

The Town of Goshen

# Local Natural Hazards Mitigation Plan

Adopted by the Goshen Board of Selectmen on 

**Prepared by:**

The Goshen Natural Hazards Mitigation Planning Committee

and

The Pioneer Valley Planning Commission  
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# 1: INTRODUCTION

## Hazard Mitigation

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The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Goshen and the Pioneer Valley Planning Commission, make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a local natural hazard mitigation plan before a disaster occurs can save the community money and facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the plan. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program are programs with this requirement.

## Planning Process

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The natural hazard mitigation planning process for the Town of Goshen included the following tasks:

- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards, particularly flooding.
- Identifying and assessing the policies, programs, and regulations a community is currently implementing to protect against future disaster damages.
- Identifying deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Local Natural Hazards Mitigation Plan.

The key product of this process is the development of an Action Plan with a Prioritized Implementation Schedule.

### **Public Committee Meetings**

July 16, 2008, 7:00 pm: Working committee meeting held at Fire Department.

August 6, 2008, 7:00 pm: Working committee meeting held at Fire Department.

September 10, 2008, 7:00 pm: Working committee meeting held at Fire Department.

A mailing was made to each committee member prior to each meeting that contained information from the previous meeting, an agenda sheet, and information to be covered.

### **Involvement of Neighboring Communities and the General Public**

Both the members of the Goshen Hazard Mitigation team and the staff from the Pioneer Valley Planning Commission (PVPC) collaborating with the Town of Goshen to develop this plan worked to inform surrounding communities and the general public about Goshen's Hazard Mitigation planning process and results.

Staff from PVPC presented on Goshen's plan at a meeting of the Hampshire county emergency preparedness committee and at a meeting of the Western Regional Homeland Security Advisory Council (WRHSAC).

A draft of the plan was posted on the Town website and on the PVPC website for 30 days of public review and comment. A media release to area papers announced the availability of the plans for public review and comment.

All meetings of the Goshen Hazard Mitigation committee were posted for public review at least 48 hours before the meetings were held.

### **Public Meetings with the Board of Selectmen**

November 16, 2005: The Board of Selectmen agreed to begin the process of developing a Local Hazard Mitigation Plan. Meeting held at Goshen Town Offices.

                    , 2009: The Board of Selectmen adopted the Local Natural Hazard Mitigation Plan. Meeting held at Goshen Town Offices.

## 2: LOCAL PROFILE

### Community Setting

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Covering about 17.7 square miles, the Town of Goshen is located in Hampshire County at the foothills of the Berkshire Mountains in western Massachusetts. Known as one of the “hilltowns,” Goshen is situated in the uplands west of the Connecticut River Valley. It is bordered by the towns of Conway to the northeast, Williamsburg to the east, Chesterfield to the south and southwest, Cummington to the northwest, and Ashfield to the north.

Named after the town in Egypt, Goshen was incorporated in 1781 as an agriculturally-based community. Several civic buildings, the meeting house, and the Congregational Church were built in the mid-1800s. Quarrying was an important industry at this time. One quarry produced what has been called Goshen Stone, and the mineral lithium aluminum silicate – the source of lithium metal – was found in Town.

During the turn of the 19<sup>th</sup> Century, Goshen became known as a summer resort community, and up until the 1950s, many seasonal homes were built. Hammond Pond was developed with waterfront cottages, and several camps were built throughout Town. The D. A. R. Forest, the first in the United States, was set aside in 1929, providing several outdoor recreation opportunities that still exist today, including a beach at the upper and lower Highland Lake.

Goshen’s lack of good roads and reliable water power prevented any major industrial development. Industry consisted of small mills and home-based businesses, which continue today. Because of its fairly remote location, it has been able to maintain a quiet, country character. Most development consists of single-family homes; the remainder of land in Goshen is hilly and forested, with some scattered open fields in farming.

Goshen’s location within 13 miles of the City of Northampton and 25 miles of the college town of Amherst, and within relatively easy access to Interstate 91, has contributed to its development as a “bedroom community” to these two larger towns, as well as the Town of Greenfield and the cities of Springfield, Chicopee, and Westfield along the I-91 corridor into Connecticut. The Town’s estimated population in 2002 was 948 people, resulting in a population density of 54 persons per square mile.

### Infrastructure

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Goshen’s infrastructure reflects its agricultural and rural roots.

#### *Roads and Highways*

Major roadways through Town are Route 9 tending northwest from Williamsburg through Goshen to Cummington, and Route 112 from the intersection of Route 9 at the north end of Goshen Center north to the Ashfield line in Franklin County.

### ***Transit***

The Pioneer Valley Transit Authority (PVRTA) provides contracts through MV Transportation to offer paratransit in Goshen, a door-to-door demand responsive van service.

### ***Public Water and Sewer Service***

Goshen's water supply comes from groundwater sources through many private wells and eleven transient non-community wells and one non-transient non-community well. Goshen does not have a public sewer system or any publicly owned wastewater treatment plants. All residences and businesses are served by on-site septic systems.

## **Natural Resources**

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Goshen's terrain and landscape has played a key role in dictating its development as a rural community. The Town's natural resources led to its development as an agricultural village, reliant on farming and its quarries, and then Goshen's natural beauty was realized by summer vacationers, and more recently, other outdoor recreation enthusiasts and campers.

### ***Water Resources***

There are several ponds and small lakes in Goshen including: Lilly Pond, Sears Meadow Pond, Upper Highland Lake, Lower Highland Lake, Hammond Pond, and Damon Pond. Many other smaller bodies of water are scattered across the landscape of Goshen primarily located along streams and in wooded areas. Most of the 227 acres of open water in Goshen are comprised of these small ponds and lakes. These water bodies offer valuable wildlife habitat, unique natural environments, and provide benefits to Goshen's human inhabitants in the form of prime recreational opportunities.

A small portion of northwestern Goshen lies within the Westfield River Watershed and is drained into that system via the Swift River. The remainder of Goshen lies within the Connecticut River Watershed Basin. There are 1,168 acres of 'Natural Land - Riparian' in Goshen within the Westfield River basin and 832 acres of 'Natural Land - Riparian' in Goshen's portion of the Connecticut River basin. These natural lands are areas within the riparian corridor that remain in a "natural state", potentially functioning as a corridor for select species movement, as well as additional ecological purposes.

There are 596 acres of land within the 100-foot Rivers Protection Buffer Area - the inner riparian zone. Development activity in this area is limited by the Massachusetts Wetlands Protection Act (Rivers Protection Act). However, the outer riparian zone is susceptible to limited development in certain instances.

### ***Forests and Fields***



The forest resources and woodlands in Goshen are abundant throughout the town. The town has large expanses of permanently and temporarily protected vegetated open space located within a North Central Hardwoods-Hemlock-White Pine zone. The extensive range of these forestlands encompasses approximately 9,307 acres, which comprises 82% of the total land area in the Town. These areas are habitat for several tree and plant species as well as wildlife.

## **Development**

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Despite a rural veneer, Goshen has changed a great deal in the past 50 years. Just before the beginning of World War II, Goshen reached its lowest population, at 224 residents. Several factors have now brought the Town to the edge of a critical transformation, and the Town has experienced growth pressures with the population increasing 42% to 948 since 1980.

The Town of Goshen has limited economic resources and is primarily considered a “bedroom community,” since most residents travel outside of town boundaries for employment. However, the housing market has expanded in the Pioneer Valley and as housing pressures intensify in the valley, Goshen and other hilltowns are likely to see an increase in new home development over the next several years.

In addition to other factors, zoning and other land use regulations constitute Goshen’s “blueprint” for its future. Land use patterns over time will continue to look more and more like the town’s zoning map until the town is finally “built out”—that is, there is no more developable land left. Therefore, in looking forward over time, it is critical that the town focus not on the current use and physical build-out today, but on the potential future uses and build-out that are allowed under the town’s zoning map and zoning bylaws. Zoning is the primary land use tool that the town may use to manage development and direct growth to suitable and desired areas while also protecting critical resources and ensuring that development is in keeping with the town’s character.

The Goshen Zoning Bylaw establishes just one zone district, the Residential-Agricultural District.

The Zoning Bylaw also establishes a Special Permit Approval procedure for specific uses and structures within Goshen. This review allows the Special Permit Granting Authority the ability to review development to ensure that the basic safety and welfare of the people of Goshen are protected, and includes several specific evaluation criteria that are relevant to natural hazards.

### ***Current Development Trends***

Today, the vast majority of Goshen’s 17.7 square miles is undeveloped land, totaling more than 9,673 acres. Residential land is the second most prolific land use, at approximately 748 acres, followed by agricultural land at approximately 481 acres. Water comprises almost 237 acres of land in Goshen. There are 111 acres of outdoor recreation land in Town, and 34 acres characterized as urban open/public land. Land

used for industrial uses constitutes approximately 42 acres, whereas the amount of commercial land is relatively small at just 17 acres.

Currently, development in Goshen is slightly encouraged by existing zoning and other land use regulations to seek areas where the environmental conditions and existing public utilities support such development. With just one zone district, the Town relies heavily on special permitting and subdivision regulations in order to manage development.

### ***Development in Hazard Areas***

Hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding. According to the Community Information System (CIS) of FEMA, there were 20 structures located within the Special Flood Hazard Area (SFHA) in Goshen as of August 2005, the most current records in the CIS for the Town of Goshen.

# 3: HAZARD IDENTIFICATION & ANALYSIS

## Profiling the Natural Hazards

Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to identify and profile the natural hazards which are most likely to have an impact on Goshen.

Each of these hazards was assessed by the Committee for location of occurrence, extent, previous occurrences, and probability of future events.

## Natural Hazard Profiling Methodology<sup>1</sup>

In order to adeptly profile each of the hazards, a Hazard Identification and Analysis Matrix was prepared to organize the information that was gathered for this project.

