THE TOWN OF MONSON

LOCAL NATURAL HAZARDS MITIGATION PLAN

Adopted by the Monson Board of Selectmen on _____

Prepared by:
The Monson Natural Hazards Mitigation Planning Committee

and

The Pioneer Valley Planning Commission
26 Central Street, Suite 34
West Springfield, MA 01089
(413) 781-6045
www.pvpc.org

This project was funded by a grant received from the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation Services (formerly the Department of Environmental Management)

TABLE OF CONTENTS

Acknowledgements

The Monson Board of Selectmen extends special thanks to the Monson Natural Hazards Mitigation Planning Committee as follows:

Jeremy Bedson, Emergency Management Director
John Morell, Monson Highway Superintendent
Stephen Kozloski, Monson Police Chief
Marty Harris, Monson Fire Chief
Craig Jalbert, Monson Water and Sewer Superintendent
Gary Allard, Monson Board of Health, Chair
Chip Lapointe, Monson Building Inspector
Michelle Loglisci, Monson Public Schools Transportation Coordinator
Karen Patenaude, Monson School Committee

The Monson Board of Selectmen offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Commonwealth of Massachusetts Natural Hazards Mitigation Plan (http://www.mass.gov/dcr/stewardship/mitigate/plan.htm) which served as a model for this plan. In addition, special thanks are extended to the staff of the Pioneer Valley Planning Commission for professional services, process facilitation and preparation of this document.

The Pioneer Valley Planning Commission

Catherine Miller, Principal Planner/Project Manager
Andrew Smith, Planner Specialist
Todd Zukowski, Senior Planner/GIS Specialist
Jim Scace, GIS Specialist

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 Monson 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 Monson 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 Pioneer Valley Planning Commission during several brainstorming sessions 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
(See Appendix B for agendas)

October 25, 2006, 10:00 – 11:00 a.m.: Public informational and organizational meeting, held at Monson Town Offices
November 15, 2006, 10:30 - 12:00 p.m.: Working committee meeting held at Monson Town Hall.
January 24, 2007, 10:00 - 11:30 a.m.: Working committee meeting held at Monson Town Offices
February 28, 2007, 10:00 - 11:30 a.m.: Working committee meeting held at Monson Town Offices.
March 7, 2007 10:30 – 12:00 p.m.: Working committee meeting held at Monson Town Hall
April 25, 2007, 10:30 - 12:00 p.m.: Working committee meeting held at Monson Town Hall
September 5, 2007, 10:00 - 11:30 p.m.: Working committee meeting held at Monson Town Hall
October 24, 2007 – 7:00 – 8:30 p.m. : Public meeting held at Monson Town Hall

Public Meetings with the Board of Selectmen

DATE, 2007: Meeting with Board of Selectmen to be held

DATE, 2007: Presentation at Town Meeting yet-to-occur

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

Public Involvement in the Planning Process

On September 13, 2007 the Pioneer Valley Planning Commission sent a press release to all area media outlets to inform the general public that drafts of the region's Hazard Mitigation plans were complete and available for public comment and review on the Commission's website (www.pvpc.org). This press release (appendix F) resulted in a series of news articles (Appendix F) that further enhanced awareness of the Hazard Mitigation Planning Process. This action was undertaken to fulfill

the requirement that a Hazard Mitigation Plan be developed in a format that is open to the public for comments.

Involving neighboring Jurisdictions

In the initial stages of the planning process for this mitigation plan, the Pioneer Valley Planning Commission conducted a series of outreach efforts to make the public aware of the regional mitigation process. In October of 2005, the Planning Commission notified all Select Boards and Chief Elected Officials that their community could participate in the region's mitigation planning process. Again, on April 4, 2006, the Planning Commission mailed a notice of planning activities to all Chief Elected Officials and Select Board in the Pioneer Valley. Both mailings explained the purpose of mitigation planning and invited communities to participate in either Round I or Round II of the region's mitigation planning process.

On November 20th, 2007 the Pioneer Valley Planning Commission Presented the planning process that led to the creation of the *Monson Local Natural Hazards Mitigation Plan*. 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.

Additionally, the Hampshire Regional Emergency Planning Committee was presented with the findings of this plan during its November15, 2007 meeting. Prior to this briefing, the HREPC was provided with updates of the Hazard Mitigation Planning Process on April 20, 2007 and again on December 21, 2006.

Managing and Updating the Plan

The Monson Local Emergency Planning Committee will manage this plan, update the plan's action steps, update the plan every five years and support funding applications for implementing the plan's action steps.

2 – LOCAL PROFILE[1]

Community Setting

Monson is a rapidly-growing semi-rural community located in Hampden County in south-central Massachusetts. Monson's historic downtown—a local center for business, government, and civic life—is nestled in the valley of Chicopee Brook and surrounded by steep and rugged hills covered by forest and farms. The Town's total land area is approximately 28,800 acres, or 45 square miles, making it one of the larger towns in Massachusetts.

Monson was originally a part of Brimfield until 1775, when it was incorporated as a separate town. The Town began as a farming and lumbering community, but evolved into an industrial town early in the 18th century, when water power from Chicopee Brook and a transportation system based on the railroad, fueled a thriving textile industry. In the past few decades, the Town's industrial base has declined, and farming and lumbering have become more limited. At the same time, Monson has become a desirable location for new residences, especially for commuters, and portions of the Town have become more suburban in character as new development has spread out along existing public roads.

Monson is bordered by Palmer to the north, Brimfield and Wales to the east, Wilbraham and Hampden to the west and Stafford, Connecticut, to the south. Monson is 17 miles east of Springfield, 40 miles west of Worcester, 77 miles southwest of Boston and about 157 miles from New York City. The Town is within close proximity to the Massachusetts Turnpike and I-84, which offer quick and convenient access to Springfield, Hartford, and eastern Massachusetts. The New England Central Railroad runs in a north-south direction through the Town, connecting New Haven, Connecticut to Burlington, Vermont. Amtrak service is provided on this rail line, but there is no passenger service to Monson.

Since 1980, Monson's population has grown at an average rate of about 7% per decade, which translates on average to about 60 new persons per year. Over the past several years, an average of about 35-45 new single-family houses have been constructed each year.

Land Uses

[1] This information came from The Monson Master Plan, Final Report, January 2004

Agriculture: This category includes cropland, pasture, orchards, and nurseries. Most of the land identified as agriculture is enrolled in the state's Chapter 61A tax abatement program, which means that they are actively being farmed.2 Major crops and products from Monson's farms include dairy products, hay, and some row crops.

Forest: Forest covers almost 76% of the Town's land area. Approximately 38 privately owned parcels totaling approximately 3,000 acres are enrolled in the Chapter 61 tax abatement program, which means that they are actively managed for forestry.

Wetlands: The 166 acres of wetlands identified in includes only unforested wetlands bordering streams and ponds and occupying isolated pockets of land throughout the Town. An additional 800 or so acres of forested wetlands are included in the "forest" land use category.

Recreation: This category includes playgrounds, golf courses, and other similar facilities, but excludes parks, which are included in the following category.

Floodplain District
The Floodplain District is defined as all lands designated as Zone A or Zone A1-30 on the Town of Monson Flood Insurance Rate Maps and the floodway boundaries delineated on the Monson Flood Boundary and Floodway Map. The district is intended to maintain the water table, protect water recharge areas, and protect against flooding by limiting uses in flood-prone areas to conservation; outdoor recreation; wildlife management areas; foot, bicycle, and horse paths; grazing and farming; forestry; nurseries; lawful pre-existing dwellings; and temporary non-residential structures. Certain uses are permitted in this district by Special Permit if appropriate flood proofing measures are taken.

Water Supply Protection District
The Water Supply Protection District is intended to protect lands within the primary recharge area of groundwater aquifers and the watershed areas of reservoirs which now or may in the future provide public water supply. To protect surface and groundwater resources, the overlay district prohibits many noxious uses such as solid waste disposal facilities, disposal of liquid or leachable wastes, and storage of petroleum products. Commercial or industrial uses that are allowed in the underlying district may be allowed by Special Permit.

Scenic District

The Scenic District is intended to preserve and enhance areas considered to be of natural scenic beauty such as wooded canyons, ridges and fine vistas or viewsheds. Although the Town has adopted the Scenic District Bylaw, it has not adopted a Scenic District map. Therefore, the Scenic District does not have any effect at this time. If, in the future, a map is adopted, the following uses will be prohibited within the Scenic District: surface mining, above-ground pipelines, power plants, refineries or above ground oil/gas tanks, auto sales or storage, solid waster disposal and wrecking yards. Any new construction or establishment of any dwelling, sign or other facility that requires a building permit within the Scenic District will be subject to review by the Scenic District Review Board if any such action affects exterior appearance. These regulations provide broad discretion for the Town to review the siting and design of new development—even single-family homes—in the Scenic District. A proposal submitted under the Scenic District Review process must demonstrate that the buildings and landscaping blend into the natural terrain. Retaining walls, parking lots, and significant re-grading must be screened from view. Business uses must be conducted within structures. Variable setbacks, multiple building orientations, and other site planning techniques are also encouraged.

Other Provisions

Site Plan Approval

Site plan approval is intended to ensure that new development is consistent with the Town's visual and environmental character, protects property values, and provides adequate drainage and access. The review process is required for construction or exterior alteration of commercial or industrial structures, residential developments requiring approval under the Subdivision Control Law (M.G.L. Chapter 41), and the development of certain other uses noted in the Use Regulations Table of the Zoning Bylaw. Criteria for site plan approval include conformance with the Zoning Bylaw; compatible design and architectural style; adequate water supply and wastewater disposal systems; convenient and safe vehicular and pedestrian access; protection of natural and cultural resources; appropriate screening from the public view; and minimization of burden to the Town's services and infrastructure.

Wireless Communications Facilities Regulations

Wireless Communications Facilities Regulations were added to the Zoning Bylaw in May 2000. The bylaw establishes siting criteria and standards for wireless communication facilities. The purpose of the bylaw is to minimize the adverse impact of such facilities on adjacent properties, scenic views

and the Town's character, and limit the number of such facilities by promoting shared use of existing facilities.

Open Space Communities Bylaw

Open space residential development is a development technique whereby homes are grouped on one or more portions of a lot that are most suitable for development, in order to protect the rest of the site as common open space. Monson's Open Space Communities (OSC) Bylaw allows the development of an open space community in the Rural Residential District by Special Permit from the Planning Board. In an Open Space Community, individual house lots are smaller than the ordinary minimum zoning requirement, but no more lots are allowed than would be allowed in a conventional subdivision. The land that is preserved by the use of smaller lot sizes is dedicated as common open space to be protected from development in perpetuity. For example, if the minimum lot size ordinarily required by zoning is 60,000 square feet, but the lot size is reduced to 30,000 square feet in an Open Space Community, at least 50% of the Open Space Community tract must be set aside as open space.

Open space communities can be an effective means to permanently protect open space and maintain a town's rural character while at the same time allowing for housing growth. However, OSC design can only be applied to residential subdivisions where several homes are being developed at once. As noted above, most of Monson's residential development is in the form of single-lot, Approval-Not-Required development, which is not conducive to OSC design. Mainly for this reason, Monson's OSC Bylaw has never been used. Typically, as a community develops, substantial amounts of subdivision development will not occur until most of the ANR development opportunities have already been exhausted. Therefore, while the OSC bylaw is a good tool for Monson to keep for future growth management, it is unlikely to be utilized in the immediate future.

Infrastructure[2]

Monson's geography has been a major factor in the development of its infrastructure. Rounded hill tops surrounded by large wetland systems have helped to shape and guide local land use patterns as well as limit the value that existing and potential infrastructure might offer towards the expansion of development beyond those lots with frontage on the main roadways in town.

Roads and Highways

Monson has approximately 106 miles of Town maintained ways including 93 miles of paved roads and 13 miles of gravel roads. In addition, approximately four miles of private ways exist in the Town. Most of the private ways were constructed prior to the adoption of Monson's Subdivision Regulations. Overlook Drive is the only private way constructed under subdivision control. All of Route 20 and portions of Route 32 are maintained by the state through the Massachusetts Highway Department. A 1.6 mile portion of Main Street (Route 32) located in the town center is Town maintained. The majority of maintenance work conducted on public ways is funded through federal and state programs. The Massachusetts Legislature appropriates funds known as Chapter 90 funds to communities on a yearly basis for the repair and maintenance of public ways. The level of funding is derived from a formula based on the number of miles of public ways, employment figures, and town population. The level of funding through this program has decreased steadily over the past few years. In Monson, these funds are the primary source of funding for road maintenance and repair work. The Town has also utilized Community Development Block Grant funds for road and sidewalk improvements in the town center.

Approximately 13 miles of sidewalks exist in Monson (mainly in the town center). Few sidewalks exist in the rural residential areas of Town. These sidewalks are in fair to poor condition. The Town allocates $2,000 per year for sidewalk improvements. In addition, if the Town reconstructs a road or conducts major road repairs, the sidewalks are repaired at the same time.

Rail

The New England Central Railroad runs through Monson, and the CSX track threads Monson's Northern border.

[2] Monson Master Plan, 2004

Public Transportation

Monson is not a member of a Regional Transit Authority and, therefore, does not have any public transportation options available to its citizens.

Public Drinking Water Supply

The Town's water supply currently consists of three groundwater wells: the Bunyan Road, the Palmer Road, and the Bethany Road wells. These three sources are located along Chicopee Brook. The water system has one water storage tank with a capacity of 1,000,000 gallons and the distribution system consists of about 36 miles of pipe. The majority of the distribution system consists of unlined cast iron pipe that is 100 years old in some places. According to the Water Supply, Distribution and Storage Study prepared in 1998 by the Board of Water Commissioners with Tighe & Bond, the Town provides water to about 44% of the population. The remaining residents obtain their water from individual on-site wells.

