The Town of Longmeadow

Local Natural Hazards Mitigation Plan

March 2016

Adopted by the Longmeadow Select Board on May 2, 2016

Prepared by:

Longmeadow Hazard Mitigation Planning Committee

and

The Pioneer Valley Planning Commission

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Acknowledgements

The Longmeadow Select Board extends special thanks to the Longmeadow Natural Hazard Mitigation Planning Committee as follows:

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The Longmeadow Select Board offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Commonwealth of Massachusetts Natural Hazards Mitigation Plan (www.state.ma.us/dem/programs/mitigate/index.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.

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1: INTRODUCTION

Hazard Mitigation

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

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

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

Planning Process

The planning process for the Longmeadow Local Natural Hazard Mitigation Plan involved a five-member committee:

- Eric Madison, Longmeadow EMD and Fire Chief
- Robert Siano, Chief of Police
- Yem Lip, Town Engineer
- Michael Wrabel, Director of the Department of Public Works
- Walter Gunn, Chair of the Planning Board

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

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

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

Committee Meetings

Public meetings of the planning committee were all held on the dates listed below. Agendas for these meetings are included in Appendix E. The Town posted agendas for public notice in advance of all meetings.

- **December 4, 2012, 2:00 p.m.**
  Work group meeting included hazard mitigation planning overview, identification and organizing of the planning team, and beginning of critical facilities identification.

- **January 16, 2013, 1:00 p.m.**
  Work group revisited critical facilities and evacuation routes potentially affected, discussed history of natural hazard events, reviewed vulnerability assessment methodology, profile hazards, and discussed development trends relative to natural hazard areas.

- **January 30, 2013, 8:00 a.m.**
  Work group reviewed revised vulnerability assessment, reviewed map of location of critical facilities and natural hazards, prioritized the identified mitigation strategies, defined plan implementation process and discussed public outreach process.

- **January-March 2016**
  Members of Longmeadow's Hazard Mitigation Committee participated in conversations and email communications with MEMA and PVPC staff to address FEMA comments.

Participation by Public & Entities in Surrounding Communities

On May 24, 2013 the Town of Longmeadow issued a notice of a public meeting to be held on June 4, 2013. The Pioneer Valley Planning Commission sent a press release (see Appendix F) to all area media outlets to inform the public that a draft of Longmeadow's Hazard Mitigation Plan had had been placed on PVPC's website as well as the website for the Town of Longmeadow. The release also indicated that hard copies were available at PVPC's offices and that all residents, businesses and other concerned parties of Longmeadow and adjacent communities were encouraged to comment on the plan. The plans were made available in this manner for 30 days. Citizens from adjacent municipalities were also encouraged to comment on Longmeadow's plan.

In addition to media outreach, notice of the public meeting held on June 4, 2013 was posted at Longmeadow's Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law.

No members of the public attended the public meeting, so no modifications were made to the draft plan based on public input.

Select Board Meetings

In 2012, the Town of Longmeadow agreed to begin the process of developing its new Hazard Mitigation Plan. Once the plan is provisionally approved by FEMA, the Select Board will adopt it.

2: LOCAL PROFILE

Community Setting

The Town of Longmeadow lies 91 miles from the metropolitan center of Boston. It is located in Western Massachusetts' Hampden County, on the eastern shore of the Connecticut River between Enfield, Connecticut, and Springfield, Massachusetts. It has a total land area of 9.5 square miles. Land in the western portion of town consists of a large flat area, commonly referred to as the "Meadows," located in the Connecticut River floodplain. The larger portion of town is located 200 feet above sea level on the uplands east of the Meadows.

Longmeadow was first settled as a farming community in the Meadows along the Connecticut River in 1645. The great flood of 1695, however, drove families to the uplands. In 1709, the Town became independent of Springfield, and the first meetinghouse on the green was built in 1716. The town was incorporated October 13, 1783, including land extending eastward through Hampden, in what is now East Longmeadow. Eventually the area of the West Village and the East Village were divided and East Longmeadow was incorporated in 1894.

Suburban development began when the Springfield trolley network reached Longmeadow in 1896. Longmeadow experienced rapid growth as Springfield's development pushed southward through the Forest Park area. Today, Longmeadow is primarily a residential suburban community. Service businesses are located at eight separate locations in the Town. Several professionals also conduct businesses in their residences. There is no industry, although rights of way exist for electric power lines and natural gas lines.

Although geographically small, Longmeadow's population density is large, with approximately 1,670 residents per square mile, ranking Longmeadow as the 94th densest community in Massachusetts (out of 351). Just over 20% of these residents are 65 years of age or older, which is far greater than the national average of 12.4%. Longmeadow is also home to 1,300 resident college students and over 3,300 children younger than 17.

Infrastructure

Longmeadow's infrastructure reflects its prime location in terms of access to the larger region, but also its strong desires to remain residential with very limited commercial development.

Roads and Highways

Two principal north-south highways parallel the Connecticut River: Route 5 (Longmeadow Street) on the upland, and Interstate 91 in the Meadows. Other main

arteries connect Longmeadow with Enfield to the south, with East Longmeadow to the east and Springfield to the north.

Public Water Service

The City of Springfield provides drinking water for Longmeadow. Protection of the Springfield source watershed and its Cobble Mountain reservoir is a priority for the Town. The vast majority of the Town is serviced by this public water system, as opposed to private wells.

Sewer Service

The vast majority of the Town is serviced by a public sewage system that is pumped to Bondi's Island Water Treatment Center.

Waste Disposal

Roadside pickup of Town resident's waste is contracted for by the Town and collected on a weekly basis. The Town recycles 60% of its solid waste. This includes sorting glass, cans, and plastic as well as paper and cardboard for curbside pickup. Leaves and yard waste are also recycled.

Natural Resources

Longmeadow's natural resources are defined in very large part by the Connecticut River and its floodplain.

Water Resources

Longmeadow's entire western edge extends along the shore of the Connecticut River. Four major brooks and their tributaries traverse the Town's landscape, flowing into wetlands along the River. These include Longmeadow Brook, Wheelmeadow Brook, and Raspberry Brook. The Town also has four ponds within its borders,

Forests and Fields

Longmeadow's principal unique feature is its nearly 1,700 acre Connecticut River floodplain, which is comprised of prime agricultural land, the privately owned Fannie Stebbins Memorial Wildlife Refuge, 474 acres of municipal conservation land, a small number of privately owned year-round residences and several undeveloped parcels. This floodplain is host to threatened or endangered species of plants that have been identified by the Massachusetts Natural Heritage and Endangered Species Program of the Department of Fisheries and Wildlife.