The matrix is organized into the following sections: Type of Hazard, Location of Occurrence, Extent of Impacts, Previous Occurrences, Probability of Future Occurrence, and Hazard Index. The Hazard Index was completed to rank the hazards according to the frequency of occurrence and the amount of potential damage likely to occur. The Hazard Index forms the basis for concentrating the future mitigation efforts outlined in this plan. A description of each of the matrix categories is provided below. The completed Matrix is shown as Table 3.1.

### *Location of Occurrence*

The classifications are based on the area of the Town of Goshen that would potentially be affected by the hazard. The following scale was used:

<b>Location of Occurrence</b>	<b>Percentage of Town Impacted</b>
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

### *Extent of Impacts*

The extent of direct impacts an affected area could potentially suffer were classified according to the following scale:

<sup>1</sup> Source: information adapted from Town of Holden Beach, NC Community-Based Hazard Mitigation Plan, July 15, 2003, and Hyde County, NC Multi-Hazard Mitigation Plan, Sept 2002; and the Massachusetts Emergency Management Agency (MEMA).

<b>Table C.2: Extent of Impacts, Magnitude of Multiple Impacts of Given Natural Hazard</b>	
<b>Extent of Impacts</b>	<b>Magnitude of Multiple Impacts</b>
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

**Previous Occurrences**

Whether or not previous hazard events had occurred is also included, with detailed descriptions of specific previous occurrences within the hazard identification and vulnerability assessments, if necessary.

**Probability of Future Occurrence**

The likelihood of a future event for each natural hazard was classified according to the following scale:

<b>Table C.3: Frequency of Occurrence and Annual Probability of Given Natural Hazard</b>	
<b>Frequency of Occurrence</b>	<b>Probability of Future Event</b>
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

**Hazard Index**

The hazard index ratings were determined after assessing the frequency, location and impact classifications for each hazard. The hazard index ratings are based on a scale of 1 (highest risk) through 5 (lowest risk). The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of hazard. The size and impacts of a natural hazard can be unpredictable however; many of the mitigation strategies currently in place and many of those proposed for implementation can be applied to the expected natural hazards, regardless of their unpredictability.

The Hazard Ratings are labeled as follows:

- 1 – High Risk
- 2 – Medium-High Risk
- 3 – Medium Risk
- 4 – Medium Low Risk
- 5 – Low Risk

This resulted in a ranking of hazard, by risk, see Table 3.1. More detailed descriptions of each of the points of analysis are included in the Identification and Vulnerability Assessment (below).

<b>Table 3.1: Hazard Profiling and Risk Index Worksheet</b>					
<b>Type of Hazard</b>	<b>Location</b>	<b>Extent</b>	<b>Previous Occurrences</b>	<b>Probability of Future Events</b>	<b>Hazard Risk Index Rating</b>
Flooding (100-year)	Large	Limited	Yes	Low	2
Flooding (localized)	Medium	Minor	Yes(extensive)	Very High	1
Severe Snow/Ice Storms	Large	Limited	Yes	Very High	1
Hurricanes/Severe Wind	Large	Minor	Yes (minimal)	Very Low	4
Tornado/Microburst	Small	Catastrophic	No	Very Low	3
Wildfire/Brushfire	Small	Minor	Yes (minimal)	Very High	3
Earthquake	Large	Catastrophic	No	Very Low	4
Dam Failure	Medium	Limited	No	Low	3
Drought	Small	Minor	Yes (minimal)	Low	5
Man-Made Hazard: Hazardous Materials	Medium	Critical	No	Low	2

## **Natural Hazard Identification and Vulnerability Assessment**

The following is a description of natural and manmade disasters, and the areas affected by them, that have or could affect the Town of Goshen. The *Past and*

*Potential Hazards/Critical Facilities Map* (Appendix D) reflects the contents of this analysis.

### **Vulnerability Assessment Methodology**

In order to determine estimated losses due to natural hazards in Goshen, each hazard area was analyzed with results shown below. The data below was calculated using FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses*, August 2001.

**Total value of all structures in Goshen (2006): \$126,827,371**

**Median value of a home in Goshen (2006): \$198,500**

**Average household size: 2.4 persons**

Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimate and likely reflect worst-case scenarios. Computing more detailed damage assessment based on assessor's records is a labor-intensive task and beyond the scope of this project.

## **Flooding**

The average annual precipitation for Goshen and surrounding areas in northwestern Massachusetts is 46 inches. There are three major types of storms that bring precipitation to Goshen. Continental storms that originate from the west continually move across the region. These storms are typically low-pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. Precipitation from coastal storms, also known as nor'easters, that travel into New England from the south constitute the second major storm type. In the late summer or early fall, the most severe type of these coastal storms, hurricanes, may reach Massachusetts and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods can be classified as either flash floods, which are the product of heavy, localized precipitation in a short time period over a given location or general floods, which are caused by precipitation over a longer time period in a particular river basin. There are several local factors that determine the severity of a flooding event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Furthermore, flooding can be influenced by larger, global climate events. Global warming and climate change have the potential to shift current rainfall and storm patterns. Increased precipitation is a realistic result of global warming, and could

potentially increase the frequency and intensity of flooding in the region. Currently, floods occur and are one of the most frequent and costly natural hazards in the United States.

Flash flooding events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area (roadways, parking lots, roof tops).

In contrast, general flooding events may last for several days. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large “sponges” to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard. In addition to damage of buildings directly in the floodplain, development can result in a loss of natural flood storage capacity and can increase the water levels in water bodies. Flood levels may then increase, causing damage to structures not normally in the flood path.

The Floodplain Map for the Town of Goshen shows the 100-year and 500-year flood zones identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a one percent chance of occurring in any given year. Likewise, the 500-year flood has a 0.2 percent chance of occurring in any given year.

The major floods recorded in Western Massachusetts during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. Goshen has experienced some flooding events over the last decade. Generally, these small floods have had minor impacts, temporarily impacting roads and residents' yards. However, town-wide flooding on Patriots Day in April, 2007 caused some damage.

As described above, flooding can happen on a range of scales. For the purposes of this analysis, the hazard has been broken into two separate types – **Flooding (100-year)** and **Flooding (localized)**. Risk and vulnerability assessment for these separate types of flooding are analyzed below.

## **Flooding (100-year base flood): Medium High Risk**

There are approximately 405 acres of land within the FEMA mapped 100-year floodplain and 128 acres of land within the 500-year floodplain within the Town of Goshen. According to the Community Information System (CIS) of FEMA, there were 20 structures (all residential) located within the Special Flood Hazard Area (SFHA) in Goshen as of August 2005, the most current records in the CIS for the Town of Goshen. Therefore, a vulnerability assessment for a 100-year flood equals approximately \$3.97 million of damage, with approximately 48 people impacted.

There are no locations in Goshen that have been susceptible to 100-year floods in the past. At this time the Town of Goshen has no repetitive loss properties as defined by FEMA's NFIP.

### **Location**

None

### **Extent**

Based on past records and the knowledge and experience of members of the Goshen Hazard Mitigation committee and residents, the extent of the impact of localized flooding would be minor. This means that community anticipates very few injuries, if any, and only minor property damage and minimal disruption of the quality of life of residents. There may be temporary shutdown of some facilities.

### **Previous Occurrences**

See information in Location section. With the increase in extreme weather events attributed to the effects of global warming, many engineers and disaster preparedness planners are concerned that past events (previous occurrences) will no longer be reliable predictors of future events.

### **Probability of Future Events**

There is a very high chance of localized flooding within the 100-year flood plain in the next year, but these floods are small and generally cause little damage. The chance of a major flood in the 100-year flood plain is by definition 1% in any given year.

## **Flooding (localized) –High Risk**

In addition to the floodplains mapped by FEMA for the 100-year and 500-year flood, Goshen often experiences minor flooding at isolated locations due to drainage problems, or problem culverts.

There are a total of 3 problem culverts or other localized flooding areas are all over Town, and have been mapped on the Past and Potential Hazards/Critical Facilities Map (Appendix D). Most of the flood hazard areas listed here were identified due to known past occurrence in the respective area. There are many areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff.



Additionally, the vast majority of culverts throughout town tend to be impacted by beavers, so localized flooding can potentially occur at any culvert crossing (noted on maps).

### **Probability of Future Events**

There is a very high (70-100% probability in the next year) chance of localized flooding within the 100-year flood plain every year, but these floods are small and generally cause little damage.

### **Severe Snow/Ice Storm – High Risk**

Severe winter storms can pose a significant risk to property and human life because the rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can disrupt utility service, phone service, and make roadways extremely hazardous. Severe winter storms can also be deceptive killers. The types of deaths that can occur as a result of a severe winter storm include: traffic accidents on icy or snow-covered roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold temperatures. Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt. Power and telephone lines, trees, and telecommunications structures can be damaged by ice, wind, snow, and falling trees and tree limbs. Icy road conditions or roads blocked by fallen trees may make it difficult to respond promptly to medical emergencies or fires. Prolonged, extremely cold temperatures can also cause inadequately insulated potable water lines and fire sprinkler pipes to rupture and disrupt the delivery of drinking water and cause extensive property damage.

### **Location**

Severe winter weather occurs regionally and therefore would impact the entire town, although this past winter's ice storm exposed the vulnerability of Goshen's ridge lines to ice storms.

### **Extent**

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS scores factor in the area affected by the snowstorm, the snow, and the number of people living in the path of the storm. The NESIS score varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the

five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

### **Previous Occurrences**

Goshen's recent history has recorded one life lost due to snow during extreme winter weather, and there are usually several incidents of property damage or personal injury each winter. In addition, during heavy snow years, accumulations can reach several feet deep. Goshen's mountainous terrain creates some steep grades, sometimes making plowing difficult and causing snow and ice hazards. In addition the Town's many unpaved roads make snow clearing difficult. Many of the farms and open meadows and fields throughout town cause snow drifts. Especially dangerous roads include: South Main, Corner Road, and Spruce Road.