The Bunyan Road well is the primary water supply source for the Town. The well has a safe yield of 800 gallons per minute (gpm). The pump in this well originally had a capacity of 900 gpm, but there has been a considerable decrease in the production of the well over the years due to the accumulation of mineral solids. In 1998, the well was producing about 510 gpm. Due to the natural acidic nature of the groundwater, a corrosion control system has been installed at the Bunyan Road well. The Palmer Road well and the Bethany Road well are used on a limited basis due to the absence of a corrosion control system and to minimize utility demand and power costs.
Between 1992 and 2001, the Bunyan Road well has supplied, on average, 97% of the total water supplied to the system, the Palmer Road well has accounted for an average of 2.75% and the Bethany Road well has made up the remaining 0.25%. From 2002 to the present, the Bunyan Road well is supplying 0%, Palmer Road 98%, and Bethany 2%.

The maximum daily water demand in 2000 was estimated to be approximately 1.15 million gallons per day (mgd). The projected maximum daily demand is expected to increase to 1.37 mgd by the year 2020; however, it should be noted that future projections are difficult to make because a single large industrial water user could account for at least as much new demand as all new residential development over the next 20 years. Residential water usage from Monson's public water supply has actually dropped in recent years, most likely the result of a decrease in water usage at the Monson Developmental Center. The current available municipal supply sources have sufficient safe yield to meet the

current and projected maximum day demands, assuming that all well sources are functional. Typical water works practice for supply planning is to analyze the system with one major supply off-line. If the Bunyan Road well is off-line for maintenance purposes, the Town must use the Palmer Road well and the Bethany Road well. The combined yields from these two wells can comfortably meet the 2020 maximum day demand of 1.27 mgd. However, because neither of these sources is equipped with treatment systems for corrosion control, the Town could potentially be in violation of the Lead and Copper Rule of the Safe Drinking Water Act if the Bunyan Road well is off-line for extended periods.

Water storage facilities provide additional water supply to meet peak demands during well shutdowns, drought conditions, or fire emergencies. The Town has a single one million gallon storage tank located on Ely Road. According to the 1998 Tighe & Bond report, the existing storage tank does not have sufficient water storage capacity to meet the Town's current needs. An additional 1.1 million gallons of storage capacity will be needed to meet the Town's projected 2020 water storage needs. Specifically, consideration should be give to the installation of a 1.1 million-gallon storage tank on Brimfield Road and the installation of a 0.5 million-gallon storage tank on Bald Peak Road, which would provide system flexibility by facilitating a future connection to the Palmer water system.

Sewer Service

The Town's sewer system is approximately 20 years old. The sewer system generally follows the location of the municipal water system with the exception of the Paradise Lake area, which has public sewerage but not public water. The system includes one pump station located on Hospital Road. The Town's wastewater is not treated in Monson but is transferred to the Palmer wastewater system for treatment and disposal. The Town is currently not considering any significant sewer system expansions. However, a revenue review study should be implemented to recognize the impact of decreasing water demand, free water supplied to municipal and school buildings and the future capital improvements that will be required. This should include a review of the water and sewer rate structure.

Stormwater

There are areas within the downtown with undersized stormwater drainage lines. As development continues and the amount of impervious

(paved and building) surface increases, improvements to these systems will be needed. In addition, there are 1,100 catch basins located throughout the Town. The Department of Public Work uses an outside contractor to clean approximately 200 basins a year. Due to location and siltation rates, many of the same basins are cleaned each year but some catch basins are not cleaned for years. Lack of maintenance can lead to flooding, environmental problems, and the need for expensive repairs.

Schools

Public schools serving Monson include the Monson High School, Granite Valley Middle School, Quarry Hill Community School

Natural Resources[3]

Monson's existing natural and historic resources play a major role in defining the community's identity. The Town's forests, streams, valleys, and wildlife define its rural, natural setting, while historic buildings in the downtown and elsewhere impart a timeless charm on the community. This section describes Monson's natural and historic resources and evaluates the status of their protection based on information from previous studies, MassGIS, the Massachusetts Natural Heritage and Endangered Species Program, and the Massachusetts Historical Commission.

Monson consists of a north/south oriented Y-shaped valley nestled between two prominent ridge lines. The western ridge and hills are granite intrusions that were formed several hundred million years ago by a bubble of molten rock that pushed its way to the surface but did not break through. As these igneous intrusions cooled, they formed the granite hills that separate Monson from Wilbraham. Monson's highest peaks, such as Peaked Mountain (1,278 feet), West Hill (900 feet), and Chicopee Mountain (800 feet) are found along the western ridgeline. At the base of these formations, Monson Granite was quarried for use in many of the Town's now historic buildings. The east ridgeline, in contrast, was formed from glacial deposits composed of granite, sandstone, feldspar, and quartz. These formations were created when the glaciers retreated several thousand years ago and dropped debris gathered from distant landscapes.

[3] Monson Master Plan, 2004

Monson's valley contains smaller changes in topography such as drumlins and eskers. These features were also created by glacial deposits. For example, a drumlin, or rounded hill of glacial debris, can be found on the west side of Bethany Road; an esker, formed by a large piece of glacier breaking off and depositing its sediment load in glacial meltwater channels, can be found on the site of the Monson Sand and Gravel Company on Stafford Road.

Monson's historical development pattern has been affected by its geological and soil characteristics. The eastern ridge was settled first in part because of its loose stone glacial deposits. This loose subsurface made it easier to develop, drill wells, and to till the land. Vegetation was also much more abundant on this eastern ridge because of the loose composition of the soil. Small, family-owned farms still exist on the ridge along East Hill Road to the north, and on Moulton Hill Road to the south. In contrast, the western ridge was more suitable for lumbering and less suitable for farming, due to steep slopes. Development of this ridge is much more recent, and has in some instances occurred along unpaved lumber roads. Monson's physical environment also affects recreation in an indirect way. Historically, Monson's hilly terrain has helped to discourage development. Large tracts of unbroken forest and undeveloped land still exist today. Many residents take advantage of undeveloped areas and unpaved roads and trails for
numerous sports, including hunting, hiking, mountain-biking, all terrain-vehicle riding, and horseback riding.

Monson's soils relate directly to the geologic forms and slope of the landscape. The composition of the lowland and eastern ridge soils are characteristic of the glacial deposits that were left in the outwash plain of the Monson valley. The western upland soils represent glacial deposits and erosion of igneous landforms. The valley floor is made up of different deposits of Hinkley-Merrimack-Windsor soils found in a variety of locations from nearly level terrain to steep slopes. The Hinkley-Merrimack Windsor soils are excessively well-drained, having formed in sandy and gravely outwash plains, and often overlie aquifers. Development on top of these soils can be problematic since there is a diminished ability to filter pollution, which may drain directly into the aquifer. Monson's uplands are comprised of Scituate-Montauk-Charlton soils. These soils are found on level to very steep slopes and are well-to-moderately drained. They occur in areas of loamy and sandy glacial till, subject to a seasonal high water table after prolonged rains in the winter and spring.

Water Resources

Monson's plentiful water resources include numerous rivers and streams, extensive wetlands, and ponds. Currently, the Town relies on its groundwater supplies, but Monson's surface water supplies could be tapped to help meet increases in need.

Rivers and Streams

Monson lies within portions of three watersheds. The largest of these watershed areas is the Chicopee River watershed, which occupies approximately 77% (21,940 acres) of the Town. The Chicopee River watershed includes most of the Town's significant ponds, wetlands, and aquifers. The other watershed areas within Monson include the Connecticut River watershed (3,980 acres in Monson), and Quinnabog watershed (2,715 acres in Monson). These two watershed areas are located mainly in the southern part of the Town near the Connecticut state line. Chicopee Brook is Monson's largest stream, and flows north to the Quaboag River. In the past, Chicopee Brook powered many of Monson's mills. The Quaboag River forms the northern boundary between Monson and Palmer. The quality of the Quaboag River has improved since the 1960s and 1970s, largely because of the abandonment of the industries and factories along the river. Compared to present standards, however, the water quality of the Quaboag is still a concern. Monson has approximately 133 acres of surface water. The Town's surface water includes many small
ponds and lakes such as Pulpit Rock Lake and Paradise Lake, in addition to an intricate network of small streams that meander through the forests to the valley.

Wetlands

There are approximately 960 acres of forested and unforested wetlands in the Town.1 Wetlands are located throughout Monson's landscape in areas of poorly-drained glacial till soils that are a heterogeneous mixture of clay, silt, sand and gravel deposited by glacial ice. This unsorted layer of glacial deposits has low water permeability and therefore retains moisture. The number of streams and brooks that flow into these poorly-drained areas is also a factor in the formation of wetlands. The Cedar Swamp in Monson's southeast corner represents a unique wetland landscape feature. Cedar Swamp is owned by the Monson Conservation Commission.

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.

Cedar Swamp: A 50-acre white cedar swamp is located off Cedar Swamp Road. The vegetation in the swamp includes maple, birch, azaleas, mountain laurel, fern, fringed gentian, and skunk cabbage. The area is suitable for nature study, and is open to the general public under the auspices of the Monson Conservation Commission. The western section of the swamp is suitable for wildlife habitat preservation and management for deer and hare. The wooded roads along the northwest side of the swamp are suitable for hiking and provide access to the woods for hunting and woodland management.

Aquifers

Groundwater can exist in aquifers as well as the pores within rock formations. An aquifer is a geologic formation capable of yielding significant quantities of water. Aquifers are generally found in sand and gravel deposits where pores in the soil allow water to collect. Groundwater enters the aquifer through sand and gravel soils, wetlands, and surface water bodies, and slowly percolates through the ground in a down-gradient direction. Monson's aquifers are located primarily along Chicopee Brook.

Hickley-Merrimack-Windsor soils.

Approximately 56 percent of the Town's residents obtain their drinking water from individual private wells. The remaining 44 percent receive water through the Town's municipal water system, which relies on three groundwater wells. As required by the Department of Environmental Protection, the Town has hired a water consultant (Tighe & Bond) to delineate the Zone II aquifer recharge areas for the Town's municipal wells based on hydrogeological studies. The newly delineated Zone II areas will be added to the Town's Water Supply Protection District and submitted to Town Meeting for approval.

Floodways

Water levels in Monson' rivers, streams, and wetlands rise and fall seasonally and during high rainfall events. High water levels are typical in

spring, due to snowmelt and ground thaw. This is the period when flood hazards are normally expected. Low water levels occur in summer due to high evaporation and plant uptake (transpiration). At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage, which then overflow adjacent lands.

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. Most of the floodways in Monson are narrow, fewer than 400 feet wide, because the town's hilly topography and rocky terrain do not permit the formation of broad floodplains. Monson'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 Monson:

(1) Connant Brook
(2) Chicopee Brook-through the center of town and north to the Quaboag River
(3) Vinica Brook
(4) Twelve Mile Brook and surrounding residential properties

Forests

The vast majority of Monson is forrested, which provides an abundance of timber, opportunities for recreation, wildlife habitat, the benefits of climate moderation, and the protection of water quality. The forest and intermixed agricultural land also provide a visually pleasant landscape for residents and visitors too. The town's forests are mainly closed-canopied and middle-aged, having a great diversity of species, but no diversity of horizontal or vertical structural. Interestingly, the town is eighty-five percent forested.

Large blocks of contiguous forestland such as those in Monson are important resources for several reasons. First they represent an area with a low degree of fragmentation. Wildlife species that require a certain amount of deep forest cover separate from people's daily activities tend

to migrate out of fragmenting landscapes. New frontage lots and subdivisions can often result in a widening of human activity, an increase in the populations of plants and animals that thrive alongside humans (i.e. raccoons and squirrels) and a reduction in the species that have larger home ranges and unique habitat needs. Large blocks of forest provide clean water, air, and healthy wildlife populations.

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 Monson.

Floods

The average annual precipitation for Monson and surrounding areas in Hampden County is 45 inches. There are three major types of storms that bring precipitation to Monson. 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.

Both hurricanes and tropical storms can produce substantial damage from storm surge, waves, erosion and intense winds. While storm surge has been the number one cause of hurricane related deaths in the past, more people have died from inland flooding associated with tropical systems in the last 30 years. Since the 1970s, inland flooding has been responsible for more than half of all deaths associated with tropical cyclones in the United States. Inland flooding from hurricanes can occur hundreds of miles from the coast, placing communities which would not normally be affected by the strongest hurricane winds in great danger.

Some of the greatest rainfall amounts associated with tropical systems occurs from weaker tropical storms that have a slow forward speed (1 to 10 mph) or stall over an area. Due to the amount of rainfall a Tropical Storm can produce, they are capable of causing as much damage as a category 2 hurricane. For a more detailed description of hurricanes and tropical storms, see the following section on Wind-Related Hazards.

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 Hampden. There have been sixteen tornadoes that have touched down in Hampden County since 1950. One Category F1 tornado has hit Monson since 1950. 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.).

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.[4]

Wildland Fires/Brushfires

According to FEMA, there are three different classes of wildland fires: *surface fires*, *ground fires* and *crown fires*.[5] 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 lightening. 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 Monson, 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 32 total fires reported in Monson in 2005; eight of these fires were structural, six were vehicular and 18 were outdoor fires.

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.[6] 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.[7]

[4] *http://www.fema.gov/regions/vii/2003/03r7n06a.shtm*
[5] FEMA, "Fact Sheet: Wildland Fires," September 1993.
[6] Northeast States Emergency Consortium Web site: *www.nesec.org/hazards/earthquakes.cfm.*
[7] 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
Total Number of Earthquakes within the New England states between 1568 and 1989 = 1,239.		

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. In 2005, DCR issued regulations for the inspection of dams, and property owner became fully responsible for maintaining and inspecting their dams in a timely, safe and efficient manner.

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 26 dams, two of which are considered to be High Hazards for Monson's residents; these are the Zero Manufacturing Company Dam and the Connant Brook Dam.