Besides the large floodplain, Longmeadow is home to many smaller natural areas and unique features. One such feature is the north-south wooded escarpment separating the floodplain from the uplands. Longmeadow Brook, Wheelmeadow Brook, Raspberry Brook, and Cooley Brook all run through town and constitute unique landscapes. These brooks and their tributaries provide "green belts" between residential properties. A number of valleys and dingles as well as isolated wetlands are also scattered throughout. Substantial acreage owned by individuals has not been developed and

exists in a natural state with some gardens, orchards, and woodlands. The City of Springfield owns 48 acres of land in the northeast corner of Longmeadow as part of the public Franconia Golf Course. Two other Country Clubs, Longmeadow Country Club in the south west and Twin Hills Country Club in the south east offer large tracts of open space. The City of Springfield also controls 10 acres on the northern border of Longmeadow as part of Forest Park.

The Massachusetts Department of Fisheries and Wildlife has identified areas within Longmeadow as unique environments. The entire Meadows section to the west of Interstate 91 is categorized as a Critical Natural Landscape. These Critical Natural Landscapes serve to buffer wetlands and aquatic areas. This area is also considered Core Habitat. Core Habitats are high quality habitat for rare, vulnerable, or uncommon birds, reptiles, amphibians, invertebrate, and plant species. Two other Core Habitat areas are identified in Longmeadow: The Pomeroy Plot (located east of Route 5, south of Nevins Avenue and northwest of the border with Connecticut), and Wolf Swamp Park Conservation Area.

Development

Located along Route 91 with convenient access to the metropolitan centers of Hartford, Connecticut, and Springfield, Massachusetts, Longmeadow has developed as a classic suburban bedroom community. While the population saw dramatic growth of 140% between 1950 and 1970, from 6,508 to 15,630 people, the population has remained stable since then, with a 2010 census population of 15,784.

Current zoning and other land use regulations constitute Longmeadow's "blueprint" for its future. Zoning is the primary land use tool that the town may use to manage development and direct growth to suitable and desired areas while also protecting critical resources and ensuring that development is in keeping with the town's character. Approximately 74 percent of the land in Town is zone residential. Just over 23 percent is zone for agriculture, a use that also permits development of single-family residential homes. Two percent is for highway, and the remaining one percent of land remaining in Town is zoned for percent is for professional or business uses.

Longmeadow's Zoning Ordinances establish 8 base zones and 1 overlay zone:

- Agricultural zone
- Five residential zones – Residence A-2 Zone; Residence A-1 Zone; Elderly Residential Zone; Residential Condominium Reuse Zone; and Elderly Congregate Residential Zone
- Two business zones – Business Zone; Professional Zone
- Flood Plain Overlay District

Although appropriate zoning is all relevant to protecting the health and safety of the Town residents, Longmeadow's Flood Plain Overlay District is specifically relevant to natural hazard mitigation. The zone is outlined here:

- Floodplain - The floodplain zone applies to those areas within the boundary of the one-hundred-year flood elevations that are considered hazardous according to FEMA. This zone severely restricts uses within the floodplain.

The zoning bylaws also establish Special Permit and Site Plan approval procedures for specific uses and structures within Longmeadow. This review allows the Special Permit Granting Authority the ability to review development to ensure that the basic safety and welfare of the people of Longmeadow are protected, and includes several specific evaluation criteria that are relevant to natural hazards.

Current Development Trends

Longmeadow's 9.5 square miles is largely built-out to the extent possible given current zoning. Residential is the most prolific land use, followed by agricultural. There are very few parcels that would conform to local zoning requirements left for development. However, residents spend far more on retail goods and services than is needed to support local business, thus indicating there is a potential market for expanded retail, commercial or office space if the town were to support zoning changes to allow for this.

Since 2008 just 12 building permits have been issued. Permits included a new parish center at Saint Mary's Church, a new accessory building at Twin Hills Country Club, and a new residential unit at Emerson Manor Nursing Home. The most likely new development continues to be renovations and additions to existing buildings. There are no subdivisions scheduled to be built or in the permitting process.

Development in Hazard Areas

The floodplain overlay district, combined with Conservation Commission oversight, severely limits new development in hazard areas. Rather, existing zoning and other land use regulations guide development interests in Longmeadow to seek areas where the environmental conditions and existing public utilities support such development. Instances of steep slopes also act as constraints on development. As noted, Longmeadow is virtually built-out, so there is not a major threat of new development in hazard areas.

Many of the hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding and inundation in the event of a dam failure. According to the Longmeadow Town Assessor, there are 17 residential structures located within the 100-year flood plain.

3: HAZARD IDENTIFICATION AND ANALYSIS

The following section includes a summary of disasters that have affected or could affect Longmeadow. Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to develop this list. Identified hazards are the following:

- Floods
- Severe snowstorms / ice storms
- Hurricanes
- Severe thunderstorms / wind / tornadoes
- Wildfires / brushfires
- Earthquakes
- Dam failure
- Drought

Natural Hazard Analysis Methodology

This chapter examines the hazards in the Massachusetts State Hazard Mitigation Plan which are identified as likely to affect Longmeadow. The analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability. A description of each of these analysis categories is provided below.

Hazard Description

The natural hazards identified for Longmeadow are: floods, severe snowstorms/ice storms, hurricanes, severe thunderstorms / wind / tornadoes, wildfire/brushfire, earthquakes, dam failure / levee breech, and drought. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may cause wind-related damage.

Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion, such as a floodplain or area that is susceptible to wild fires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Percentage of Town Impacted by Natural Hazard	
Land Area Affected by Occurrence	**Percentage of Town Impacted**
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

Extent

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, and duration.

Previous Occurrences

Previous hazard events that have occurred are described. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

Probability of Future Events

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

Frequency of Occurrence and Annual Probability of Given Natural Hazard	
Frequency of Occurrence	**Probability of Future Events**
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

Impact

Impact refers to the effect that a hazard may have on the people and property in the community, based on the assessment of extent described above. Impacts are classified according to the following scale:

Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
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.

Vulnerability

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 through 5 as follows:

1 – Very high risk
2 – High risk
3 – Medium risk
4 – Low risk
5 – Very low 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.