### **Probability of Future Events**

Based on the NESIS scale, Goshen is at risk of a major to extreme winter storm in any given year is slightly less than 50 percent. The committee ranked the probability of future severe snow/ice storms as very high, meaning that there is a 70-100% probability of such an event in the next year.

## **Hurricanes/Severe Wind – Medium-Low Risk**

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour, and large amounts of precipitation. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. Severe wind can also occur in the absence of a hurricane, especially impacting mountain tops. Global warming will increase the threat of hurricanes and severe wind as oceans and the atmosphere warms. Climate change research indicates that storms like hurricanes will become more intense and more frequent in the future.

In Massachusetts, sixteen hurricanes have had landfall since 1851, two of which impacted Western Massachusetts. These include Hurricane Carol in 1954 and Hurricane Gloria in 1985. Hurricanes are usually ranked category 1-5, using the Saffir-Simpson Scale, with category 5 hurricanes being the most severe. Both Hurricane Carol and Gloria were category 1-2 storms, meaning winds ranged from 74-110 mph with the potential for some roofing or window damage to buildings, damage to unanchored mobile homes, trees, or poor construction, and/or some minor flooding.

### **Location**

All of Goshen is at risk from hurricanes with ridgetops more susceptible to wind damage and the flood-prone portions of town to flooding from the heavy rains.

### **Extent**

Goshen's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events.

During hurricanes or severe wind events, the town has experienced small blocks of downed timber and uprooting of trees onto structures.

- Estimated wind damage: 5% of the structures with 10% damage, \$634,137;
- Estimated flood damage: 10% of the structures with 20% damage, \$2,536,547;
- Vulnerability assessment for a hurricane event (both wind and flood damages): \$3,170,684;
- Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included.

**Previous Occurrences**

In Massachusetts, sixteen major hurricanes have made landfall since 1851, some of which affected Western Massachusetts. These include: Hurricane Carol in 1954 and Hurricane Gloria in 1985. Hurricanes are usually ranked category 1-5, using the Saffir-Simpson Scale, with category 5 hurricanes being the most severe. Both Hurricane Carol and Gloria were category 1-2 storms, meaning winds ranged from 74-110 mph with the potential for some roofing or window damage to buildings, damage to unanchored mobile homes, trees, or poor construction, and/or some minor flooding.

- Connecticut River corridor at risk.
- 1938 hurricane was a major event - wind damage and flooding statewide.
- Power and phone lines - disruptions of services.
- Flooding/washing of evacuation routes.

<b>Table 3.2 Major Non-Winter Storms to Affect Goshen Area</b>		
Hurricane/Storm Name	Year	Saffir/Simpson Category (when reached MA)
Great Hurricane of 1938	1938	Unclear, 3 or 4
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1
Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm

**Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of major hurricanes in Goshen (once every fifty years is less than a one percent chance of any such storm occurring in a given year) while the possibility of a less severe hurricane or tropical storm affecting Goshen in any given year is approximately 10 percent.

## **Tornadoes/Microbursts – Medium Risk**

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in Hampshire County.

Of additional concern are microbursts, which often do tornado-like damage and can be mistaken for tornadoes. In contrast to the upward rush of air in a tornado, air blasts rapidly downward from thunderstorms to create microbursts. Microbursts and tornadoes are expected to become more frequent and more violent as the earth's atmosphere warms, due to predictions of climate change from global warming.

### **Location**

The hazard area for tornadoes in Goshen varies according to the intensity and size of the tornado. There have not been enough tornadoes in Goshen to accurately predict sections of town that are more likely to experience a tornado.

### **Extent**

Risk of tornadoes is considered to be medium in Hampshire County. No known tornados have ever touched down in Goshen, but there have been several high-wind storms and hail events. Three documented microbursts occurred in the nearby communities of Chesterfield, Northampton, Cummington and Worthington.

Because tornadoes and microbursts rarely occur in this part of the country, assessing damages is difficult. Furthermore, buildings have not been built to Zone 2, Design Wind Speed Codes. The entire Town of Goshen is vulnerable.

- Tornadoes/microburst hazard estimates 20% damage to 10% of structures in Town;
- Vulnerability assessment estimates in damages; \$2,536,547
- Estimated cost does not include building contents, land values or damages to utilities.

### **Previous Occurrences**

In Western Massachusetts, the majority of sighted tornadoes have occurred in a swath east of Goshen, known as "tornado alley." Thirteen incidents of tornado activity (all F2<sup>2</sup> or less) occurred in Hampshire County between 1959 and 2005.

### **Probability of Future Events**

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<sup>2</sup> F2 refers to the commonly used Fujita Tornado Damage Scale which ranks tornados F0-F5 depending on estimated wind speeds and damages, with F5 the most severe.

Based upon the past events, it is reasonable to say that there is a low frequency of tornadoes in Goshen.

## **Wildfires/Brushfire – Medium Risk**

According to FEMA, there are three different classes of wildland fires: surface fires, ground fires and crown fires. The most common type of wildland fire is a surface fire that burns slowly along the floor of a forest, killing or damaging trees. A ground fire burns on or below the forest floor and is usually started by lightning. Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions. While wildfires or brushfires have not been a significant problem in Goshen, there is always a possibility that changing land use patterns and weather conditions will increase a community's vulnerability. For example, drought conditions can make forests and other open, vegetated areas more vulnerable to ignition. Once the fire starts, it will burn hotter and be harder to extinguish. Soils and root systems starved for moisture are also vulnerable to fire. Residential growth in rural, forested areas increases the total area that is vulnerable to fire and places homes and neighborhoods closer to areas where wildfires are more likely to occur. Global climate changes may also influence precipitation patterns, making the region more susceptible to drought and therefore, wildfires.

Hampshire County has approximately 252,000 acres of forested land, which accounts for 72% of total land area. Forest fires are therefore a potentially significant issue. In Goshen, approximately 82% of the town's total land area is in forest, or about 9,306 acres, and is therefore at risk of fire.

### **Location**

Approximately 82% of Goshen is forested so the entire town is at risk of wildfires.

### **Extent**

The Goshen Fire Department reports that it has records of only small brushfires covering less than a few acres at the most. All of the fires were permitted burns that got out of control.

However, moderate risk exists for potential wildfire incidents due to the extensive forest cover. Forested and agricultural areas with high fuel content have more potential to burn. In addition, it is often very difficult to access some of the locations to extinguish the brushfire.

- Up to 25 homes on the lake could be impacted by a wildfire;
- Assuming 100% damage to 100% of the structures, not including costs repairing or replacing any power lines, telephone lines, and contents of structures;
- Vulnerability assessment estimates approximately \$4,962,500 in damages (25 x \$198,500) for a wildfire.

### **Previous Occurrences**

According to the Goshen Fire Department, there was only one unauthorized burn last year. As a point of comparison, 81 burn permits were issued this year.

**Probability of Future Events**

Based upon the past events, it is reasonable to say there is a low frequency of wildfires in Goshen.

**Earthquakes – Medium Low Risk**

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth’s surface. Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.

**Location**

In the event of an earthquake, all of Goshen would be affected with some portions more impacted than others, depending on the magnitude of the earthquake and the underlying population density.

<b>Table 3.3: New England Earthquakes (1924-2002)<sup>3</sup> magnitude 4.2 or higher</b>		
<b>Location</b>	<b>Date</b>	<b>Magnitude</b>
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1

<sup>3</sup> Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm)

Table 3.4: New England States Record of Earthquakes <sup>3</sup>		
State	Years of Record	Number of Earthquakes
Connecticut	1568 - 1989	137
Maine	1766 - 1989	391
Massachusetts	1627 - 1989	316
New Hampshire	1728 - 1989	270
Rhode Island	1766 - 1989	32
Vermont	1843 - 1989	69
New York	1737 - 1985	24
Total Earthquakes in New England (1568-1989)		1,239

### **Extent**

Massachusetts introduced earthquake design requirements into their building code in 1975. However, these specifications apply only to new buildings or to extensively-modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before 1975 may not have been designed to withstand the forces of an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

- Moderate potential for serious damage in all of Goshen;
- Structures are mostly wood frame construction, so loss estimates predict 20% of town assessed value, not including costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures;
- Vulnerability assessment estimates approximately \$25,365,474.

### **Previous Occurrences**

Nineteen earthquakes, intensity V (Modified Mercalli scale) or greater, have centered in Massachusetts since it was colonized by Europeans. A shock in 1755 reached intensity VIII at Boston and was felt across the State. In addition, Massachusetts was affected by some of the more severe Canadian shocks plus the earthquake of 1929 that centered on Grand Banks of Newfoundland.

Strong earthquakes in the St. Lawrence Valley in 1638, 1661, 1663, and 1732 were felt in Massachusetts. The 1638 and 1663 shocks damaged chimneys at Plymouth, Salem, and Lynn. On June 11, 1643, Newbury, Massachusetts, was strongly shaken. Again in 1727 (November 9) an earthquake described as "tremendous" in one report and "violent" in another caused much damage at Newbury. The shock was felt from the Keenebec River to the Delaware River and from ships at sea to the extreme western settlements. Several strong aftershocks were reported from the area through February 1728.

Tables 3.3 & 3.4 contain information regarding most of the earthquakes, including all of affecting New England, the significant ones. None have been noted to cause any damage in Goshen or the surrounding area.

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of major earthquakes in Goshen (there have been no earthquakes over 4.2 on the Richter scale in nearly 100 years) while the possibility of a less severe earthquake or tropical storm affecting Goshen in any given year is slightly less than 1 percent but these are unlikely to cause any significant damage.