Table 3-3

Pulpit Rock Pond Small Dam (NJ)	Low Hazard
Lunden Dam	Low Hazard
Bradway Pond Dam	Low Hazard
Church Manufacturing Co. Dam	Low Hazard
Paradise Lake Dam (NJ)	Low Hazard
Baldwin Pond Dam	Low Hazard
Calkins Lower Pond Dam	Low Hazard
Calkins Pond Upper Dam	Low Hazard
Aldrich Pond Dam	Low Hazard
B.C.P. Bradway Pond Dam	Low Hazard
Anderson Pond Dam	Low Hazard
Dr. Schimmel Pond Dam	Low Hazard
Monson Association Pond Dam	Low Hazard
Shepard Lower Pond Dam	Low Hazard
Shepard Upper Pond Dam	Low Hazard
Monson Water Works Dam	Low Hazard
R.S. Sutcliffe Dam & Dike	Low Hazard
C.P. Bradway Lower Pond Dam	Low Hazard
Pulpit Rock Pond Main Dam	Significant Hazard
Pulpit Rock Pond West Dam	Significant Hazard
Boulder Hill Pond Dam	Significant Hazard
Moulton Pond Dam #1	Significant Hazard
Springfield Sportsmen Club Dam	Significant Hazard
Smith Pond Dam & Dike	Significant Hazard
Zero Manufacturing Company Dam	High Hazard
Connant Brook Dam	High Hazard

The 100-year floodplain covers 791 acres of the town.

Drought[8]

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

[8] Massachusetts State Hazard Mitigation Plan

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

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 drought. 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 increasing 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, 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 Monson 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
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

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 Monson 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
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	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
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

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 Monson

TYPE OF HAZARD	FREQUENCY OF OCCURRENCE	LOCATION OF OCCURRENCE	IMPACT	HAZARD RISK INDEX RATING
Flooding	**High**	**Large**	**Critical**	**2**
Severe Snowstorms/Ice Storms	**Medium**	**Large**	**Limited/Minor**	**3**
Severe Thunderstorms (microbursts) which cause wind damage	**Medium**	**Large**	**Limited**	**3**
Hurricanes	**Very Low**	**Large**	**Critical**	**3**
Tornadoes	**Very Low**	**Small**	**Limited**	**2**
Wildfire/Brushfire	**Very Low**	**Small**	**Minor**	**4**
Earthquakes	**Very Low**	**Large**	**Catastrophic**	**1**
Dam Failures	**Very Low**	**Medium**	**Limited**	**3**
Drought	**Very Low**	**Large**	**Minor**	**4**
Man-made Hazards: Hazardous Materials	**Very Low**	**Medium**	**Limited**	**2**

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).

Detailed Natural Hazard Profile for Monson

Flooding

Location:

There is potential for annual flood incidents in Monson due to the community's location next to the Chicopee River as well as its topography. Most of the flood hazard areas listed here were identified due to known past occurrence in the respective area. There are many areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff from surrounding slopes.

Extent

There are approximately 791 acres of land within the FEMA mapped 100-year floodplain and 291 acres of land within the 500-year floodplain within the Town of Monson. According to the Community Information System (CIS) of FEMA, there were Zero 1-4 family structures and Zero "other" structures located within the Special Flood Hazard Area (SFHA) in Monson as of August 10, 2005, the most current records in the CIS for the Town of Monson. Utilizing the Town's median home value of $215,000, a preliminary damage assessment was generated. For the estimated number of people living in the floodplain, an average household size of 2.66[9] people was used.

Previous Occurrences

Summary of October, 2005[10]
General flooding occurred along the Chicopee Brook with the most severe flooding occurring in North Monson along Bunyan Drive, Fenton Road, and Pulpit Rock Pond. These areas had submerged bridges during the storm event, which resulted in the isolation of critical facilities.

Fenton Road -- Route 32 & Hospital Street Bridges
The Bridge on Route 32 and the Bridge on Hospital Street were flooded out during this storm event. There is a mobile home park located in between these two bridges, but the mobile home park was isolated during this event. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

[9] Figure courtesy of 2000 U.S. Census.
[10] Information obtained from local knowledge during planning sessions.

- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Bunyan Drive

The Bridge on Bunyan Drive was flooded out during this storm event. There is a pump station located on the western side of the bridge; reduced access could lengthen service times for facilities and residential populations.

There were no residential structures in the affected area. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Pulpit Rock Pond

Pulpit Rock Pond is a remote water body in Monson's northwestern corner. During this storm event, Twelve Mile Brook flooded the access bridge that services residents of the Pulpit Rock Pond Area. There are no residential structures in the area that flooded. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Loss of access to remote communities
- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Route 32 – North of Bethany Road

During this storm event, an undersized culvert caused localized flooding in the area known as North Monson. This section of town is largely industrial and is not included on Monson's Flood Insurance Rate Map. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Loss of access to remote communities
- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Probability of Future Events

Based upon the conversations that emerged out of the Monson PDM planning process, it seems likely that there is a five percent chance of minor or severe flooding occurring every year in Monson. This is partly a function of the topography and settlement patterns that have resulted in Monson's current formation. The area within the flood plain still has a one (1) percent chance of a severe flood in any given year.

Snowstorms

Location

The entire Town of Monson is susceptible to severe winter storms.

Extent

The Massachusetts State Hazard Mitigation Plan has identified Monson as a community that is among the state's highest locations for two-day snow fall events. This means that Monson can and has received thirty or more inches of snow in a short period of time; due to the constraints this places on the town highway department, a significant portion of town could be without transportation options, depending on the severity of the storm.

Previous Occurrences

The State Hazard Mitigation Plan identified counties that have experience severe snowfall events. Over the past fifteen years, Monson has been included in four major snow events.

- March Blizzard - (March 1993)
- January Blizzard - (January 1996)
- February Snowstorm - (Feb. 17 – 18, 2003)
- December Snowstorm (Dec. 5 & 6, 2003)

Probability of Future Events

Based upon the data presented in the State Hazard Mitigation Plan, the likelihood that a severe snow storm will hit Monson in any given year is greater than ten percent.

Hurricanes

Location: Monson's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. In previous years, Monson has had high-wind thunderstorms that have caused neither financial damage nor personal injury.

- Monson Center at risk, except for granite structures
- Power and phone lines - disruptions of services.
- Flooding/washing of evacuation routes.

Extent

In the event of a tropical storm or hurricane, the greatest risk to Monson will be flooding of the Chicopee River. Wind damage will be limited, but widely spread, perhaps including downed power and communications lines, but flooding damage will be more severe and focused on Monson Center, the town's transportation infrastructure and evacuation routes.

Previous Occurrences

According to the Northeast States Emergency Consortium (NESEC), Monson has been hit by a tropical Depression and two tropical storms since records have been kept (roughly 150 years). This means that has experience severe tropical weather in the past and is likely occur again as time passes. The last such storm that passed through Monson did so in 1954 (Source MassGIS).

Probability of Future Events

Based upon the past reporting of multiple tropical storm within Monson over a period of 150+ years, it is reasonable to say that there is a medium frequency of hurricane and tropical storm occurrence in Monson (once every fifty years is roughly a two percent chance of any such storm occurring in a given year).

Tornadoes/Microbursts

Location

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

Extent

The potential for locally catastrophic damage is a factor in any tornado event. In Monson, a tornado that traced along the hillsides in the town's western section would leave much less damage than a tornado with a travel path that ran along the Chicopee River, where most settlement has occurred. Most buildings in the Town of Monson have not been built to Zone 1, Design Wind Speed Codes. Although, the presence of the Granite Quarries and the historical tendency many New England towns had to build with local building supplies might result in buildings that are more structurally sound than any existing building codes may have indicated. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975.

Previous Occurrences

There have been sixteen tornadoes that have touched down in Hampden County since 1950. One Category F1 tornado has hit Monson since 1950. No records contained information about damage, but the Tornado was documented in southeastern Monson.

Probability of Future Events

Based upon the available historical record, as well as Monson's location in a high-density cluster of state-wide tornado activity, it is reasonable to estimate that there is a medium frequency of tornadoes in Monson (a 1% - 2% chance in any given year).

Wildfires/Brush Fires

Location

Monson is one of the largest communities in Hampden County, and, excluding the town center, a large portion of the town's land mass is forested.

Extent

Forested areas in Monson cover all of Monson's outlying areas, which can be remote and difficult for emergency crews to access. In Monson approximately 74 percent of the City's total land area is in forest, or about 21,331 acres, and is therefore at risk of fire. A large wildfire could damage a quarter of the town's land mass in a short period of time. Massachusetts receives more than 40 inches of rain per year and much of the landscape is fragmented, and together these two traits make wildfires uncommon in Massachusetts.

Previous Occurrences

In 2005, the most recent year for which Monson has records, there were 32 fires reported in Monson. Of this number, 8 fires occurred in buildings, 6 occurred in vehicles and 18 occurred out-of-doors. However, there have not been any major wildfires recorded in Monson.

Probability of Future Events

There have been no major wildfires in Monson in several decades. Therefore it is reasonable to say that there is a low frequency of occurrence of wildfires in Monson, placing the likelihood of this particular event occurring in any given year at less than 1% chance of occurring in any given year.

Earthquakes

Location

The last major earthquake to strike Massachusetts did so more than 200 years ago in 1755 when an estimated 5.75 strength earthquake struck off of Cape Anne, which is North of Boston. Damage from this event stretched from Northern Massachusetts to Boston, and is thought to have occurred because of compression and buckling along the North American Plate, which stretches from California to the middle of the Atlantic Ocean. Unlike California, where earthquakes occur along fault lines, there is no predictable pattern for where an earthquake will emerge in New England. However, the forces that initiate buckling in New England are include the downward weight of mountains and the upward stress relief that resulted from the retreat of the glaciers. These factors,

when combined with the geography of New England and the historical record, indicate that Cape Ann and Eastern Massachusetts are the sections of the Commonwealth that are most likely to experience an earthquake. However, seismologists have concluded that earthquakes in New England can occur anywhere in the region and that there is no way to specify where the greatest risk lies.

Extent

In the event of an earthquake, all of Monson would be affected with some portions more impacted than others, depending on the magnitude of the earthquake.

Previous Occurrences

Several small earthquakes have been recorded in Northampton, Amherst, Springfield and Palmer over the past 200 years. Regionally, there have been 8 minor earthquakes since 1884.

Probability of Future Events

Based upon existing records, there is a low frequency of earthquakes in Monson with a less than 1% chance of an earthquake occurring in any given year.

Dam Failure

Location

The Massachusetts Emergency Management Agency (MEMA) identifies twenty-six (26) dams in Monson. Of the twenty-six dams in Monson eighteen are classified as *Low Hazard*: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected. Six dams are categorized as 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. The Zero Manufacturing Company Dam and the Conant Brook Dam are *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.

Extent

The Zero Manufacturing Dam would impact the area around Main Street (Rte 32), specifically the South Monson area. The failure of the Army Corps Conant Brook Dam would release millions of gallons of water down the Conant Brook and result in devastation all along the Chicopee River.

Previous Occurrences

There have been no dam failures in Monson's history.

Probability of Future Events

Based on historical records, there is a very low frequency of dam failure in Monson, placing the likelihood of a dam failure well below 1% in any given year.

Drought

Location

Currently, 44% of Monson's residents obtain their drinking water from the town's public drinking water supply. The Bunyan Road Well is the primary supply for the town, and there are two minor back-up wells, but neither is prepared for long-term use. Should a drought occur and groundwater levels were to drop, all citizens would be affected equally, as all of Monson's residents rely on groundwater supplies.

Extent

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 drought. 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.

Due to Monson's reliance on the Bunyan Road Well, an event that removed this drinking water supply from the system—such as contamination—would have the same impact as a sustained drought.

Previous Occurrences

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

Probability of Future Events

In Monson, as in the rest of the state, drought occurs at a medium frequency, with a range of a 1% or a 10% chance of drought occurring in a single given year. However, due to Monson's smaller population and the water richness of Western Massachusetts, communities like Monson would not be as severely impacted as some communities in Eastern Massachusetts.

Man-made Hazards

Location

The potential for serious man-made events exists within Monson. Within town, there is a gas line, several underground storage tanks, and rail road tracks that are known to transport industrial chemicals. There are five sites off of Route 32 and Brittany Road that have been classified as EPA Tier II facilities.

Extent

There is no reliable indicator of the extent of a man-made event in Monson.

Previous Occurrences

There have been no previous occurrences in Monson.

Probability of Future Events

Unknown.

Development and Growth – Potential Hazards

The LEPC identified future growth areas on the community's P*ast and Potential Hazards/Critical Facilities Map*. None of the identified growth areas were located in a section of town that has had documented (or suspected future) natural hazards. Nevertheless, as growth occurs, most of it will take place away from the existing fire hydrant district. This has the potential of placing the community at risk of future damage from wildfires and brushfires.

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 Monson. 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 Monson, 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 Monson, including exempt structures such as schools and churches, is $763,165,138 as of 2006. The median value of a home in Monson is $215,000 according to the 2006 market data. 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): High Risk

In this section, a vulnerability assessment was prepared to evaluate the potential impact that flooding could have on the portions of Monson 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.

There are approximately 791 acres of land within the FEMA mapped 100-year floodplain and 291 acres of land within the 500-year floodplain within the Town of Monson. According to the Community Information System (CIS) of FEMA, there were Zero 1-4 family structures and Zero "other" structures located within the Special Flood Hazard Area (SFHA) in Monson as of August 10, 2005, the most current records in the CIS for the Town of Monson. Utilizing the Town's median home value of $215,000, a preliminary damage assessment was generated. For the estimated

number of people living in the floodplain, an average household size of 2.66[11] people was used.

