

THE TOWN OF SOUTH HADLEY

LOCAL NATURAL HAZARDS MITIGATION PLAN

December 2007

Adopted by the South Hadley Selectboard on _____

**Prepared by:
The South Hadley Natural Hazards Mitigation Planning Committee**

and

The Pioneer Valley Planning Commission

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1 - INTRODUCTION

Hazard Mitigation

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 South Hadley 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 Hazards Mitigation Plan before a disaster occurs can save the community money and will 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

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

- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure (i.e., critical facilities, public buildings, roads, homes, businesses, etc.) 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. Examples of such strategies include:

- Preventing or limiting development in natural hazard areas like floodplains;
 - Implementing recommendations in existing planning documents including Stormwater Management Plans, Master Plans, Open Space and Recreation Plans, and Emergency/Evacuation Plans that address the impacts of natural hazards; and
 - Requiring or encouraging the use of specific structural requirements for new buildings such as buried utilities, flood-proofed structures, and lightening grounding systems.
- Identifying deficiencies in the current strategies and establish goals for updating, revising or adopting new strategies.
 - Adopting and implementing the final Local Natural Hazards Mitigation Plan.

During the planning process, the Town’s Local Natural Hazard Planning Committee identified Action Plan items and specific time frames. The actions were selected from a list of local strategies which were compiled by the regional LEPC during several brainstorming sessions (see Regional Natural Hazard Mitigation Plan Risk Assessment Matrix – Section 3: Risk Assessment) and others identified by the Town during their review of existing programs, policies, and regulations. From this list, specific Action Items were prioritized by the Town’s Local Natural Hazards Planning Committee based on the following criteria:

- Select Action Items which have the ability to significantly mitigate the negative impact of natural hazards on people and property;
- Select Action items which the Town has the ability to implement given the financial and staff resources available;
- Select Action Items which will have the greatest influence on achieving Local Goals & Objectives;
- Select a diverse set of Action Items which will address different Natural Hazards that present a high or moderate risk to the region; and
- Select Action items which will address those mitigation measures identified as deficient or in need of attention to ensure that the Town is in the best possible position to address natural hazards which impact property and residents.

For example, updating or adopting a local floodplain bylaw would be a relatively low cost action item, which could have a significant impact on mitigating hazards caused by flooding. If adopted by the Town, this bylaw would discourage development in floodplain areas and prevent harm to people and damage to property. Another action item was to review and maintain shelters for victims of natural hazards within the Town and to conduct outreach to residents so that they are aware of the availability of those shelters.

First, however, the Town must identify what services are available at the different shelters (e.g. food preparation, potable water, back-up electrical power, heat, showers, etc.) and whether the location of different shelters will be impacted by different hazards (i.e. whether flooding will make the shelter inaccessible to some residents). This action

item, review and maintain shelters, also addressed a number of different natural hazards and would help ensure that suitable shelters are available for different types of natural hazards. The action items selected were all considered to have a low to moderate cost to implement. In some cases grant funding would be sought for implementation given the limited resources available in the Town.

The local action items represent a multi-faceted approach to addressing natural hazards in the Town and will be undertaken as resources become available and will be integrated into ongoing planning activities. As part of the review and adoption process, the Committee approved the action items that were in keeping with the goals and criteria established by the Town and assigned appropriate bodies within the Town to implement them within a five-year framework.

Public Committee Meetings

An email agenda notice was made to each committee member prior to each meeting on the following dates:

November 9, 2006 at 10:00 AM: Project Kickoff Meeting at Police Station
December 13, 2006 at 10:00 AM: Committee working meeting at Police Station
January 17, 2007 at 10:00 AM: Committee working meeting at Police Station
February 28, 2007 at 10:00 AM: Committee working meeting at Police Station
April 11, 2007 at 10:00 AM: Committee working meeting at Police Station

Public Meeting with the Selectboard

Public Outreach

September 12, 2007 – Plans available for public comment on PVPC website

This press release announced that the draft plan had been posted on PVPC's website and was available for public comment at www.pvpc.org. Comments are due no later than November 30, 2007. Press release was covered in the local newspaper article in *The Republican* on September 23, 2007.

November 15, 2005 – Hampshire Regional Emergency Planning Council Meeting

The PVPC presented the planning process that led to the creation of the Local Natural Hazards Mitigation Plans developed for communities throughout our region. The HREPC is responsible for coordinating the emergency planning activities of the communities within Hampshire County including South Hadley.

November 20, 2007 - Western Regional Homeland Security Advisory Council Meeting

The PVPC presented the planning process that led to the creation of the Local Natural Hazards Mitigation Plans developed for communities throughout our region. The Western Regional Homeland Security Council is the planning entity responsible for orchestrating the homeland security planning activities of Berkshire, Franklin, Hampden and Hampshire Counties. Collectively, this body is responsible for 101 communities.

2 – LOCAL PROFILE¹

Community Setting

The Town of South Hadley is a richly diverse community that includes farms, residences, light industry and a nationally renowned college. The town's accessibility to the major highways Interstates 91 and 90, its adjacency to the Connecticut River, and its proximity to the major cities of Springfield, Holyoke and Chicopee has contributed to its growth and vitality. The Town has two distinctive neighborhoods; the Village Commons, which is a popular commercial district near Mt. Holyoke College; and South Hadley Falls, near the Connecticut River and the source of the major commercial, mixed-use, and dense residential development in Town.

Covering about 18.3 square miles, the Town of South Hadley is located in Hampshire County, just north of the City of Chicopee. South Hadley is located just east of the Connecticut River, south of Hadley and directly west of Granby. The town consists of moderate slopes with elevations ranging from 250 feet above sea level to over 1000 feet in the northern portion of town.

According to the 1999 MacConnell Land use data, the total land area of South Hadley is approximately 11,816 acres with roughly 26 percent of those acres as developed land. The remaining land is classified as undeveloped with forest as the largest category (48% of all land in town) with 5,688 acres. Cropland is the second largest category of undeveloped land with 888 acres compared to pastureland, which represents the third greatest amount of undeveloped land in the town with 310 acres.

Infrastructure

Historically, the working landscapes of South Hadley have shaped the physical, economic, and cultural character of the community. The old mill buildings, forests and remaining farms continue to contribute to the economic and environmental well-being of the town.

Roads and Highways

South Hadley Links to its surrounding communities via two main arteries, Route 116 and Route 202. Route 116 runs north-to-south through South Hadley from Holyoke to Granby and Amherst. Route 202 southwest-to-northwest through town from Holyoke to Granby and adjacent communities. Both 116 and 202 rely on bridge crossings into Holyoke for external links to surrounding communities with 115 relying on the County Bridge and 202 relying on the Mueller Bridge. Secondary, but major, routes branch off of Route 116 to provide linkages to the north and south. Route 47 branches off of 116 in the

¹ The Majority of the information in this section comes from South Hadley's Community Development Plan, 2004.

center of town and travels north, over the Holyoke Range, to Hadley. Route 33 branches off of 116 at the intersection of 116 and Lyman street and travels south to Chicopee.

Rail

The Boston and Maine Rail Right of Way runs through South Hadley and freight loads are actively transported along the line.

Public Transportation

South Hadley is served by two different PVTA fixed bus routes, the Orange 38/9 and Red 25. Orange 38/9 is a route that caters largely to college students. It begins at UMASS and transports students to and from Mt. Holyoke College in South Hadley Center. Five College Inc supports the Orange38/9 as part of their efforts to foster interchange between the five colleges. This route only operates during the school year and winter and spring intercessions. The Red 25 begins at Veterans Park in Holyoke, proceeds to South Hadley, then Granby, returning to Veterans Park and continuing on through Holyoke to the Holyoke Mall. Some of the R25 trips go directly from Holyoke to South Hadley Center. The Red 25 has headways or frequencies that vary from 30 to 90 minutes throughout the day.

In addition to the fixed route bus service PVTA provides Paratransit van service in South Hadley. PVTA has two types of van service, dial-a-ride service and ADA service. The dial-aride service is available to all seniors over 60 on a space available basis Monday - Friday from 9:00 AM to 4:30 PM. The ADA service, which is required under the Americans with Disabilities Act, is available for people with disabilities that limits them from being able to used the fixed route bus service. The hours that the ADA service is available follows the fixed route service hours of operation.

Public Drinking Water Supply

A large portion of South Hadley, known as District #2, receives its drinking water from the Town's municipal water supplies, which are derived from the Connecticut River Valley' abundant groundwater supplies. Two surface water sources were abandoned in 2002 and, since then, South Hadley has not used any surface water sources for its drinking water needs. District #1 receives water from its connection to the Metropolitan District Commission's (MDC) Quabbin Reservoir along with several other local communities.

Sewer Service

South Hadley currently operates a wastewater treatment plant that serves approximately 7,300 households, including 240 in Chicopee and 300 in Granby. An average of 2.75 million gallons of raw sewage is treated daily. Although most of the Town is serviced by the public sewer system, much of the area north of Bachelor Brook is handled by private septic systems. This is due to the prohibitive cost of installing sewer infrastructure along the changing topography in the northern areas at the foot of the Mt. Holyoke Range. The installation of a 30 inch sewer trunk line along the Connecticut River in 1976 resulted in

the expanded residential development of the Alvord Street corridor in an area of prime farmland.

Schools

South Hadley has educational institutions at all levels of the educational scale. These institutions are: The South Hadley High School, Michael E. Smith Middle School, Mosier School and Plains School. Also, Mount Holyoke College houses a population of more than 2,000 students and draws young women between the ages of 18-22 on a national and international scale.

Natural Resources

The following in the Natural Resources section either excerpted from the South Hadley Community Development Plan (2004) or drew from the town website for facts and information.

South Hadley's landscape varies from the steep, forested mountainsides of the Mount Holyoke Range to the broad, flat alluvial floodplains of the Connecticut River. These two resources have shaped the growth of South Hadley from its founding in 1753 to the present day. In the earliest years of settlement, farming and forestry provided residents with income and nourishment. As time wore on and the industrial revolution flourished, the town embraced many new technologies that capitalized on the Connecticut River's vast reserves of unused potential and kinetic energy. The construction of canals enabled the development of an industrial sector in the town center. Industry has since retreated from its peak, but the roads and ways and neighborhoods that grew and developed as the town shifted, expanded and changed still guide and direct residential growth and development in town.

Water Resources

South Hadley's water resources include the rivers, brooks and streams, extensive wetlands, and several ponds. The abundance of water resources is also reflected in the reliable availability of groundwater for municipal water supplies.

Lakes and Ponds

There are several ponds in South Hadley including:

- Upper Pond
- Lower Pond
- Lithia Springs
- Black Stevens Pond
- Hillcrest Pond
- Titus Pond

Many other smaller bodies of water are scattered across the landscape of South Hadley primarily located along streams and in wooded areas. Most of the 452 acres of open water in South Hadley are comprised of these small ponds and lakes. These water bodies offer valuable wildlife habitat, unique natural environments, and provide benefits to South Hadley's human inhabitants in the form of prime recreational opportunities and water supply.

Rivers and Streams

South Hadley lies entirely within the Connecticut River Watershed. Many small streams in South Hadley feed two water systems, Stony and Bachelor Brooks, which flow westward into the Connecticut River. Most of the Town's drainage stays within Town boundaries before emptying into the Connecticut River.

There are 1,973 acres of land within MassGIS riparian corridors in South Hadley. There are 1,571.4 acres of land in town within the 200 ft. Rivers Protection Buffer Area and 828.5 acres of land in the 100 foot river buffer. The Rivers Protection Act protects the significant rivers and streams in South Hadley. The Rivers Protection Act offers additional protection of lands in the area within 200 feet of the mean high water mark of a perennial stream or river. Development within this 200 foot riverfront area requires proof that there is "no practicable or substantially equivalent economic alternative" with less adverse impacts. South Hadley currently has no local rivers protection bylaw. Riparian areas are those vegetated lands adjacent to streams and rivers. This juncture of land and water attracts a range of species and tends to mark a transition zone between habitats. As such, these corridors link one habitat to another.

The value in maintaining vegetative cover and uninterrupted riparian corridors goes beyond wildlife preservation. These corridors and wetlands provide many other significant public health benefits for the entire community. These benefits include:

- Flood mitigation for agricultural crops and structures by storing and slowing runoff;
- Water supply protection, through filtration of pollutants. (Studies by the Environmental Protection Agency show that over 75% of phosphorus and nitrogen can be filtered in riparian areas adjacent to farmland)
- Erosion control by absorbing and slowing down storm runoff, these storage areas reduce erosion that results from fast flowing water;
- Groundwater replenishment;
- Stormwater management and regulation of water levels in watersheds;
- Open space corridors and recreational opportunities, such as fishing, boating, and hunting.

Wetlands

There are approximately 97.2 acres of wetlands in South Hadley. Wetland habitats in town occur primarily along the streams and rivers as well as in lands adjacent to the major ponds in South Hadley. If open waters are included in this accounting, the total acreage of wetlands in South Hadley rises to 549.1. These wetlands and flood areas in are shown on South Hadley's Water Resources Map, which is included in the MapAppendix. Development of wetland areas in South Hadley is limited by the Massachusetts Wetlands

Protection Act. South Hadley does not currently have a local wetlands bylaw and, as a result, protection of these critical natural areas is not guaranteed.

