Updates any procedures or processes in the Chapter. Use the **APPENDIX B Annual Plan Evaluation and Implementation Worksheets** to guide the annual update of **8 MITIGATION ACTION PLAN**. Keep track of publicity, Department Reports, and all progress made towards the identified Actions. Add progress since the last Plan for implementation programs. Review continued public involvement for accuracy. Add other new information to the Chapter or revise as needed if new information becomes available.

10 APPENDICES

Revise the **APPENDICES A-D** as needed to update the data and documentation for Pembroke. Ensure any and all of the publicity, Agendas, Attendance Sheets, revised files and more are available for transfer

to CNHRPC when the 5-year Plan update is due. These interim files will be placed into an updated **APPENDIX C Meeting Information.**

11 MAPS

Update ***Map 1***, ***Map 2***, ***Map 3***, and ***Map 4*** of the Plan as needed to reflect the changes of the hazard event locations and site locations. Mapping assistance may be sought elsewhere, such as with the Central NH Regional Planning Commission (CNHRPC). The additional maps of the Soucook and Suncook Rivers fluvial geomorphic assessment were a one-time project with the NH Geological Survey and no further revisions are anticipated to these detailed Maps.

Implementing the Plan through Existing Programs

In addition to work by the Hazard Mitigation Committee and Town Departments, several other mechanisms exist which will ensure that the **Pembroke Hazard Mitigation Plan Update 2017** receives the attention it requires for optimum benefit. Incorporating Actions from the Plan is often the most common way the Hazard Mitigation Plan can be integrated into other existing municipal programs, as described below.

MASTER PLAN

The **Pembroke Master Plan** was adopted in **Spring 2004**, developed by the Planning Board with assistance from the CNHRPC. The Planning Board began discussing funding and staffing options in early 2016 for the Master Plan's update. Although the consensus is an update is needed, decisions have been held off based on limited funding available to contract out for the Master Plan's revision.

The Planning Board should consider adopting the **Hazard Mitigation Plan Update** as a separate Chapter to its Master Plan in accordance with RSA 674:2.II(e). The **Hazard Mitigation Plan Update** should be presented to the Planning Board after FEMA's approval. The Plan can be considered for adoption and incorporation after a duly noticed public hearing.

Process to Incorporate Actions

The Hazard Mitigation Committee will present the approved **Hazard Mitigation Plan Update** to the Planning Board within **6** months after FEMA's **Letter of Formal Approval is received** for consideration and adoption into the Master Plan after a duly noticed public hearing. This is the same process used to adopt other components of the Master Plan. The NH State law supporting the development of a natural hazard mitigation plan as a component of a community Master Plan is **RSA 674:2-III(e).** The Hazard Mitigation Committee will oversee the process to begin working with the Planning Board to ensure that the Hazard Mitigation Plan Update Actions are incorporated into the Master Plan.

Implementation Progress through the Master Plan Since the 2010 Plan

The existing 2004 Master Plan developed by the Planning Board does not yet contain the **Hazard Mitigation Plan Update 2010** (or 2017) as an Appendix.

How Was This or Will This Be Accomplished?

The 2004 Master Plan may begin to be updated in later 2016, with to particular timeframe available for completion. This will be an opportune time to integrate the **Hazard Mitigation Plan.** The Planning Board will be given a copy of the **2017 Plan** and can choose to incorporate several Action items that pertain to the Planning Board or incorporate the entire Plan by reference. Several Actions include revisions to Board regulations and to Capital Improvements, Zoning Amendments, or Subdivision and Site Plan Review regulations. The Floodplain Ordinance under the purview of the Planning Board was updated since the last Plan, in 2010. The Emergency Management Director will recommend that the Board incorporate the identified Planning Board-responsibility Actions as appropriate into the Future Land Use, Implementation, and Community Facilities Chapters and include the **Hazard Mitigation Plan** into the Master Plan Appendix whenever the Planning Board updates the Master Plan.

CAPITAL IMPROVEMENTS PROGRAM

Pembroke developed its newest **Capital Improvements Program (CIP)** for 2016-2022, with the intention of an annual update. The HMC would like to ensure Actions requiring capital improvements funding from the **Hazard Mitigation Plan Update** will be inserted into the Capital Improvements Program for funding. Depending on the Town's funding needs, a Capital Reserve Fund for Hazard Mitigation Program Projects may be established to set aside funding for the many projects identified in the Hazard Mitigation Plan Update.

Process to Incorporate Actions

The Hazard Mitigation Committee will oversee the process to begin working with the Planning Board's CIP Committee to incorporate the various Hazard Mitigation Plan projects into the yearly CIP. As the CIP is updated on a yearly basis, a representative from the Hazard Mitigation Committee could request to sit on the CIP Committee to ensure the projects are added.