A total of Zero structures are located within the SFHA in Monson, totaling approximately $0 of damage, and Zero people impacted. The damage estimate is a rough estimate and likely reflects a worst-case scenario. Computing more detailed damage assessments based on assessor's records is a labor-intensive task and beyond the scope of this project.

Nevertheless, the National Flood Insurance Program has records for six policies in Monson that are worth $857,900 as of 2006. Therefore, the estimates—based upon data obtained from FEMA resources—provides a range of a minimum of $0 and a maximum of $857,900 (or 1,293,000 if the methodology listed above is used).

Flooding: Medium-High Risk

There is potential for annual flood incidents in Monson due to the community's location next to the Chicopee River as well as its topography. Most of the flood hazard areas listed here were identified due to known past occurrence in the respective area. There are many areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff from surrounding slopes.

Summary of October, 2005[12]

General flooding occurred along the Chicopee Brook with the most severe flooding occurring in North Monson along Bunyan Drive, Fenton Road, and Pulpit Rock Pond. These areas had submerged bridges during the storm event, which resulted in the isolation of critical facilities.

Fenton Road -- Route 32 & Hospital Street Bridges

The Bridge on Route 32 and the Bridge on Hospital Street were flooded out during this storm event. There is a mobile home park located in between these two bridges, but the mobile home park was isolated during this event. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

[11] Figure courtesy of 2000 U.S. Census.
[12] Information obtained from local knowledge during planning sessions.

Bunyan Drive

The Bridge on Bunyan Drive was flooded out during this storm event. There is a pump station located on the western side of the bridge; reduced access could lengthen service times for facilities and residential populations.

There were no residential structures in the affected area. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Pulpit Rock Pond

Pulpit Rock Pond is a remote water body in Monson's northwestern corner. During this storm event, Twelve Mile Brook flooded the access bridge that services residents of the Pulpit Rock Pond Area. There are no residential structures in the area that flooded. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Loss of access to remote communities
- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

Route 32 – North of Bethany Road

During this storm event, an undersized culvert caused localized flooding in the area known as North Monson. This section of town is largely industrial and is not included on Monson's Flood Insurance Rate Map. Cost for repairing or replacing any dams or bridges, power lines, telephone lines, and contents of structures are not included.

- Loss of access to remote communities
- Annual potential for flooding in floodplain from both spring runoff and heavy summer/fall rains.
- Potential for damage/repair to road surface.

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. Ice storms have disrupted power and communication services. Timberland has been severely damaged. Extreme cold affects the elderly. Monson'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.

- Area has been subject to extremely heavy snow falls, records of early 1900s and into the 1950s and 1960s indicate this.
- High risk town wide due to snow, ice and extreme cold.
- 1969 heavy snow - several 3 feet events.
- 1988 temperature below 0 degrees for a month (Nov.-Dec.).
- Elderly are affected by extreme weather.

Hurricanes/Severe Thunderstorms: Medium Risk

Monson's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. In previous years, Monson has had high-wind thunderstorms that have caused neither financial damage nor personal injury. Estimated wind damage 5% of the structures with 10% damage $3,815,826 . Estimated flood damage 10% of the structures with 20% damage $15,263,3032. Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included.

- Monson Center at risk, except for granite structures
- 1938 hurricane was a major event - wind damage and flooding statewide.
- Power and phone lines - disruptions of services.
- Flooding/washing of evacuation routes.

Tornadoes/Microbursts: Medium Risk

Risk of tornadoes is considered to be high in Hampden County. Tornadoes rarely occur in this part of the country; therefore, assessing damages is difficult. Most buildings in the Town of Monson have not been built to Zone 1, Design Wind Speed Codes. Although, the presence of the Granite Quarries and the historical tendency many New England towns had to build with local building supplies might result in buildings that are more structurally sound than any existing building codes may have indicated. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975. According to the 2000 U.S. Census, approximately 45% of the housing in Monson was built before 1970. Estimated damages to 10% of structures with 20% damages $15,263,087. Estimated cost does not include building contents, land values or

damages to utilities.

- In the last fifty years, one known tornado has touched down in Monson
- River corridors and hill tops susceptible.
- 14 incidents of tornado activity (F3 or less) occurred in Hampshire County from 1954 to 2006.

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. Entire town - minimal forest fire protection (dependent on on-call firefighters and problems with accessibility)

Monson did not identify any areas as potential wildfire hazards.

Earthquakes: Very High Risk

Moderate potential for serious damage in the settled areas along the Chicopee Brook. Structures are mostly of wood frame construction, but there are some granite structures in town. Estimated losses to 20% of the town would be $152,633,028. Costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures are not included.

- Several small earthquakes have been recorded in Northampton, Amherst, Springfield and Palmer over the past 200 years
- Low risk to town.
- Earthquake that destroyed Quabbin Reservoir's Dikes would result in catastrophic losses

Dam Failure: Medium Risk

The Massachusetts Emergency Management Agency (MEMA) identifies twenty-six (26) dams in Monson. Table 3-3 identifies the dams within the town as well as whether they are classified as low, significant, or high hazard. Of the twenty-six dams in Monson eighteen are classified as *Low Hazard*: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected. Six dams are categorized as *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. The Zero Manufacturing Company Dam and the Conant Brook Dam are *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.

Drought: Low Risk

In Massachusetts, six major droughts have occurred statewide since 1930[13]. They range in severity and length, from three to eight years. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels.

Man-Made Hazards - Hazardous Materials: High Risk

Monson relies on the support of the Fire Department for responding to incidents involving hazardous materials. Public transportation of chemicals and bio-hazardous materials by vehicle transport on Route 32. There are five (5) sites in the Town of Monson identified by the U.S. EPA as Tier II Hazardous Material sites. These sites are off of Route 32 and Brittany Road.

(Past and Potential Hazards Map Located in Appendix E)

[13] US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US 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. The town's Police Department and Fire Department are both located in close proximity to the 100-year floodplain as shown in the table at the end of this section. Flooding of bridges could isolate these facilities and increase response times in an emergency.

The Critical Facilities List for the Town of Monson has been identified utilizing a Critical Facilities List compiled for Monson's Comprehensive Emergency Management Committee. Monson'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 Monson. 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

Municipal Office Building—Main Street
Monson Developmental Center (Alternate)—State Ave.

2. Fire Station

Monson Fire Station – Main Street

3. Police Station

Monson Police Station – Main Street

4. Highway Garage

Monson Highway Department – Main Street

5. Water and Sewer Department

Monson Water and Sewer Department – Main Street

6. Emergency Fuel Stations

N/A

7. Emergency Electrical Power Facility

Pumping Station – Liberty & Plain Street
#1 Water Pumping Station - Barnes Street
Boylston Municipal Water District Well#1 – Rte 70 and Rte 140
Boylston Water District Pump #2 – Adams St.
Boylston Water District Well #2 – Kendall Place
Brunell Sewer Pump Station – Brunell Ave.
College Highway Pumping Station – College Highway North
Feeding Hills Rd Pumping Station - Feeding Hills Road
Gillis Pumping Station – Woodland Road
Harwich Water Department – Chatham Road
Henry Ave Sewer Pumping Station – Henry Avenue/Lenox Dale
Lynnefield Water District Pumping Station – Rte 1 North
Marginal Pump Station – Washington Square
Massachusetts Avenue Sewage Pump Station – Mass Ave.
New Lenox Sewer Pump Station – New Lenox Road
North Longyard Pumping Station – North Longyard Road
Pumping Station – Brookside Road
Pumping Station – Union Street
Pumping Station – Farm River
Pumping Station – Howard St
Pumping Station – Surry Lane
Pumping Station – Grove Street
Pumping Station – Common Street
Pumping Station – West Street
Pumping Station – Jefferson Street
Pumping Station – Pearl Street
Rte. 70 Pumping Station #1 – Main Street
WWTP Pumping Station - So. Mill Street
West Shaft Rd. Lift Station – West Shaft Road
West Sterling Pumping Station – Redemption Rock Trail
Worcester Road Pumping Station – Worcester Road
Emergency Generator, Monson Highway Department
Two Emergency Generators, Monson Fire Department

Emergency Generator, Monson Police Department

8. Emergency Shelters

Quarry Hill Street –Margaret Street
Monson Fire Station—Main Street
Monson Senior Center – Main Street
Granite Valley Middle School – Thompson
Monson Developmental Center – State Avenue
Palmer Senior High School – Main Street
Monson Sr. High School—Margaret Street
Monson Fire Station – Main Street

9. Dry Hydrants - Fire Ponds - Water Sources

Numerous locations in Monson, so please refer to the *Critical Facilities Map* at the end of this document.

10. Utilities

Bay State Gas Pipeline
Exxon Mobil Pipeline
Tennessee Gas Pipeline
Verizon Switching Station

11. Helicopter Landing Sites

Veteran's Field – Rear of Municipal Building
Quarry Hill Community School
Monson Developmental Center
Field along Route 32
Corner of Easthill Road and Brimfield Road
Conant Brook Dam – Wales Road
Wilbraham Road and Wade Road – Field
Hillcrest Cemetery

12. Communications

Verizon Switching Station
Hovey Road Communications Station – Three Cell phone towers, Comcast Cable

13. Primary Evacuation Routes

Route 32 - north and south
Route 20 – east and west
Wilbraham Road

Wales Road
Lower Hampden Road

14. Bridges Located on Evacuation Routes

All routes, with the exception of Wales Road, have bridges located on them. In the worst case scenario, all routes could be limited because of flood waters.

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 Monson.

1. Water Supply

GP Well #1 – Bethany Road
GP Well #2 – Palmer Road
GP Well #3 – Bunyan Road

2. Sewer Infrastructure (Pump Stations)

Brunell Sewer Pump Station – Brunell Avenue
Henry Avenue Sewer Pumping Station – Henry Avenue
Massachusetts Avenue Sewage Pump Station – Massachusetts Avenue
New Lenox Sewer Pump Station – New Lenox Road
Waste Water Treatment Plant Pumping Station – South Mill 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

Kristy Jo's Daycare – Bethany Road
Colonial Village Senior Housing – State Street
Little Lamb Daycare – Park Avenue
Moon Mountain Daycare – Woodhill Road
Mrs. B's Daycare – Stewart Ave
Nancy's Family Daycare – Palmer Road
Robbins in the Nest - Thompson Street
Scantic Valley YMCA before/after school program – Thompson Street
Small Steps Daycare – Town Farm Road
Stimulations Preschool – Thompson Street
Sunny Brook Home Learning Childcare – sunny Brook Drive

2. Elderly Housing/Assisted Living

Colonial Village Senior Housing – State Street

3. Recreation Areas

Pulpit Rock Lake – Dickerson / Maxwell Road
Flynt Park – Park Road
Brimfield State Forest / Dean Pond – Monson, Brimfield and Wales town lines
Paradise Lake – Lakeside Drive
Springfield Sportsman Club – Wood Hill Road
Conant Brook Dam - Wales Road/Blanchard Road
Cedar Swamp – Moulton Hill Road
Cushman Field – Washington Street
Hillside School – Thompson Lane
Monsoon-Brimfield-Wales (MBW) Trail - 14.5 miles in total
Keep Homestead Museum – Ely Road
Quarry Hill Community School – Thompson Street
Veterans Fields and Tennis Courts – Man and State Streets
Quaboag Country Club – Palmer Road
Norcross Wildlife Sanctuary – Wales-Monson Road
O'Connors Fields – Bethany Road
Peaked Mountain – Butler Road
Quaboag Riders Club – Cat Rock
Sunset View Campground – Town Farm Road

4. Schools

Granite Valley Middle School – Thompson Street
Monson Senior High School – Margaret Street
Quarry Hill Community Elementary School – Margaret Street

5. Churches

First Congregational
First Methodist
St Patrick's Catholic Church
Silver Street Chapel

6. Historic Buildings/Sites

Monson Center Historic District – Junction of Main and Cushman
Monson Development Center – State Avenue
Memorial Hall – Main Street

7. Apartment Complexes

Colonial Village
Cushman Hall
Johnson's Apartments
State Street School

70 Main Street
Hyde and Canon
Quaboag Heights

8. Employment Centers

Monson Development Center
Thermotek
Lamcotek

9. Camps

Sunset View – Town Farm
Partridge Hollow – Sunset Road
Naturalist Colony – Maxwell Road

10. Mobile Home Parks

Hospital Road – 55 units **** IN FLOOD PLAIN

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding	Downtown Monson	Town Hall, Highway Garage, Police Station, Historic Structures, Fire Department	Route 32
Severe Snowstorms/Ice Storms	Entire Town	None	None
Severe Thunderstorms (microbursts) which cause wind damage	Telephone, Power Lines	Energy and Communication	None
Hurricanes	Downtown Monson	Town Hall, Highway Garage, Police Station, Historic Structures, Fire Department	Route 32
Tornadoes	Entire Town	None	None
Wildfire/Brushfire	None	None	None
Earthquakes	Entire Town	Highway Garage, Memorial Hall, Older Churches	Route 32
Dam Failures	Downtown Monson	Town Hall, Highway Garage, Police Station, Historic Structures, Fire Department	Route 32
Drought	Entire Town	Water Supply	None
Man-made Hazards: Hazardous Materials	Gas Line, Underground Storage Tanks, Rail Road Tracks	Town Hall, Highway Garage, Police Station, Historic Structures, Fire Department	Route 32

(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 Monson 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 Quaboag River (which runs along the town Monson/Palmer Town Line), the Chicopee Brook (which runs north-south along Palmer Road), Twelvemile Brook and Maxwell Brook (located in the western portion of Monson) and the Conant Brook Reservoir and the Vinica Brook (both located in south eastern Monson).