Wetland resource areas include rivers, ponds, swamps, wet meadows, beaver ponds, and land within the FEMA-defined 100-year flood area. Wetland areas are home to frogs, fish, freshwater clams and mussels, beaver, muskrats, great blue herons, waterfowl, and bitterns. Wetlands are specialized habitat areas that are always wet or are wet for extended periods of time during the year. There are many types of wetlands including:

- Marshes – These are predominantly open, herbaceous wetland areas
- Swamps – These are predominantly wooded or shrub wetland areas
- Vernal Pools – These are confined basin depressions that hold water for at least 2 continuous months in the Spring/Summer of most years
- Ponds – These are water bodies that may be natural or created by excavation or impoundment
- Riparian Areas – The zone adjacent to streams and rivers
- Streams and River – These are perennial or intermittent water resources that flow within a channel

The Commonwealth of Massachusetts regulates activities in and around wetlands in South Hadley through the Wetlands Protection Act – a state law enforced by the local Conservation Commission. Wetlands protected by the Act are primarily those that border the streams, rivers and ponds. These ‘bordering vegetated wetlands’ provide critical wildlife habitat. They also play a critical role in maintaining water quality by serving as natural filters for nutrients, toxins, and sediment that would otherwise move directly into surface and ground waters. Isolated wetlands with a volume of at least one quarter acre acre-feet and an average depth of six inches are also protected by the state regulations. Wetlands also serve as temporary storage areas for flood waters allowing the water to percolate slowly into the ground rather than run off into streams and rivers quickly and violently.

Beaver Dams

Beaver activity has been increasing over the past decade. Several wetland areas have been flooded by beaver dam construction. As a result, their vegetation has changed from forested wetland to marshy habitat. Sometimes beaver activity is detrimental to property, causing problems for local land owners (e.g., flooding of wells, septic systems, lawns, out-buildings, and roadways). Affected individuals must contact the Board of Health and Conservation Commission for advice and permission to alleviate the beaver problem.

Groundwater - Water Supply

South Hadley residents derive their water supply from both surface and groundwater sources, administered by two separate political bodies, Fire Districts #1 and #2. District #1 serves approximately 70% of the Town’s population, as well as sections of both Granby and Ludlow under a contract to purchase MDC Quabbin Reservoir water. Within this district, two water sources, Leaping Wells and Buttery Brook Reservoirs, were abandoned in 1950 due to poor water quality. In 1952 the Town was connected to the

Quabbin via the Chicopee Valley Aqueduct System. The water supplied from District #2 is pumped from the 108 foot-deep Dry Brook Well, which is comprised of saturated sand and gravel deposits sandwiched between the approximately 80 feet of confining clay layer above and impervious bedrock below.

South Hadley has a Water Supply Protection District, which increases lot size for those residences in the district that lack public sewer service. The District prohibits certain uses that would be detrimental to the groundwater supply.

South Hadley does not have any have non-community water systems or non-transient non-community (NTNC), but has one transient non-community water systems (TNC) – Skinner State Park.

Floodways

The 100-year floodplain is defined as an area with a 1% chance of flooding in a given year. The floodplain serves as a critical habitat for many plant and animal species and provides some of the most fertile soils in the region. Areas in the 100-year flood zone in South Hadley are primarily those lands adjacent to and including the open water areas located at the Connecticut River, Bachelor Brook and Stony Brook. Not including open water areas, there are 1,103 acres of 100-year floodplain in town, totaling 9.4% of the town's area.

Protective regulations and disincentives that limit development in the floodplain exist at several levels. For example, lending institutions may require flood insurance for those structures built in the 100-year flood zone. Although the consumer cost of this federally-supported insurance program is relatively inexpensive, some prospective homeowners simply do not want to take on this added burden. The town should, however, consider the role of the lender in guiding development in these areas and be proactive in its approach to educating the loan officers and boards of the effect of floodplain development. Also, The Massachusetts Wetlands Protection Act limits the impacts of construction and alteration activities in the floodplain through its local enforcement by the Conservation Commission. Moreover, South Hadley's zoning bylaw is an additional regulatory layer that can control development in these critical areas. South Hadley's Floodplain Overlay District prohibits fill and requires floor levels to be above potential flood levels. Finally, the State Building Code requires the elevation of structures in the floodway—the floor of the lowest habitable area in the structure must be above the base elevation for floodwaters during a 100-year storm event. The code also reinforces the overlay district regulations by prohibiting any change in the flood storage capacity of the area.

Floodways include the watercourses (rivers and streams) and adjacent relatively low-lying areas subject to periodic flooding (the 100-year flood zone and 500-year flood zone). These adjoining lands are flood hazard zones and they vary in their predicted flood frequency. The 100-year flood zone has a one in 100 statistical probability (or one percent chance) of being flooded in a single year or is predicted to be flooded one year out of a 100-year period; while the 500-year flood zone is based on a 500-year period.

South Hadley's floodways are corridors that pass flowing water downstream, eventually into the Connecticut River.

The National Flood Insurance Program has produced maps that identify floodways across America. The following areas have been designated as floodways in South Hadley:

- (1) Bachelor Brook—Pearl Street south along Route 47, Moody Corner to the Connecticut River, Pearl Street to the South Hadley Town Line;
- (2) Stoney Brook—Town Line to Granby Road continuing on to the Mount Holyoke Campus Ponds continuing on to Route 116 and draining into the Connecticut River between Ferry and Alvord Streets;
- (3) Connecticut River—Smith's Ferry area, the majority of the Town's western boundary, most especially within the White Brook Area;
- (4) South Hadley's Town Center is located within the Connecticut River's 100 year flood plain, which places the Town Police Station and the Town Hall in a flood-prone area

Forests

Forest cover is by far the most prominent land use in South Hadley. South Hadley's map of existing land use shows the extensive range of these forestlands. They encompass approximately 5,639 acres, which comprises 48% of the total land area in the Town (source: MassGIS). Over 100 acres of South Hadley forestlands are protected under the Forest Legacy program. Wooded areas are habitat for bears, coyotes, deer, grouse, woodpeckers, squirrels, porcupines, and deep wood songbirds such as wood thrush, scarlet tanager, and veery.

South Hadley is in the enviable position of having significant forest and hillside resources that can provide a benefit to wildlife and residents of the community. Protecting and enhancing these resources can provide long term economic benefits as well as providing protection for the diversity of wildlife species that are fully dependent on the forestlands.

3 – HAZARD IDENTIFICATION & ANALYSIS

Natural Hazard Identification

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

Floods

The average annual precipitation for South Hadley and surrounding areas in central western Massachusetts is 42.5 inches. There are three major types of storms that bring precipitation to South Hadley. 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. Floods occur more frequently and are one of the most 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.

Severe Snowstorms/Ice Storms

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 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.

Hurricanes

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. In Massachusetts, major hurricanes occurred in 1904, 1938, 1954, 1955, 1960 and 1976.

Tornadoes

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. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and

other personal property (cars, etc.). Since the 1950s, there have been nine tornadoes 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.²

Wildland Fires/Brushfires

According to FEMA, there are three different classes of wildland fires: *surface fires*, *ground fires* and *crown fires*.³ 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 wildland fires have not been a significant problem in South Hadley, 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. There were nine small brushfires in South Hadley Fire District #1 and seven in Fire District #2 in 2006.

Earthquakes

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. 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.⁴ 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.⁵

² <http://www.fema.gov/regions/vii/2003/03r7n06a.shtm>

³ FEMA, "Fact Sheet: Wildland Fires," September 1993.

⁴ Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

⁵ Federal Emergency Management Agency Web site: www.fema.gov/hazards/earthquakes/quake.shtm.

Table 3-1
New England Earthquakes with a Magnitude of 4.2 or more 1924 - 2002

Location	Date	Magnitude
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

Source: Northeast States Emergency Consortium Web site:
www.nesec.org/hazards/earthquakes.cfm

Table 3-2
New England States Record of Historic Earthquakes

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
<i>Total Number of Earthquakes within the New England states between 1568 and 1989 = 1,239.</i>		

Source: Northeast States Emergency Consortium Web site:
www.nesec.org/hazards/earthquakes.cfm

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.

Dam Failure

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. Most earthen dam failures occur when floodwaters above overtop and erode the material components of the dam. 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.

The Massachusetts Department of Conservation and Recreation (MA DCR) is 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. As of 2005, it is the responsibility of individual dam owners to make sure they comply with DCR’s rules and regulations for the inspection and maintenance of their property.

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.

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.

The Massachusetts Emergency Management Agency (MEMA) identifies thirteen dams in South Hadley. Some of these are High Hazard Dams, some are Significant/Medium Hazard and some are Low Hazard. The following table summarizes the hazard level of the dams in South Hadley:

Mt. Holyoke College Upper Pond Dam	High
Mt. Holyoke College Lower Pond Dam	High
Marcalus Manufacturing Company Dam	High
Leaping Well Reservoir Dam	High
Hillside Beach Dam	High
Holyoke Dam	High
Queensville Pond Dam	Significant
Lithia Springs Reservoir Dam	Low
Newton Smith - Lower Dam	Low
Sunset Beach Upper Pond Dam	Low
Sunset Beach Tributary Dam	Low
Pearl City Pond Dam	Low
Mt. Holyoke College Middle Pond Dam	Low

It is also important to consider and plan for any potential critical failure of dams upstream in Granby and Belchertown. Belchertown has one *High Hazard* dam.

The 100-year floodplain covers about 5.4 percent, or approximately 642 acres of the town and, 1.4 percent, or roughly 160 acres, in the 500-year floodplain.

Drought

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.⁶

In Massachusetts, six major droughts have occurred statewide since 1930⁶. They range in severity and length, from three to eight years. In many of these droughts, water-supply

⁶ US Geological Survey Water-Supply Paper 2375. “National Water Summary 1989 – Floods and Droughts: Massachusetts.” Prepared by S. William Wandle, Jr., US Geological Survey.

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.

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.

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 drought⁷. However, 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.

Man-made Hazards – Hazardous Materials

Technologic, or man-made, disasters are commonly defined as emergencies characterized by a sudden threat to lives, property, public health and the environment, arising from a failure of critical infrastructure systems or the release, or potential release, of oil, radioactive materials, or hazardous chemicals or bio-hazards, into the air, land or water. These emergencies may occur from transportation accidents, unusual events at facilities that use or manufacture chemicals or biological hazards, or as a result of natural or man-made events. While these incidents are most often accidental, intentional acts of sabotage, or terrorism, must increasingly be considered as a discrete category of technological disaster.

Critical Infrastructure Threats - Critical infrastructure is defined as “the linked systems of facilities and activities vital to providing services necessary to support the nation's economy and quality of life...including electrical power, medical and public health services, transportation, oil and gas production and storage, water supply, emergency services, government services, banking and finance, and telecommunications.” These systems are increasingly varied and complex, and are operated with increasingly sophisticated information technology systems. The integration of aging civil infrastructure systems into larger networks and the associated loss of redundancy can lead to reduced reliability and intricate interdependencies. Failure of particular components or subsystems within this critical infrastructure can incapacitate the entire system.

Oil, Chemical, Bio-Hazards Spills and Accidents Almost 14,000 oil spills are reported each year in the U.S., mobilizing thousands of specially trained emergency response personnel and challenging the best-laid contingency plans. Although many spills are contained and cleaned up by the party responsible for the spill, some spills require assistance from local and state agencies, and on occasion, the Federal Government. Similarly, the safe handling of industrial chemicals became a significant priority for disaster managers worldwide following the 1984 accident at Union Carbide's Bhopal,

⁷ National Drought Mitigation Center – <http://drought.unl.edu>

India, factory that killed more than 2,000 people. The most recent, and severe, chemical spills in Massachusetts occurred on April 27, 2003 when a barge heading north in Buzzard's Bay toward the Cape Cod Canal ran aground, causing a rupture in its hull. This accident resulted in the spill of approximately 98,000 gallons of heating oil into the Bay. The spill closed shell fishing areas and beaches, causing thousands of dollars in loss wages and property damage.

Building Fires. In 1999, building fires caused \$10 billion in property damages, more than 4,000 deaths (including 100 firefighters) and 100,000 injuries in the U.S. The Worcester Cold Storage Fire on December 3, 1999 caused the deaths of 6 Worcester firefighters. The number of deaths due to fire has decreased during the past 30 years as a result of revised fire standards and codes, yet property losses remain about the same as reported in 1973, when annual property losses exceeded \$11 billion.

Natural Hazard Analysis Methodology

In order to review the likelihood of a specific hazard occurring, to identify the location of occurrence, and to assess the impacts of the hazard event, 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, Frequency of Occurrence, Severity of Impacts 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 on Table 3-6.

Type of Hazard

The natural hazards identified for South Hadley include floods, severe snowstorms/ice storms, hurricanes, tornadoes, wildfires/brushfires, dam failure and earthquakes. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may cause wind-related damage. A more detailed description of each type of hazard is included in the earlier section of this chapter.

Frequency of Occurrence

The frequency or likelihood of occurrence for each natural hazard was classified according to the following scale:

**Table 3-3
Frequency of Occurrence and Annual Probability of Given Natural Hazard**

Frequency of Occurrence	Annual Probability
<i>Very High</i>	70-100% probability in the next year
<i>High</i>	40-70% probability in the next year

<i>Moderate</i>	10-40% probability in the next year
<i>Low</i>	1-10% probability in the next year
<i>Very Low</i>	Less than 1% probability in the next year

Source: information adapted from Hyde County, North Carolina Multi-Hazard Mitigation Plan, September 2002.

Location of Occurrence

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

Table 3-4
Location of Occurrence and Percentage of Town Impacted of Given Natural Hazard

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

Source: information adapted from Hyde County, North Carolina Multi-Hazard Mitigation Plan, September 2002.

Severity of Impacts

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

Table 3-5
Severity of Impacts and Magnitude of Multiple Impacts of Given Natural Hazard

Severity of Impacts	Magnitude of Multiple Impacts
<i>Catastrophic</i>	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.
<i>Critical</i>	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
<i>Limited</i>	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
<i>Minor</i>	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Source: information adapted from Hyde County, North Carolina Multi-Hazard Mitigation Plan, September 2002.

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.

**Table 3-6
Hazard Identification and Analysis Worksheet for South Hadley**

TYPE OF HAZARD	FREQUENCY OF OCCURRENCE	LOCATION OF OCCURRENCE	IMPACT	HAZARD RISK INDEX RATING
100-yr Flooding	Low	Small	Minor	5
Flooding	Moderate	Small	Minor	5
Severe Snowstorms/Ice Storms	High	Large	Limited	3
Severe Thunderstorms /Hurricanes	Low	Large	Minor/Limited	3
Tornadoes / Microbursts	Very Low	Small	Limited	2
Wildfire/Brushfire	Low	Small	Minor	5
Earthquakes	Low	Large	Minor	5
Dam Failures	Low	Medium	Critical	3
Drought	Low	Large	Limited	5
Man-made Hazards: Hazardous Materials	Very Low	Medium	Critical	1

Source: information adapted from Town of Holden Beach North Carolina Community-Based Hazard Mitigation Plan, July 15, 2003 and the Massachusetts Emergency Management Agency (MEMA).