Hazard Profiling and Risk Index Worksheet					
Type of Hazard	**Previous Occurrences**	**Location of Occurrence**	**Impact (Damage)**	**Probability of Future Events**	**Hazard Risk Index Rating**
Flooding	Yes	Small	Limited	Moderate	3
Severe Snow/Ice Storms	Yes	Large	Critical	High	2
Hurricanes/Tropical Storms	Yes	Large	Critical	Very Low	4
Severe Thunderstorms/Tornado/Microburst	Microburst only	Small	Minor	Low	4
Wildfire/Brushfire	Yes	Small	Minor	High	5
Earthquake	Yes	Large	Catastrophic	Low	5
Dam Failure	No	Large	Minor	Very Low	5
Drought	No	Small	Minor	Very Low	5
Man-Made Hazard: Hazardous Materials	No	Large[1]	Limited	Low	4

Overall Summary Statement of Community's greatest Vulnerabilities

While flooding is generally ranked highest among Natural Hazards in the Pioneer Valley region, it is not ranked as a high risk for the Town of Longmeadow, due to the effective limitations on any new development in flood-prone areas, the fact that the community is essentially 'built-out' and not experiencing any significant new building, and the Town's participation in the National Flood Insurance Program (NFIP). The following 37 pages detail Longmeadow's history of and vulnerability to natural hazards. The Longmeadow Hazard Mitigation committee has determined that severe snow and ice storms pose the greatest natural hazard threat--specifically the danger of trees and/or branches falling and causing injury, death and/or property damage, followed by flooding, hurricanes and severe thunderstorms. Because of Longmeadow's location on a very sharp curve of Interstate-91, hazardous materials are also ranked as a medium risk. Wildfire, earthquake, dam failure and drought are ranked as low risk based on the community's thorough assessment. After reviewing the town's history of past hazards as well as historic data, the local Hazard Mitigation committee further determined that there is no danger to the town from flooding from ice jams, from landslides or from extreme temperatures.

[1] Town is very vulnerable because of proximity to I-91 and dense population.

Natural Hazard Identification and Vulnerability Assessment

The following is a description of natural and manmade disasters, and the areas affected by them, that have or could affect the Town of Longmeadow. These natural and manmade disasters are: floods, severe snowstorms/ice storms, hurricanes/severe winds, tornadoes/microbursts, wildland fires/brushfires, earthquakes, dam failure, drought, man-made hazards-hazardous materials. The Past and Potential Hazards/Critical Facilities Map (Appendix D) reflects the contents of this analysis.

Vulnerability Assessment Methodology

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

Total value of all structures in Longmeadow (2014): $ 1,951,621,392
Median value of a home in Longmeadow (2013): $ 338,800
Average household size: 2.78 persons

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

Flooding

Hazard Description

The average annual precipitation for Longmeadow and surrounding areas in northwestern Massachusetts is 46 inches. There are three major types of storms that bring precipitation to Longmeadow:

- **Continental storms** are typically low-pressure systems that can be either slow or fast moving. These storms originate from the west and occur throughout the year.

- **Coastal storms**, also known as nor'easters, usually occur in late summer or early fall and originate from the south. The most severe coastal storms, hurricanes, occasionally reach Massachusetts and generate very large amounts of rainfall.

- **Thunderstorms** form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

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

Location

Within the FEMA mapped 100-year floodplain, there are approximately 1130 acres of land, and within the 500-year floodplain, there are 60 acres of land.

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

in any given year. Likewise, the 500-year flood has a 0.2 percent chance of occurring in any given year. In Longmeadow, there are two 100-year floodplain areas – along the Connecticut River to the embankment with Route 91, and along Longmeadow Brook. These areas are significant as they contain infrastructure that sustains daily life and the economy of the town and greater region. Additionally here are several areas identified as 500-year flood zone areas along the railroad tracks and Interstate 91 adjacent to the Connecticut River, as well as along Longmeadow Brook, Raspberry Brook and near the pods in Laurel Park. Localized flooding may occur during weather events, making these areas inaccessible and impassable while potentially damaging infrastructure and property.

The Hazard Mitigation Committee was consulted for specific areas within the Town that have been previously identified as locations for localized flooding. This includes portions of Hazardville Road, Route 5, Cooley Brook, Raspberry Brook and Wimbleton Drive. A drainage study of the Town, conducted by Tighe and Bond in conjunction with the Town also provided input into areas of localized flooding.

All of the properties potentially affected by the 100-year flood are located in the same neighborhood, near the Connecticut River. As indicated in the previous section, at this time the Town of Longmeadow does not have any Repetitive Loss Properties, according to the NFIP as of November 2013.

In addition to the 17 residential structures, there is one critical facility owned by the Town of Longmeadow and located within the floodplain: the town's sewage pumping station, which pumps wastewater to the City of Springfield's Bondi's Island wastewater treatment facility.

In addition to the floodplains mapped by FEMA for the 100-year and 500-year flood, Longmeadow often experiences minor flooding at certain locations due to proximity to rivers and streams and to drainage problems, or problem culverts. There are numerous problem culverts or other localized flooding areas that are all over Town. Most of the flood hazard areas listed here were identified due to known past occurrence in the respective area. This includes moderate flooding in 1982 and 1985 that resulted from multiple days of rain.

In the flooding that occurred in 1982 and again in 1985, properties on Dunn Road, Anthony Road, West Road, and Emerson Road all experienced minor flooding.

Major flooding occurred in Longmeadow on June 2, 1984, at the corner of Bark Haul and Pondside

More information about specific localized flooding locations can be found below.

Longmeadow Street between Meadowbrook Road and Edgewood Avenue (Raspberry Brook Crossing)

- No critical facilities in area;
- Approximately 4 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $307,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Blueberry Hill Road between Bliss Road and Lawrence Drive

- One EPA Tier II critical facility located in area (though Committee has determined facility is not a hazard);
- Approximately 8 residential structures in this area that have been affected or could be affected by a flood incident;

- Vulnerability assessment: $614,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Captain Road east of Viscount Road

- No critical facilities in area;
- Approximately 4 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $307,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Williams Street between Woodside Drive and Ridge Road

- No critical facilities in area;
- Approximately 24 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $1,842,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Wimbleton Drive between Wolf Swamp Road and Avondale Road

- No critical facilities in area;
- Approximately 48 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $3,684,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Brookwood Drive

- No critical facilities in area;
- Approximately 4 residential structures in this area that have been affected or could be affected by a flood incident;

- Vulnerability assessment: $307,000 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Hazardville Road between Tedford Drive and Maple Road

- No critical facilities in area;
- Approximately 14 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $1,074,500 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

Frank Smith Road over Wolfswamp Brook

- No critical facilities in area;
- Approximately 2 residential structures in this area that have been affected or could be affected by a flood incident;
- Vulnerability assessment: $153,500 (assuming 50% damage to 50% of the structures);
- Cost for repairing or replacing business and town facilities, any power lines, telephone lines, and contents of structures are not included.