The major floods recorded in Monson 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 Monson lists the following generic mitigation measures for flood planning:

1. Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
2. Disseminate emergency public information and instructions concerning flood preparedness and safety.
3. Community leaders should ensure that their community is enrolled in the National Flood Insurance Program.
4. 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.
5. Ensure that flood control works are in good operating condition at all times.
6. Natural water storage areas should be preserved.
7. Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

The Comprehensive Emergency Management (CEM) Plan for Monson 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 flood gates.
- Notify all Emergency Management related groups that will assist with flood response activities to be ready in case of flood 'warning'.

Evacuation Options

The 100-year flood zone covers mostly narrow bands of level floodplain land along the Quaboag River (which runs along the town Monson/Palmer Town Line), the Chicopee Brook (which runs north-south along Palmer Road), Twelvemile Brook and Maxwell Brook (located in the western portion of Monson) and the Conant Brook Reservoir and the Vinica Brook (both located in south eastern Monson). According to the Monson CEM Plan, local officials have stated that there are local shelters available for flooding victims, including people with Special, non-institutional needs. These are Quarry Hill Street, the Monson Senior Center, the Granite Valley Middle School, various school department buildings, the Monson Developmental Center, the Palmer Senior High School (located in the neighboring town of Palmer), the Monson Fire Station and the Monson Senior High School. Approximately six properties would be impacted by a 100-yr.flood. Emergency management personnel should assess existing floodplain and dam failure data to determine an appropriate evacuation plan.

In addition, Monson has 22 bridges 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

Conant Brook Dam: This approximately 300-acre parcel of land is owned by the U.S. Army Corps of Engineers for flood control purposes. The area includes a rare kettle pond. The floodplain is currently dry with only a small shallow silt pool. The area overall is suitable for hiking and horseback riding.

Land Use Regulations that Mitigate Impacts from Flooding[14]

The Town of Monson 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

Monson's most recent draft of its Subdivision Rules and Regulations (1983) which govern the subdivision of land were adopted for the purpose of "protecting the safety, convenience and welfare of the inhabitants of the cities and towns in which it is, or may hereafter be, put in effect 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 powers of the planning board and of a board of appeals under the subdivision control law shall be exercised with due regard for the provision of adequate access to all of the lots in a subdivision by ways that will be safe and convenient for travel; for lessening congestion in such ways and in the adjacent public ways; for reducing danger to life and limb In the operation of motor vehicles; for securing safety in the case of fire, flood, panic and other emergencies; for insuring compliance with the applicable zoning ordinances or by-laws; for securing adequate provision for water, sewerage, drainage and other requirements where necessary in a subdivision; and for coordinating the ways in a subdivision with each other and with the public ways in the city or town in which it is located and with the ways in neighboring subdivisions. It is the intent of the subdivision control law that any subdivision plan filed with the planning board shall receive the approval of such board if said plan conforms to the recommendation of the board

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

of health and to the reasonable rules and regulations of the planning board pertaining to subdivisions of land; provided, however, that such board may, when appropriate, waive, as provided for in section eighty-one R, such portions of the rules and regulations as is deemed advisable." The Subdivision Rules and Regulations contain several provisions that mitigate the potential for, and impact of, flooding, including:

- Section 5.3. [Definitive plan] Contents. Requires the proponent, in part, to identify:
    - 5.3.4. Major site features, such as…swamps, flood plains, historic features, and wooded areas; the plan shall identify which of the above shall remain undisturbed
    - 5.3.5. Location of natural waterways and waterbodies within and adjacent to the subdivision;
    - 5.3.15.b. Drainage details for catch basins, man-holes, inwalls and all other components or features, with specific references to the appropriate sections of the State Construction Standards;
    - 5.3.15.c. Drainage trench or waterway relocation section;
    - 5.3.16.b. Storm Drainage System including manholes, pipes, culverts, catch basins and appurtenant structures;
- Section 8.5. Environmental Impact. This section shall deal separately with both short-term and long-term impacts. A narrative statement shall be submitted, documenting all mitigative measures taken to:…:

    Section 8.50 Prevent Surface Water Contamination, changes in surface water level, or both.

    Section 8.51 Prevent Groundwater Contamination, changes in groundwater level, or both.

    Section 8.52 Maintain Slope Stability.

    Section 8.53 Prevent erosion, sedimentation, or other instability in soils or vegetative cover.

    Section 8.57 Protect wetlands and floodplains, and ensure compliance with the Wetlands Protection Act (Sections 40 and 40A of Chapter 131 of the General Laws).

- Section 7.32 Drainage and Drainage Structures

a. Culverts to be installed to carry runoff from existing streams shall be designed to satisfy requirements of a hundred-year storm.

b. Proposed culverts and ditches to be installed for street drainage shall be designed to satisfy requirements of a twenty five-year storm.

- Section 7.33 Catch Basins and Manholes

  Adequate disposal of surface water shall be provided for in a manner satisfactory to the Planning Board, and shall address runoff from the proposed subdivision. Such system may include a system of storm drains, culverts, ditches, underdrains, detention basins, drywells, and related installations, including catch basins, gutters and manholes, and shall be designed and installed to provide adequate disposal of surface water, including control of erosion, flooding, storm water management and standing water from or in the subdivision and adjacent lands. A catch basin to manhole system of drainage is required.

  When development of an area will increase runoff to downstream properties, a detention area shall be constructed. Such detention area will be designed to handle the 100-year storm without increasing downstream runoff above pre-construction conditions, and such size shall be determined by using the flood routing procedure as described in the U.S.D.A. Soil Conservation Service Technical Release No. 55. Storm Water calculations shall be prepared by a Registered Professional Engineer using two methods of calculations. One method shall be as described in U.S.D.A. Soil Conservation Service Technical Release No. 55.

- Section 7.33.2 Piped Systems

  e. No open water body or pond shall be filled in, and no wet or swampy area shall be filled in unless approval has been obtained in accordance with Chapter 131 of the Massachusetts General Laws.

  f. Where open stream channels exist within a subdivision, adequate provision shall be made for properly maintaining them or for properly enclosing them, if absolutely necessary. It is the Town's Intent to preserve and maintain the natural features of such streams and any development should be planned accordingly.

- Section 7.34

a. In order to replicate the flood control value of undisturbed lands, provide compensatory storage of storm water runoff, and comply with the Town of Monson's Zoning Bylaws, the Town of Monson may allow the construction of storm water detention basins provided that:

5. their location is not in an area such that the sudden release of water, due to failure, would result in loss of life, injury to persons, damage to residences or buildings or cause interruptions of use or service of public utilities;

- Section 7.34.2 Contents

The following information shall be required to be submitted as part of the Definitive Plan:

b. Water courses, ponds, marshes, flood plains, rock outcrop, and other significant natural features within 100 feet of the proposed high water mark (as determined by the 100-year storm frequency);

c. A drainage area map outlining the watershed area; the map shall show the watershed boundary; the drainage pattern; location of bridges, culverts and other structures that affect the flow of water; location of roads, buildings, property lines and fences or walls; and a north arrow.

e. Drainage calculations for proposed and existing conditions, done for a minimum 25 year and 100-year storms. Critical volume calculations should be checked by an independent alternate method using both short duration/high intensity and long duration storms.

j. All drainage design Information, drawings and runoff calculations must be prepared, signed, dated, and stamped by a Massachusetts Registered Professional Engineer using standard acceptable engineering methods. The runoff calculations should be based on soil cover conditions expected to prevail during the anticipated effective life of the structure.

A 100-year design frequency storm is required for all storm water detention basins.

- Section 5.1.5. Stormwater Runoff

In those areas not served by storm drains, the rate of surface water run-off from a site shall not increase after construction. If needed to meet this requirement and to maximize groundwater recharge, increased

runoff from impervious surfaces shall be recharged on site by being diverted to vegetated surfaces for infiltration or through the use of detention ponds. Dry wells shall be used only where other methods are and shall require oil, grease and sediment traps to facilitate removal of contaminants.

- 5.51 Water Supply Protection District,

  Any portion of a proposed subdivision which lies within the limits of the Water Supply Protection District shall conform to the requirements of said district as stated in the appropriate section of the Monson Zoning Bylaw

- **7.50 General Standards**

1. All public and private sewers, surface water drains, water and gas pipes, electric, telephone and Cable TV lines, together with their appropriate underground structures, within the street right-of-way, shall be placed underground at the discretion of the Board.

- Driveway Standards, From the "Definitions" Section

  - That portion of a parcel of land on private property designed by the property owner as the vehicle access from a street to parking or garage areas on private property. A driveway shall have a maximum grades of 12% for a distance of twenty-five (25) feet from the street line and shall be no closer than ten (10) feet from any abutting side property line. The driveway access shall occur across the minimum frontage required in the Zoning District in which the frontage is located. Section 4600.

- Easements.

  Section 4620. Where a subdivision is traversed by a water course, drainage way, stream, or channel, the Board may require that a storm water easement or drainage right-of-way be provided of adequate width to provide for free flow of water in its natural course, for construction, or for other necessary purposes.

- **Section 5.52 Wetlands Protection**
  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/or Department of Environmental Quality Engineering.

- Section 5.61 [Role of Conservation Commission]
  At the time of the filing of the Definitive Plan with the Planning Board, one (1) copy shall be filed by the applicant with the Conservation Commission for review. The making of a report by the Conservation Commission to the Planning Board concerning a proposed Definitive Plan shall not be treated so, nor deemed to be approval of, an Order of Conditions or any other approval provided by the Wetlands Protection Act or regulations issued thereunder, or by any local wetlands bylaw; and, a request by the Planning Board for such a report shall not be treated as, nor deemed to be, a Notice of Intent or any other application provided by the Wetlands Protection Act or regulations issued thereunder, or by any local wetlands bylaw.

Monson Zoning By-Laws

The Town of Monson has established a set of bylaws designed in part to "to promote the general welfare of the Town of Monson, to protect the health and safety of its inhabitants, to encourage the most appropriate use of land throughout the town, and to increase the amenities of the town, all as authorized by, but not limited to, the provisions of the Zoning Act, G.L. c. 40A, as amended, and Section 2A of 1975 Mass. Acts 808." The Zoning By-Laws include several provisions that mitigate the potential for flooding, including:

- Environmental Controls

Section 5.1.6. Erosion Control The landscape shall be preserved in its natural state, insofar as practical, by minimizing tree removal and any grade changes shall be in keeping with the general appearance of neighboring developed areas. These regulations are intended to supplement the Wetlands Protection Act. Erosion of soil and sedimentation of streams and water bodies shall be minimized by using the following erosion control practices:

1. The duration of exposure of disturbed areas due to stripping of vegetation, soil removal, and regarding shall be kept to a minimum.

2. During construction, temporary vegetation and/or mulching shall be used to protect exposed areas from erosion. Until a disturbed area is permanently stabilized, sediment in runoff water shall be trapped by using staked hay bales or sedimentation traps.

3. Permanent erosion control and vegetative measures shall be in accordance with the erosion/sedimentation/vegetative practices recommended by the Soil Conservation Service.

4. All slopes exceeding 15% resulting from site grading shall be either covered with 4 inches of topsoil and planted with a vegetative cover sufficient to prevent erosion or be stabilized by a retaining wall. 5. Dust control shall be used during grading operations if the grading is to occur within 200 feet of an occupied residence of place of business.. Dust control methods may consist of grading fine soils on calm days only or dampening the ground with water.

- **6.13 Protection of Natural Features**

All natural features, such as large trees, watercourses, wetlands, scenic points, historic spots, and similar community assets which will add attractiveness and value to the property shall be preserved. (Six (6) inches of top soil shall be replaced on all disturbed earth within the subdivision.)

- **6.6 Earth Removal and Filling of Land Bylaw**

6.6 [Applicability] In any zoning district, removal or addition of soil, loam, sand, gravel, clay, sod, quarried stone, or other mineral deposit shall not be permitted except by special permit from the Zoning Board of Appeals.

Scope of Authority

Section 6.6.7.4. Filling of land in conjunction with the installation of an approved Title V septic system provided the fill is not placed closer than (10) ten feet to the side and rear property lines and does not increase the stormwater run off from the property. Provide a plan, prepared by a registered engineer, showing compliance with these provisions.

Section 6.6.7.5. Filling of land in conjunction with the construction and landscaping of a single family home, provided the grade is not raised by more than (4) four feet and the fill is not placed closed than (10) ten feet to the side and rear property lines and does not increase the stormwater run off from the property. Provide a plan, prepared by a registered engineer, showing compliance with these provisions.

- **Section 7.4 Site Plan Review**

7.4.2. Purpose. The purpose of site plan approval is to further the purposes of this Bylaw and to ensure that new development is designed in a manner which reasonably protects visual and environmental qualities and property values of the Town, and to assure adequate drainage of surface water and safe vehicular access.

7.4.4 Required Site Plan Contents. All site plans shall show:

2. Existing and proposed topography including contours, the location of wetlands, streams, waterbodies, drainage swales, areas subject to flooding, and unique natural land features;

7.4.6 Site Plan Review Criteria. The following will be taken into consideration:

2. The development shall be integrated into the existing terrain and surrounding landscape, and shall be designed to protect abutting properties and community amenities. Building sites shall, to the extent feasible: (a) minimize use of wetlands, steep slopes, floodplains, hilltops: (b) minimize obstruction of scenic views from publicly accessible locations; (c) preserve unique natural or historical features; (d) minimize tree, vegetation and soil removal and grade changes; and (e) maximize open space retention; and (f) screen objectionable features from neighboring properties and roadways.

- **Section 4.1. Floodplain District Regulations**

Section 4.1.1 Purpose. 1. To provide that lands in the Town of Monson subject to seasonal or periodic flooding described hereinafter shall not be used for residence or other purposes in such manner as to endanger the health or safety of the occupant thereof.

2. To protect, preserve and maintain the water table and water recharge, areas within the Town so as to preserve present and potential water supplies for the public health and safety of the Town of Monson.

3. To assure the continuation of the natural flow pattern of the water course(s) within the Town of Monson in order to provide adequate and safe floodwater storage capacity to protect persons and property against the hazards of flood inundation.