Vulnerability Assessment

The following is a list of natural and manmade disasters, and the areas affected by them, that have or could affect the Town of South Hadley. The Past and Potential Hazards Map at the end of this Plan reflects the contents of this list.

In order to determine estimated losses due to natural and man made hazards in South Hadley, each hazard area was analyzed with results shown below. 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 value of all structures in the Town of South Hadley, including exempt structures such as schools and churches, is \$1,559,228,299 as of 2006. The median value of a home in South Hadley is \$206,500 according to the 2000 U.S. Census. The data below was calculated using FEMA's Understanding Your Risks: Identifying Hazards and Estimating Losses, August 2001. In addition, the Committee completed the Vulnerability Assessment Worksheets which provided more data to estimate the potential losses.

Past and Potential Hazards

Flooding (100-year base flood): Low Risk

In this section, a preliminary vulnerability assessment was prepared to evaluate the potential impact that flooding could have on the portions of South Hadley located within the 100-year floodplain. Flooding was chosen for this evaluation because it is a natural hazard likely to impact the community and the location of the impact can be determined by mapping of areas inundated during severe flooding events. Flooding can be caused by severe storms, such as hurricanes, nor'easters, and microbursts, as well as ice dams and snow melt.

According to the Community Information System (CIS) of FEMA, there are 66 one to four family structures and 34 other structures located within the Special Flood Hazard Area (SFHA) in South Hadley as of May 6, 1999, the most current record in the CIS for the Town of South Hadley utilizing the Town's median home value of \$206,500, a preliminary damage assessment was generated. An average household size of 2.45⁸ persons was used to calculate the number of people living in the floodplain. The total damage estimate for the 66 one to four family structures located within the SFHA in Holland is \$13,629,000 (assumes 100 percent loss), and 162 people affected. The damage estimate is a rough estimate and likely reflects the worst case scenario.

Regular flooding occurs within the 100-year floodplain affecting the certain critical features. The following is a summary of those locations and the critical facilities affected:

River Road

Recent upgrades to the Holyoke Dam involving the replacement of breakaway boards with air bladders has caused higher water levels in the Connecticut River. Unlike the

⁸ figure courtesy of 2000 U.S. Census

breakaway boards which released automatically when water levels and water pressure reached certain levels, the air bladders require manual release. The resultant higher water levels have caused regular flooding of residential yards and basements along River Road.

Route 47 at Bachelor Brook

Reconstruction of this bridge by MassHighway is scheduled to begin in the Spring of 2007.

Flooding: Low Risk

There is also the potential for annual flooding in areas outside of the FEMA mapped flood zone due to topography. The flood hazard areas listed below were identified by the Hazard Mitigation Committee based on knowledge of previous flood incidents.

Pearl Street

Occasional flooding on Pearl Street from back up in the 4' culvert for Bachelor Brook.

Abby Street

The 15" culvert for Buttery Brook occasionally floods onto Abby Street. This culvert is scheduled to be replaced in the Spring 2007.

Lathrop Street

Heavy Fall rains and Winter runoff create back ups in the culvert for Buttery Brook at 218 and 220 Lathrop Street.

Woodbridge Street

Root infested storm drainage pipes create occasional flooding on Woodbridge Street. Pipes are scheduled for replacement in Spring 2007.

Newton Street

The Queensville Dam gate to the culvert under Route 116 is in need of repair.

Silver Street

Occasional flooding in two locations on Silver Street is caused by undersized culverts.

Severe Snowstorms/Ice Storms: Medium Risk

Three types of winter events are heavy snow, ice storms and extreme cold which cause concern. Occasionally heavy snow years will collapse buildings. Since the adoption of the State Building Code in 1975, buildings are constructed to Zone 3 Snow Loading Code. Ice storms have disrupted power and communication services. Timberland has been severely damaged. Extreme cold affects the elderly. South Hadley's recent history has not recorded any loss of life due to the extreme winter weather. These random events are difficult to set a cost to repair or replace any of the structures or utilities affected.

The area has been subject to extremely heavy snow falls as recorded in the early 1900s and into the 1950s and 1960s. Extreme cold plagued the area in 1988 when temperatures remained below zero degrees for a month in November and December.

Hurricanes/Severe Thunderstorms: Medium Risk

South Hadley's location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. The Town has experienced small blocks of downed timber and uprooting of trees onto structures. Hurricanes can and do create flooding. Estimated wind damage 5% of the structures with 10% damage \$7,796,141. Estimated flood damage 10% of the structures with 20% damage \$31,184,566. Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included. The 1938 hurricane was a major event causing wind damage and flooding statewide. Other risks caused by hurricanes and severe thunderstorms include disruption of phone and power service and road washout on evacuation routes.

Tornadoes/ Microbursts: Medium-High Risk

Risk of tornadoes is considered to be high in Hampshire County even though tornadoes rarely occur in this part of the country. Assessing damages is difficult and can be significant when they do occur. Since the adoption of the State Building Code in 1975, buildings are constructed to Zone 1 Design Wind Speed Code. Estimated damages to 10% of structures with 20% damages \$31,184,566. Estimated cost does not include building contents, land values or damages to utilities.

There have not been any tornadoes recorded in the Town of South Hadley, however there have been nine incidents of tornado activity (F3 or less) in Hampshire County between 1954 and 2006. River corridors and hilltops are the most susceptible.

Hurricanes / Severe Thunderstorms: Medium Risk

South Hadley's location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. The Town has experienced small blocks of downed timber and uprooting of trees onto structures. Hurricanes can and do create flooding. Estimated wind damage 5% of the structures with 10% damage \$7,796,141. Estimated flood damage 10% of the structures with 20% damage \$31,184,566. Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included. The 1938 hurricane was a major event causing wind damage and flooding statewide. Other risks caused by hurricanes and severe thunderstorms include disruption of phone and power service and road washout on evacuation routes.

Wildfires/Brush Fires: Low Risk

As timber harvesting is reduced, wood roads close, debris builds up on the ground, potential for wildfire increases town-wide. The town has adequate fire fighting equipment for wildfires and works closely with the Massachusetts Department of Conservation and Recreation to manage forest fires on state-owned land as occurred during the eleven day fire on Mt. Tom in 2003. South Hadley also participates in the Massachusetts Mobilization Plan, a statewide mutual aid program for sharing equipment and other resources during times of need.

Earthquakes: Low Risk

Moderate potential for serious damage in village portion of town and along Connecticut River shoreline. Structures are mostly of wood frame construction estimated loss 20% of town assessed structural valuation \$311,845,660. Costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures are not included. New construction since adoption of the State Building Code in 1975 does adhere to seismic design codes.

Dam Failures: Medium Risk

The Massachusetts Emergency Management Agency (MEMA) identifies thirteen dams in South Hadley. Six of these are High Hazard Dams, one is Significant/Medium Hazard and six are Low Hazard. High hazard dams are 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 are located where failure or improper operation may cause minimal property damage. Of South Hadley's high hazard dams, failure of the Holyoke Dam, would result in the most significant loss of life

Drought: Low Risk

South Hadley has had limited experience with severe drought conditions. Drought will increase the risk of wildfire, especially in areas of high recreational use. In Massachusetts, six major droughts have occurred statewide since 1930⁹.

Man-Made Hazards - Hazardous Materials: High Risk

South Hadley relies on the support of Fire Districts #1 and #2 for responding to incidents involving hazardous materials. Public transportation of chemicals and bio-hazardous materials by vehicle transport along Routes 47 and 116 are a concern. There are five sites in the Town of South Hadley identified by the U.S. EPA as Tier II Hazardous Material sites located on Canal Street, New Ludlow Road, and Gaylord Street.

(Past and Potential Hazards Map Located In Back of Plan)

⁹ U.S. Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., U.S. Geological Survey.

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

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 South Hadley has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. South Hadley'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 South Hadley. 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 Map at the end of this Plan identifies these facilities.

Category 1 – Emergency Response Services

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

South Hadley District 1 Fire Department, 144 Newton Street
South Hadley District 2 Fire Department, 20 Woodbridge Street

2. Fire Station

South Hadley District 1 Fire Department, 144 Newton Street
South Hadley District 2 Fire Department, 20 Woodbridge Street

3. Police Station

South Hadley Police Department, 41 Bridge Street

4. Highway Garage

Department of Public Works, 10 Industrial Drive

5. Water Department

District #1, 338 Granby Road

District #2, 20 Woodbridge Street

6. Emergency Fuel Stations

South Hadley Electric Light Department, diesel and gas for Districts #1 and #2 Fire Departments

Department of Public Works, 1,000 gallons diesel tank

Haydocy Gas Station, Carb Street (Police, Ambulance and DPW)

Marion Excavating, 500 New Ludlow Road

Jacques Construction, diesel and gas

7. Emergency Electrical Power Facility

Department of Public Works has one 75 kw generator, two portable generators

South Hadley Police Department has two generators

South Hadley High School has a back-up generator

South Hadley Middle School has a back up generator

Fire Districts #1 and #2 have back up generators

Mount Holyoke College has buildings with back up generators

8. Emergency Shelters (Not Red Cross Approved)

Mosier Elementary School – 101 Mosier Street

Michael E. Smith Middle School, 100 Mosier Street

South Hadley high School, 153 Newton Street

Mount Holyoke College, 50 College Street

9. Dry Hydrants - Fire Ponds - Water Sources

Any where water is accessible

Lythia Springs

10. Transfer Station

South Hadley Transfer Station – Industrial Drive

11. Utilities

Mount Holyoke Substation

South Hadley Electric Light Department Substation – Pine Street

Natural Gas Vault for Baystate Gas – New Ludlow Road

12. Helicopter Landing Sites

Recreation Field behind Kendall Hall – Mount Holyoke Campus

South Hadley High School Recreational Field

Pioneer Valley Performing Arts School

13. Communications

Cell Towers:

- Amherst Road Cell Tower
- Five Cell Carriers on Mulligan Drive Water Tank
- Three Cell Carriers on Industrial Drive Water Tank
- Two Cell Carriers on Skinner Lane Water Tank

Telephone Cross Boxes:

- Woodbridge Street at Silverwood Terrace
- West Summit Street
- Morgan Street at College Street
- Main Street at Pump Station
- Alvord Street Extension

14. Primary Evacuation Routes

- Routes 47, 116, 202
- River Road
- Cove Island Road

15. Bridges Located on Evacuation Routes

- Bachelor Brook Bridge, Route 47
- Bachelor Brook Bridge, Route 116
- Veterans Memorial Bridge, Rte 116
- Stony Brook Bridge, Route 116
- Muller Bridge, Route 202

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 South Hadley.

1. Water Supply

- District #1 – Quabbin Trunk
- District #2 – Sullivan Line
- Park Street Tank
- Mulligan Drive Water Tank
- Industrial Drive Water Tank
- Skinner Lane Water Tank

2. Sewer Infrastructure (Pump Stations)

- Main Street
- Stony Brook, Dove hill
- Morgan Street
- Toper Station (Sycamore Park)

3. Problem Culverts

Pearl Street
Abby Street
Route 47
Lathrop Street (218–220)
Woodbridge Street
Route 116/College Street

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

Camp Perkins (Girl Scout Camp), Woodbridge Avenue
South Hadley Public and Private Schools, as displayed on Critical Infrastructure Map
Mount Holyoke College
Berkshire Music Academy
Girls School, Canal Street
Pioneer Valley Christian School, Ferry Street
200+ daycare facility at Mt. Holyoke Student Center, Old Lyman Road and Willamansett Street

Elderly:

Windgate, Granby Road
Loomis Village, North Main
Newton Mannor, Newton Street
Lathrop Mannor, Lathrop Street
Canal Street and West Summit Street – Under Construction

2. Elderly Housing/Assisted Living

Windgate, Granby Road
Loomis Village, North Main
Newton Mannor, Newton Street
Lathrop Mannor, Lathrop Street
Canal Street and West Summit Street – Under Construction

3. Recreation Areas

Ledges Golf Course, Mulligan Drive
Orchards Golf Course, Silverwood Terrace
Brunelles Marina, Alvord Street
Red Cliff Canoe Club, Canal Street
Western Massachusetts Yacht Club, Cape Island
Passive Access, West Summit Street and Canal Street
Mount Holyoke Boat House, Ferry Street (design stages)

Beach Grounds, Main Street
Riverside Park, Main Street (design stages)
Buttery Brook Park, Willamansett Street
McCray's Farm, Alvord Street

4. Schools

Christian Academy, Ferry Street
Gorsee Child Study Center, Morgan Street
Michael E. Smith Middle School, Mosier Street
Mosier Elementary, Mosier Street
Mount Holyoke College, College Street
Plains Elementary, Granby Road
South Hadley High, Newton Street
Stoneybrook Children's Center, Morgan Street
The Canal Village School, Carew Street
Wee Friends Preschool, North Main Street

5. Churches

Second Baptist Church
St. Peter's Lutheran Church
Our Savior Lutheran Church
United Methodist Church
United Church of Christ Holyoke
Church of Christ Congregational
Center Church
First Presbyterian Church
Immaculate Heart of Mary
St. Theresa Church
St. Patrick Church
All Saints Episcopal Church
Falls Congregational Church

6. Historic Buildings/Sites

South Hadley Canal Historic District
The Sycamores – 28 Woodbridge Street
Woodbridge Street Historic District – 3, 7 Silver Street and 25-82 Woodbridge Street

7. Apartment Complexes

Park View Apartments, Main Street
Buttery Brook Apartments, Bridge Street
Hadley Village Condominiums, Granby Road
Hillcrest Park, Lakeview Drive
Village Green Apartments, Hadley Street
Riverview Condominiums, Summit Street
Kenlee Gardens, Summit Street
Pine Grove Condominiums, Granby Road

Shadow Brook Condominiums, Willimansett Street
The Mill, College Street
Alvord Place, Alvord Street
Riverboat Village, River Lodge Road

8. Employment Centers

Intellicoat Technology, 28 Gaylord Street
Mount Holyoke College
Village Commons
Raymond Center – Rte 202

9. Camps

Camp Perkins (Girl Scouts)
Mount Holyoke College Summer Programs

10. Mobile Home Parks

None

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year Flood)	100-year floodplain along Connecticut River shoreline, Bachelor Brook, and Stony Brook	- South Hadley Police Station - South Hadley Electric and Light Department - Town Hall - Main Street Pump Station - Stony Brook / Dove Hill Pump Station - Bachelor Brook/Route 47 Bridge	None None None None None None Route 47
Flooding	Abby Street	None	None
	Lathrop Street	None	None
	Newton Street	None	Route 116
	Pearl Lane	None	None
	Silver Street	None	None
	Woodbridge Street	None	None
Hazardous Materials (EPA Tier II Sites)	75 Canal Street	None	None
	28 Gaylord Street	None	None
	Mount Holyoke College	None	None
	755 New Ludlow Road	None	None

	775 New Ludlow Road	None	None
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(Past and Potential Hazards / Critical Facilities Map Located In Back of Plan)

5 – CURRENT MITIGATION STRATEGIES

Flooding

The Critical Facilities, Infrastructure, 1999 Land Use & Natural Hazards Map for the Town of South Hadley shows the 100-year flood zone 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. The 100-year flood zone covers mostly narrow bands of level floodplain land along the Bachelor Brook, Stony Brook, the Connecticut River, and the area of town that includes South Hadley's Town Hall and Police Station [detailed below]. In several areas, the flood zone widens out to encompass farmland, some residential land and industrial lands.