There is additional flooding in Town at the Bliss Road / Bliss Court intersection, on Dwight Road, at the culvert over Pondside Road, at the Elmwood Drive outfall, and near Laurel Park Pond. However, no residential property damage occurs at these locations.

Longmeadow is a participating member of the National Flood Insurance Program, and had the following NFIP policy and claim statistics as of October of 2013:

- Food Insurance Maps (FIRMs) are used for flood insurance purposes and are on file with the Longmeadow Planning Board.

- FIRMs have been effective since September 1, 1978 with the current map in effect since July 16, 2013.

- Longmeadow has 34 in-force policies in effect for a total of $8,098,500 worth of insurance.

- There have been 2 losses for a total amount of $ 1,036.15.

- As of 2013, there have been no Repetitive Loss Properties in Longmeadow

- The Town will maintain compliance with the NFIP throughout the next 5-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District and ensuring that the district accurately reflects the 100-year flood plain and FEMA Flood Insurance Rate Map (FIRM).

Extent

Floods can be classified as one of two types: flash floods and general floods.

- **Flash floods** are the product of heavy, localized precipitation in a short time period over a given location. 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).

- **General floods** may last for several days or weeks and are caused by precipitation over a longer time period in a particular river basin. 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).

The average annual precipitation for Longmeadow and surrounding areas in western Massachusetts is 46 inches. During the Flood of 1936 water reached 63 feet above flood level. During the Flood of 1938 water reached 60.3 feet above flood level. The back to back hurricanes of Connie and Diane had water levels reach 56 feet above flood levels.

Previous Occurrences

The major floods recorded in Western Massachusetts during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. Longmeadow and the greater region have experienced a history of flood events that compromised life, property, and government operations. However, the community has learned from this

history and instituted regulations and constraints on development such that the community is no longer at serious risk from flooding.

A terrible flood in the meadows in 1695 caused residents to realize the need to move their settlement to higher ground. In 1703 permission was granted to settle on "the hill" (current Longmeadow Street) and to begin to establish a community separate from Springfield.

During the Flood of 1936 water reached 63 feet above flood level. During the Flood of 1938 water reached 60.3 feet above flood level. The back to back hurricanes of Connie and Diane had water levels reach 56 feet above flood levels.

All three floods did extensive damage to the City of Springfield, two miles up river.

In the days before flood control dams were built the Connecticut River reached very high flood levels. This marker shows the high water marks above flood stage for three major events.

In 1936 and 1938 there were no flood control dams on the Connecticut River. Subsequently the Knightville and Littleville Dams were constructed by the U.S. Army Corps of Engineers. The Knightville Dam was built in 1941 and the nearby Littleville Dam was built in 1963.

The Flood of 1955 came from the residual rain of two hurricanes, and yet because of its suddenness in striking in the wee hours on August 19th, seemed to come out of nowhere.

Hurricane Connie (August 11-14, 1955), and Hurricane Diane (August 17-20, 1955), neither of which actually entered New England, nevertheless pushed a couple of feet of rain, a deluge in a very short span of just over a day. The sodden ground could take no more, and the rivers morphed into monsters and took property, and lives, away.

There seemed to be less havoc on the Connecticut River, which had the benefit of flood control projects inspired by previous flood disasters, but the smaller rivers and tributaries were not protected quite so well.

Longmeadow has experienced many flooding events over the last decades, including in the fall of 1982 and in 1984. Generally, these floods have had minor impacts, temporarily impacting roads and residents' yards.

Probability of Future Events

Based on previous occurrences, the frequency of flooding in Longmeadow is "moderate," with a 1 to 10 percent probability in any given year. Flooding probabilities for the various floodplains in Longmeadow are defined by FEMA as the following:

- 10-year floodplain – 10 percent chance of flooding in any given year
- 25-year floodplain – 2.5 percent chance of flooding in any given year
- 100-year floodplain – 1 percent chance of flooding in any given year
- 500-year floodplain – 0.2 percent chance of flooding in any given year

Climate scientists predict that in the next few decades, climate change will increase the frequency and intensity of all storms that can cause flooding. Currently, floods are the most costly natural hazard in the United States, and climate change will only increase this damage. More information about the effect of Climate Change can be found in the Pioneer Valley Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org.

The Massachusetts State Climate Change Adaptation Report has additional information about the impact of climate change and can be accessed at www.mass.gov/eea/air-water-climate-change/climate-change/climate-change-adaptation-report.html.

The area within the 100-year flood plain has a 1 percent chance of flooding in any given year.

Impact

The impact of a flooding event is deemed to be "limited." To determine the vulnerability of the Town to localized flood events, the property within identified areas was visually analyzed using aerial photography (Pictometry), which allowed structures to be identified and tallied. Then, utilizing the Town's median home value of $338,800 a preliminary damage assessment was then generated. For the estimated number of people living in the floodplain, an average household size of 2.8 people was used[2]. These damage estimates are rough estimates and likely reflect 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. Human losses are not calculated

[2] Figure courtesy of 2008-2012 U.S. Census American Community Survey 5-year estimates.

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.

An estimated 20 percent of damage would occur to each structure in the 100-year floodplain. According to the Town of Longmeadow Town Assessor's data, accessed via the Town's online GIS system, there were17 residential structures located within the 100-year floodplain, with a total building value of $1,949,500. Therefore, a vulnerability assessment for a 100-year flood equals approximately $2 million of damage, with approximately 45 people impacted.

Vulnerability

Based on the above analysis, Longmeadow has a hazard index rating of "3 – medium risk" for flooding.

The Town of Longmeadow does not have any Repetitive Loss Properties, according to the NFIP as of November 2013.

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

Flooding (100-year base flood): Medium Risk

The classification for a major flood in Longmeadow is a flood level of 9 feet. There have been 8 such floods since 1936, as shown in the table below.