4.1.2 [Scope of Authority]. The Floodplain District is an overlay district and shall be superimposed on the other districts established by this Bylaw. All regulations of the Monson Zoning Bylaw applicable to such underlying districts shall remain in effect, except that where the Floodplain District imposes additional regulations, such regulations shall prevail.

1. The Floodplain District is defined as all lands designated as Zone A or Zone A 1-30 on the Town of Monson Flood Insurance Rate Maps (FIRM) panels 250145-0008-9, 0015-0019, 0035 and 0040, of plans on file with the Town Clerk or as determined by a registered professional engineer and approved by the Floodplain Administrator.

2. The floodway boundaries are delineated on the Monson Flood Boundary and Floodway Map (FBFM) panel 250145-0001-0045 dated June 1981 and modified by subsequent changes or as determined by a registered professional engineer and approved by the Floodplain Administrator.

4.1.4 [Restrictions]

In the Floodplain District no new building shall be erected or constructed, and no existing structure shall be altered, enlarged or moved; no dumping, filling or earth transfer or relocation shall be permitted; nor shall any land, building or structure be used for any purposes

4.1.7 Prohibited Uses. The following uses are specifically prohibited and may not be allowed by special permit:

1. Solid waste landfills, junkyards and dumps.

2. Business and industrial uses, not agricultural, which manufacture, use process, store or dispose of hazardous materials or wastes as a principal activity, including but not limited to metal plating, chemical manufacturing, wood preserving, furniture stripping, dry cleaning and auto body repair.

3. The outdoor storage of salt, other de-icing chemicals, pesticides or herbicides shall be prohibited without suitable overhead protection from weather. All storage shall be within an impervious containment area.

4. Draining, dredging, excavation or disposal of soil or mineral substances, except as necessary for permitted uses or uses allowed by special permit, as specified in the Earth Removal Bylaw, Section 6.6.

- **Section 2.3 Reserved Land District**

Section 2.3.1 Purpose. 2.3.1 Purpose. The purpose of the R.L. Zone District is to conserve lands in generally public or semi-public ownership, and to limit the location and use of land and buildings under private ownership for trade, industry, agriculture, and residential purposes, but this section shall in no way limit nor prohibit the use of land or buildings for any church or other religious purpose, or for any educational purpose, as provided in Section 2 of Chapter 40A of the General Laws of Massachusetts.
Section 2.4.2-3. [Restrictions]

2.3.2 Permitted Uses. Any use which is permitted in the charter of the owner, provided that any industrial, business, and/or residential uses shall be limited to, and used exclusively by and for the requirements of the owner.

2.3.3 Prohibited Uses. Any industrial, business and/or residential use under private ownership that does not furnish a public service or utility…

- Section 4.2 Water Supply Protection District

Section 4.2.1. Purpose. a. promote the health, safety and general welfare of the community by ensuring an adequate quality and quantity of drinking water for the residents, institutions and businesses of the Town of Monson.
b. preserve and protect existing and potential sources of drinking water supplies; c. conserve the natural resources of the town and; d. prevent temporary and permanent contamination of the environment.

Section 4.2.2. Scope of Authority:

The Water Supply Protection District is an overlay district superimposed on the zoning districts. This overlay district shall be apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities/uses in a portion of one of the\ underlying zoning districts which fall within the Water Supply Protection

District must additionally comply with the requirements of this district. Uses prohibited in the underlying zoning districts shall not be permitted in the Water Supply Protection District. Land lying within a horizontal distance of fifty (50) feet on each side of the bank and/or edge of each and every "Minor Stream" in the Town of Monson…

Section 4.2.4. Establishment and Delineation of Groundwater Protection District

For the purposes of this district, there are hereby established within the town certain groundwater protection areas, consisting of aquifers or recharge areas which are delineated on a map. This map is at a scale of 1 inch to 12,000 feet and is entitled "Zone II Map, Bethany, Palmer & Bunyan Road Wells, Town of Monson" dated October 2001. This map is hereby made a part of the town zoning bylaw and is on file in the Office of the Town Clerk.

Section 4.2.6. A. Permitted
vi. residential development, subject to [4.2] Section B (prohibited uses) and [4.2] Section C (special permitted uses)[15];

Section 4.2.6.B Prohibited Uses
ii. Automobile graveyards and junkyards, as defined in MGL c. 140B, sec. 1;

Section 4.2.6.C Uses and Activities Requiring a Special Permit

iii. any use that will render impervious more than 15% or 2500 square feet of any lot, whichever is greater. A system for groundwater recharge must be provided, which does not degrade groundwater quality. For non-residential uses, recharge shall be by storm water infiltration basins or similar system covered with natural vegetation and dry wells shall be used only where other methods are infeasible. For all non-residential uses, all such basins and wells shall be preceded by oil, grease and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.

Section 4.3 Scenic District

4.3.1 Purpose

[15] Section A and B of this Section 4.2 mostly deal with restrictions on toxic substances, petroleum, municipal waste treatment facilities and road salt storage.

1. Create, preserve and enhance areas considered to be of natural scenic beauty including wooded canyons, ridges and fine vistas or viewsheds.
2. Regulate removal, filling, excavation or alteration of land within a scenic area, which is likely to have a significant adverse effect on watershed resources or natural scenic qualities.

4.3.2 Scope of Authority. The Scenic District is an overlay district and shall be superimposed on the other districts established by this Bylaw. All regulations of the Monson Zoning Bylaw applicable to such underlying districts shall remain in effect, except that where the Scenic District imposes additional regulations, such regulations shall prevail.

4.3.3 Designated Area. The Scenic District Bylaw shall be applied to areas of scenic value as designated on the overlay map entitled "Scenic District, Town of Monson" on file with the Town Clerk.

4.3.6 Uses Not Permitted. The following uses are not permitted in the Scenic District:

1. Surface mining;
2. Pipelines located above ground;
3. Power plants;
4. Refineries or oil or gas tanks storing over 5,000 gallons above ground;
5. Auto sales, storage, or salvage yards;
6. Solid waste disposal sites;
7. Wrecking yards.

4.3.10.1 Scenic District Review Criteria

1. Scenic District review should ensure that when man-made structures are built in scenic areas, they are sensitively related to the natural setting and that special consideration has been given to their siting and design.

- **6.4 Open Space Communities**

Section 6.4.3.1. Purpose. 1. allow for greater flexibility and creativity in the design of residential subdivisions, provided that the overall density of the development is no greater than what is normally allowed in the district;

2. encourage the permanent preservation of open space, agricultural lands and other natural resources;

3. maintain the traditional New England rural character and land use pattern in which small villages contrast with open space and farmlands;

4. facilitate the construction and maintenance of streets, utilities and public services in a more economical and efficient manner;

5. encourage a less sprawling form of development that consumes less open land.

Section 6.4.4. [Applicability]. 1. The development shall include single-family dwellings only.

2. The minimum land required for a cluster development shall be ten (10) acres and the parcel shall be held in single ownership or control at the time of application.

3. Each lot shall have adequate access on a public or private way.

4. Each lot shall be of a size and shape to provide a building site, which shall be in harmony with the natural terrain and other features of the land.

5. There shall be an adequate, safe, and convenient arrangement of pedestrian circulation, facilities, roadways, driveways, and parking.

6. The site plan shall identify the location and extent of all wetlands on the site as determined by the Conservation Commission under the Massachusetts Wetlands Protection Act, M.G.L. Chapter 131, Section 40.

Section 6.4.6 and 6.4.7 Applicable Scope of Authority

Section 6.4.6.1 A one-family detached dwelling, or lawful accessory building, may be constructed on a lot with an Open Space Community development although such lot has less area and frontage than normally required, as herein specified.

Section 6.4.6.2.The maximum number of dwelling units permitted in an open space community shall be calculated based upon 1.5 units per acre for the net developable acreage remaining once the area of all wetlands, all areas unsuitable for on-site sewage disposal and lands with

slopes greater than twenty-five (25) percent have been subtracted from the total acreage of the property.

Section 6.4.6.3. Under the supervision of the Conservation Commission and in accordance with the provisions of the Wetlands Protection Act, M.G.L. Chapter 131, Section 40, all wetlands shall be identified, and their area subtracted from the net developable acreage of the total parcel.

6.4.6.5. Lot sizes shall not be less than one-half (50%) of the minimum lot size normally required in the district, or thirty thousand (30,000) square feet per lot.

6.4.7.3. The following lands shall not be used to meet the common open space requirements:

(a) Lands within the floodplain district;

(b) Lands identified as wetlands in accordance with the Massachusetts Wetlands Protection Act;

(c) Lands with slopes greater than twenty-five percent (25%)

River and Stream Protection

The Town of Monson follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the town Conservation Commission. The Town also has instituted its Watershed Protection District, an overlay district that provides restrictions solid wastes, hazardous liquids and petroleum products.

Monson Open Space and Recreation Plan

Recent efforts by the Town of Monson Conservation Commission and others have resulted in the creation of municipal plans that are useful for flood hazard mitigation purposes. In 1999, the town completed its Open Space and Recreation Plan. The intent of the document is not to address hazard mitigation or flood control in a direct or comprehensive way; however, it inventories the natural features and environments in the town, many of which, such as wetlands, aquifer recharge areas, farms, rivers, streams, and brooks, contain floodplain, dam failure inundation or localized flooding areas.

The plan highlights the importance of balancing future development with the preservation of the community's natural and scenic resources. The

preservation of open space and farmland will provide flood storage capacity, which reduces the amount of impervious surfaces in an area, as well as other benefits not directly related to natural hazard mitigation. Monson's OSRP is current until November 2010, and a plan should be in place to guarantee that the Town remains eligible for state grants tied to a current and approved OSRP.

National Flood Insurance Program

The Town of Monson participates in the National Flood Insurance Program. As of 2006, there were six policies in effect in Monson for a total of $857,900 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
Subdivision Rules and Regulations	1. Definitive Plan requires delineation of hydrological features and mandates that they not be disturbed; requires drainage and 100-year storms 2. Environmental Impact Statement requires short-term and long-term impacts and measures taken to prevent water contamination, erosion, floodplain and wetlands degradation. 3. Drainage shall be designed to withstand a 100-year storm; culverts shall be designed to withstand a twenty-five year storm; detention basins designed to withstand a 100-year storm; no filling of wet areas; open streams	1. Entire town. 2. Downtown 3. Zone II Well Head Protection District	**2. Somewhat effective in increasing awareness of flooding impacts.** **3. Effective in new construction**	**2. Expand to include a larger geographic area of Monson** **3. Retrofit culverts as needed in Monson.**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
	maintained ◦ Portions of subdivisions within the Water Supply Protection District shall conform to the requirements of said bylaw ◦ Maximum driveway grade of 12% for first 25 feet. ◦ Conservation Commissioners review subdivision plan			
Zoning Bylaws: **Environmental Controls** **Protection of Natural Features**	Landscape preserved in natural state during development In all districts, natural features will be preserved and six (6) inches of topsoil shall be placed on all	Entire town. Entire town	**Somewhat effective in preserving flood storage capacity during and after development** **Somewhat effective in preserving**	

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
	disturbed earth.		**flood storage capacity**	**Decrease threshold.**
1. Earth Removal and Filling of Land Bylaw **2. Site Plan Review** **3. Floodplain District Regulations** **4. Reserved**	1. In all zoning districts, removal or addition of fill shall only be permitted by special permit once a developer has crossed thresholds established in the bylaw. 2. Ensures that commercial development is designed in a manner that protects visual and environmental amenities 3. Prevent development in sections of town that are subject to periodic flooding; no new	1. Entire town 2. Entire Town 3. See Monson Flood Insurance Rate Map 4. See	**1& 2. Effective at preventing reduction in water storage capacity** **3. Effective method for preventing new construction in the flood plain** **4. Somewhat**	**4. Land conservation strategy to permanently protect**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Land District **5. Water Supply Protection District** **6. Scenic District**	construction but existing buildings can continue 4. Conserves lands in generally public, such as golf courses and camp grounds, ownership by restricting use for industry, commercial, residential or industrial uses. Exceptions for grandfathered uses exist. 5. Protect the drinking water supplies for Monson's citizens and ensure adequate quality and quantity of drinking water supplies. Restricts development in sensitive lands.	Monson Zoning Map 5. Overlay District identified on Zoning Map 6. Not delineated	**effective for preventing development** **5. Effective for keeping industrial chemicals out of the drinking water supply. Compliant with 310 CMR 22.21** **6. Not effective, as no zoning district has been finalized.**	**these lands.** **5. Improved monitoring of uses to ensure impervious surface area and percent of lot coverage are compliant with regulations.** **6. Map district boundaries and seek approval at town meeting.**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Open Space Communities	6. Preserves wooded canyons, ridges, scenic vistas and viewsheds. Restricts the location of industrial uses. Allows the clustering of development on a ten acre site and permits 1.5 acres per single-family unit.	Residential districts	**Preserves lands that can be used for flood storage**	**None**
River and Stream Protection	Monson follows the Wetlands Protection Act and the Rivers Act; furthermore, the town also has implemented a Watershed Protection District.	Entire town.	State law effectively protects wetlands and rivers that meet the statutory definition of a wetlands and rivers; the town has adopted regulations to protect their sub-surface	**None**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
			waters	
Town of Monson 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 only insofar as it qualifies the town for Rural Self-help grants. This, in turn, allows Monson to pursue conservation of properties identified in OSRP.	
Participation in the National Flood Insurance Program	As of 2006, there were six homeowners with flood insurance policies.	Areas identified by the FEMA maps.	Effective for limiting financial risk to landowners and the entire town.	**Consider adopting regulations that allow Monson to qualify for the Community Rating System. This lowers the premiums of flood insurance purchasers.**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Beaver Management Strategy	Currently, the town recommends beaver trapping during beaver trapping season to prevent problems and seeks emergency orders if necessary.	Areas within the 100-Year Floodplain.	Effective at preventing problems while allowing the population a chance to remain stable.	**None.**

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.[16]

Management Plans

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

1. 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.
2. Local governments should assume that winter will occur annually and budget fiscal resources with snow management in mind.
3. 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 Monson lists the following generic preparedness measures for severe winter storms:

1. Ensure that warning/notification and communications systems are in readiness.
2. Ensure that appropriate equipment and supplies, especially snow removal equipment, are in place and in good working order.
3. Review mutual aid agreements.
4. Designate suitable shelters throughout the community and make their locations known to the public.