- (1) Bachelor Brook—Pearl Street south along Route 47, Moody Corner to the Connecticut River, Pearl Street to the South Hadley Town Line;
- (2) Stony Brook—Town Line to Granby Road continuing on to the Mount Holyoke Campus Ponds continuing on to Route 116 and draining into the Connecticut River between Penny and Alvord Streets;
- (3) Connecticut River—Smith's Ferry area, the majority of the Town's western boundary, most especially within the White Brook Area;
- (4) South Hadley's Town Center is located within the Connecticut River's 100 year flood plain, which places the Town Police Station and the Town Hall in a flood-prone area

The major floods recorded in South Hadley during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. One of the goals of this Natural Hazards Mitigation Plan is to evaluate all of the town's existing policies and practices related to natural hazards and identify potential gaps in protection.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for South Hadley lists the following generic mitigation measures for flood planning:

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Community leaders should ensure that South Hadley is enrolled in the National Flood Insurance Program.
- Strict adherence should be paid to land use and building codes, (e.g. Wetlands Protection Act), and new construction should not be built in flood prone areas.

- Ensure that flood control works are in good operating condition at all times.
- Natural water storage areas should be preserved.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

The Comprehensive Emergency Management (CEM) Plan for South Hadley lists the following generic preparedness and response measures for floods:

- Place EOC personnel on standby during stage of flood ‘watch’ and monitor NWS/New England River Forecast Center reports.
- Ensure that public warning systems are working properly and broadcast any information that is needed at this time.
- Review mutual aid agreements.
- Monitor levels of local bodies of water.
- Arrange for all evacuation and sheltering procedures to be ready for activation when needed.
- Carry out, or assist in carrying out needed flood-proofing measures such as sand bag placement, etc.
- Regulate operation of flood control works such as floodgates.
- Notify all Emergency Management related groups that will assist with flood response activities to be ready in case flood ‘warning’.
- Broadcast warning/notification of flood emergency.
- Coordinate traffic control and proceed with evacuation of affected populations as appropriate.
- Open and staff shelters and reception centers.
- Undertake, or continue to carry out, flood proofing measures.
- Dispatch search and rescue teams.
- Dispatch emergency medical teams

Evacuation Options

The land subject to the 100-year floodplain in town, which is located along Bachelor Brook, Stoney Brook, and the Connecticut River, represents a varied terrain. The Connecticut River's floodplain covers both farm fields and the South Hadley Falls section of Town. Bachelor brook's floodplain includes wetlands and forests down in the Connecticut's floodplain, but some residential development can be found at the brook's headwaters. Stony Brook's floodplains include mixed wood stands and residential lots.

In addition, South Hadley has nine bridges (five on primary evacuation routes) situated either in or near the 100-year floodplain, which could make evacuation efforts as a result of dam failure more difficult. Some of the roads that residents would most likely take to reach safety travel through flood-affected areas.

Flood Control Structures

MEMA has identified 13 dams in South Hadley.

Land Use Regulations that Mitigate Impacts from Flooding¹⁰

The Town of South Hadley has adopted several land use regulations that serve to limit or regulate development in floodplains, to manage stormwater runoff, and to protect groundwater and wetland resources, the latter of which often provide important flood storage capacity. These regulations are summarized below and their effectiveness evaluated in Table 4-1.

Subdivision Rules and Regulations

South Hadley's Subdivision Rules and Regulations which govern the subdivision of land were adopted for the purpose of "protecting the safety, convenience and welfare of the inhabitants of South Hadley by regulating the laying out and construction of ways in subdivisions providing access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions in subdivisions and in proper cases parks and open areas." The Subdivision Rules and Regulations contain several provisions that mitigate the potential for, and impact of, flooding, including:

Section 5.03 [Definitive Plan] Contents [in part]

The Definitive Plan shall contain the following information:

9. Significant site features such as existing stone walls, fences, buildings, wetlands, flood plains, large trees and rock outcroppings.

Form WPC-P-1 Development Impact Statement [in part]

¹⁰ All bulleted items and direct quotes in the South Hadley Local Natural Hazards Mitigation Plan are taken from the Town of South Hadley's zoning bylaw and subdivision regulations. Other references to those documents contained herein are paraphrases of the same.

A Development Impact Statement (DIS) is a documented, written analysis of a proposed development which provides the Planning Board and Town Officials with information necessary for plan review. It is a developer's responsibility to prepare and document the DIS in sufficient detail to permit an adequate evaluation by the Planning Board; however, additional data may be requested in writing by the Board. It is necessary to respond to all sections of the DIS form except when a written exemption is granted by the Planning Board. The applicant is urged to contact the Office of the Town Planner in the process of completing a Development Impact Statement.

III. SUPPORT SYSTEMS.

2. Private - Discuss the types of wells proposed for the project, means for providing fire supply, and any special problems which might arise.

b. Sewage Disposal

1. Public - Discuss the project's sewage disposal system, including projected flow, size of pumping stations including auxiliary power, and any special problems such as check valves, etc. which must be dealt with, and the effects on the waste water treatment facility.

c. Storm Drainage - Discuss the storm drainage system including the projected flow from 10 year and a 100 year storm, name of the receptor stream, and any flow constriction between the site and the receptor stream.

f. Fire Protection - Discuss the type and capacity of fuel storage facilities, location of storage areas for hazardous substances, special requirements, and distance to fire station.

IV. NATURAL CONDITIONS - Describe briefly the following natural conditions:

a. Topography - Indicate datum, source, date, slopes greater than 25%

d. Surficial geology

i. Flood prone areas

f. Aquifer recharge areas

k. Unique wildlife habitats

g. Wetlands

l. Unique flora

h. Watercourses

VI. ENVIRONMENTAL IMPACT

c. Measures taken to maximize ground water recharge

e. Measures taken to prevent erosion and sedimentation

VII. PLANS - Describe how the project relates to the following guidelines.

a. Master Plan

b. Open Space Plan

c. Regional plans prepared by the Lower Pioneer Valley Regional Planning Commission

8.09 Utilities

1. General Standards

The installation of utilities and underground structures shall conform to the following general standards:

a. All public and private sewers, surface water drains, water and gas pipes, electric, telephone and cable T.V. lines, together with their appropriate underground structures, within the street right-of-way, shall be placed underground.

i. Private, on-site water supply wells shall be located a minimum of one hundred (100) feet from a leaching field, seepage pit or cesspool; ten (10) feet from a sewer line; and fifty (50) feet from a septic tank.

2. Drainage System

a. The storm drainage system shall be so designed to intercept storm water runoff from the entire portion of the drainage basin that drains to or across the proposed subdivision, and provisions shall be made for proper and adequate storm lines, structures, and channels to accommodate up stream properties as well as affording protection from flooding and erosion to adjacent and down stream properties.

b. In determining quantities of storm water for system design, the rational method should be used, unless another method is shown to be more appropriate in specific cases, but in, any event, the system should be designed for a minimum of twenty-five (25) year storm frequency.

c. Discharge of storm water shall be either into an existing, adequate storm system or the nearest natural water course. Where necessary, the developer shall obtain and convey to the Town drainage easements on adjacent properties, and be responsible for installation of pipe and structures or channels at his expense.

- d. Storm water shall not be permitted to cross over the roadway on the surface, and must be piped underneath the roadway.
- f. Catchbasins shall be located on both sides of the roadway at intervals of not more than three hundred (300) feet on continuous grades, and at low points and sags in the roadway and near the corners of the roadway at intersecting streets.
- g. Maximum distance for surface runoff to flow upon the road surfaces shall be three-hundred (300) feet.
- i. Where storm water discharges into an open stream or channel, provisions shall be made for proper stabilization of the stream channel.
- j. As construction progresses, unforeseen groundwater conditions may be encountered which require additional subdrains, curtain drains and/or footing drains. These conditions include potential problems if construction is in progress at a time of low water table or other dry conditions. The Board, acting on the advice of the Department of Public Works, reserves the right to require appropriate systems, including stubs, to accommodate the problems.
- l. Through every phase of construction no surface run-off will drain onto the abutting public way or abutting private property.

3. Sanitary Sewer System

- a. Wherever, in the opinion of the Planning Board, the public sewerage system is reasonably accessible and where connection to it is feasible, the applicant shall properly connect all lots in the subdivision to the public sewerage system.

4. Water Systems

- a. Where available and feasible, all lots in a subdivision shall connect to the appropriate water service system: Water Department, Fire District Nos. 1 and 2.

5. Electrical, Telephone and other Wires

- a. All electrical, telephone, fire alarm, cable T.V. and other wires and cables shall be installed underground, unless in the opinion of the Planning Board and the appropriate utility company, such installation is impractical or not in the best interest of the Town. Installation of the underground electrical distribution system shall be in accordance with the specifications and regulations of the South Hadley Electric Light Department.

Section 7.02 Easements [in part]

2. Where a subdivision is traversed by a water course, drainage way, channel or stream, the Planning Board may require that there be provided a storm water easement or drainage right-of-way of adequate width to conform substantially to the lines of such water course, drainage way, channel or stream, and to provide for construction or other necessary purposes.

5.04 Additional Subdivision Requirements

3. Wetlands Protection Act

In accordance with Chapter 131, Section 40 of the General Laws, no person shall remove, fill, dredge or alter any bank, beach, dune, flat, marsh, meadow or swamp bordering on any existing creek, river, stream, pond, lake or any land under said waters or subject to flooding without filing written notice of intention to perform said work with the local Conservation Commission and State Departments of Natural Resources and Public Works. In order to determine if certain proposed subdivisions, or parts thereof, are subject to the provisions of the Wetlands Protection Act, the Planning Board will, where it deems necessary, submit a copy of the Definitive Plan or Plan for More Than One Building for Dwelling Purposes Per Lot to the Conservation Commission. The Conservation Commission shall, to the extent practicable, file a report with the Planning Board not later than forty-five (45) days after receipt of the plan stating that the proposed plan:

- 1) is not subject to the provisions of the Wetlands Protection Act, or
- 2) the Wetlands Protection Act applies to certain designated areas. In the event the Conservation Commission indicates that the plan shall be governed by said Act, the Planning Board shall include in its decision for approval, a condition that the applicant shall obtain approval from the Conservation Commission prior to any construction activity in the affected areas.

7.03 Open Spaces and Protection of Natural Features

Before approval of a plan, the Planning Board may also, in proper cases, require the plan to show a park or parks suitably located for playground or recreation purposes or for providing light and air. The park or parks shall not be unreasonable in area in relation to the land being subdivided and to the prospective uses of such land. The Planning Board may by appropriate endorsement on the plan require that no building be erected upon such park or parks for a period of not more than three (3) years without its approval. Due regard shall be shown for all natural features such as large trees, water courses, scenic points, historic spots and similar community assets, which if preserved, will add to the attractiveness and value of the subdivision and the Town.

7.04 Compliance with Zoning By-Law

No plan of a subdivision shall be approved unless all of the lots shown on the plan comply with the Zoning By-law [note, this includes all floodplain regulations].

South Hadley Zoning Bylaws

The Town of South Hadley has established a set of bylaws designed in part to promote “the health, safety, convenience, amenity and general welfare of the inhabitants of the Town of South Hadley, through encouraging the most appropriate use of land, as authorized by Chapter 40A of the General Laws, Sections 1 to 17 inclusive. In pursuit of this purpose, the objectives of this By-Law include the following: to lessen congestion in the streets; to conserve health; to secure safety from fire, flood, panic and other dangers; to provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population; to facilitate the adequate provision of transportation, water supply, drainage, sewerage, schools, parks, open space and other public requirements; to conserve the value of land and buildings, including the conservation of natural resources and the prevention of blight and pollution of the environment; to encourage the most appropriate use of land throughout the Town by considering the recommendations of the master plan; and to preserve and increase amenities by the promulgation of regulations to fulfill said objectives.” The Zoning By-Laws include several provisions that mitigate the potential for flooding, including:

Section 12 Site Plan Review

The purpose of site plan review is to ensure that new development is designed in a manner which reasonably protects visual and environmental qualities and property values of the Town, to assure adequate drainage of surface water, and safe vehicular access, and is consistent with the Zoning By-Laws and Building Regulations.