Highest Flood Levels on Record for Connecticut River at Thomsonville, CT (directly downstream from Longmeadow)	
Date	**Flood Level (ft.)**
March 20, 1936	16.6
July 23, 1938	14.4
August 19, 1955	10.93
May 31, 1984	10.8
April 20, 1933	10.47
April 6, 1960	10.01
January 1, 1949	9.3
April 14, 1934	8.96
March 23, 1948	8.93
April 1, 1987	8.74

Flooding (localized) – Medium-Low Risk

The history of localized flooding is summarized at the beginning of the Flooding section. To date Longmeadow has experienced minor localized flooding and it is not a significant vulnerability for the Town.

Severe Snow/Ice Storm – Medium-High Risk

Hazard Description

Severe winter storms can pose a significant risk to property and human life. The rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can cause the following hazards:

- Disrupted power and phone service
- Unsafe roadways and increased traffic accidents
- Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt
- Tree damage and fallen branches that cause utility line damage and roadway blockages
- Damage to telecommunications structures
- Reduced ability of emergency officials to respond promptly to medical emergencies or fires
- Elderly are affected by extreme weather

Location

The entire town of Longmeadow is susceptible to severe snowstorms. Because these storms occur regionally, they impact the entire town. As a result, the location of occurrence is "large," with over 50 percent of land area affected.

Extent

While the Town of Longmeadow has not tracked snowfalls in the community, the weather reporters for the local Channel 3 news station produced this summary report of the top 10 snowfalls recorded in the region since 1905.

24.0 inches | January 12, 2011

21.9 inches | February 12, 2006

21.0 inches | February 11-2, 1983

18.2 inches | December 19-20, 1945

17.7 inches | December 29, 1945

17.4 inches | February 19-20, 1934

17.0 inches | February 20-21, 1921

16.9 inches | February 6-7, 1978

16.9 inches | December 26-27, 1947

16.3 inches | March 5, 2001

16.2 inches | February 4, 1926

16.0 inches | February 14, 1914

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

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

Northeast Snowfall Impact Scale Categories		
Category	**NESIS Value**	**Description**
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Previous Occurrences

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Severe winter storms typically occur during January and February; however, they can occur from late September through late April.

Based on data available from the National Oceanic and Atmospheric Administration, there are 47 winter storms since 1958 that have registered on the NESIS scale. Of these,

approximately 26 storms resulted in snow falls in the Pioneer Valley of at least 10 inches. These storms are listed in the table on the next page, in order of their NESIS severity.

Recently, Longmeadow has recorded two storm-related deaths: one resident was removing a tree and it fell on him, and one resident froze to death in a home that was not heated properly. In addition, there are usually several incidents of property damage or personal injury each winter. In addition, during heavy snow years, accumulations can reach several feet deep. Clean up from the snowstorm in October, 2011 cost Longmeadow $12.5 million. The town was completely without power for three days and staggered restoration of power took seven days.

Severe winter weather occurs regionally and therefore would impact the entire town. Members of the Hazard Mitigation Team indicated there are no specific problems in any part of town due to winter weather.

Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 1958-2013

Date	NESIS Value	NASIS Category	NESIS Classification
3/12/1993	13.2	5	Extreme
3/2/1960	8.77	4	Crippling
2/15/2003	7.5	4	Crippling
2/2/1961	7.06	4	Crippling
1/21/2005	6.8	4	Crippling
1/19/1978	6.53	4	Crippling
12/25/1969	6.29	4	Crippling
2/10/1983	6.25	4	Crippling
2/14/1958	6.25	4	Crippling
2/5/1978	5.78	3	Major
2/23/2010	5.46	3	Major
2/8/1994	5.39	3	Major
1/9/2011	5.31	3	Major
2/18/1972	4.77	3	Major
12/11/1960	4.53	3	Major
2/7/2013	4.35	3	Major
2/22/1969	4.29	3	Major
1/18/1961	4.04	3	Major
2/8/1969	3.51	2	Significant

2/5/1967	3.5	2	Significant
4/6/1982	3.35	2	Significant
3/4/2013	3.05	2	Significant
3/15/2007	2.54	2	Significant
3/31/1997	2.29	1	Notable
2/2/1995	1.43	1	Notable
1/25/1987	1.19	1	Notable

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Probability of Future Events

Based upon the availability of records for Hampden County, there is a "high" probability)40 to 70 percent in any given year) that a severe snow or ice storm will occur in Longmeadow. Overall, New England generally experiences at least one or two severe winter storms each year with varying degrees of severity.

Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. More information about the effect of Climate Change can be found in the Pioneer Valley Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org.

The Massachusetts State Climate Change Adaptation Report has additional information about the impact of climate change and can be accessed at www.mass.gov/eea/air-water-climate-change/climate-change/climate-change-adaptation-report.html.

Impact

Based on the accompanying analysis, the impact of a potential severe snow or ice storm is deemed as "critical," with more than 25 percent of property in Longmeadow possibly damaged or destroyed.

To approximate the financial impact to property and people that could be imposed by this hazard, the total value of all property in Longmeadow, $1,951,621,392 is used. An estimated 25 percent of damage would occur to 10 percent of structures, resulting in a total of $48,790,534 worth of damage. The cost of repairing infrastructure, such as roads, bridges, and utilities is excluded from this estimate.

Vulnerability

Based on the comprehensive assessment of the data and public input, Longmeadow faces a hazard index rating of "1 – very high risk" from severe snow and ice storms. The most obvious vulnerability Longmeadow experiences from severe snow and ice as well as hurricanes/severe wind is the danger of falling trees and/or branches.

Hurricanes/Tropical Storms – Medium-Low Risk

Hazard Description

Hurricanes are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour and which generate large amounts of precipitation. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities.

Location

Because of the hazard's regional nature, all of Longmeadow is at risk from hurricanes and tropical storms, meaning the location of occurrence is "large," with over 50 percent of land area affected. Ridgetops are more susceptible to wind damage.

Extent

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

SAFFIR-SIMPSON SCALE	
Category	**Maximum Sustained Wind Speed (MPH)**
1	74–95
2	96–110
3	111–129
4	130–156
5	157 +

Source: National Hurricane Center, 2012

Previous Occurrences

Hurricanes that have affected Longmeadow are shown in the following table.