[16] Comprehensive Emergency Management Plan for the Town of Leverett, August1999.

5. Implement public information procedures during storm 'warning' stage.
6. Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and those with special needs).

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms.
The Town of Monson's Zoning Bylaw sets maximum grade limits on driveways, 12%, in Section 6.5 and restrictions on utility placement (Section 7.5 of the Subdivision Rules and Regulations), which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms:

Section 7.54:

All electrical, telephone, fire alarm, cable TV 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 beat Interest of the Town.

- 6.5.8 The grade length and location of access driveways shall be constructed and maintained to provide

  (c) A maximum grade of twelve percent (12 %), beyond 50 feet from the street line

- **7.50 General Standards**

  1. All public and private sewers, surface water drains, water and gas pipes, electric, telephone and Cable TV lines, together with their appropriate underground structures, within the street right-of-way, shall be placed underground at the discretion of the Board.

Other Mitigation Measures

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service. All emergency shelters are served by generators 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 addresses designing buildings to withstand snowloads. The Town of Monson staffs its own Building Inspection and Code Enforcement Department.

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	Establishes a 12 percent maximum for grades for first 25 feet	Entire town.	Effective for reducing the risk of winter storms in new construction	**None**
Common Private Ways	Common private ways are permitted, maximum width of 20 feet and no more than 4% grade 40 feet away from the street line.	Entire town.	Somewhat effective	**Adopt a common driveway bylaw that allows the sharing of driveway space; this will result in well-designed projects that reduce the risks associated with steep slopes.**

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 existing utility lines in locations where repetitive outages occur. Work with National Grid to ensure that the existing utility right-of-way is maintained and free of debris.**
State Building Code	Monson has adopted the State Building Code	Entire town.	Effective.	**None.**

Hurricanes & Tropical Storms

Both hurricanes and tropical storms can produce substantial damage from storm surge, waves, erosion and intense winds. While storm surge has been the number one cause of hurricane related deaths in the past, more people have died from inland flooding associated with tropical systems in the last 30 years. Since the 1970s, inland flooding has been responsible for more than half of all deaths associated with tropical cyclones in the United States. Inland flooding from hurricanes can occur hundreds of miles from the coast, placing communities which would not normally be affected by the strongest hurricane winds in great danger.

Some of the greatest rainfall amounts associated with tropical systems occurs from weaker tropical storms that have a slow forward speed (1 to 10 mph) or stall over an area. Due to the amount of rainfall a Tropical Storm can produce, they are capable of causing as much damage as a category 2 hurricane. For a more detailed description of hurricanes and tropical storms, see the following section on Wind-Related Hazards.

Of all the natural disasters that could potentially impact Monson, 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).[17] 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 Monson Comprehensive Emergency Management (CEM) Plan identifies the following areas as being most vulnerable to the hazards associated with hurricanes: Monson's Town Center and areas down stream from Monson Reservoir as well as communities around Pulpit Rock Pond.

Town of Monson 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.

[17] Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.

Management Plans

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

1. Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
2. Community leaders should ensure that the community is enrolled in the National Flood Insurance Program.
3. 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.
4. Make informed decisions concerning protecting natural attributes such as beaches and dunes with breakwaters and sea walls. Review National Flood Insurance Rate Maps and Hurricane Evacuation Maps for possible impact on the community. Hurricane Evacuation Maps are available for coastal communities along Buzzard's Bay and Nantucket Sound.
5. Maintain plans for managing all hurricane emergency response activities.

The CEM Plan for Monson includes the following generic preparedness measures for hurricanes:

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

Evacuation Options

According to feedback contributed during a committee meeting on December 6, 2006 all emergency shelters in Monson (Quarry Hill Community School and the Monson Senior Center) are open to hurricane victims.

Zoning

- Section 6.14.2. Wireless Communications Facilities Regulations

  Section 6.14.2. [Purpose]. The purpose of this subsection of the Zoning By-Law is to establish appropriate siting criteria and standards for wireless communications facilities, to minimize the adverse impact on adjacent properties, to preserve scenic views, to limit the number and height of such facilities, to promote the shared use of existing facilities to reduce the need for new facilities, and to provide maximum wireless coverage as mandated by Section 704 of the Federal Telecommunications Act of 1996, while protecting the historic and residential character of the Town of Monson, the property values of the community and health and safety of citizens.

  Section 6.14.2 Wireless Communications Facilities Regulations [Restrictions]

  Section 6.14.2.7. All wireless communications towers shall be designed to be constructed at minimum height necessary to accommodate the anticipated and future use. In residential zoning districts, wireless communications facilities shall not exceed one hundred (100) feet in height as measured from ground level at the base of the tower.

  Section 6.14.2.8. All wireless communications towers shall be pre-engineered to fail at a pre-determined height and "fold in half' in the event of a catastrophic failure.

  Section 6.14.2.9. The setback of a wireless communications tower from the lot line or street line of the lot on which it is located shall be at least equal to 150% of the tower's height. Further, within the residential districts (RV & RR) the tower shall be located a minimum of five hundred (500) feet from existing lot lines.

Restrictions on Development

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

Mobile Homes

According to the Town of Monson Zoning Bylaws, mobile homes are an allowed use in the RV and RR districts. Furthermore, trailers may be replaced if they are an existing unit, are not replaced with a larger unit and are in compliance with the state building code.

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 Monson has professional building inspection and code enforcement services.

Tornadoes

Worcester County and areas just to its west, including portions of Franklin 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.[18] 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.[19] 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 Monson 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.

[18] Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.
[19] *www.ibhs.org.*

- 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 Monson 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.
- 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.

Evacuation Plans

There is no shelter for tornado victims identified in the Monson CEM Plan.

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

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Tele-communications Facilities	Permitted with a maximum height of 100 feet in residential districts, maximum setback of 150% of maximum height.	Entire town.	Effective.	**Consider adding safety and prevention of wind-related damage as a stated purpose.**
Windmills	Permitted to a maximum of 125 feet with a 200 foot setback.	Entire town	Effective.	**Consider adding safety and prevention of wind-related damage as a stated purpose.**
Mobile Homes	Existing mobile homes are an allowed use in RV and RR districts.	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. Develop a plan with National Grid for ensuring that the utility right-of-way remains clean, clear and free of debris.**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
State Building Code	The Town of Monson has adopted the Massachusetts State Building Code.	Entire town.	Effective.	**None.**
Debris Management Plan	A debris management plan could be developed.[20]	Entire town.	Effective.	**Consider participation in the creation of a Regional Debris Management Plan.**
Shelters	Quaboag Hills, Granite Valley, and the Senior Center.	Entire town.	Somewhat effective.	**Establish staging areas for this type of disaster, extend connections with the Monson Developmental Center.**

[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 Monson approximately 74 percent of the City's total land area is in forest, or about 21,331 acres, and is therefore at risk of fire. In 2005, there were 32 fires reported in Monson. Of this number, 8 fires occurred in buildings, 6 occurred in vehicles and 18 occurred out-of-doors.

Management Plans

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

Regulatory Measures

Burn Permits: The Monson Fire Department issues burn permits in Monson in accordance with M.G.L. 148.

Subdivision Review: The Monson Fire Department reviews subdivision regulations to ensure that road widths are adequate to accommodate emergency vehicles and works with the building inspector to guarantee an adequate flow of water for the purposes of fighting a fire.

Public Education/Outreach: The Monson Fire Department partners with the Monson Senior Center to make sure batteries have been replaced and/or that smoke detectors have been installed where they are needed.

Restrictions on Development

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

Table 5-4
Existing Wildfire/Brushfire Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Burn Permits	Burn permits are issued on either a daily or a seasonal basis. Either way, the fire department must be notified of an intended burn.	Entire town.	Effective.	**None.**
Subdivision Review: **Fire Safety**	The Fire Department is involved in the review of subdivision plans Monson's municipal water supplies only service 40% of the town. The remainder of the structures are on private septic.	Entire town. Entire town.	Effective. Effective when a structure is serviced. Town must rely on fire trucks' supplies otherwise.	**None.** **None.**

Public Education/Outreach	Monson's fire department operates the S.A.F.E. program in schools and nursing homes.	Schools and Nursing Homes.	Effective.	**None.**

Earthquakes

Although there are five mapped seismological faults in Massachusetts and two in Monson (which intersect at right angles at a point between Putney and Montague Roads), 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 Monson 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 Monson 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.

Evacuation Options

The Monson CEM lists several shelters available to earthquake victims: Quarry Hill Street, Monson Fire Station, Monson Senior Center,
Granite Valley Middle School, Monson Developmental Center, Palmer Senior High School, Monson Sr. High School, Monson Fire Station.

The maximum peak population affected by an earthquake is estimated at 1,900 people.

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. According to the 2000 U.S. Census, 92 percent of the housing in Monson was built before 1970. 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 Monson has adopted the 6th 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 the Elementary School 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.**
Shelters	Shelters have been identified for victims of earthquakes in Monson.	Entire town.	Effective.	**Consider identifying shelters for all natural disasters in Monson.**

(This Page Intentionally Left Blank)

Dam Failures

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

The Monson 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 Monson 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 Monson. 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 Monson 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.

Evacuation Options

The Monson CEM Plan identifies Conant Brook as the highest risk to the Town.

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 Monson 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.

(This Page Intentionally Left Blank)

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 has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Entire town.	Low.	**Develop program for informing dam owners of their responsibilities under DCR's regulations.** **Sort out ownership of private dams in Monson.** **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.**

6 – INCORPORATION

Existing plans, studies, reports and technical information were incorporated throughout the planning process. This included a review and incorporation of significant information from the following key documents:

- *Monson Comprehensive Emergency Management Plan* (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Town that have been identified as crucial to the function of the Town; also, this resource was used to identify special needs populations as well as potential emergency shortcomings.

- *Monson Open Space and Recreation Plan* – this Plan was used to identify the natural context within which the Town mitigation planning would take place. This proved useful insofar as it identified water bodies, rivers, streams, infrastructure components (i.e. water and sewer, or the lack thereof), as well as population trends. This was incorporated to ensure that the Town's mitigation efforts would be sensitive to the surrounding environment. During the OSRP update, the Town can use the work of the PDM Plan to incorporate identified hazard areas into open space and recreation planning. This could either take the form of acquiring parcels of land that are currently un-developed, but situated within an identified hazard area, as permanent open space, thereby minimizing the likelihood that critical infrastructure components will be constructed in an area prone to damage from natural hazards.

- *Town Community Development Plan*—this Plan was used to identify any action items that might prove successful, based on previous planning efforts. The Community Development Plan can reflect the need to reduce development in high-hazard areas.

- *Town Zoning Bylaw* - The Town's Zoning Bylaw was used to gather identify those actions that the Town is already taking that are reducing the potential impacts of a natural hazard (i.e. floodplain regulations) to avoid duplicating existing successful efforts. The town can review the findings of the Hazard Mitigation Plan and develop a list of zoning regulations to address such problems as inadequate water supply for fire fighting in new development.

- *Draft State of Massachusetts' Multi-Hazard Mitigation Plan* - This plan was used to insure that the Town's PDM was consistent with the State's Plan.

- *Pioneer Valley Regional Hazard Mitigation Plan*-Monson's findings will be incorporated into this final document.

7 – FUTURE MITIGATION STRATEGIES

Goal Statements and Action Items

As part of the natural hazards mitigation planning process that will be undertaken by the Monson Natural Hazards Planning Committee, existing gaps in protection and possible deficiencies will be identified and discussed. The committee will then develop 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 hazards. For example, updating the Subdivision Regulations to require new utility lines be placed underground will prevent property damage and loss of service in the event of high winds (tornado or hurricane) or severe snow and ice storms.

General Mitigation Action Items

Goal Statement: To mobilize Monson's municipal resources for the purpose of reducing the likelihood of damage to life and property from all natural hazards that Monson might experience.

Action Item: Examine current notification system including feasibility of Reverse 911.[21] Develop a preliminary project proposal and cost estimate.
Responsible Department/Board: Select Board
Proposed Completion Date: 2008

[21] In essence, Reverse 911 is a Windows compatible software program, which uses GIS and database technology to create call lists of phone numbers within a specified geographical area and provide prerecorded messages to the residents at those numbers. Call lists can be created ahead of time or as emergency or other situations arise. The system is voluntary and it is a simple matter to remove those residents who do not wish to participate. Cost of the system varies depending on a number of factors. The Town of Green Tree, Pennsylvania was able to subsidize their purchase of a Reverse 911 system through a $10,000 Community Development Block Grant.

Action Item: Using construction dates of existing shelters, identify those shelters that were built to Massachusetts' current seismic code.
Responsible Department/Board: Emergency Management Director, Building Inspector
Proposed Completion Date: 2008

Action Item: Update Monson's Natural Hazard Mitigation Plan every Five (5) Years.
Responsible Department/Board: Emergency Management Director, LEPC.
Proposed Completion Date: on-going.

Flooding

Overall, the Town of Monson'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 and Community Development Plan also address flood prevention and mitigation either directly or indirectly in the goals and objectives listed in these documents.

Goal Statement: To take actions that are designed to lessen the impact of a flood in Monson and implement mitigation actions that will reduce the loss of life, damage to property, and the disruption of governmental services and general business activities due to flooding.