### **Dam Failure – Medium Risk**

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is released. Often dam breaches lead to catastrophic consequences as the water ultimately rushes in a torrent downstream flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built in the 19th century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events. Most earthen dam failures occur when floodwaters above overtop and erode the material components of the dam.

The Massachusetts Department of Conservation and Recreation (MA DCR) was the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). Until 2002, DCR was also responsible for conducting dam inspections but then state law was changed to place the responsibility and cost for inspections on the owners of the dams. This means that individual dam owners are now responsible for conducting inspections.

The state has three hazard classifications for dams:

- High Hazard: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- Significant Hazard: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.



- Low Hazard: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.
- Non-jurisdictional: The storage capacity of the impoundment and height of dam are such that they need not be regulated.

The inspection schedule for dams is as follows:

- Low Hazard dams – 10 years
- Significant Hazard dams – 5 years
- High Hazard dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. All other dams are subject to the regulations unless exempted in writing by DCR.

**Location**

According to DCR sources, as well as local knowledge, there are currently seven<sup>4</sup> dams in Goshen. The follow table identifies the dams within the town as well as whether they are classified as low, significant, non-jurisdictional or high hazard.

<b>Table 3.5: Dams in Goshen</b>					
<b>Dam name/ date built</b>	<b>ID</b>	<b>Owner</b>	<b>Purpose</b>	<b>Condition/last inspected</b>	<b>Hazard Risk</b>
Lower Highland Lake Dam	MA00598	Commonwealth of MA- DCR	Recreation	Poor/ 5-25-06	High
Upper Highland Lake Dam	MA00058		Recreation	Fair/ 5-25-06	Significant
Upper Highland Lake Dike	MA00059		Recreation	Satisfactory/ 5-25-06	Significant
Hammond Acres Lake Dam	MA00176	Hammond Acres Club, Inc.	Recreation	Good/ 10-23-03	Significant
Sears Meadow Dam	MA01253	William M. Kelly & Abigail Kingman	Recreation	Unknown / Unknown	Low
Williams Pond Dam	MA01726	Phebe Williams	Unknown	Drained 9-10-08	Non-jurisdictional
Twining Brook Pond Dam	MA03274	Commonwealth of MA- DCR	Recreation	Fair/ Unknown	Non-jurisdictional

<sup>4</sup> It is difficult to track down accurate records of dams, as ownership and exact location is not clear. Furthermore, many very old dams listed in DCR records are not in existence anymore, according to local knowledge. This list is compiled from a combination of sources, and then verified by the Committee.

### **Extent**

A vulnerability assessment was done for the inundation area below the one high risk, Lower Highland Lake Dam, and the three significant risks, Upper Highland Lake Dam and Dike, and Hammond Acres Lake Dam.

#### **Upper Highland Lake Dam**

- 100 homes located in the inundation zone of the Dam;
- Assumes 100% damage to 100% of the structures, but does not include costs of repairing or replacing the road, or any power or telephone lines, or the contents of structures;
- Vulnerability assessment estimates \$19,850,000 in damages;
- Water flow during a dam failure could also significantly impact the culvert under East Street, most likely washing out that stretch of the road.

### **Previous Occurrences**

Goshen has never experienced a dam failure.

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low (1-10% probability in the next year) probability of dam failure in Goshen.

## **Drought – Low Risk**

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector.

Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of the direct impacts of drought. Of course, these impacts can have far-reaching effects throughout the region and even the country.

### **Location**

A drought would affect all of Goshen but depending on location of homes, wells might be more or less likely to dry up. In the past, concerns have focused on wells in the center of Town.

### **Extent**

The severity of a drought would determine the scale of the event and would vary among town residents depending on the type of well they have and their location in the community. All residents' water supply is derived from private wells.

When evaluating the region's risk for drought on a national level, utilizing a measure called the Palmer Drought Severity Index, Massachusetts is historically in the lowest

percentile for severity and risk of drought. Even so, there have been several years of drought-like conditions in Western Massachusetts: 1940-1952, 1980-1983, and 1995-2001. Furthermore, global warming and climate change may have an effect on drought risk in the region. With the projected temperature increases, some scientists think that the global hydrological cycle will also intensify. This would cause, among other effects, the potential for more severe, longer-lasting droughts. Additionally, even minor droughts will increase the risk of wildfire, especially in areas of high recreational use.

### **Previous Occurrences**

In Massachusetts, six major droughts have occurred statewide since 1930. They range in severity and length, from three to eight years. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels.

Goshen has had limited experience with severe drought conditions. The Town has not experienced a threat to its groundwater supply, and doesn't anticipate any severe water shortages throughout town. However, there is a limited history of wells drying up on Main street in the center of Town.

### **Probability of Future Occurrences**

Based upon the past events, it is reasonable to say that there is a low frequency of drought in Goshen.

## **Man-Made Hazards – Hazardous Materials – Medium-High Risk**

Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes and businesses routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.

Goshen relies on the regional HazMat team located in Holyoke for responding to incidents involving hazardous materials through a mutual aid agreement.

### **Location**

There is one Tier II Hazardous Materials storage facility in Town, and it is included on the Past & Potential Hazards/Critical Facilities Map (Appendix D).

In addition, varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores. These hazardous materials are transported regularly over our highways (and rails, although none in Goshen) and if released can spread quickly to any community. Incidents can occur at

any time without warning. Human error is the probable cause of most transportation incidents and associated consequences involving the release of hazardous materials.

### **Extent**

The extent of hazardous chemical release is not predictable as it is dependent on the location including whether it is from a stationary or moving source, amount and type of chemical released, and weather conditions at the time of the release, but given the relative lack of hazardous chemicals present in Goshen the extent is likely to be limited.

### **Previous Occurrences**

There is no history of any major accidents involving some sort of oil or chemical spill, but transportation of chemicals and bio-hazardous materials by vehicle transport on Route 9 and Route 112 is a concern. Small areas of hazardous materials storage increase the potential for future incidents. A propane distributor is located at the intersection of Routes 9 and 112 in Goshen. A truck on Rte 112 with failed brakes could skid across Rte 9 into George Propane.

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low probability of hazardous chemical releases in Goshen.

## 4: CRITICAL FACILITIES

A Critical Facility is defined as a building, structure, or location which:

- is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

### **Critical Facilities within Hazard Areas**

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Hazards identified in this plan are regional risks and, as such, all critical facilities fall into the hazard area. The exception to this is flooding. There are several critical facilities that fall within the 100-year floodplain as shown in the table at the end of this section.

The Critical Facilities List for the Town of Goshen has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Goshen's Hazard Mitigation Committee has broken up this list of facilities into four categories:

- The first category contains facilities needed for Emergency Response in the event of a disaster.
- The second category contains Non-Emergency Response Facilities that have been identified by the Committee as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Goshen.
- The third category contains Facilities/Populations that the Committee wishes to protect in the event of a disaster.
- The fourth category contains Potential Resources, which can provide services or supplies in the event of a disaster.

The critical facilities and evacuation routes potentially affected by hazard areas are identified in Table 4-1, following this list. The Past and Potential Hazards/Critical Facilities Map (Appendix D) identifies these facilities.

### **Category 1 – Emergency Response Services**

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The Town has identified the Emergency Response Facilities and Services as the highest priority in regards to protection from natural and man-made hazards.

- 1) Emergency Operations Center
  - Primary: Goshen Fire Station – 56 Main Street
  - Secondary: Town Hall and Center School Annex – 40/42 Main Street

- 2) Fire Station  
Goshen Fire Department – Headquarters: 56 Main St.
- 3) Police Station  
Goshen Town Police Department – 555C East St.
- 4) Highway Department  
Highway Department – 8 Highland Rd.
- 5) Water  
Transient/non-transient non-community wells  
20,000 gallon cistern  
Dry Hydrants: gravity fed on East St., Brook on East St./Mill River, Pond Hill Rd, at upper end of Hammond Pond, Dam House at Hammond Pond
- 6) Emergency Fuel Stations  
Highway Department – 8 Highland Rd.  
Dresser’s Mobil Station, 80 Main St.  
MassHighway Garage, Rte 9 at corner with Spruce corner
- 7) Emergency Electrical Power Facility  
Fire Department - emergency generator to serve EOC and Police Department  
3 portable generators
- 8) Emergency Shelters  
Goshen Town Hall- Marine Corp Highway (Route 9)  
New Hingham regional elementary school, 30 Smith Rd., Chesterfield  
  
\*no generators at shelters
- 9) Transfer Station  
Town of Goshen Refuse Disposal and Recycling Center- Wing Hill Rd. and East St.
- 10) Helicopter Landing Sites  
Riding club, Ball Rd.  
Tilton Field  
(Permitted anywhere feasible.)
- 11) Communications  
Goshen Public Library- 42 Main St. (Wireless Internet Access)  
Goshen Fire Department – Headquarters: 56 Main St.
- 12) Primary Evacuation Routes  
Route 112  
Route 9
- 13) Bridges/Culverts Located on Evacuation Routes

## Bridges

<u>Evacuation Route</u>	<u>Crosses</u>	<u>Owner</u>	<u>Year Built</u>	<u>Year Rebuilt</u>
State Route 9	Stone Brook	Mass Highway	1950	NA
State Route 9	Stone Brook	Mass Highway	1950	NA

There is a bridge heading east on Rte 9 after Shaw Rd. that has a problem culvert. There is also a possible problem on Rte 9 just east of Spruce Corner Rd.

## **Category 2 – Non Emergency Response Facilities**

The town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Goshen.