Major Hurricanes and Tropical Storms Affecting Longmeadow		
Hurricane/Storm Name	**Year**	**Saffir/Simpson Category (when reached MA)**
Great Hurricane of 1938	1938	3
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1
Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm
Irene	2011	Tropical Storm
Sandy	2012	Super Storm

Source: National Hurricane Center, 2012

The Hurricane of 1938 destroyed many of the great elm trees on the Green and left the community without power for one month.

For most other hurricanes or severe wind events, the Town has experienced small blocks of downed timber and uprooting of trees onto structures. Hurricanes can and do create flooding, and except for the Hurricanes of 1938 and 1955 (Diane), damages from flooding have been minor according to Hazard Mitigation team members.

Probability of Future Events

Longmeadow's location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events. Based upon past occurrences, it is reasonable to say that there is a "low" probability of hurricanes or tropical storms, or a 1 to 10 percent probability in any given year.

Impact

A description of the damages that could occur due to a hurricane is described by the Saffir-Simpson scale, as shown below.

Hurricane Damage Classifications			
Storm Category	**Damage Level**	**Description of Damages**	**Wind Speed (MPH)**
1	MINIMAL Very dangerous winds will produce some damage	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
2	MODERATE Extremely dangerous winds will cause extensive damage	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
3	EXTENSIVE Devastating damage will occur	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
4	EXTREME Catastrophic damage will occur	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
5	CATASTROPHIC Catastrophic damage will occur	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+

The impact of a hurricane would be "critical," with more than 25 percent of property in affected areas damaged or destroyed.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property of $1,951,621,392 is used. Wind damage of 5 percent to 10 percent of structures would result in an estimated $4,879,053 damage. Flood damage of 10 percent to 20 percent of structures would result in $9,758,107 of damage. The cost of repairing or replacing roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Longmeadow faces a hazard index rating between "3 – medium risk" and "4 – low risk" from hurricanes.

The most obvious vulnerability Longmeadow experiences from severe snow and ice as well as hurricanes/severe wind is the danger of falling trees and/or branches.

Severe Thunderstorms / Wind / Tornadoes – Medium-Low Risk

Hazard Description

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain, and sometimes hail. Effective January 5, 2010, the NWS modified the hail size criterion to classify a thunderstorm as "severe" when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Wind is air in motion relative to the surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (sustained winds of 31 to 39 mph for at least 1 hour or any gusts 46 to 57 mph) or a High Wind Warning (sustained winds 40+ mph or any gusts 58+ mph). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph. A hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph. Effects from high winds can include downed trees and/or power lines and damage to roofs, windows, etc. High winds can cause scattered power outages. High winds are also a hazard for the boating, shipping, and aviation industry sectors.

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.

Location

As per the Massachusetts Hazard Mitigation Plan, the entire town is at risk of high winds, severe thunderstorms, and tornadoes. However, the actual area exposed to the impacts of these hazards is usually quite isolated. Therefore, the location of occurrence is determined to be "small," with less than 10% of all land area vulnerable to damage.

Extent

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. Thunderstorms can cause hail, wind, and flooding.

For more than three decades, the method for evaluating the severity of a tornado involved relating the degree of damage to the intensity of the wind, using the Fujita Scale, known as the F-scale (1 through 6 with 6 being the most severe). This generalized method has been problematic, according to information from National Oceanic and Atmospheric Administration's (NOAA's) Storm Prediction Center, as different winds may be needed to cause the same damage depending on how well-built a structure is, wind direction, wind duration, battering by flying debris, and a bunch of other factors. The process of rating the damage itself is largely a judgment call, according to NOAA's Storm Prediction Center. Even meteorologists and engineers highly experienced in damage survey techniques often came up with different F-scale ratings for the same damage.

As of February 2007, an enhanced F-Scale should be used. NOAA's Storm Prediction Center reports,

> The Enhanced F-scale is a much more precise and robust way to assess tornado damage. It classifies F0-F5 damage as calibrated by engineers and meteorologists across 28 different types of damage indicators (mainly various kinds of buildings, but also a few other structures as well as trees). The idea is that a "one size fits all" approach just doesn't work in rating tornado damage, and that a tornado scale needs to take into account the typical strengths and weaknesses of different types of construction….In the Enhanced F-scale, there will be different, customized standards for assigning any given F rating to a well built, well anchored wood-frame house compared to a garage, school, skyscraper, unanchored house, barn, factory, utility pole or other type of structure. In a real-life tornado track, these ratings can be mapped together more smoothly to make a damage analysis. Of course, there still will be gaps and weaknesses on a track where there was little or nothing to damage, but such problems will be less common than under the original F-scale. As with the original F-scale, the enhanced version will rate the tornado as a whole based on most intense damage within the path. There are no plans to systematically re-evaluate historical tornadoes using the Enhanced F-scale.

Enhanced Fujita Scale Levels and Descriptions of Damage			
EF-Scale Number	**Intensity Phrase**	**3-Second Gust (MPH)**	**Type of Damage Done**
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	Incredible	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Previous Occurrences

Because thunderstorms and wind affect Longmeadow annually, there are not significant records available for these events. According to the Massachusetts Hazard Mitigation Plan, these weather events appear for approximately 10 to 30 days in the state each year. Additionally, there are typically 1 to 3 tornadoes in southern New England per year. Typically, they have touched down during the late afternoon and early evening hours, when heat and humidity reach a zenith.

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in Hampshire County.

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

No known tornados have touched down in Longmeadow, but the town is located in a section of the state that has been identified as having the highest density of tornadoes in the Commonwealth. In June 2011, a tornado touched down in neighboring Springfield (after touching down in Westfield and West Springfield) and traveled on to Monson and Brimfield.

Longmeadow was significantly affected by a Microburst one week after the June 1, 2011 tornado. The microburst downed 35 trees and left some portions of the community without power for 1-2 days.

In western Massachusetts, the majority of sighted tornadoes have occurred in a swath east of Longmeadow, known as "tornado alley." Sixteen incidents of tornado activity (all F2 or less) occurred in Hampden County between 1959 and 2011.

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

Microbursts, on the other hand, are common in Longmeadow and while their impact is small and isolated, they do often leave the areas they touch without power for 1-2 days and they bring a few trees down each time.

Probability of Future Events

One measure of tornado activity is the tornado index value. It is calculated based on historical tornado events data using USA.com algorithms. It is an indicator of the tornado level in a region. A higher tornado index value means a higher chance of tornado events. Data was used for Hampden County to determine the Tornado Index Value as shown in the table below.