Implementation Progress through the CIP Since the 2010 Plan

Many of the Completed Actions are able to be completed because of their placement into and purchase out of the Capital Improvements Program.

How Was This or Will This Be Accomplished?

The Town Departments and Town Administrator will work together with Planning Board to identify the items needed for the Hazard Mitigation Plan Action implementation. The Actions identified were then (or will be in the future) added to the next updated CIP.

ZONING ORDINANCE AND REGULATIONS

Several of the implementation strategies proposed involve revisions to the Zoning Ordinance, Subdivision Regulations, and/or the Site Plan Review Regulations. The Town staff and Planning Board annually draft Zoning Ordinance amendments for Town Meeting approval, and will be requested to do so in order to accommodate Actions. The Regulations are updated by the Board as needed.

Process to Incorporate Actions

A Hazard Mitigation Committee member, perhaps the Town Planner, will work with Planning Board to develop appropriate language for modifications to the Zoning Ordinance and the Subdivision and Site Plan Regulations as they deem appropriate as appropriate to accommodate Actions in the **Hazard Mitigation Plan Update 2017**. Other Committee members, if requested, could help Town staff draft language for respective changes to the Regulations or the Zoning Ordinance, and assist Town staff with presenting the language to the Planning Board for consideration.

The Hazard Mitigation Committee representative will request from the Planning Board a copy of future required language for any FEMA Zoning Ordinance Updates for incorporation into the Plan.

Implementation Progress through Zoning Since the 2010 Plan

The Town adopted the April 19, 2010 NFIP DFIRM Maps and respective updates to the Zoning Ordinance. Other Zoning Ordinance changes did not pertain to mitigation.

How Was This or Will This Be Accomplished?

The Planning Board directly obtains the required NFIP floodplain ordinance revision information from the NH Office of Energy and Planning and provides it to the Board of Selectmen for approval, a legislative power granted to them. For any future updates to the Floodplain Development Ordinance not required by FEMA, the changes will have to be approved at Town Meeting.

TOWN MEETING

In Pembroke, the annual Town Meeting is held in March where the voters of the Town vote to raise money for capital projects and approve the annual operating budget of the Town. This is an opportunity to get some of the Actions of the Hazard Mitigation Plan Update funded.

Process to Incorporate Actions

The Hazard Mitigation Committee members will work with the Budget Committee and Board of Selectmen to develop warrant article language for appropriate Actions. A representative from the Hazard Mitigation Committee will provide a copy of the **Mitigation Action Plan** to both the Budget Committee and Board of Selectmen and validate the need for funding at the annual Town Meeting to accomplish the projects. The representative will work with the Town Administrator to write warrant article language for approval Action items if needed or to get the items placed into Department Operating Budgets.

Implementation Progress through Town Meeting Since the 2010 Plan

Town Meetings are used to accomplish many of the Action purchases**. Mitigation Actions Completed Since 2010** through separate warrant articles, warrant articles to remove funds from the Capital Improvements Program, or through adoption of Department Operating Budgets and the General Fund.

How Was This or Will This Be Accomplished?

The Emergency Management Director, a member of the Hazard Mitigation Committee, brings Action items to be purchased to the Board of Selectmen and Budget Committee for consideration. The CIP contains many of the Actions, as discussed previously. The Board of Selectmen and Budget Committee bring Actions to the Town Meeting via warrant articles, as well as the Operating Budgets, additional warrant articles which may include Action items in the CIP, and warrant articles to add funding into the capital reserve funds. Many of the Action items are funded in this manner.

OPERATING BUDGETS

Many of the Actions will not require specific funding but are identified as requiring in-kind Staff labor to perform the work required to undertake the Actions. Town Departments and Staff have rigorous job functions that demand their undivided attention to the tasks required to run their respective Departments. Additions to the work load to accommodate the Actions can put a strain on their ability to serve the public during performance of their normal job duties. When possible, Pembroke Departments and Staff will be able to prioritize their tasks to work on **Hazard Mitigation Plan Update 2017** Actions. The in-kind work performed comes out of the Operating Budget for that particular Department.

Process to Incorporate Actions

With getting started help from the HMC, the Department or Board given the responsibility to ensure the Action gets completed will work on the Actions allocated to him/her or delegate the Action to another person, when their normal job duties permit. The funding for the Actions comes out of the Department's operating budget as work is undertaken by the Staff person on an as-time-permits basis unless the Action is a component of the Staffs' normal work duties.

Staff or volunteers will attempt to follow the **Action Timeframe** as a guideline for completion. A yearly review of the **Mitigation Action Plan** by the Hazard Mitigation Committee will reprioritize the Actions, and the members can report on their progress, asking for assistance or more time as needed.