- 1) Problem Culverts
  - Route 9 at Swift River
  - Route 9 at East Brook
  - Route 112 at Sears Meadow
- 2) Water Supply
  - Hammond Pond
  - Mill River West Branch
  - Stones Brook
  - Swift River
  - Upper and Lower Highland Lake
  - Sears Meadow
  - Webster Brook
  - Damon Pond

## **Category 3 – Facilities/Populations to Protect**

The third category contains people and facilities that need to be protected in event of a disaster.

- 1) Special Needs Population
  - Nursing Home – none
  - Group Home – none
  - Neighborhoods with language barriers - none
- 2) Elderly Housing/Assisted Living
  - None
- 3) Public Buildings/Areas
  - Camp Holycross- P.O. Box 501
  - Camp Howe Youth Summer Camp- DAR Forest Rd.
  - DAR State Forest- 78 Cape St.
  - Goshen Public Library - 42 Main St.

U.S. Post Office - 33c Main St.

- 4) Schools/Daycare
  - Learning Loft – 40 Main St.
  - In-home 542 East St.
  - In-home 172 West St.
  - In-home 185 West St.
- 5) Churches
  - Goshen Congregational Church- 45 Main St.
- 6) Historic Buildings/Sites
  - Goshen Cemetery – Mollis Hill Rd.
  - Goshen Historical Community Museum- Main St.
  - Riding Club – Ball Road
  - Private Residence – 2 Williams Drive
  - Town Hall – 52 54 Main Street
- 7) Apartment Complexes
  - General Store (3 units) - 31 Main St.
  - Old Wale Inn (4 units) – Main St.
  - Wildwood Condominiums – 1-7 Wildwood Lane
- 8) Employment Centers
  - On Route 9 there are Goshen’s large employers: Goshen Stone, George Propane, AccuFab and Lashway Lumber

## **Category 4 – Potential Resources**

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Contains facilities that provide potential resources for services or supplies.

- 1) Food/Water
  - Goshen General Store– 31 Main St.
  - Northern Hilltown Food Pantry– 40 Main St.
- 2) Hospitals/Medical Supplies
  - Cooley Dickinson Hospital - 30 Locust St., Northampton, MA  
(14 miles from Goshen)
  - Williamsburg Pharmacy, Rte 9 (5 miles from Goshen)
- 3) Gasoline/Propane
  - George’s Propane- 3 Berkshire Trail West (partnership with town?)
- 4) Building Materials Suppliers
  - Accufab Ironworks Inc.- 82 Main St.
  - Dan Lashway Lumber- Route 9
  - Goshen Stone Co.- 56 Main St.



Goshen Stone for Landscaping (George D Judd and Sons LLC)- 145 Berkshire Trail  
West  
Judd Enterprises- P.O. Box 502  
Kelley's Meadow Wood- 120 Sears Rd.

5) Heavy & Small Equipment Suppliers  
CE Roberts, Hyde Hill  
Town volunteers

6) Gravel Pits  
Peck's Pit - East St.  
Judd Enterprises- P.O. Box 502

**Table 4.1: Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas**

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year)			none
Flooding (localized)	Sears Rd at Ashfield town line	Road and culvert	Local roads and Rte 9
Severe Snow/Ice Storm	Ridge lines and high areas	None	Local roads and Rte 9
Hurricane/Severe Wind			Local roads and Rte 9
Wildfire/Brushfire			
Earthquake			
Dam Failure	East Street		Rte 9 Eastbound
Drought			
Hazardous Materials			Local Roads and Rte 9

(Past & Potential Hazards/Critical Facilities Map Located In Appendix D)

## 5: MITIGATION STRATEGIES

One of the steps of this Natural Hazard Mitigation Plan is to evaluate all of the town's existing policies and practices related to natural hazards and identify potential gaps in protection. Once these gaps in protection are identified, future mitigation strategies can be crafted and recommended. This is done by evaluating existing and future measures in comparison to the Town's goal statement for natural hazard mitigation.

### Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to natural disasters. To provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.

For the extent of this analysis, the Committee reviewed the following Town documents:

- Zoning By-Laws
- Subdivision Rules and Regulations
- Goshen Community Plan
- CEM Plan
- Other relevant By-Laws as identified (Fire Department Burn Permit Procedures, Building Code, etc.)

This section of the plan serves to identify current mitigation strategies and recommend future mitigation strategies. This is done both generally, and by hazard type.

### General Mitigation Measures

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Several of the recommended mitigation measures have multiple benefits because, if implemented, they will mitigate or prevent damages from more than one type of natural hazard. These do not fall under one hazard type, but could be put into place for facilitation of better natural hazard protection generally.

Some of these general hazard-related strategies and measures do not fall specifically under the category of "mitigation," but are instead tools for

### What's the CEM Plan?

An important existing general preparedness and response tool is Goshen's Comprehensive Emergency Management Plan (CEM Plan). Although the CEM Plan is focused on the procedural response to an emergency, it organizes information, includes supply and information inventories, and outlines detailed steps for increasing preparedness.

preparedness. The Hazard Mitigation Planning Committee recognizes that these are also important recommendations for the Town, and has included them here:

- Establish system to inventory supplies at existing shelters and develop a needs list and storage requirements. Establish arrangements with local or neighboring vendors for supplying shelters with food and first aid supplies in the event of a natural disaster.
- Examine current notification system including feasibility of new siren warning system, internet radio system, or Reverse 911. Develop a preliminary project proposal and cost estimate.
- Collect, periodically update, and disseminate information on emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.

## Flooding

The key factors in flooding are the water capacity of water bodies and waterways, the regulation of waterways by flood control structures, and the preservation of flood storage areas and wetlands. As more land is developed, more flood storage is demanded of the town's water bodies and waterways.

### *Current Mitigation Measures*

The Town currently addresses this problem with a variety of mitigation tools and strategies. Flood-related regulations and strategies are included in the Town's zoning by-law, subdivision regulations, as well as a proposed stormwater management by-law. Relevant goals are included in the adopted Open Space and Recreation Plan. Infrastructure like dams and culverts are in place to manage the flow of water. These current mitigation strategies are outlined in the following table.

**Table 5-1: Existing Flood Hazard Mitigation Measures**

Existing Strategy	Description	Effectiveness	Potential Changes
Flood Control Structures	Seven dams.	Somewhat effective. High risk dams are of concern-upper and lower highland dam-state owned?	Ensure dam owners realize their responsibility to inspect and maintain the dams.
Culvert Replacement	Under-sized culverts: South Chesterfield Rd, etc Ditching—stormwater management problems, high % of dirt/gravel roads	Very effective for managing flood control needs.	Seek funding from HMGP for top-priority culvert replacement projects.

Zoning By-Laws	Use Regulations – Special Permit	Seasonal dwellings converted into year-round residence must show that soil absorption, filtration, ground water supply are not impacted	Somewhat effective for managing new development, esp near waterbodies	Consider making all new development near waterbodies, not just conversions, show that soil absorption, filtration, ground water supply are not impacted
		Earth removal/excavation projects in excess of 100 cu yds require permit	Low	Consider adding performance standards for run-off, drainage, water pollution caused during earth removal/excavation
Subdivision Regulations	Definitive Plan	Proposed layout of drainage, water supply, etc.	Somewhat effective for managing run-off	
		Proposed location of natural features including waterways, natural drainage courses	Somewhat effective for protecting natural drainage processes	
	Design Standards	Drainage, stormwater easements required when near watercourse	Somewhat effective for managing run-off	Consider adding stormwater retention/detention requirements
		Utilities – catch basins must be provided to remove surface water off roads		
Goshen Community Plan	Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, groundwater recharge areas, farms and open space, rivers, streams and brooks.	Effective in identifying sensitive resource areas, including floodplains. Encourages forest, farmland protection, help conserve the town's flood storage capacity.	Work to implement relevant goals and policies in Plan.	
National Flood Insurance Program Participation	As of 2006, there were 14 homeowners with flood insurance policies.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	The town should evaluate whether to become a part of FEMA's Community Rating System.	

***Future Mitigation Measures***

Several potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Replace top priorities on culvert replacement list.
  - Itemized list of culvert replacements here.
  - a culvert replacement
  - a culvert replacement
- Ensure dam owners realize their responsibility to inspect the dams regularly.
- Add a Floodplain Protection District to limit or restrict development within the floodplains, and/or a Groundwater Supply Protection District to limit or restrict development in groundwater recharge areas.
- Create more performance-based evaluations for earth removal and site plan approval.
- Add stormwater retention/detention requirements to design standards in Subdivision Regulations.
- Implement the goals and strategies of the Goshen Community Plan dealing with protection of floodplain, forests, and farmland.
- Evaluate whether to become a part of FEMA's Community Rating System.
- Educate citizens living in the floodplain about the NFIP.

#### **What is the NFIP's Community Rating System?**

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

## **Severe Snow/Ice Storm**

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Winter storms can be especially challenging for emergency management personnel. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected. Even though the storm has usually been forecast, there is

no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

**Current Mitigation Measures**

The Town’s current mitigation tools and strategies focus on preparedness, with many regulations and standards established based on safety during storm events. These current mitigation strategies are outlined in the following table.

Note: To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 5-1 in the previous section can also be considered as mitigation measures for severe snow/ice storms.

<b>Table 5-2: Existing Severe Snow/Ice Storm Hazard Mitigation Measures</b>				
<b>Existing Strategy</b>		<b>Description</b>	<b>Effectiveness</b>	<b>Potential Changes</b>
Zoning By-law	Driveway Bylaw	Driveways must be approved, and bylaw also regulates grade of driveways where they meet with roadway	Effective for preventing incompatible driveways or loss of access.	
Subdiv Regs	Design Standards	Standards include street grade regulations (maximum 8% or 15%)	Somewhat effective for promoting safe passage.	
State Building Code		The Town of Goshen has adopted the Massachusetts State Building Code.	Effective.	
Backup Electric Power		Shelters have backup power, three mobile generators	Very effective in case of power loss.	Need an estimated \$5,000-10,000 for a transfer switch in the Town offices. Problems with electrical coverage and distribution within Fire Station—need to re-evaluate back up electrical system
Tree Management		List of dangerous trees created annually for WMECO.	Very effective, preventative collaboration.	Need to encourage tree warden to inspect trees regularly and prioritize tree removal or trimming as appropriate.