Tornado Index for Hampden County	
Hampden County	138.23
Massachusetts	87.60
United States	136.45

Source: USA.com, http://www.usa.com/hampden-county-ma-natural-disasters-extremes.htm

Impact

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. In Longmeadow, a tornado that hit the residential areas would leave much more damage than a tornado with a travel path that ran along the town's forested uplands, where little settlement has occurred. Many buildings in the Town of Longmeadow have not been built to Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, with a portion of the Town's housing built before this date.

The estimated impact of a severe thunderstorm, wind, or tornado to Longmeadow is "limited," with more than 10 percent of affected property damaged or destroyed. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $1,951,621,392 is used. An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of $39,032,427 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Longmeadow faces a hazard index rating of "3 – medium risk" for severe thunderstorms, winds, and tornadoes.

The most obvious vulnerability Longmeadow experiences from severe snow and ice as well as hurricanes/severe wind is the danger of falling trees and/or branches.

Wildfires/Brushfires – Low Risk

Hazard Description

Wildland fires are typically larger fires, involving full-sized trees as well as meadows and scrublands. Brushfires are uncontrolled fires that occur in meadows and scrublands, but do not involve full-sized trees. Both wildland fires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

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

Location

Hampden County has approximately 273,000 acres of forested land, which accounts for 67% of total land area. So even though Longmeadow does not have significant forested area, forest fires are a potential hazard. Illegal brushfires in Longmeadow occur on average about 15 times per year, but the vast majority of these fires are small and they are quickly contained.

The location of occurrence of a wildfire in Longmeadow is determined to be "small," with less than 10 percent of total land affected.

Extent

Wildfires can cause widespread damage to the areas that they affect. They can spread very rapidly, depending on local wind speeds and be very difficult to get under control. Fires can last for several hours up to several days.

The local Hazard Mitigation Committee does not believe wildfire to be a significant hazard. The limited forest cover, the fact that Massachusetts receives more than 40 inches of rain per year and that fact that much of the landscape is fragmented, make wildfires uncommon in Massachusetts.

Previous Occurrences

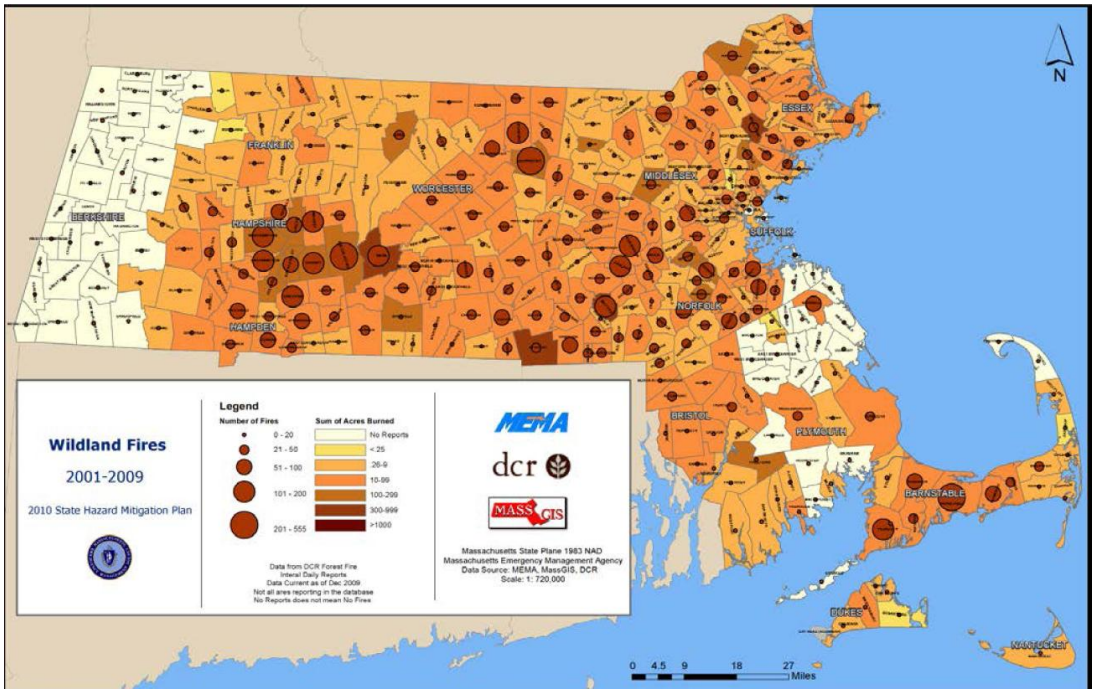
Longmeadow has not experienced any significant fire events in the last twenty plus years. In the early to mid 1990s a brush fire occurred along Maple Road, along the Connecticut line, and significantly threatened several homes.

According to the Longmeadow Fire Department, there are approximately 20 unauthorized burns (or brushfires) per year, on average. As a point of comparison, approximately 25 open burning permits are issued annually.

During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 1995 – Russell, 500 acres burned on Mt. Tekoa
- 2000 – South Hadley, 310 acres burned over 14 days in the Litihia Springs Watershed
- 2001 – Ware, 400 acres burned
- 2010 – Russell, 320 acres burned on Mt. Tekoa
- 2012 – Eastern Hampden County, dry conditions and wind gusts created a brush fire in Brimfield, and burned 50 acres

Wildland Fires in Massachusetts, 2001-2009



Source: Massachusetts Hazard Mitigation Plan

Probability of Future Events

In accordance with the Massachusetts Hazard Mitigation Plan, the Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, given the proximity of previous wildfires, and their proximity to the Town, the likelihood of a future wildfire is determined to be "moderate," or between a 10 and 40 percent probability in any given year.

Climate scenarios project summer temperature increases between 2ºC and 5ºC and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called "fertilization effect"—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown.

Impact

The impact of this hazard is considered to be "minor," resulting in minimal property damage and risk of fatalities. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town,

$1,951,621,392 is used. An estimated 1/2 percent of damage would occur to 5 percent of structures, resulting in a total of $487,905 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the data incorporated into the analysis above, it is determined that Longmeadow faces a hazard index rating of "4 – low risk" from wildfires and brushfires.

Earthquakes – Low Risk

Hazard Description

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. The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times.

Location

As earthquakes generally reverberate regionally, the entire Town of Longmeadow is susceptible to earthquakes. This makes the location of occurrence and catchment area for potential damages "large," or over 50 percent of the town's total land area impacted.