Implementation Progress through Operating Since the 2010 Plan

The Operating Budgets of the Town Departments typically served to implement many of the Actions displayed in **Mitigation Action Plan.**

How Was This or Will This Be Accomplished?

Department heads who participated in the Hazard Mitigation Committee submitted their Action items to Board of Selectmen and Budget Committee for consideration. Individual Department needs are recognized as part of their respective Operating Budgets and are proposed to the Board of Selectmen and Budget Committee. All Operating Budgets go to Town Meeting for voter approval.

Continued Public Involvement

On behalf of the Hazard Mitigation Committee, the Emergency Management Director and the Staff Coordinator, under direction of the Town Administrator, will be responsible for ensuring that Town Departments and the public have adequate opportunity to participate in the planning process. Administrative staff may be utilized to assist with the public involvement process.

For each interim meeting in the annual update process, and for the five-year update process procedures that will be utilized for public involvement include:

- Provide personal invitations to Town volunteer Board and Committee Chairs, and Budget Committee members;
- Provide personal invitations to Town Department heads, including Pembroke Water Works and Tri-Town Ambulance Service;
- Provide personal invitations to the following entities listed below;
- Post public meeting notice flyers on the Town's website at www.pembroke-nh.com and in the Town Hall, Town Safety Center, Town Library, and Kimball's Cavern (a local business)
- Submit media releases to the Union Leader newspaper (a state-wide newspaper), the Concord Monitor (a regional newspaper serving 39 communities around the Concord area) and the Concord Patch (a popular online local news source).

Agencies and businesses to invite to future **Hazard Mitigation Plan Update** meetings include the Pembroke School District, Associated Grocers of New England, engaged Town citizens, the local State Representative; and local businesses Clean Energy, and Carlucci Electrical (see **APPENDIX A Critical and Community Facilities Vulnerability Assessment** Tables: Vulnerable Populations, Economic Assets and Recreational and Gathering Sites). The Emergency Management Directors of the neighboring communities of Epsom, Allenstown, Bow, and Concord, and Loudon will again be invited as will the NH Homeland Security and Emergency Management Field Representative.

The Hazard Mitigation Committee will ensure that the Town website's Emergency Management webpage at http://pembroke-nh.com/emd.asp is updated with the Hazard Mitigation meeting notices that first appear on the welcoming Home page. A number of Action Plan items which will be undertaken relate to public education and involvement. The website could be a good way to get the word out.

Implementation and Evaluation of the Plan

During the Committee's annual review of the **Mitigation Action Plan,** the Actions are evaluated as to whether they have been **Completed, Deleted**, or **Deferred.** Those Action types are placed into their respective Tables. Any **New** Actions will be added as necessary. Each of the Actions within the updated **Mitigation Action Plan** will undergo the enhanced STAPLEE ranking as discussed in **8 MITIGATION ACTION PLAN.**

A set of comprehensive **Annual Interim Plan Evaluation and Implementation Worksheets** is available to assist the community with Plan implementation in **APPENDIX B**. These worksheets are to be used during the Hazard Mitigation Committee basic meeting schedule outlined previously in **Table 50**.

The worksheets include administrative and organizational documents, those that are used with the **APPENDICES** spreadsheets developed, and two Agendas to get started with HMC Interim Update meetings:

- **Purpose of the Permanent Hazard Mitigation Committee for the Selectmen's Establishment and Committee Appointments**
- **Hazard Mitigation, Prevention, Response and Recovery Resources for Communities Compiled by the CNHRPC**
- **Organization of Public Invitees to Join Meetings**
- **Meeting Publicity (Press Releases and Public Notice Meeting Posters) Tracking**
- **Example Agenda Interim Meeting 1 (IM1)**
- **Example Agenda Interim Meeting 2 (IM2)**

- **Interim Meeting Attendance Sheet**
- **Mitigation Action/Project Status Tracking Sheet**
- **Mitigation Action/Project Progress Report**
- **Annual Hazard Mitigation Plan Evaluation Worksheet**

The five-year full Plan update will evaluate the Actions in the same manner in addition to fulfilling all of the **TASKS OF THE PLAN UPDATE** earlier in this Chapter.

10 APPENDICES

The following **APPENDICES A-F** are included under a separate electronic or paper document to maintain the relative brevity of this **Hazard Mitigation Plan Update**.

Listing of Pembroke Hazard Mitigation Plan Update 2017 Appendices

Some of these documents should be updated annually as part of the interim Action implementation and Plan evaluation process*. The remaining **APPENDICES** could be amended as a result of the new or revised annual information, but they are optional. It is necessary to establish a location for placing any new or updated hazard, Action, meeting or Plan data over the 5-year interim until the Plan is fully updated again.