B. Projects Requiring Site Plan Review

1. the construction or exterior expansion of commercial structures;
2. the construction or exterior expansion of industrial structures;
3. any other use specified in Section 5(D), Schedule of Use Regulations, which indicates Site Plan Review is required unless the use is locating in an existing structure and no additions to the structure is to be undertaken and the Town Planner determines no additional parking will be required to conform to the Parking Requirements outlined in Section 8 of the Zoning By-Law. No special permit or building permit shall be applied for or issued for any of the above uses unless a site plan has been endorsed by the Planning Board, after consultation with other boards, including but not limited to the following: Building Commissioner, Board of Health, Electric Light Department, Water Department,

Conservation Commission, DPW Superintendent, Fire Department, Tree Warden and Police Department.

E. Site Plan Review Criteria

The Planning Board shall review the site plan and supporting data taking into consideration the reasonable fulfillment of the following objectives:

1. Integrates the development into the existing terrain and surrounding landscape.
3. Provides for building sites, which to the extent feasible,
 - (a) minimize use of wetlands, steep slopes, floodplains, hilltops;
 - (d) minimize tree, vegetation and soil removal and grade changes;
 - (e) maximize open space retention; and
6. Provides for adequate water supply and waste disposal systems. For structures to be served by on-site waste disposal systems, the applicant shall submit a system design prepared by a Commonwealth of Massachusetts licensed sanitary engineer and approved by the Board of Health.
7. Provides for adequate measures to prevent pollution of surface or ground water, to minimize erosion and sedimentation, and to prevent changes in ground water levels, increased run-off and potential for flooding.
8. Mitigates adverse impacts on the town's services and infrastructure.
9. Requires that electric, telephone, cable tv, and other utilities be underground where physically and environmentally feasible.

L. Flood Plain Regulations

1. Purposes. These flood plain regulations are intended to provide standards for the use of those lands deemed subject to seasonal or periodic flooding, and are enacted for the following purposes:
 - a. To eliminate potential dangers to the health and safety of occupants of said lands, or of the public generally;
 - b. To prevent loss and damage to property, and relieve the burden from the public of costs resulting from the unwise use of said lands;. and
 - c. To retain the natural storage capacity of the water-shed, and assure the continuation of the natural flow pattern of water courses within the Town, in

order to avoid encroachment on the floodplain which would increase the extent and severity of flooding up- and downstream.

2. Flood Plain District. [Establishment of District]

The Flood Plain District is herein established as an overlay district. The Flood Plain District includes all special flood hazard areas designated as Zone A, A1-30 on the South Hadley Flood Insurance Rate Maps (FIRM), and all areas within the limits of the 100 year flood boundary indicated on the Flood Boundary and Floodway map, said maps dated August 15, 1979 having been prepared by the U.S. Dept. of Housing and Urban Development (HUD) and having been placed on file with the Town Clerk, Planning Board and Building Commissioner. These maps as well as the accompanying South Hadley Flood Insurance Study are incorporated herein by reference. The above-described Flood Plain District is hereinafter also referred to as the flood plain. The floodway is hereby defined to include: (1) the area shown as within the floodway on the above-referenced maps, and (2) the area within the flood plain which lies ten (10) feet or more below the elevation of the flood plain limits. The boundaries of the floodway shall be determined by the limits of the more extensive of the aforesaid areas. Within Zone A, where the base flood elevation is not provided on the FIRM, the applicant for any building permit shall obtain any existing base flood elevation data and it shall be reviewed by the Building Commissioner for its reasonable utilization toward meeting the elevation or floodproofing requirements, as appropriate, of this Section and of the State Building Code.

3. Permitted Uses. [Regulations]

Within the flood plain but outside of the floodway, all uses as permitted in the applicable zoning district are allowed, provided that the lowest floor, including basement or cellar, of any building or structure is constructed at an elevation of at least one (1) foot above the elevation of the flood plain limits as defined in the above-referenced maps. Within the floodway, only uses not involving a building, such as farming, forest management, nurseries, conservation areas, parks, playgrounds, boat landing ramps, public utility wires and pipe lines, and vehicular parking areas are permitted. Open storage of materials or equipment subject to flotation or washing away, such as lumber storage, is not a permitted use nor is the storage of inflammable liquids such as petroleum. The addition or filling of soils, gravel, rocks, waste materials or other substances to raise the elevation or contours of land in the floodway is prohibited.

4. Exceptions.

The Planning Board, acting as the special permit granting authority, may grant a special permit for the construction of non- residential structures or buildings in the flood plain but not in the floodway, provided that the following conditions are satisfied:

a. The building or structure is a permitted use in the applicable zoning district; and

b. Such building or structure shall be designed and constructed to meet the structural design requirements for flood proofing as specified in Section 748.2 of the Massachusetts State Building Code, as amended, up to an elevation not less than two (2) feet above the elevation of the flood plain limits. Working plans and specifications bearing the seal of a registered architect or engineer shall be submitted to the Planning Board and the Building Commissioner to verify that the proposed construction will withstand flood conditions as set forth in said State Building Code. The Planning Board may attach conditions to such special permit to protect the health and safety of the occupants of the premises, to prevent loss and damage to the property, and to insure that construction and improvements on the land will not result in flood channel impoundments creating hazardous conditions for those properties upstream from that of the applicant.

7. Compliance with Other Regulations. [Additional Protection]

All development and use of land in the Flood Plain District, including structural and non-structural activities, whether permitted by right, Special Permit or Site Plan Review (noted as Y, SP, SPR respectively in Subsection 5(D) of the Zoning By-Law) must be in compliance with Chapter 131, Section 40 of the Massachusetts General Laws and with other state and local regulations including but not limited to, the following:

a. Applicable section(s) of the Massachusetts State Building Code which addresses floodplain and coastal high hazard areas;

b. Department of Environmental Protection (DEP) regulations regarding:

- Wetlands Protection

- Inland Wetlands Protection

- Subsurface Disposal of Sanitary Sewage

Variations granted by the Town of South Hadley under Chapter 40A, MGL or the Town's Zoning By-Law do not convey a grant of a variance from State Regulations. Accordingly, any variations from the provisions and requirements of the State Regulations referenced in paragraphs 7a or 7b above may only be granted in accordance with the required variance procedures of the applicable State regulations.

[Impact on Subdivision Regulations]

b. All Preliminary and Definitive Subdivision Plan and Site Plan proposals must be designed, and are to be reviewed, to assure that:

- 1.) development and use proposals minimize flood damage; and
- 2.) all public utilities and facilities are located and constructed to minimize or eliminate flood damage; and,
- 3.) adequate drainage is provided to reduce exposures to flood hazards.

N. Water Supply Protection District [in part, filtered according to impact on water flow and pervious surfaces]:

1. Purpose: To promote the health, safety and welfare of the community by protecting and preserving the surface and groundwater resources of the Town and the region from any use of land or buildings which may reduce the quality and quantity of its water resources.

3. District Delineation.

The Water Supply Protection District is herein established to include all lands within the Town of South Hadley, lying within the primary and secondary recharge areas of groundwater aquifers and watershed areas of reservoirs which now or may in the future provide public water supply. The map entitled "South Hadley Water Protection Area" on file with the Town Clerk, delineates the boundaries of the district. Where the bounds delineated are in doubt or in dispute, the burden of proof shall be upon the owner(s) of the land in question to show where they should properly be located.

4. [The following uses are permitted in this district, provided there are no conflicts with sections 7N5-7N8]:

- a. Single family residences, provided that where not serviced by public sewer, lot size shall be 10,000 square feet of lot area per bedroom or 40,000 square feet, whichever is greater. For cluster development, minimum lot size may be calculated on a net density for an entire development, which includes individual lots and common open space of varying size. Where serviced by public sewerage, minimum residential lot size shall comply with the residential requirement of the underlying district.
- b. Residential accessory uses, including garages, driveways, private roads, utility rights of way, and on-site wastewater disposal systems.
- c. Agricultural uses such as farming, grazing and horticulture.

- d. Forestry and nursery uses.
- e. Outdoor recreational uses, including fishing, boating and play areas.
- f. Conservation of water, plants and wildlife.
- g. Wildlife management areas.
- h. Excavation for earth removal, provided that the requirements of Section 7N6 and 8E are met, and an earth removal permit is granted by the Building Commissioner.
- i. Wireless Communications Facilities when approved pursuant to Section 5(D) and Section 7(S) subject to the conditions of the Planning Board as set forth in the Special Permit decision.

6. Restricted Uses

The following uses are restricted within the Water Supply Protection District:

- a. Excavation for removal of earth, loam, sand, gravel and other soils or mineral substances shall not extend closer than five (5) feet above the historical high groundwater table (as determined from on-site monitoring wells and historical water table fluctuation data compiled by the United States Geological survey, whichever is higher. A monitoring well shall be installed by the property owner to verify groundwater elevations. This section shall not apply to excavations incidental to permitted uses, including but not limited to providing for the installation or maintenance of structural foundations, freshwater ponds, utility conduits or on-site sewage disposal.

2. Upon completion of earth removal operations, all altered areas shall be restored with topsoil and vegetative plantings. All fine materials, such as clays and silts, removed as part of the earth removal operation and leftover as by-products, shall be disposed of off-site to prevent damage to aquifer recharge characteristics.

7. Drainage

For commercial and industrial uses, to the extent feasible, run-off from impervious surfaces shall be recharged on the site by being diverted toward areas covered with vegetation for surface infiltration. Such run-off shall not be discharged directly to rivers, streams or other surface water bodies. Dry wells shall be used only where other methods are infeasible, and shall be preceded by oil, grease and sediment traps to facilitate removal of contamination.

8. Special Permit Uses

- a. Uses Allowed by Special Permit

1. Commercial, industrial, governmental or educational uses which are allowed in the underlying district, and which are not prohibited in Section 7-N-5.
2. Any enlargement, intensification, change of use or alteration of an existing commercial or industrial use;
3. The rendering impervious of more than 15%, or 2,500 square feet of any lot, provided that a system for artificial recharge of precipitation to groundwater is developed, which shall not result in degradation of groundwater. (See (7) above).

[Special Permit Granting Authority and Site Engineering]

1. The Special Permit Granting Authority shall follow all special permit procedures contained in Section 9 of this By-Law. In addition the Special Permit Granting Authority shall distribute copies of all application materials to the Board of Health, the Conservation Commission and the Water Commissioners, each of which shall review the application, and following a vote, shall submit recommendations and comments to the Special Permit Granting Authority. Failure of boards to make recommendations within 35 days of distribution of the applications shall be deemed to be lack of opposition.

3. In no way, during construction or thereafter, adversely affect the existing or potential quality or quantity of water that is available in the Water Supply Protection District, and;

4. Be designed to avoid substantial disturbance of the soils, topography, drainage, vegetation and other water-related natural characteristics of the site to be developed.

J. Flexible Development [in pertinent part]

Purpose.

b. Preservation of natural open space for its scenic qualities and for its agricultural, environmental, forestry, and recreational uses.

c. Protection and enhancement of property values.

d. Housing located sensitive to a site's environmental assets and constraints.

4. Design Process. Flexible Development is a unique approach in that it permits wide flexibility in defining the dimensional standards and density allowed for the residential development with a focus on open space and cultural space preservation. The design process outlined below is essential to achieving the purposes of the Flexible Development provisions of the Zoning By-Law.

Accordingly, each development plan shall be based on following the multi-step design process outlined below.

c. Designation of preservation areas. The third step is to identify the common open space and cultural areas of the site to be preserved or enhanced. These areas should include the most important and unique resources and scenic view elements. To the extent appropriate, areas that serve to extend neighborhood and community open space networks should be included in these areas.

d. Delineation of development features. The fourth step is to delineate the locations/areas to be used for the development features, including, but not limited to, building sites, streets, parking areas; paths, utility infrastructure corridors, and drainage basins. This process should reflect an integrated community which is compatible with surrounding and historical development patterns.

5. Procedures. c. Supplemental Contents. In addition to the requirements specified in Section 9 and Appendix E of the Zoning By-Law, applications for a Flexible Development must include the following information:

i. Boundaries of areas subject to regulation by the South Hadley Conservation Commission.

9. [Density Bonuses and Required Open Space]:

a. Additional open space. For each additional ten percent of the site (over and above the required 30 percent) set aside as common open space, a density bonus of one additional unit may be awarded; provided that this density bonus shall not exceed 50 % of the base number of dwelling units. Vegetated areas required as buffer areas between the subject development and adjoining properties or roadways shall not qualify for this additional open space density bonus.

10. Site Design Standards

d. Water Supply Protection District.

The Planning Board may grant a Special Permit to allow a Flexible Development in the Water Supply Protection District where the following conditions are satisfied.

South Hadley's Open Space and Recreation Plan

South Hadley's Open Space and Recreation Plan has expired and needs to be updated if the Town is to qualify for any available self-help grants that the state might offer in the future. When complete, this plan will contain information on open space parcels, farmland, forests, wetlands and bodies of water that are high priorities for the town to

preserve. Developing a plan for preserving these areas will give the Town a strategy for protecting those lands in town that act as “sponges” when the town’s water bodies flood.

National Flood Insurance Program

The Town of South Hadley participates in the National Flood Insurance Program. As of 2006, there were 62 policies in effect in South Hadley for a total of \$8,342,600 worth of insurance. The town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps that a town has taken to control flood losses.