Action Item: Actively pursue conservation and permanent protection of lands subject to flooding to prevent damage to life and property from flooding.
Responsible Department/Board: Conservation Commission, Planning Board and the Select Board
Proposed Completion Date: Ongoing

Action Item: The town should evaluate whether to become a part of FEMA's Community Rating System.
Responsible Department/Board: Select Board, Emergency Management Director

Proposed Completion Date: 2008

Action Item: Establish a plan to prioritize and acquire undeveloped properties within flood zones throughout Town.
Responsible Department/Board: Select Board, Conservation Commission
Proposed Completion Date: 2010

Action Item: Prepare a priority list and seek funding through the Hazard Mitigation Grant Program (HMGP) for the replacement of undersized culverts throughout town, both those currently identified and culverts that have –yet-to-be identified.
Responsible Department/Board: Select Board, Highway Department
Proposed Completion Date: 2009

Severe Snow Storms/Ice Storms

Goal Statement: Take actions that reduce the impact of Sever Snow and Ice Storms on Monson. Monson's location in New England makes severe winter storms frequent, but the Town will implement mitigation actions that minimize the loss of life, damage to property, damage to infrastructure, and the disruption of governmental services and general business activities from severe snow and ice storms.

Action Item: Drainage repairs on roads that consistently ice over to lessen the potential for future damage to Monson's residents.
Responsible Department/Board: Department of Public Works
Proposed Completion Date: 2012

Hurricanes

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

Goal Statement: To mitigate the impacts of high-wind events in Monson through adopting policies and measures that will lessen loss of life, damage to property, damage to infrastructure, and the disruption of governmental services and general business activities that would accompany the high winds associated with hurricanes and tornadoes/Microbursts.

Action Item: Reverse 911 for mass notification in the event of a large catastrophic complication from a Hurricane, such as a dam breach.
Responsible Department/Board: Police Department, Fire Department
Proposed Completion Date: on-going

Tornadoes

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

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: Clear high-risk trees away from critical infrastructure and facilities to ensure that these will be most fully operational in all events, especially wind related events.
Responsible Department/Board: Department of Public Works, Fire Department
Proposed Completion Date: 2012

Action Item: Tornado education pamphlet to help residents identify tornado conditions as they might appear in Monson.
Responsible Department/Board: Department of Public Works, Fire Department
Proposed Completion Date: 2010

Wildfires/Brushfires

Goal Statement To mitigate the impacts of large wildfires on Monson through minimizing the urban-rural interface with the goal of minimizing the loss of life, damage to property, damage to infrastructure, and the disruption of governmental services and general business activities due to wildfires/brushfires.

Action Items: Continue to develop and distribute an educational pamphlet on fire safety and prevention.
Responsible Department/Board: Fire Department
Proposed Completion Date: Ongoing

Earthquakes

Goal Statement: To make structural and policy changes prior to a large earthquake to mitigate the impacts of an earthquake on the Town of Monson with the intent of minimizing loss of life, property damage, damage to infrastructure, and the disruption of governmental services and general business activities due to earthquakes.

Action Item: Install sufficient back-up generator in all shelters and critical facilities to ensure operations in the event of a primary power failure.
Responsible Department/Board: Emergency Management Director, Building Inspector
Proposed Completion Date: 2008

Dam Failure

Goal Statement: To mitigate the threat that Monson's aging dams pose to the Town of Monson through quantifying the anticipated scope of any impact with the purpose of reducing loss of life, damage to property, damage to infrastructure, and the disruption of governmental services and general business activities due to dam failures.

Action Item: Map inundation zones to determine how heavily impacted critical facilities in the center of town would be in the event of a major dam breach.
Responsible Department/Board: Emergency Management Director, Conservation Commission, Highway Department.

Action Item: Construct flood walls at critical facilities to lessen the impact of a major Dam Breach.

Responsible Department/Board: Emergency Management Director, Conservation Commission, Highway Department.

Proposed Completion Date: 2012

Man-Made Hazards

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

Action Item: Establish action plan that addresses hazardous chemical spills and releases at EPA Tier II locations and on transportation routes.

Responsible Department/Board: Emergency Management Director, Fire Department

Proposed Completion Date: 2009

Prioritized Implementation Schedule

Summary of Critical Evaluation

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

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

Project Prioritization

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

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

PRIORITIZED IMPLEMENTATION SCHEDULE (ACTION PLAN)

IMPLEMENTATION STRATEGY FOR PRIORITY MITIGATION ACTIONS

The Monson 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
Reverse 911 feasibility study with proposed budget for Town Meeting	Select Board	2008	Town Staff/Volunteers	$3-$5 per household	High
Collect information on dates of shelters to determine whether they meet current Massachusetts Seismic Code standards	Emergency Management Director, Building Inspector	2008	Town Staff	Regular Program Activity	Medium
Install sufficient generator capacity to ensure operations at critical facilities	EMD, Building Inspector	2008	Town Staff/Volunteers/HMGP/CIP	$5,000 - $10,000 per unit	High
Evaluate whether to become a part of FEMA's Community Rating System	Board of Selectmen, EMD	2008	Town Staff	N/A	Medium
Establish a response plan for hazardous chemical spills and releases from EPA Tier II locations and routes	EMD, Fire Department	2009	Town Staff	N/A	High
Prepare a priority list for culvert replacement in town	Select Board, Highway Department	2009	Town Staff	To be Determined	Very High
Establish a plan for purchasing flood-prone properties in Monson	Select Board, Conservation Commission	2010	Town Staff/Volunteers	TBD	High

Tornado education pamphlet to help residents identify tornado conditions, as they exist, in Monson	Highway Department, Fire Department	2010	Town Staff	$1-$5 per household	Low
Map dam inundation zones to determine impacts of dam failure on critical facilities	EMD, Conservation Commission, Highway Department	2010	Town Staff, Engineering Support	TBD	High
Drainage repairs on roads that consistently ice over to prevent damage	Highway Department	2012	Town Staff/HMGP/CIP	Price per linear foot of materials, with labor	Very High
Clear high-risk trees away from critical infrastructure to prevent damage	Highway Department	2012	Town Staff	N/A	Medium
Construct flood walls around critical facilities to lessen the impact of a major dam breach	EMD, Conservation Commission, Highway Department	2010	Town Staff/HMGP	TBD	High
Actively pursue conservation and permanent protection of flood-prone properties in Monson	Conservation Commission, Planning Board, Select Board	Ongoing	MA Rural Self-help Grants/Community Preservation Act, APR Program	Price per acre of land	High
Update Monson's *NHMP* every five years	EMD, LEPC	Ongoing	Town Staff/Volunteers, HMGP	$1,000 - $15,000	Medium
Continue to develop and distribute a fire education pamphlet on the rural-urban interface	Fore Department	Ongoing	Town Staff/CIP	TBD	Low

8 – PLAN ADOPTION & IMPLEMENTATION

Plan Adoption

Upon completion, copies of the Draft Local Hazards Mitigation Plan for the Town of Monson were distributed to the town boards for their review and comment. A public meeting was held by the Monson Select Board to present the draft copy of the Monson Local Natural Hazards Mitigation Plan to town officials and residents and to request comments from this committee and the general public. The Natural Hazards Mitigation Plan was 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 Monson Local Natural Hazards Mitigation Plan will begin following its formal adoption by the Monson 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 Monson Natural Hazards Planning Committee will oversee the implementation of the plan.

Plan Monitoring and Evaluation

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

The Monson Natural Hazards Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan. At a minimum, the committee will review and update the plan every year,

beginning in the fall of 2008. The meetings of the committee will be organized and facilitated by the Emergency Management Director or the Monson Select Board.

CERTIFICATE OF ADOPTION

TOWN OF MONSON, MAASSACHUSETTS

BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE MONSON

HAZARD MITIGATION PLAN

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

WHEREAS, several public planning meetings were held between October 2006 and May 2007 regarding the development and review of the Monson Hazard Mitigation Plan; and

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

WHEREAS, a duly-noticed public hearing was held by the Monson Board of Selectmen on [DATE], 2007 to formally approve and adopt the Monson Hazard Mitigation Plan.

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

ADOPTED AND SIGNED this [DATE], 2007.

_____

Edward S. Harrison, Chair, Monson Board of Selectmen

_____

Kathleen C. Norbut, Monson Board of Selectmen

_____

Richard E. Guertin, Monson Board of Selectmen

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
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)……...413/781-6045
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/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/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/g eog/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://wwwep.es.llnl.gov/wwwep/g hp.html	General hazard information developed for the Dept. of Energy.
The Tornado Project Online	http://www.tornadoroject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iiaa.iix.com/ndcmap.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

Monson Hazard Mitigation Planning Committee

Meeting #1

AGENDA

October 25, 2006
10:00 a.m.

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

Monson Hazard Mitigation Planning Committee
Meeting #2

AGENDA
November 15, 2006
10:30 a.m.
Monson Town Hall

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

3) Question and Answer Period

4) Set Goals for Next Meeting

Monson Hazard Mitigation Planning Committee

Meeting #3

AGENDA

January 24, 2007
10:00 a.m.
Monson Town Hall

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

Monson Hazard Mitigation Planning Committee
Meeting #4

AGENDA
February 28, 2007
10:00 a.m.
Monson Town Hall

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

Monson Hazard Mitigation Planning Committee

Meeting #5

AGENDA

March 7, 2007
10:30 a.m.
Monson Town Hall

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 *Monson Hazard Mitigation Plan*

4) Discuss Next Steps for the *Monson Hazard Mitigation Plan* including FEMA/MEMA Review and Adoption by the Board of Selectmen.

5) Question and Answer Period

Monson Hazard Mitigation Planning Committee

Meeting #6

AGENDA

April 25, 2007
10:00 a.m.
Monson Town Hall

1) **Develop Process for Adoption and Monitoring of the Plan**

2) **Review & Revise as Necessary Final Draft of the *Monson Hazard Mitigation Plan***

3) **Discuss Next Steps for the *Monson Hazard Mitigation Plan* including FEMA/MEMA Review and Adoption by the Board of Selectmen.**

4) **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	Board of Selectmen
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

Appendix D

(Documentation of Public Involvement Process)

Press Release

CONTACT: Andrew Smith, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE
September 12, 2007

Public Input Sought on Pre-Disaster Mitigation Plans

The Pioneer Valley Planning Commission has completed final working drafts of pre-disaster mitigation plans for thirteen communities in the region: Agawam, Chester, Chesterfield, Easthampton, Hadley, Hampden, Hatfield, Holland, Holyoke, Ludlow, Monson, Northampton, and South Hadley.

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

The draft plans are posted for public review and comment on PVPC's website at www.pvpc.org. Please submit comments to PVPC's Andrew Smith at (413) 781-6045 or asmith@pvpc.org no later than November 30, 2007. Communities with approved plans will be eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency.

—30—

The Republican.

'Predisaster plans' readied for grants

Sunday, September 23, 2007

By NANCY H. GONTER
ngonter@repub.com

It's the public's turn to weigh in on plans prepared by local communities to keep the damage from natural disasters to a minimum. Sixteen "predisaster mitigation plans," developed by the Pioneer Valley Planning Commission working with local officials from each community, are part of an effort to secure grant money from the Massachusetts Emergency Management Agency, said Catherine M. Miller, principal planner with the commission.

"This comes from an effort by the Federal Emergency Management Agency that while we are aware you can't prevent natural disasters from happening, you can prevent the long term consequences," Miller said.

The plans, which average more than 100 pages each, can be viewed on the agency's Web site at www.pvpc.org Plans for Agawam, Chester, Chesterfield, Easthampton, Hadley, Hampden, Hatfield, Holland, Holyoke, Ludlow, Monson, Northampton, South Hadley, Southwick, Ware and Wilbraham are available, she said.

"This is largely an education exercise so people know local government is looking into these things and thinking about what the consequences of natural disasters would be. It's reassuring to know local governments are looking at this kind of thing especially after all the awareness following (hurricane) Katrina," Miller said.

Comments may be made by calling Andrew Smith at the Commission at (413) 781-6045 or by e-mailing him at asmith@pvpc.org by Nov. 30.

The plans were developed with a state grant of $224,962 which was supplemented by local communities for total cost of just under $300,000, she said.

Each plan looks at the risks communities may face from natural disasters such as flooding, tornadoes, drought and earthquakes, and what can be done to prevent damage to property and loss of life. They also prioritize projects for funding for mitigation efforts, Miller said.
An example of a mitigation project is Greenfield's purchase of the Wedgewood Gardens mobile home park which was badly flooded by the Green River in 2005 and had previously been flooded, although that was not part of this program, Miller said.

The commission is working with 32 communities in this area and a second round of 16 more communities will soon be started. They are Amherst, Belchertown, Brimfield, Chicopee, Cummington, Goshen, Granby, Huntington, Palmer, Southampton, Springfield, Westfield, West Springfield, Westhampton, Williamsburg and Worthington.

After that, a plan for the entire region will be prepared, Miller said.

Northampton Deputy Fire Chief Dana Cheverette, a member of the local committee that worked with the commission on the city's plan, said going through the process of preparing the plan was helpful.

"You identify the flood plans and you identify the area where you need to put your resources. In 1988 when the Oxbow area flooded, a lot of people got isolated. Now we know where the people could get isolated," Cheverette said.

Sunday's news briefs

Posted by The Republican Newsroom September 30, 2007 12:04PM

Predisaster plan drafts
The Pioneer Valley Planning Commission has completed final working drafts of predisaster mitigation plans for 13 communities in the region. The draft plans are posted for public review and comment on the commission's Web site at www.pvpc.org. The deadline for comments is Nov. 30.

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. Communities with approved plans will be eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

Affected are Agawam, Chester, Chesterfield, Easthampton, Hadley, Hampden, Hatfield, Holland, Holyoke, Ludlow, Monson, Northampton and South Hadley.

Appendix E

(Past and Potential Hazards/Critical Facilities Map)