**Future Mitigation Measures**

Several potential changes to the Town’s current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Work with National Grid to facilitate the underground placement of new utility lines in general and existing utility lines in locations where repetitive outages occur.
- Determine if existing generators at shelters are effective, replace if not effective.
- Increase enforcement of restrictions prohibiting residents from plowing snow into the road.
- Participate in the creation of a Regional Debris Management Plan.

### **What is a Regional Debris Management Plan?**

Natural disasters can precipitate a variety of debris, including trees, construction and demolition materials and personal property. After a natural disaster, potential threats to the health, safety and welfare of impacted citizens can be minimized through the implementation of a debris management plan. Such a plan can be critical to recovery efforts after a disaster, including facilitating the receipt of FEMA funds for debris clearance, removal and disposal.

## **Hurricanes/Severe Wind**

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Of all the natural disasters that could potentially impact Goshen, hurricanes provide the most lead warning time because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees North Latitude (Long Island). Even with significant warning, hurricanes can do significant damage – both due to flooding and severe wind.

The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 5-1 can also be considered hurricane mitigation measures.

The high winds that oftentimes accompany hurricanes can also damage buildings and infrastructure. But regulations can be put into place to help minimize the extent of wind damages.

The Town's current mitigation strategies to deal with severe wind are equally applicable to wind events such as tornadoes and microbursts. Therefore, the analysis of severe wind strategies is coupled with this hazard.



## Tornadoes/Microbursts

The location and extent of potential damaging impacts of a tornado are completely unpredictable. Most damage from tornadoes or microbursts comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail. According to the Institute for Business and Home Safety, the wind speeds in most tornadoes are at or below design speeds that are used in current building codes. In addition, current land development regulations can also help prevent wind damages.

The following table outlines the Town’s existing mitigation strategies that help prevent wind damages, whether from hurricanes, tornadoes, microbursts, or any other event.

**Table 5-3: Existing Severe Wind Hazard Mitigation Measures  
(Including Hurricane, Tornado, Microburst Hazards)**

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning By-law	Permissible Uses by Special Permit	Allows mobile homes/trailers, if meet requirements	Somewhat effective for preventing damage to susceptible structures	
	Protective Bylaw	Requires any dwelling to be on permanent foundations		
State Building Code		The Town has adopted the MA State Building Code.	Effective.	
Tree Management		List of dangerous trees created annually for National Grid.	Very effective, preventative collaboration.	

### *Future Mitigation Measures*

Several potential changes to the Town’s current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Work with National Grid to facilitate the underground placement of new utility lines in general and existing utility lines in locations where repetitive outages occur (as applicable).
- Participate in the creation of a Regional Debris Management Plan.

## Wildfire/Brushfire

Although somewhat common, the vast majority of brushfires in Goshen are small and quickly contained. However, as with any illegal fire or brushfire, there is always the risk

that a small brushfire could grow into a larger, more dangerous wildfire, especially if conditions are right. Therefore, it is important to take steps to prevent wildfires and brushfires from turning into natural disasters.

***Current Mitigation Measures***

The following table identifies what the Town is currently doing to manage brushfires and makes some suggested potential changes and recommendations for decreasing the Town’s likelihood of being heavily impacted by a wildfire or brushfire.

Table 5-4: Existing Wildfire/Brushfire Hazard Mitigation Measures				
Existing Strategy		Description	Effectiveness	Potential Changes
Zoning By-law	Use Regulations	Sawmills and lumberyards must clean up residue to prevent fire.	Effective.	
Burn Permits		Residents must obtain burn permits, and personnel provide information on safe burn practices.	Somewhat effective.	None
Public Education/ Outreach		The Fire Department has an ongoing educational program in the schools.	Effective.	Maintain State funding of SAFE program.

***Future Mitigation Measures***

Goshen has a very thorough process to integrate fire prevention into development. The plan recommends that the Fire Department maintain this level of effective involvement and outreach.

- Continue to have Fire Department review subdivision and site plans.
- Maintain education and enforcement of burn permits; including pre-season review of regulations in public outreach campaign and/or invoking penalties for offenders.

**Earthquake**

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Although there are five mapped seismological faults in Massachusetts, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for.

Most buildings and structures in the state were constructed without specific earthquake resistant design features. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation

efforts for other natural hazards identified in this plan may be applicable during the Town's recovery from an earthquake.

***Current Mitigation Measures***

The Town's most relevant existing mitigation measures are described in the following table.

<b>Table 5-5: Existing Earthquake Hazard Mitigation Measures</b>			
<b>Existing Strategy</b>	<b>Description</b>	<b>Effectiveness</b>	<b>Potential Changes</b>
State Building Code	The Town of Goshen has adopted the State Building Code.	Effective for new buildings only.	

***Future Mitigation Measures***

Potential changes to the Town's current strategies have been identified in the above table, and these are compiled below:

- Participate in the creation of a Regional Debris Management Plan.

**Dam Failure**

Dam failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has no where to flow.

***Current Mitigation Measures***

The only mitigation measures currently in place are the state regulations governing the construction, inspection, and maintenance of dams. This is managed through the Office of Dam Safety at the Department of Conservation and Recreation.

<b>Table 5-6: Existing Dam Failure Hazard Mitigation Measures</b>			
<b>Existing Strategy</b>	<b>Description</b>	<b>Effectiveness</b>	<b>Potential Changes</b>
New Dam Construction Permits	State law requires a permit for the construction of any dam.	Effective. Ensures dams are adequately designed.	
Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Low. The responsibility for this is now on dam owners, who may not have sufficient funding to comply.	Identify sources of funding for dam safety inspections. And make sure State is being responsible.

***Future Mitigation Measures***

Recent changes in legislation have shifted some of the responsibility of dam safety onto dam owners. The Town recognizes the need to adjust to this change. Several potential changes to the Town’s current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Identify sources of funding for dam safety inspections.
- Work with State to bring funding to Goshen.

## Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. And unlike other places, drought can most likely be effectively mitigated in regions like the Pioneer Valley if measures are put into place.

### *Current Mitigation Measures*

Goshen has several water protection regulations in place, as evidenced in the section on flooding. Additional regulations and mitigation options, specific to drought mitigation, are included here.

**Table 5-7: Existing Drought Hazard Mitigation Measures**

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning By-law	Use Regulations – Special Permit	Seasonal dwellings converted into year-round residence must show that ground water supply is not impacted	Somewhat effective for preventing ground water contamination	Consider making these requirements ( Seasonal dwellings converted into year-round residence must show that ground water supply is not impacted) for all new development near waterbodies, not just conversions
Subdiv Regs	Definitive Plan	Proposed layout of water supply must be included	Somewhat effective for ensuring adequate supply for a new subdivision.	
Goshen Community Plan		Makes recommendations for protecting Goshen’s water quality/supply.	Somewhat effective for raising awareness about protecting water quality, supply, and conservation.	Seasonal dwellings converted into year-round residence must show that ground water supply is not impacted

### ***Future Mitigation Measures***

Potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Add a Floodplain Protection District to limit or restrict development within the floodplains, and/or a Groundwater Supply Protection District to limit or restrict development in groundwater recharge areas.
- Including regulations for storage and usage of hazardous materials/wastes near waterbodies - utilizing DEP's model water protection bylaw for definitions of hazardous materials/wastes.
- Implement the goals and strategies in the Goshen Community Plan which recommend protection of natural resources, particularly those dealing with protection of waterbodies.
- Create Water Conservation Guidelines, as education to Town residents.

## **Hazardous Materials**

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Hazardous materials are in existence throughout Town, and are constantly being moved on Goshen's roads and highways. However, there is no way to anticipate where and when a hazardous materials spill or explosion could take place. Therefore, it makes is somewhat difficult to determine mitigation strategies, and Goshen has no regulations currently in place to mitigate the impacts of a hazardous materials disaster.

### ***Future Mitigation Measures***

Because the Town has no current strategies to mitigate the impacts of a hazardous materials disaster, some potential mitigation measures have been identified and are compiled below:

- Include regulations for storage and usage of hazardous materials/wastes near waterbodies - utilizing DEP's model water protection bylaw for definitions of hazardous materials/wastes.

## 6: PRIORITIZED IMPLEMENTATION SCHEDULE

### Summary of Critical Evaluation

The Goshen Hazard Mitigation Planning Committee reviewed each of the recommendation future mitigation measures identified, and used the following factors to prioritize mitigation projects:

- Ability to reduce loss of life
- Ability to reduce disaster damage
- Social acceptability
- Ability to complete or be combined w/other actions
- Technical feasibility / potential success
- Impact on the environment
- Administrative workability
- Ability to meet regulations
- Political acceptability
- Ability to save or protect historic structures
- Legal implementation
- Ability to meet other community objectives
- Economic impact
- The duration of its implementation period
- Environmental compatibility

### Project Prioritization

The Goshen Hazard Mitigation Planning Committee created the following prioritized schedule for implementation of prioritized items. The table lists items in order of priority.