The Community Rating System reduces flood insurance premiums to reflect what a community does above and beyond the National Flood Insurance Program’s (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for what they are doing, as well as to provide an incentive for new flood protection activities. To participate in the CRS, a community must fill out an application and submit documentation that shows what it is doing and that its activities deserve at least 500 points. More information including instructions and applications is available at <http://training.fema.gov/EMIWeb/CRS/m3s1main.htm>

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

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Flood Control Structures	Thirteen (13) dams	Flood inundation zones below dams	Very effective for preventing flooding downstream	Ensure dam owners realize their responsibility to inspect the dams.
Subdivision Rules and Regulations	<p>Requires a Definitive Plan for new subdivisions, including location of all wetlands, flood plains and proposed storm drainage.</p> <p>Requires a Development Impact Statement (DIS) detailing the impacts of the subdivision on surface water and subsurface conditions.</p> <p>Requires compliance with Zoning Bylaw including Floodplain Regulations.</p>	<p>All subdivisions</p> <p>All subdivisions</p> <p>All subdivisions</p>	<p>Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.</p> <p>Somewhat effective for controlling impacts from stormwater runoff.</p> <p>Somewhat effective at protection against flooding.</p>	<p>None</p> <p>DIS should identify impacts of the development on the potential for flooding, and include mitigation measures, if deemed necessary by the Planning Board.</p> <p>None</p>

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Zoning Bylaws				
Water Supply Protection District	Provisions to control soil erosion.	Aquifer recharge areas	Very effective for preventing groundwater contamination and for controlling stormwater runoff.	None
Site Plan Review	Site Plan Review requires measures to reduce runoff and potential for flooding.	Commercial, industrial and other specified projects	Effective at controlling stormwater	None
Flood Plain Regulations	Areas delineated as part of the 100-year flood plain are protected by strict use regulations.	100-year flood plain	Very effective for preventing incompatible development within the floodplain.	None.
Flexible Development	Flexibility in defining dimensional standards and density for residential developments.	Entire town	Effective at protecting important open space that encourages onsite storage of stormwater and	None.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
			recharge.	
Open Space and Recreation Plan	Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, aquifer recharge areas, farms and open space, rivers, streams and brooks.	Entire town.	Effective in identifying sensitive resource areas, including floodplains. Encourages forestland and farmland protection, which will help conserve the town's flood storage capacity.	None.
Participation in the National Flood Insurance Program	As of 2006, there were 62 policies.	Areas identified by the FEMA maps.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	The town should evaluate whether to join FEMA's Community Rating System.

Severe Snowstorms/Ice Storms

Winter storms can be especially challenging for emergency management personnel even though the storm has usually been forecast. 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.¹¹

Management Plans

The CEM Plan for South Hadley lists the following generic mitigation measures for severe winter storms:

- Develop and disseminate emergency public information concerning winter storms, especially material which instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.
- As it is almost guaranteed that winter storms will occur annually in Massachusetts, local government bodies should give special consideration to budgeting fiscal resources with snow management in mind.
- Maintain plans for managing all winter storm emergency response activities.

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 4-1 can also be considered as mitigation measures for severe snowstorms/ice storms.

The CEM Plan for South Hadley lists the following generic preparedness and response measures for severe winter storms:

- Ensure that warning/notification, and communications systems are in readiness.
- Ensure that appropriate equipment and supplies, (especially snow removal equipment), are in place and in good working order.
- Review mutual aid agreements.
- Designate suitable shelters throughout the community and make their locations known to the public.
- Implement public information procedures during storm ‘warning’ stage.

¹¹ Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.

- Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and special needs).
- Broadcast storm warning/notification information and instructions.
- Conduct evacuation, reception and sheltering activities.
- If appropriate, activate media center. Refer to Resource Manual for media center information.
- Dispatch search and rescue teams.
- Dispatch emergency medical teams.
- Take measures to guard against further danger from power failure, downed trees and utility lines, ice, traffic problems, etc.
- Close roads, and/or limit access to certain areas if appropriate.
- Provide assistance to homebound populations needing heat, food, and other necessities.
- Provide rescue and sheltering for stranded/lost individuals.

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms. The Town of South Hadley Subdivision Rules and Regulations set grade limits on streets that are included in an Alternative Procedures Plan (Section 2300) and as part of its Section 4000 Required Improvements, and restrictions on utility placement (Section 4400. Municipal Services), which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms:

Subdivision Rules and Regulations

Section 2370 Alternate Procedures Plan – Common Private Ways

Common Private Ways shall have: a staging area of at least 40 feet in length from the street line, with a minimum width of 20 feet pavement in accordance with the Subdivision Regulations, and sloped not more than 4% grade for the 40 feet it extends from the street line.

Section 7.0 Design Standards

3. Grades

The minimum grades of all streets and ways shall be:

- a. Type "A" Subdivisions

- 1) No grade shall be greater than nine (9) percent.
 - 2) No grade shall be less than one-half of one (0.5) percent.
- b. Type "B" Subdivisions
- 1) No grade shall be greater than six (6) percent.
 - 2) No grade shall be less than one-half of one (0.5) percent.

8.09 Utilities

1. General Standards

The installation of utilities and underground structures shall conform to the following general standards:

- a. All public and private sewers, surface water drains, water and gas pipes, electric, telephone and cable T.V. lines, together with their appropriate underground structures, within the street right-of-way, shall be placed underground.

Other Mitigation Measures

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service. The High School, Police Station and DPW are served by a large pad-mounted generator that will provide electric power in the event of primary power failure.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which requires Zone 3 Design Codes for snow loads. The Town of South Hadley has a professionally licensed building inspector.

**Table 5-2
Existing Severe Snowstorms/Ice Storms Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Subdivision Regulations – Design Standards for Roads and Common Driveways	Standards include street grade regulations (4 to 9 percent maximum).	Entire town.	Effective.	None.
Subdivision Regulations – Utilities (The town requires all utilities for new subdivisions to be underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Work with utility companies to underground existing utility lines in locations where repetitive outages occur.
State Building Code	The Town of South Hadley has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.

Hurricanes

Of all the natural disasters that could potentially impact South Hadley, 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).¹² 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 4-1 can also be considered hurricane mitigation measures. High winds that oftentimes accompany hurricanes can also damage buildings and infrastructure. The South Hadley Comprehensive Emergency Management (CEM) Plan identifies the following areas as being most vulnerable to the hazards associated with hurricanes, particularly flooding: River Road, Cove Island Road, western end of Pearl Street, Brunelle's Marina.

Town of South Hadley telecommunications facilities bylaw, restrictions on development, and mobile home and State Building Code regulations, as listed below, are equally applicable to wind events such as hurricanes and tornadoes.

Management Plans

The CEM Plan for South Hadley includes the following generic mitigation measures for hurricane planning and response:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that South Hadley is enrolled in the National Flood Insurance Program.
- Develop and enforce local building codes to enhance structural resistance to high winds and flooding. Build new construction in areas that are not vulnerable to direct hurricane effects.
- Maintain plans for managing all hurricane emergency response activities.

The CEM Plan for South Hadley includes the following generic preparedness and response measures for hurricanes:

- Ensure that warning/notification systems and equipment is ready for use at the 'hurricane warning' stage.
- Review mutual aid agreements.

¹² Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.

- Designate suitable wind and flood resistant shelters in the community and make their locations known to the public.
- Prepare for coordination of evacuation from potentially impacted areas including alternate transportation systems and locations of special needs facilities.
- Activate warning/notification systems to inform public of protective measures to be taken including evacuation where appropriate.
- Conduct evacuation of affected populations.
- Open and staff shelters and reception centers.
- Dispatch search and rescue teams.
- Dispatch emergency medical teams.
- Activate mutual aid activities.
- Take measures to guard against further danger from downed trees and utility lines, debris, etc.

Evacuation Plans

There is no shelter for hurricane victims identified in the South Hadley CEM Plan.

Restrictions on Development

The only restrictions on development that are wind-related are the provisions in the zoning bylaw related to wireless communications facilities.

Zoning Bylaws

S. Wireless Communications Zoning [in part]:

Purpose:

- a. Provide reasonable, non-discriminatory standards and procedures under which adequate and necessary Wireless Communications - Facilities may be permitted, developed and maintained; and,
- b. Ensure that permitting Wireless Communications Facilities will be in harmony with the Zoning By-Law and the character and appearance of the surrounding community; and,
- c. Protect the community's scenic, historic, and environmental resources; and,

- d. Locate Wireless Communications Facilities such that their location does not have negative impacts (such as, but not limited to visual blight, attractive nuisance, noise and falling objects) on the general safety, welfare and quality of life of the community; and,
- e. Encourage Co-Location of Wireless Communications Facilities to the maximum extent possible; and,
- f. Provide for the development of free standing Wireless Communications Towers to the extent necessary to enable the Providers of Wireless Communications Services to provide adequate coverage throughout the community, yet limit the number of such Towers to the minimum amount needed for such services....

5. Location Criteria

- a. Existing Towers and Alternate Tower Structures: To the extent feasible, Antennas are to be located on existing Towers and existing Alternate Tower Structures.
- b. Spacing: No Wireless Communications Tower shall be located closer than one mile of any other such Tower, except as provided below. The spacing distance shall be measured as the shortest distance between two points as if on a flat topography.
- c. Historic and Residential Properties: No Wireless Communications Tower shall be located closer than three-hundred feet (300') to any property (1) listed on either the State or National Register of Historic Places or (2) developed as part of a residential subdivision for which a Definitive Plan was approved by the South Hadley Planning Board, except as may be waived by the Planning Board...

Mobile Homes

According to the Town of South Hadley Zoning Bylaws, mobile homes are an allowed use in the A-1, A-2 and R-B Districts (subject to approval of the building commissioner), provided they are comparable to fixed, frame-built houses. However, none have ever been permitted.

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction that adheres to the State Building Code, which, when followed, results in buildings that withstand high winds. The Town of South Hadley has a building inspector.

Tornadoes / Microbursts

Worcester County and areas just to its west, including portions of Hampshire County, have been dubbed the “tornado alley” of the state because the majority of significant tornadoes in Massachusetts’s weather history have occurred in that region.¹³ 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.¹⁴ Like earthquakes, the location and extent of potential damaging impacts of a tornado are completely unpredictable. Most damage from tornadoes comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail.

Management Plans

The CEM Plan for South Hadley includes the following generic mitigation measures for tornado planning and response:

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.
- Maintain plans for managing tornado response activities. Refer to the non-institutionalized, special needs and transportation resources listed in the Resource Manual.

The CEM Plan for South Hadley includes the following generic preparedness and response measures for tornadoes:

- Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- Periodically test and exercise tornado response plans.
- Put Emergency Management on standby at tornado ‘watch’ stage.
- At tornado ‘warning’ stage, broadcast public warning/notification safety instructions and status reports.
- Conduct evacuation, reception, and sheltering services to victims.
- Dispatch search and rescue teams.

¹³ Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.

¹⁴ www.ibhs.org.

- Dispatch emergency medical teams.
- Activate mutual aid agreements.
- Take measures to guard against further injury from such dangers as ruptured gas lines, downed trees and utility lines, debris, etc.
- Acquire needed emergency food, water, fuel, and medical supplies.
- Take measures relating to the identification and disposition of remains of the deceased.

**Table 5-3
Existing Hurricane & Tornado Hazard Mitigation Measures
(Wind-related)**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Zoning regulations for Tele-communications Facilities	Provides for siting wireless communications facilities in locations without negative impacts on safety.	Entire town	Effective	None
Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Work with utility companies to underground new utility lines in general and existing utility lines in locations where repetitive outages occur.
Zoning Regulations regarding new mobile homes	Mobile homes are an allowed use in all districts.	Entire town.	Does not address the potential for wind-related damage to mobile homes.	None.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
State Building Code	The Town of South Hadley has adopted the Massachusetts State Building Code.	Entire town	Effective	None
Debris Management Plan	A debris management plan could be developed. ¹⁵	Entire town	Effective	Consider participation in the creation of a Regional Debris Management Plan

²⁶ 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. Additional information is available at <http://www.fema.gov/rrr/pa/dmgbroch.shtm>.

Wildfires/Brushfires

Hampshire and Hampden Counties have approximately 469,587 acres of forested land, which accounts for 63 percent of total land area. Forest fires are therefore a potentially significant issue. In South Hadley approximately 48 percent of the town's total land area is in forest, or about 5,687 acres, and is therefore at risk of fire. In 2004, there were 12 fires reported in South Hadley. Seven of these fires were building fires, four were vehicular in nature and one took place in a situation that was out-of-doors¹⁶. In 2006, Fire District #1 responded to nine small brush fires, none of which required significant equipment or manpower.

Management Plans

The South Hadley CEM Plan does not include any specific information on wildfires.

Regulatory Measures

Burn Permits

The issuance and oversight of burn permits is somewhat convoluted. Burn Permits for both Fire Districts #1 and #2 are issued out of the Building Inspectors office during normal business hours but are considered the jurisdiction of the town Forest Warden. Once the permit is issued, it is the responsibility of the applicant to notify Fire District #1 on the day of the burn, whether or not the applicant lives in District #1 or not, that they will be burning. Fire District #2 is not notified when a burn is occurring in their district.

Site Plan Review

Section 12, Site Plan Review, includes provisions that make mandatory a review of a submitted site plan by a representative of the fire department.

Public Education/Outreach

The Fire Districts perform a fire safety program in the elementary, middle and high schools annually about basic fire safety and prevention. The program curriculum is based on three concepts: hear (elementary school), practice (middle school) and teach (high school). The Districts also participate in a town-wide safety fair each year. Fire district #2 is interested in starting a voluntary home fire and life safety inspection program.

Restrictions on Development

There are currently no restrictions on development that are based on the need to mitigate the hazards of wildfires/brushfires.

¹⁶ *Massachusetts Fire Incident Reporting System, 2004*

**Table 5-4
Existing Wildfire/Brushfire Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Burn Permits	Requires Fire District #1 notification	Entire Town	Somewhat effective	<p>Inform applicants as to which Fire District they live in at permit issuance.</p> <p>At a minimum, require applicant to notify appropriate Fire District on day of burn.</p> <p>Require Building Department to notify Fire Districts of issued burn permits.</p> <p>Require burn permits to be issued through Fire Districts.</p>
	Burn Permits issued through Building Department	Entire Town	Somewhat effective	
Public Education/Outreach	School program and town-wide fair	Entire Town	Effective	None

Earthquakes

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.