- **A Critical and Community Facility Vulnerability Assessment**
- **B Annual Plan Evaluation and Implementation Worksheets ***
- **C Meeting Information ***
- **D Plan Approval Documentation**
- **E Suncook River Fluvial Geomorphic Assessment 2015**
- **F Soucook River Fluvial Geomorphic Assessment 2015**

11 MAPS

Four detailed Maps were created during the development of the **Hazard Mitigation Plan 2017**. Data from the previous Plan maps were used, new standardized data layers were available, and Hazard Mitigation Committee members added their own knowledge of sites and hazard events. Maps from the 2015 Hazard Mitigation Plan Addendums of the **Soucook River and Suncook River Fluvial Geomorphic Assessments** are included as they are an integral component of the potential hazard issues along these two rivers.

Plan Update 2017 Maps

Map 1 - Potential Hazards illustrates potential hazard event locations in Pembroke that have the possibility of damaging the community in the future. The ***Map 1*** legend includes (technology) infrastructure hazards such as dams, bridges, water lines, gas lines, sewer lines, electric transmission lines, and evacuation routes. Natural hazards are displayed such as Special Flood Hazard Areas (SFHAs), locations of potential road washout, fire/wildfire, and more.

Map 2 - Past Hazards illustrates the locations of where hazard events have occurred in Pembroke in the past, including areas of flooding, washouts, transportation accidents, fire, lightning, and more.

Map 3 - Critical and Community Facilities includes all of the infrastructure included in ***Map 1 Potential Hazards*** on a background of aerial photography to give readers a better, real world perspective. The locations of all critical facilities and community facilities as recorded in the Community Vulnerability Assessment are displayed on the Map. Each of these sites is numbered on a key listing the names of each facility.

Map 4 - Potential Hazards and Losses utilizes all the features of Map 3 on an aerial photography background and includes the ***Map 1 Potential Hazards*** and any realistic ***Map 2 Past Hazards*** locations where hazard events can occur again.

- **Map 1 - Potential Hazards**
- **Map 2 - Past Hazards**
- **Map 3 - Critical and Community Facilities**
- **Map 4 - Potential Hazards and Losses**

Fluvial Geomorphic Assessment 2015 Maps

As a result of the many flooding events and existing complications of the very dynamic Suncook River and a potential for flooding on the Soucook River the NH Geological Survey (NHGS) at the NH Department of Environmental Services (NHDES) coordinated fluvial geomorphology assessments of both rivers. Conducted by Field Geology Services who collected fluvial geomorphology field data in designated river reaches of the Suncook River in Allenstown/Pembroke and Epsom in 2013 and the Soucook River in Concord/Pembroke and Loudon in 2014, a suite of data features was collected from the confluence of the Merrimack River to the northern Epsom town line (Suncook River) and into Loudon (Soucook River). The Town of Barnstead's section of the Suncook River was assessed, but the middle communities (Chichester and Pittsfield) opted out.

The NHGS wrote the *Suncook River Fluvial Geomorphology Assessment Discussion Guide* in Spring 2015 to help communities interpret the data that was collected on by river reach. While **APPENDIX E** and **APPENDIX F** are the **Suncook River** and **Soucook River Fluvial Geomorphic Assessments** respectively, the accompanying maps comprise important **Hazard Mitigation Plan** information that should be considered when developing mitigation Actions.

FLUVIAL GEOMORPHIC ASSESSMENT (FGA) MAPS

Suncook River

- **Map 5A - Fluvial Geomorphology Features West**
- **Map 5B - Fluvial Geomorphology Features Center**
- **Map 5C - Fluvial Geomorphology Features East**
- **Map 6A - Fluvial Erosion Hazard Meander Belts West**
- **Map 6B - Fluvial Erosion Hazard Meander Belts Center**
- **Map 6C - Fluvial Erosion Hazard Meander Belts East**
- **Map 7A - Large Woody Material Density West**
- **Map 7B - Large Woody Material Density Center**
- **Map 7C - Large Woody Material Density East**

Soucook River

- **Map 8A - Fluvial Geomorphology Features West**
- **Map 8B - Fluvial Geomorphology Features Center**
- **Map 8C - Fluvial Geomorphology Features East**
- **Map 9A - Fluvial Erosion Hazard Meander Belts West**
- **Map 9B - Fluvial Erosion Hazard Meander Belts Center**
- **Map 9C - Fluvial Erosion Hazard Meander Belts East**

All **19** FGA Maps incorporated into the **Hazard Mitigation Plan 2017** are included as color fold-out 11x17" pages in the back of the Plan document.