*Note: As additional information becomes available regarding project leadership, timeline, funding sources, and/or cost estimates, the Plan will be reviewed and amended accordingly.*

**Table 6.1: Prioritized Implementation Schedule – Action Plan**

Priority	Mitigation Action	Responsible Department/Board	Proposed Completion Date	Funding Source/ Estimated Cost	Incorporation into Existing Plans
1	Ensure dam owners realize their responsibility to inspect and maintain the dams. EMD will secure proof from owner of up to date inspection.	EMD	2009 and ongoing	Local/minimal	n/a
2	Seek funding from HMGP for top-priority culvert replacement projects.	Highway Dept, SelectBoard, EMD	2010	HMGP/significant	Integrate into capitol improvement plan
6	Consider making all new development near waterbodies, not just conversions , show that soil absorption, filtration, ground water supply are not impacted	Planning Board	2010	Local/minimal	Integrate into master plan and osrp when/if we create them
7	Consider adding performance standards for run-off, drainage, water pollution caused during earth removal/excavation	Planning Board	2010	Local/minimal	Integrate into master plan and osrp when/if we create them
8	Consider adding stormwater retention/detention requirements	Planning Board	2010	Local/minimal	Integrate into master plan and osrp when/if we create them
5	The town should evaluate whether to become a part of FEMA's Community Rating System.	EMD/SelectBoard	2009	Local/minimal	Integrate into capitol improvement plan
3	Need an estimated \$5,000-10,000 for a transfer switch in the Town offices	EMD/Fire Chief/SB	2009	Homeland security/HMGP/local/minimal	Integrate into capitol improvement

					plan
9	Need to encourage tree warden to inspect trees regularly and prioritize tree removal or trimming as appropriate.	SB/PB/Highway Dept	2009 ongoing	Local/minimal	Integrate into master plan and osrp when/if we create them
4	Identify sources of funding for dam safety inspections.	MEMA/PVPC/EMD/DCR	ongoing	Combined/minimal	n/a
10	Seasonal dwellings converted into year-round residence must show that ground water supply is not impacted	Planning Board	2009	Local/minimal	Integrate into master plan and osrp when/if we create them



## **7: PLAN ADOPTION & IMPLEMENTATION**

### **Plan Adoption**

Upon completion, copies of the Draft Local Hazards Mitigation Plan for the Town of Goshen were distributed to the town boards for their review and comment. A public meeting was held by the Goshen Board of Selectmen to present the draft copy of the Goshen Local Natural Hazards Mitigation Plan to town officials and residents and to request comments from this committee and the general public. The Natural Hazards Mitigation Plan was forwarded to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their approval and upon conditional approval by FEMA formally approved by the Board of Selectmen.

### **Plan Implementation**

The implementation of the Goshen Local Natural Hazards Mitigation Plan will begin following its formal adoption by the Goshen Board of Selectmen and approval by MEMA and FEMA. Specific town departments and boards will be responsible for ensuring the development of policies, bylaw revisions, and programs as described in Sections 5 and 6 of this plan. The Goshen Natural Hazards Planning Committee will oversee the implementation of the plan.

### **Plan Monitoring and Evaluation**

The measure of success of the Goshen Local Natural Hazards Mitigation Plan will be the number of identified mitigation strategies implemented. In order for the town to become more disaster resilient and better equipped to respond to natural disasters, there must be a coordinated effort between elected officials, appointed bodies, town employees, regional and state agencies involved in disaster mitigation, and the general public.

The Goshen Natural Hazards Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan. At a minimum, the committee will review and update the plan every five years, beginning in the fall of 2013. The meetings of the committee will be organized and facilitated by the Emergency Management Director or the Goshen Board of Selectmen.

CERTIFICATE OF ADOPTION  
TOWN OF GOSHEN, MASSACHUSETTS  
BOARD OF SELECTMEN  
A RESOLUTION ADOPTING THE GOSHEN  
NATURAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Goshen established a Committee to prepare the Goshen Hazard Mitigation plan; and

WHEREAS, several public planning meetings were held between July and October 2008 regarding the development and review of the Goshen Hazard Mitigation Plan; and

WHEREAS, the Goshen Hazard Mitigation Plan contains several potential future projects to mitigate hazard damage in the Town of Goshen, and

WHEREAS, a duly-noticed public hearing was held by the Goshen Board of Selectmen on \_\_\_\_\_, 2009 to formally approve and adopt the Goshen Hazard Mitigation Plan.

NOW, THEREFORE BE IT RESOLVED that the Goshen Board of Selectmen adopts the Goshen Hazard Mitigation Plan.

ADOPTED AND SIGNED this \_\_\_\_\_, 2009.

\_\_\_\_\_, Chair  
Goshen Board of Selectmen

\_\_\_\_\_  
Goshen Board of Selectmen

\_\_\_\_\_  
Goshen Board of Selectmen

ATTEST

# APPENDICES

## Appendix A – Technical Resources

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### 1) Agencies

Massachusetts Emergency Management Agency (MEMA).....	508/820-2000
Hazard Mitigation Section .....	617/626-1356
Federal Emergency Management Agency (FEMA) .....	617/223-4175
MA Regional Planning Commissions:	
Berkshire Regional Planning Commission (BRPC).....	413/442-1521
Cape Cod Commission (CCC).....	508/362-3828
Central Massachusetts Regional Planning Commission (CMRPC).....	508/693-3453
Franklin Regional Council of Governments (FRCOG).....	413/774-3167
Martha’s Vineyard Commission (MVC).....	508/693-3453
Merrimack Valley Planning Commission (MVPC).....	978/374-0519
Metropolitan Area Planning Council (MAPC).....	617/451-2770
Montachusett Regional Planning Commission (MRPC).....	978/345-7376
Nantucket Planning and Economic Development Commission (NP&EDC).....	508/228-7236
Northern Middlesex Council of Governments (NMCOG).....	978/454-8021
Old Colony Planning Council (OCPC).....	508/583-1833
Pioneer Valley Planning Commission (PVPC).....	413/781-6045
Southeastern Regional Planning and Economic Development District (SRPEDD).....	508/823-1803
MA Board of Building Regulations & Standards (BBRS).....	617/227-1754
MA Coastal Zone Management (CZM).....	617/626-1200
DCR Water Supply Protection.....	617/626-1379
DCR Waterways.....	617/626-1371
DCR Office of Dam Safety.....	508/792-7716
DFW Riverways.....	617/626-1540
MA Dept. of Housing & Community Development.....	617/573-1100
Woods Hole Oceanographic Institute.....	508/457-2180
UMass-Amherst Cooperative Extension.....	413/545-4800
National Fire Protection Association (NFPA).....	617/770-3000
New England Disaster Recovery Information X-Change (NEDRIX – an association of private companies & industries involved in disaster recovery planning).....	781/485-0279
MA Board of Library Commissioners.....	617/725-1860
MA Highway Dept, District 2.....	413/582-0599
MA Division of Marine Fisheries.....	617/626-1520
MA Division of Capital & Asset Management (DCAM).....	617/727-4050
University of Massachusetts/Amherst.....	413/545-0111
Natural Resources Conservation Services (NRCS).....	413/253-4350
MA Historical Commission.....	617/727-8470
U.S. Army Corps of Engineers.....	978/318-8502
Northeast States Emergency Consortium, Inc. (NESEC).....	781/224-9876
National Oceanic and Atmospheric Administration: National Weather Service; Tauton, MA.....	508/824-5116
US Department of the Interior: US Fish and Wildlife Service .....	413/253-8200
US Geological Survey .....	508/490-5000

### 2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) .....	Massachusetts Emergency Management Agency
406 Public Assistance and Hazard Mitigation .....	Massachusetts Emergency Management Agency
Community Development Block Grant (CDBG).....	DHCD, also refer to RPC
Dam Safety Program.....	MA Division of Conservation and Recreation

Disaster Preparedness Improvement Grant (DPIG) .....	Massachusetts Emergency Management Agency
Emergency Generators Program by NESEC† .....	Massachusetts Emergency Management Agency
Emergency Watershed Protection (EWP) Program.....	USDA, Natural Resources Conservation
Service Flood Mitigation Assistance Program (FMAP) .....	Massachusetts Emergency Management Agency
Flood Plain Management Services (FPMS).....	US Army Corps of Engineers
Mitigation Assistance Planning (MAP).....	Massachusetts Emergency Management Agency
Mutual Aid for Public Works.....	Western Massachusetts Regional Homeland Security Advisory Council
National Flood Insurance Program (NFIP) † .....	Massachusetts Emergency Management Agency
Power of Prevention Grant by NESEC† .....	Massachusetts Emergency Management Agency
Roadway Repair & Maintenance Program(s).....	Massachusetts Highway Department
Section 14 Emergency Stream Bank Erosion & Shoreline Protection .....	US Army Corps of Engineers
Section 103 Beach Erosion.....	US Army Corps of Engineers
Section 205 Flood Damage Reduction.....	US Army Corps of Engineers
Section 208 Snagging and Clearing .....	US Army Corps of Engineers
Shoreline Protection Program.....	MA Department of Conservation and Recreation
Various Forest and Lands Program(s).....	MA Department of Environmental Protection
Wetlands Programs .....	MA Department of Environmental Protection

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

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

### 3) Internet Resources

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	<a href="http://www.colorado.edu/litbase/hazards/">http://www.colorado.edu/litbase/hazards/</a>	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	<a href="http://wxp.eas.purdue.edu/hurricane">http://wxp.eas.purdue.edu/hurricane</a>	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	<a href="http://nemaweb.org">http://nemaweb.org</a>	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center “Disaster Finder:	<a href="http://www.gsfc.nasa.gov/ndrd/disaster/">http://www.gsfc.nasa.gov/ndrd/disaster/</a>	Searchable database of sites that encompass a wide range of natural disasters.