Earthquakes can involve several potentially devastating secondary effects including:

- The collapse of buildings, bridges, roads, dams, and other vital structures;
- Rupture of utility pipelines;
- Flooding caused by dam failure;
- Landslides;
- Major transportation accidents, (railroad, chain highway crashes, aircraft, and marine);
- Extended power outage;
- Fire and/or explosion;
- HAZMAT accident; and,
- Water contamination.

Management Plans

The South Hadley CEM Plan lists the following generic mitigation measures for earthquakes:

- Community leaders in cooperation with Emergency Management Personnel should obtain local geological information and identify and assess structures and land areas that are especially vulnerable to earthquake impact and define methods to minimize the risk.
- Strict adherence should be paid to land use and earthquake resistant building codes for all new construction.
- Periodic evaluation, repair, and/or improvement should be made to older public structures.
- Emergency earthquake public information and instructions should be developed and disseminated.

- Earthquake drills should be held in schools, businesses, special care facilities, and other public gathering places.

The South Hadley CEM Plan lists the following generic preparedness and response measures for earthquakes:

- Earthquake response plans should be maintained and ready for immediate use.
- All equipment, supplies and facilities that would be needed for management of an earthquake occurrence should be maintained for readiness.
- Emergency Management personnel should receive periodic training in earthquake response.
- If the designated Emergency Operations Center (EOC) is in a building that would probably not withstand earthquake impact, another building should be chosen for an earthquake EOC.
- Mass Care shelters for earthquake victims should be pre-designated in structures that would be most likely to withstand earthquake impact.
- EOC will be activated and response will immediately be engaged to address any and all earthquake effects listed.
- Emergency warning/notification information and instructions will be broadcast to the public.
- Search and rescue teams will be dispatched.
- Emergency medical teams will be dispatched.
- Firefighters will address fires/explosions, and HAZMAT incidents.
- Law enforcement personnel will coordinate evacuation and traffic control.
- Reception centers and shelters will be opened and staffed.
- Animal control measures will be taken.
- Law enforcement personnel will protect critical facilities and conduct surveillance against criminal activities.
- Immediate life-threatening hazards will be addressed such as broken gas lines, downed utility wires, and fire control resources.
- Emergency food, water, and fuel will be acquired.

- Activate mutual aid.
- Measures will be taken relating to identification and disposition of remains of deceased by the Chief Medical Examiner.

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 6th Edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, of many buildings and structures do not have specific earthquake resistant design features. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

Restrictions on Development

There are no seismic-related restrictions on development.

**Table 5-5
Existing Earthquake Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
State Building Code	The Town of South Hadley has adopted the 6 th Edition of the State Building Code.	Entire town but applies to new construction only.	Effective for new buildings only.	Evaluate older structures to be used as shelters and schools to determine if they are earthquake resistant.
Debris Management Plan	A debris management plan could be developed.	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.

Dam Failures

The only mitigation measures in place are the state regulations that control the construction and inspection of dams.

The South Hadley CEM Plan states that there are three categories of dam failure or overspill and that action should be taken according to hazard rating:

Type 1: Slowly developing condition

- Activate EOC
- Activate all communication networks
 - Establish communications with Command Post
 - On a 24-hour basis.
- Release public information
- Notify
 - MEMA Region Headquarters
 - American Red Cross
 - Downstream communities
- Review Plans for evacuation and sheltering
 - Evacuation
 - Routes
 - Notification
 - Sheltering
 - Availability and capacity
 - Food, supplies and equipment
 - Shelter owners and managers
 - Other communities (if out of town sheltering is required)
- Require “Stand By” status of designated emergency response forces.

Type 2: Rapidly developing condition

- Establish a 24-hour communications from dam site to EOC.
- Assemble, brief and assign specific responsibilities to emergency response forces.
- Release public information.
- Obtain and prepare required vehicles/equipment for movement.
- Prepare to issue warning.

Type 3: Practically instantaneous failure

- Issue warning
- Commence immediate evacuation.
- Commit required resources to support evacuation.
- Activate shelters or coordinate activation of shelters located outside the community.
- Notify:
 - MEMA Region Headquarters
 - Red Cross
- Initiate other measures as required to protect lives and property.

Management Plans and Regulatory Measures

The South Hadley CEM Plan contains the following generic mitigation measures for dam failure:

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam over-spill or failure.
- Emergency Management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams, which impact South Hadley. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.
- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.
- Determine minimum notification time for down stream areas.

The South Hadley CEM Plan contains the following generic preparedness and response measures for dam failure:

- Pre-place adequate warning/notification systems in areas potentially vulnerable to dam failure impact.
- Pre-place procedures for monitoring dam site conditions at first sign of any irregularity that could precipitate dam failure.
- Identify special needs populations, evacuations routes, and shelters for dam failure response.
- Have sandbags, sand, and other items to reinforce dam structure or flood proof flood prone areas.
- Disseminate warning/notification of imminent or occurring dam failure.
- Coordinate evacuation and sheltering of affected populations.
- Dispatch search and rescue teams.
- Coordinate evacuation and sheltering of affected populations.
- Activate mutual aid if needed.
- Acquire additional needed supplies not already in place, such as earth moving machinery.
- Establish incident command post as close to affected area as safely possible.
- Provide security for evacuated public and private property.

Permits Required for New Dam Construction

Massachusetts State Law (M.G.L. Chapter 253 Section 45) regulates the construction of new dams. A permit must be obtained from the Department of Conservation and Recreation (DCR) before construction can begin. One of the permit requirements is that all local approvals or permits must be obtained.

Dam Inspections

The DCR requires that dams rated as Low Hazards are inspected every ten (10) years and dams that are rated as Medium/Significant Hazards are inspected every five (5) years.

Zoning

There is no mention made regarding the construction of new dams in the Town of South Hadley zoning or subdivision regulations.

Restrictions on Development

There are no town restrictions on dam locations. The DCR issues permits for new dams and does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable.

**Table 5-6
Existing Dam Failure Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Permits required for new dam construction	State law requires a permit for the construction of any dam.	Entire town.	Effective. Ensures dams are adequately designed.	None.
Dam Inspections	DCR requires an inspection schedule of the dam owner that is based on the hazard rating of the dam (low, medium, high hazard).	Entire town.	Low. The DCR does not have adequate staff and resources oversee inspection program on the required schedule.	Identify sources of funding for dam safety inspections. Incorporate dam safety into development review process.
Evacuation Plans	Comprehensive evacuation plans would ensure the safety of the citizens in the event of dam failure.	Inundation areas in town.	None.	None.

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. South Hadley 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.

Management Plans

The South Hadley CEM Plan contains the following generic mitigation measures for drought:

1. Seeks to balance demand on water supply through land use, zoning and other tools.
2. Encourages water conservation and water control measures to ease demand on water supply.
3. Improves efficiency and capacity of the water supply system, including leak detection and repair.

The South Hadley CEM Plan contains the following generic preparedness and response measures for drought:

1. Identify potential emergency water sources, such as purchase from adjoining communities if available.
2. Keep abreast of drought forecasts issued by the State Drought Task Force.
3. Encourages businesses and other bulk users to develop water conservation and shortage plans.
4. Implement water use controls as needed.
5. Coordinate requests for potable water in emergency situations.

The South Hadley's Open Space and Recreation Plan by its very nature encourages the protection of open space, a critical component of aquifer recharge.

Land Development Regulations that Mitigate Impacts of Drought

Hadley's Land Development Ordinance has several sections governing flood and stormwater management, proper drainage, and aquifer protection. The by-laws protecting these features of the landscape can also be seen as preventing drought, as they promote the natural processes of infiltration and groundwater recharge.

Water Supply Protection District Zoning
[See Flood Section above]

Flexible Development Zoning Bylaw
[See Flood Section above]

Open Space and Recreation Plan
[See Flood Section above]

Table 5-7: Existing Drought Hazard Mitigation Measures

Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Zoning By-Laws:				
Water Supply Protection District	Areas delineated as part of the aquifer recharge zones are protected by strict use regulations	Aquifer recharge areas	Effective for preventing groundwater contamination and for controlling stormwater runoff	None
Flexible Development	Requires protection of open space in this type of residential development	Zoning overlay district	Effective	None
Open Space and Recreation Plan	Promotes protection of open space	Entire Town	Effective	None

Man-Made Hazards/Hazardous Materials

Hazardous materials are in existence throughout Town, and are transported on South Hadley'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 it somewhat difficult to determine mitigation strategies, but South Hadley has some regulations currently in place to mitigate the impacts of a hazardous materials disaster.

Management Plans

A Model Hazardous Materials Response Plan is provided in the South Hadley CEM Plan framework for community and/or LEPC use under the Specific Hazards Annexes section. Complete plans may be attached to the CEM or referenced as a separate document. The CEM Plan may also support regional emergency planning committees.

Land Development Regulations that Mitigate Impacts of Hazardous Materials

Development within the Water Supply Protection District is governed by specific use restrictions in the Zoning By-Laws, including regulation of hazardous materials.

Definitions

Hazardous Material - Material including but not limited to, any material, in whatever form, which, because of its quantity, concentration, chemical, corrosive, flammable, reactive toxic, infectious or radioactive characteristics, either separately or in combination with any substance or substances, constitutes a present or potential threat to human health, safety, welfare, or to the environment, when improperly stored, treated, transported, disposed of used, or otherwise managed. The term shall not include oil.

N. Water Supply Protection District [in part]

The following uses are prohibited within the Water Supply Protection District:

- a. Business and industrial uses, not agricultural including but not limited to metal plating, chemical manufacturing, wood preserving, furniture stripping, dry cleaning and auto body repair, which generate, use, treat, process, store or dispose of hazardous wastes except for the following:
 1. very small quantity generators of hazardous waste, as defined by 310 CMR 30.00 which generate less than 20 kilograms or 6 gallons of hazardous waste per month may be allowed by Special Permit in accordance with Section 9 of this by-law;
 2. household hazardous waste collection centers or events operated pursuant to 301 CMR 30.390;
 3. household hazardous waste collection centers or events operated pursuant to 301 CMR 30.390;

6. Restricted Uses

The following uses are restricted within the Water Supply Protection District:

- i. All liquid hazardous materials as defined in M.G.L., Chapter 21E, must be stored either in a free standing container within a building or in a free standing container above ground with protection to contain a spill the size of the containers total storage capacity.

The following uses may be allowed by Special Permit obtained from the Planning Board:

2. Those businesses using or storing such hazardous materials shall file a hazardous materials management plan with the Planning Board, Fire Chief and Board of Health, which shall include:
 - a. Provisions to protect against the discharge of hazardous materials or wastes to the environment due to spillage.
 - b. Accidental damage, corrosion, leakage or vandalism, including spill containment and clean-up procedures.
 - c. Provisions for indoor, secured storage of hazardous materials and wastes with impervious floor surfaces.

Other Regulations

Board of Health Hazardous Material Regulation

The Board of Health has submitted a draft Hazardous Materials regulation to the Massachusetts Department of Health for review and approval.

Table 5-8: Existing Man-Made Hazard/Hazardous Materials Mitigation Measures

Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Zoning By-Laws				
Water Supply Protection District	Restricts uses in aquifer recharge areas, regulates how to correctly store hazardous materials.	Aquifer recharge areas	Effective for preventing hazardous materials spills and leaks.	<p>Consider prohibiting any hazardous materials within the aquifer recharge area.</p> <p>Add petroleum products to definition of Hazardous Materials.</p> <p>Add performance standards for the storage of petroleum products including automated spill/leak detection and fuel delivery identifier systems to prevent tank overflow.</p>

6 – FUTURE MITIGATION STRATEGIES

Goal Statements and Action Items

As part of the natural hazards mitigation planning process that was undertaken by the South Hadley Natural Hazards Planning Committee, existing gaps in protection and possible deficiencies were identified and discussed. From this analysis, the committee developed general Goal Statements and Action Items that, when implemented, will help to reduce risks and future damages from natural hazards. The Goal Statements, Action Items, town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of natural hazard are described below. Several of the Action Items have multiple benefits because, if implemented, these Action Items will mitigate or prevent damages from more than one type of natural hazard.

General Mitigation Action Items

Goal Statement: 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.

Action Item 1-1: Establish a Local Emergency Management Planning Committee (LEPC)

Responsible Department/Board: Selectboard

Proposed Completion Date: 2007

Action Item 1-2: Support Emergency Management Director (EMD) to perform duties.

Responsible Department/Board: Selectboard, LEPC

Proposed Completion Date: 2007+

Action Item 1-3: 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.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2007

Action Item 1-4: Establish back up power at Emergency Operation Centers.

Responsible Department/Board: Selectboard, LEPC

Proposed Completion Date: 2007

Action Item 1-5: Collect, periodically update, and disseminate information on which local radio stations provide 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.

Responsible Department/Board: LEPC, Board of Health

Proposed Completion Date: 2008

Flooding

Overall, the Town of South Hadley's existing land use regulations regulate development, reduce or eliminate localized flooding events and control the quantity and quality of stormwater runoff. Long-range planning documents such as the town's Open Space and Recreation Plan also address flood prevention and mitigation either directly or indirectly in the goals and objectives listed in these documents.

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to flooding.

Action Item 2-1: Ensure that the Development Impact Statement identifies Impacts of the proposed development could have on the potential for flooding, and include mitigation measures, if deemed necessary by the Planning Board.

Responsible Department/Board: Planning Board

Proposed Completion Date: 2008

Action Item 2-2: Consider implementing an Erosion and Sediment Control Bylaw compliant with NPDES Phase II.

Responsible Department/Board: Planning Board, Conservation Commission, DPW

Proposed Completion Date: 2008

Action Item 2-3: The town should evaluate whether to become a part of FEMA's Community Rating System.

Responsible Department/Board: Selectboard, LEPC

Proposed Completion Date: 2008

Action Item 2-4: Develop a Beaver Management Strategy.

Responsible Department/Board: Board of Health, Fire Department, Conservation Commission

Proposed Completion Date: 2008

Action Item 2-5: Seek funding and replace undersized culverts and which lead to collection of debris and localized flooding.

Responsible Department/Board: DPW, Selectboard

Proposed Completion Date: 2008+

Action Item 2-6: Coordinate with owner of Holyoke Dam to better regulate flood control boards to prevent flooding on River Road.

Responsible Department/Board: Holyoke Gas and Electric, DPW, Conservation Commission, Selectboard.

Proposed Completion Date: 2008

Severe Snow Storms/Ice Storms

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to severe snow and ice storms.

Action Item 3-1: Establish a Red Cross approved shelter.

Responsible Department/Board: LEPC

Proposed Completion Date: 2007

Action Item 3-2: Purchase and install backup generator at Fire District #2 headquarters.

Responsible Department/Board: Selectboard, Fire District #2, LEPC

Proposed Completion Date: 2007

Hurricanes and Tornadoes

The Action Items listed above, under flooding, address the flooding that can result from a hurricane.

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to high winds associated with hurricanes and tornadoes.

Action Item 4-1: Consider participation in the creation of a Regional Debris Management Plan.

Responsible Department/Board: Selectboard, Planning Board, LEPC

Proposed Completion Date: 2008

Wildfires/Brushfires

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to wildfires/brushfires.

Action Item 5-1: Develop a voluntary home fire and safety inspection program.

Responsible Department/Board: Fire Districts #1 and #2

Proposed Completion Date: 2008

Action Item 5-2: Establish better coordination between Building Department and Fire Districts about burn permit issuance notification.

Responsible Department/Board: Building Inspector, Forest Warden, Fire District #1 and #2

Proposed Completion Date: 2008

Earthquakes

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to earthquakes.

Action Item 5-1: Evaluate emergency shelters to determine if they are earthquake resistant.

Responsible Department/Board: Building Inspector, Emergency Management Director

Proposed Completion Date: 2007

Action Item 5-2: Ensure that all identified shelters have sufficient back-up utility service in the event of primary power failure.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2007

Dam Failure

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to dam failures.

Action Item 6-1: Identify sources of funding for dam safety inspections.

Responsible Department/Board: LEPC

Proposed Completion Date: 2007+

Drought

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to drought.

Action Item 7-1: Develop a Water Conservation Plan

Responsible Department/Board: Water Departments

Proposed Completion Date: 2009

Man-Made Hazards/Hazardous Materials

Goal Statement: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to man-made hazards/hazardous materials.

Action Item 8-1: Consider prohibiting any hazardous materials within the Water Supply Protection District.

Responsible Department/Board: Planning Board, Water Department

Proposed Completion Date: 2009

Action Item 8-2: Add definition of petroleum products to definition section of in Zoning Bylaw.

Responsible Department/Board: Planning Board

Proposed Completion Date: 2008

Action Item 8-3: Add performance standards to the Water Supply Protection district Zoning for the storage of petroleum products including automated spill/leak detection and fuel delivery identifier systems to prevent overflow.

Responsible Department/Board: Planning Board

Proposed Completion Date: 2008

Action Item 8-4: Require businesses using and storing hazardous materials to keep a set of Material Safety Data Sheets (MSDS) in a lock box on the outside of the building, with access for EMD.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2008

Prioritized Implementation Schedule

Summary of Critical Evaluation

The South Hadley Hazard Mitigation Planning Committee reviewed each of the actions identified above, as well as the existing mitigation strategies using the following factors to prioritize mitigation projects:

- Ability to reduce disaster damage
- Social acceptability
- Ability to compare or be compared with other actions
- Technical feasibility and 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 implementation period
- Environmental compatibility

Project Prioritization

The South Hadley Hazard Mitigation Planning Committee created the following prioritized schedule for implementation of prioritized item. 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.

**PRIORITIZED IMPLEMENTATION SCHEDULE
(ACTION PLAN)**

IMPLEMENTATION STRATEGY FOR PRIORITY MITIGATION ACTIONS

The South Hadley Hazard Mitigation Planning Committee created the following prioritized schedule for implementation:

MITIGATION ACTION	RESPONSIBLE DEPARTMENT/BOARD	PROPOSED COMPLETION DATE	POTENTIAL FUNDING SOURCE(S)	ESTIMATED COST	PRIORITY
Establish a Local Emergency Management Planning Committee (LEPC)	Selectboard	2007	Town Staff/Volunteers	N/A	High
Support Emergency Management Director to perform duties	Selectboard, LEPC	2007+	Town Staff/Volunteers	N/A	High
Inventory Supplies at existing shelters and develop a needs list of storage requirements. Establish arrangements with local or neighboring vendors to supply shelters with food and first aid supplies in the event of a natural disaster.	Emergency Management Director	2007	Town Staff/Volunteers	N/A	High
Establish backup power at Emergency Operation Centers	Selectboard, LEPC	2007	Town Staff/Volunteers	To be determined	High
Collect, periodically update, and disseminate information on which local radio stations provide 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.	LEPC, Board of Health	2008	Town Staff/Volunteers	N/A	High
Ensure the Development Impact Statement identifies impacts of the proposed development for flooding and include mitigation measures if deemed necessary by the Planning Board.	Planning Board	2008	Town Staff/Volunteers	N/A	High
Implement the Erosion and Sediment Control Bylaw compliant with NPDES Phase II.	Planning Board, Conservation Commission, DPW	2008	Town Staff/Volunteers	N/A	High
Town should evaluate whether to become part of FEMA's Community Rating System	Selectboard, LEPC	2008	Town Staff/Volunteers	N/A	Medium
Develop a beaver management strategy	Board of Health, conservation commission, Fire Department	2008	Town Staff/Volunteers	N/A	Low

MITIGATION ACTION	RESPONSIBLE DEPARTMENT/BOARD	PROPOSED COMPLETION DATE	POTENTIAL FUNDING SOURCE(S)	ESTIMATED COST	PRIORITY
Seek funding to replace undersized culverts that lead to collection of debris and localized flooding	Selectboard, DPW	2008+	DEP s.319 Grants, Hazard Mitigation Grants	To be determined	High
Coordinate with owner of Holyoke Dam to better regulate flood control boards to prevent flooding on River Road	Holyoke Gas and Electric, DPW, conservation Commission, Selectboard	2008	Town Staff/Volunteers	N/A	High
Establish a Red Cross approved shelter	LEPC	2007	Town Staff/Volunteers	N/A	High
Purchase and install backup generator at Fire District #2 headquarters	Selectboard, Fire District #2, LEPC	2007	Town Staff, Town Budget	To be determined	High
Consider participation in a regional Debris Management Plan	Selectboard, Planning Board, LEPC	2008	Town Staff/Volunteers	N/A	Medium
Develop a voluntary home fire and safety inspection program	Fire Districts #1 and #2	2008	Town Staff/Volunteers	N/A	Medium
Establish better coordination between Building Departments and Fire Districts about burn permit issuance and notification	Building Inspector, Forest Warden, Fire Districts #1 and #2	2008	Town Staff/Volunteers	N/A	Medium
Evaluate emergency shelters to determine if they are earthquake resistant	Building Inspector, Emergency Management Director	2007	Town Staff/Volunteers	N/A	High
Ensure that all identified shelters have sufficient backup utility service in the event of primary power failure	LEPC	2007	Town Staff/Volunteers	To be determined	High
Identify sources of funding for dam safety inspections	LEPC	2007+	Town Staff/Volunteers	N/A	Medium
Develop a Water Conservation Plan	Water Departments	2009	Town Staff/Volunteers	N/A	Low
Consider prohibiting any hazardous materials within the Water Supply Protection District	Planning Board, Water Department	2009	Town Staff/Volunteers	N/A	Low
Add definition for "petroleum products" to definition section of Zoning Bylaw	Planning Board	2008	Town Staff/Volunteers	N/A	Low
Add performance standards to the Water Supply Protection District Zoning for the storage of petroleum products including automated spill/leak detection and fuel delivery identifier systems to prevent overflow.	Planning Board	2008	Town Staff/Volunteers	N/A	Low
Require businesses using and storing hazardous materials to keep a set of Material Safety Data Sheets (MSDS) in a lock box on the outside of the building and provide access to Emergency Management Director	Emergency Management Director	2008	Town Staff/Volunteers	N/A	Medium

7 – PLAN ADOPTION & IMPLEMENTATION

Plan Adoption

Upon completion, copies of the Draft Local Hazards Mitigation Plan for the Town of South Hadley were distributed to town boards for their review and comment. A public meeting was held by the South Hadley Select Board to present the draft copy of the South Hadley 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 formally approved by the Select Board and forwarded to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their approval.

Plan Implementation

The implementation of the South Hadley Natural Hazards Mitigation Plan will begin following its formal adoption by the South Hadley Select Board 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 South Hadley Local Emergency Planning Committee (LEPC) and identified departments and town personnel will oversee implementation of this plan.

Plan Monitoring and Evaluation

The measure of success of the South Hadley 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 South Hadley LEPC 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 Spring of 2011. Meetings of the committee will be organized and facilitated by the Emergency Management Director or the South Hadley Selectboard.

CERTIFICATE OF ADOPTION
TOWN OF SOUTH HADLEY , MAASSACHUSETTS
SELECTBOARD
A RESOLUTION ADOPTING THE SOUTH HADLEY
HAZARD MITIGATION PLAN

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

WHEREAS, several public planning meetings were held between November 2006 and April 2007 regarding the development and review of the South Hadley Hazard Mitigation Plan; and

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

WHEREAS, a duly-noticed public hearing was held by the South Hadley Selectboard on _____, 2007 to formally approve and adopt the South Hadley Hazard Mitigation Plan.

NOW, THEREFORE BE IT RESOLVED that the South Hadley Selectboard adopts the South Hadley Hazard Mitigation Plan.

ADOPTED AND SIGNED this _____, 2007.

_____, Chair
South Hadley Selectboard

_____,
South Hadley Selectboard

_____,
South Hadley Selectboard

_____,
South Hadley Selectboard

_____,
South Hadley Selectboard

ATTEST

APPENDICES

Appendix A

TECHNICAL RESOURCES

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
DFP Wetlands and Waterways.....	XXX/XXX-XXX
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
Massachusetts Association of Regional Planning Agencies (MARPA).....	XXX/XXX-XXX
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
US Department of Commerce: National Oceanic and Atmospheric Administration: National Weather Service; Tauton, Massachusetts	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) Websites

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	http://www.colorado.edu/litbase/ha_zards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center “Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/dis_aster/	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/geog/floods/	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.html	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://www.met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links
National Lightning Safety Institute	http://lightningsafety.com/	Information and listing of appropriate publications regarding lightning safety.
NASA Optical Transient Detector	http://www.ghcc.msfc.nasa.gov/ot_d.html	Space-based sensor of lightning strikes
LLNL Geologic & Atmospheric Hazards	http://www.wep.es.llnl.gov/www/wep/geog.html	General hazard information developed for the Dept. of Energy.
The Tornado Project Online	http://www.tornadoobject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iaaa.iix.com/ndcmap.html	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

Appendix B

Documentation of the Planning Process

**South Hadley Hazard Mitigation Planning Committee
Meeting #1**

AGENDA

**November 9, 2006 at 10:00 AM
South Hadley Police Station**

1) Introduction

2) Purpose of Committee

- Why selected to serve on Committee
- What we are doing and why

3) What is Hazard Mitigation Planning?

- PowerPoint Presentation on Hazard Mitigation

4) Step 1: Organize Hazard Mitigation Team

- Establish a chairperson/point of contact

5) What must we do to prepare a Hazard Mitigation Plan?

- Explain/set milestones (4-5 committee meetings)
- Agree on next committee meeting date

6) Question and Answer Period

South Hadley Hazard Mitigation Planning Committee Meeting #2

AGENDA

**December 13, 2006 at 10 AM
South Hadley Police Station**

1) Identify Hazards (past and potential) on Base Map

- What are the hazards?
- What is at risk from those hazards?

2) Develop Base Map with Critical Facilities

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

3) Question and Answer Period

4) Set Goals for Next Meeting

**South Hadley Hazard Mitigation Planning Committee
Meeting #3**

AGENDA

**January 17, 2007 at 10 AM
South Hadley Police Station**

1) Review Identification of Hazards

- Past and Potential
- Critical Facilities

2) Analyze Development Trends

- Looking at Community Change
- Map out Development Patterns

3) Existing Protection Measures

- Review of Draft Existing Protection Measures

4) Question and Answer Period

5) Set Goals for Next Meeting

**South Hadley Hazard Mitigation Planning Committee
Meeting #4**

AGENDA

**February 28, 2007 at 10:00 AM
South Hadley Police Station**

- 1) Identify What's in Place & Identify gaps in the current protection**
 - Review Draft Existing Protection Measures
 - Identify gaps in existing protection
- 2) Review of Draft Goal Statements**
- 3) Brainstorm Mitigation Actions**
 - What actions can be taken?
 - Evaluating Action Feasibility
- 4) Prioritize Final List of Actions**
 - Select Actions which Best Suit Community's Needs
 - Include actions that can be implemented quickly
- 5) Question and Answer Period**
- 6) Set Goals for Next Meeting**

**South Hadley Hazard Mitigation Planning Committee
Meeting #5**

AGENDA

**April 11, 2007 at 10AM
South Hadley Police Station**

- 1) Develop Strategy to Implement Selected Prioritized Actions**
 - Who will be responsible for implementing each prioritized action;
 - When will these actions be implemented?
 - How will the community fund the projects?

- 2) Develop Process for Adoption and Monitoring of the Plan**

- 3) Review & Revise as Necessary Final Draft of the *South Hadley Hazard Mitigation Plan***

- 4) Discuss Next Steps for the *South Hadley Hazard Mitigation Plan* including FEMA/MEMA Review and Adoption by the Selectboard.**

- 5) Question and Answer Period**

Appendix C

List of Acronyms

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	Selectboard
DPW	Department of Public Works
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
Ag Com	Agricultural Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
EMA	Emergency Management Agency
RACES	Radio Amateur Civil Emergency Service
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

Past and Potential Hazards/Critical Facilities Map