NASA Natural Disaster Reference Database	<a href="http://ltpwww.gsfc.nasa.gov/ndrd/main/html">http://ltpwww.gsfc.nasa.gov/ndrd/main/html</a>	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	<a href="http://www.statelocal.gov/">http://www.statelocal.gov/</a>	General information through the federal-state partnership.
National Weather Service	<a href="http://nws.noaa.gov/">http://nws.noaa.gov/</a>	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	<a href="http://h20.usgs.gov/public/realtime.html">http://h20.usgs.gov/public/realtime.html</a>	Provisional hydrological data
Dartmouth Flood Observatory	<a href="http://www.dartmouth.edu/artsci/geog/floods/">http://www.dartmouth.edu/artsci/geog/floods/</a>	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	<a href="http://www.fema.gov/fema/csb.html">http://www.fema.gov/fema/csb.html</a>	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	<a href="http://www.met.fsu.edu/explores/tropical.html">http://www.met.fsu.edu/explores/tropical.html</a>	Tracking and NWS warnings for Atlantic Hurricanes and other links
The Tornado Project Online	<a href="http://www.tornadoject.com/">http://www.tornadoject.com/</a>	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	<a href="http://www.nssl.uoknor.edu/">http://www.nssl.uoknor.edu/</a>	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	<a href="http://www.iaa.ix.com/ndcmap.html">http://www.iaa.ix.com/ndcmap.html</a>	A multi-disaster risk map.
Earth Satellite Corporation	<a href="http://www.earthsat.com/">http://www.earthsat.com/</a>	Flood risk maps searchable by state.
USDA Forest Service Web	<a href="http://www.fs.fed.us/land">http://www.fs.fed.us/land</a>	Information on forest fires and land management.

## Appendix B – List of Acronyms

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FEMA	Federal Emergency Management Agency
MEMA	Massachusetts Emergency Management Agency
PVPC	Pioneer Valley Planning Commission
EPA	Environmental Protection Agency
DEP	Massachusetts' Department of Environmental Protection
NWS	National Weather Service
HMGP	Hazard Mitigation Grant Program
FMA	Flood Mitigation Assistance Program
SFHA	Special Flood Hazard Area
CIS	Community Information System
DCR	Massachusetts Department of Conservation and Recreation
FERC	Federal Energy Regulatory Commission
TRI	Toxics Release Inventory
FIRM	Flood Insurance Rate Map
NFIP	National Flood Insurance Program
CRS	Community Rating System
BOS	Board of Selectmen
BOH	Board of Health
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

## Natural Hazard Profiling Methodology<sup>5</sup>

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In order to adeptly profile each of the hazards, a Hazard Identification and Analysis Matrix was prepared to organize the information that was gathered for this project.

The matrix is organized into the following sections: Type of Hazard, Location of Occurrence, Extent of Impacts, Previous Occurrences, Probability of Future Occurrence, and Hazard Index. The Hazard Index was completed to rank the hazards according to the frequency of occurrence and the amount of potential damage likely to occur. The Hazard Index forms the basis for concentrating the future mitigation efforts outlined in this plan. A description of each of the matrix categories is provided below. The completed Matrix is shown as Table 3.1 (Section 3, page 7).

### *Location of Occurrence*

The classifications are based on the area of the Town of Goshen that would potentially be affected by the hazard. The following scale was used:

Location of Occurrence	Percentage of Town Impacted
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

### *Extent of Impacts*

The extent of direct impacts an affected area could potentially suffer were classified according to the following scale:

Extent of Impacts	Magnitude of Multiple Impacts
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.

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<sup>5</sup> Source: information adapted from Town of Holden Beach, NC Community-Based Hazard Mitigation Plan, July 15, 2003, and Hyde County, NC Multi-Hazard Mitigation Plan, Sept 2002; and the Massachusetts Emergency Management Agency (MEMA).

Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.
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**Previous Occurrences**

Whether or not previous hazard events had occurred is also included, with detailed descriptions of specific previous occurrences within the hazard identification and vulnerability assessments, if necessary.

**Probability of Future Occurrence**

The likelihood of a future event for each natural hazard was classified according to the following scale:

<b>Table C.3: Frequency of Occurrence and Annual Probability of Given Natural Hazard</b>	
<b>Frequency of Occurrence</b>	<b>Probability of Future Event</b>
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

**Hazard Index**

The hazard index ratings were determined after assessing the frequency, location and impact classifications for each hazard. The hazard index ratings are based on a scale of 1 (highest risk) through 5 (lowest risk). The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of hazard. The size and impacts of a natural hazard can be unpredictable however; many of the mitigation strategies currently in place and many of those proposed for implementation can be applied to the expected natural hazards, regardless of their unpredictability.

The Hazard Ratings are labeled as follows:

- 1 – High Risk
- 2 – Medium-High Risk
- 3 – Medium Risk
- 4 – Medium Low Risk
- 5 – Low Risk



## Appendix D – Past & Potential Hazards/Critical Facilities Map

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## Appendix E – Documentation of the Planning Process

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### Town of Goshen Hazards Mitigation Planning

#### Meeting #1

Wednesday, July 16, 2008 7 p.m.

Goshen Fire Station

#### 1) Hazards Mitigation Planning Overview

- What is it? ▪ What is the process? ▪ What funding is available?

#### 2) Review Draft plan and Crosswalk procedure for adoption by FEMA

#### 3) Identify Critical Facilities

- The following list contains items that should be clearly identified in the narrative and on the map, as they apply to your community:
  - Emergency Operations Center
  - Emergency Fuel Facilities
  - Town/City Hall
  - Police Station
  - Fire Station
  - Public Works Garages
  - Water Treatment Facilities
  - Sewage Treatment Plants
  - Water Tower/Supply Pumps
  - Power Plants
  - Electrical Power Substations
  - Schools
  - Major Highways and Roadways
  - Bridges
  - Dams
  - Nursing Homes
  - Elderly Housing
  - Day-Care Facilities
  - Correctional Facilities
  - Other Congregate Care Facilities
  - Shelters
  - Special Needs Populations
  - Hazardous Materials Facilities
  - Access Roads to Critical Facilities
  - Evacuation Routes
  - Unique or Historic Resources
  - Commercial Economic Impact Areas
  - Socio-Economic Impact Areas
  - Areas with Second Language Needs
  - Hospitals

#### 4) Hazards Analysis Methodology

- Identify Past Hazard Occurrences, Location and Damage Assessments
- Hazard Identification and Analysis Worksheet

#### 5) Information needed for PDM Plan

- Review highlighted areas in DRAFT plan

#### 6) Schedule and Agenda for Next Meetings

#### 7) Homework for next meeting

- Think about critical facilities and the evacuation routes potentially affected by hazard areas. (Chapter 4)
- Review Chapter 3 and provide additional details and information about hazards wherever possible.

**City/Town Clerk: Please post this notice per M.G.L., Chapter 39, Section 23b.**

**Goshen Hazard Mitigation Planning Committee**  
**Meeting #2**  
**8/6/08**  
**Fire Station**

**AGENDA**

**1. Continue review of draft plan focusing on hazard identification and critical facilities**

**2. Identify Critical Facilities** (to be shown on Base map)

- Identify Critical Facilities on Base Map. The following list contains items that should be clearly identified on the map, as they apply to your community:

- Emergency Operations Center
- Emergency Fuel Facilities
- Town/City Hall
- Police Station
- Fire Station
- Public Works Garages
- Water Treatment Facilities
- Sewage Treatment Plants
- Water Tower/Supply Pumps
- Power Plants
- Electrical Power Substations
- Schools
- Major Highways and Roadways
- Bridges
- Dams
- Nursing Homes
- Elderly Housing
- Day-Care Facilities
- Correctional Facilities
- Other Congregate Care Facilities
- Shelters
- Special Needs Populations
- Hazardous Materials Facilities
- Access Roads to Critical Facilities
- Evacuation Routes
- Unique or Historic Resources
- Commercial Economic Impact Areas
- Socio-Economic Impact Areas
- Areas with Second Language Needs
- Hospitals

**3. Hazards Analysis Methodology**

- Identify Past Hazard Occurrences, Location and Damage Assessments
- Hazard Identification and Analysis Worksheet

**4. Analyze Development Trends**

Review local zoning districts. Identify planned and proposed subdivisions and other common developments. Is planned development at risk by natural hazards? Are there mitigation measures that can be taken to prevent loss of life, property damage, and disruption of governmental services and general business activities.

**5. Review Vulnerability Assessment Methodology and Potential Loss Estimates**

**6. Schedule and Agenda for next meeting**

**TOWN CLERK: Please Post this notice per M.G. L. Chapter 39, Section 23, A-C**

Posted in February, 2009 on the PVPC web-site for public review and comment, with an accompanying media release to all area newspapers and television stations.



*Catalyst for Regional Progress*

**PVPC**

Timothy W. Brennan, Executive Director

## **PRESS RELEASE**

CONTACT: Catherine Miller, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE

February 5, 2009

### **Pre-Disaster Mitigation Plans Public Comment Period**

The Pioneer Valley Planning Commission, in conjunction with local hazard mitigation planning committees, has produced drafts of pre-disaster mitigation plans for the communities of Huntington, Worthington, Granby, and Goshen. Residents, business owners, and other concerned parties of these municipalities and adjacent communities are encouraged to comment on these plans, which are currently available for viewing on PVPC's website at [www.pvpc.org](http://www.pvpc.org) (under Projects and Plans) and the websites of the municipalities, where possible. Paper copies of the plans may be obtained at the Pioneer Valley Planning Commission offices at 26 Central Street, West Springfield or at the individual city and town halls. The plans will be available for the next 30 days.

Starting this month pre-disaster mitigation plans will be developed for Amherst, Belchertown, Brimfield, Chicopee, Springfield, West Springfield, and Williamsburg, and will also be available for public comment as they are developed.

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

PVPC has previously facilitated development of plans for 21 communities in the Hampshire and Hampden county areas. Following completion of all 32 local hazard mitigation plans, PVPC will be developing a regional hazard mitigation plan. Communities with approved plans are eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency. For additional information, please contact PVPC's Catherine Miller at (413) 781-6045 or [cmiller@pvpc.org](mailto:cmiller@pvpc.org).

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