Extent

The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times. The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

Richter Scale Magnitudes and Effects	
Magnitude	Effects
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Modified Mercalli Intensity Scale for and Effects			
Scale	**Intensity**	**Description Of Effects**	**Corresponding Richter Scale Magnitude**
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Source: US Federal Emergency Management Agency

Previous Occurrences

Nineteen earthquakes, of an intensity of V or greater on the Modified Mercalli Scale, have centered in Massachusetts since it was colonized by Europeans. An earthquake of an intensity of V is felt by nearly everyone; many folks are awakened. Some dishes and windows are broken. Unstable objects are overturned, and clocks may stop. A shock in 1755 reached intensity VIII at Boston and was felt across the state. In addition, Massachusetts was affected by some of the more severe Canadian shocks plus the earthquake of 1929 that centered on Grand Banks of Newfoundland.

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

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

New England Earthquakes with a Magnitude of 4.2 or more, 1924 – 2012

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
Bar Harbor, NH	October 3, 2006	4.2
Hollis Center, ME	October 16, 2012	4.6

Source: Northeast States Emergency Consortium website, www.nesec.org/hazards/earthquakes.cfm

New England States Record of Historic Earthquakes		
State	**Years of Record**	**Number Of Earthquakes**
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
Total Number of Earthquakes within the New England states between 1638 and 1989 is 2262.		

Source: Northeast States Emergency Consortium website, *www.nesec.org/hazards/earthquakes.cfm*

Probability of Future Events

One measure of earthquake activity is the Earthquake Index Value. It is calculated based on historical earthquake events data using USA.com algorithms. It is an indicator of the earthquake activity level in a region. A higher earthquake index value means a higher chance of earthquake events. Data was used for Hampden County to determine the Earthquake Index Value as shown in the table below.

Earthquake Index for Hampden County	
Hampden County	0.24
Massachusetts	0.70
United States	1.81

Based upon existing records, there is a "low" frequency of earthquakes in Longmeadow with between a 1 to 10 percent chance of an earthquake occurring in any given year.

Impact

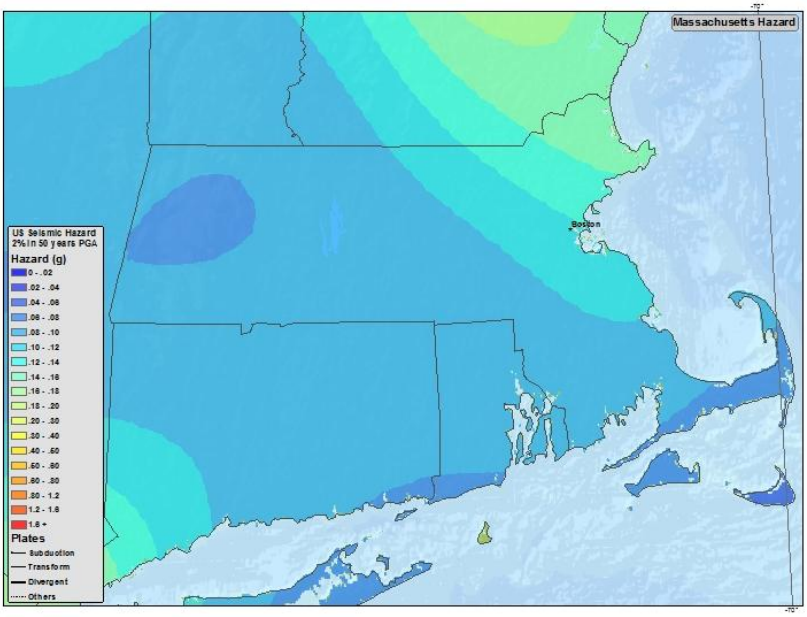
Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code for seismic reasons in the 1980s. However, these specifications apply only to new buildings or to extensively-modified existing buildings.

Buildings, bridges, water supply lines, electrical power lines and facilities built before the 1980s 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.

There are utility lines under the Connecticut River that connect Longmeadow's water, sewer, and power systems to the greater region. A breakage could potentially occur in the event of an earthquake and result in these systems needing to be repaired. Because I-91 is constructed on sandy soils that could shift in the case of an earthquake, the road could potentially be significantly damaged in the case of a very large earthquake.

- Because many of the buildings were built before the 1980s, there is potential for damage on all streets;
- Structures are mostly wood frame construction, so loss estimates predict 20% of town assessed value, not including costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures;
- Vulnerability assessment estimates approximately $227,938,400.

US Seismic Hazard Map for Massachusetts



Source: USGS Earthquake Hazards Program, http://earthquake.usgs.gov/earthquakes/states/massachusetts/hazards.php

Vulnerability

Based on the above analysis, Longmeadow faces a hazard index rating of "4 – low risk" from earthquakes.

Dam Failure – Low Risk

Hazard Description

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

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

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). DCR was also responsible for conducting dam inspections until 2002, when state law was changed to place the responsibility and cost for inspections on the owners of the dams. This means that individual dam owners are now responsible for conducting inspections. Notice for dam owners to comply with the inspection schedule did not go out until 2006. Extensions were provided to some dam owners, particularly to towns, so that they could include the costs of inspection within their next funding cycles.[3] A number of dams in Western Massachusetts have received letters of non-compliance for failure to comply with inspection schedules and are under possible penalties of $500 per day.

Location

Based on DCR sources, there are currently 3 dams in Longmeadow. Two of these are low hazard and one is a significant hazard. The table below identifies dams within the town, state id, name of owner, purpose, condition, last inspected date, and hazard risk classification.

[3] Alice Bilbo-Miles , legal advisor to the Massachusetts Office of Dam Safety.

Longmeadow Dams, Classified by Hazard Risk					
Dam name/ date built	**ID**	**Owner**	**Condition/ last inspected**	**Hazard Risk**	**Location**
Turner Park Dam	MA00543	Town of Longmeadow	Fair / July 28, 2009	Low	Adjacent to Turner Park Road
Longmeadow Country Club Dam	MA00544	Longmeadow Country Club	Good / November 2, 2006	Low	Adjacent to Shaker Road
Laurel Park Dam	Unknown	Town of Longmeadow	Unknown / Never	Low	Laurel Park, near Route 5

Source: Massachusetts Department of Conservation and Recreation, Office of Dam Safety, September 2009

Based on this analysis, a dam failure is estimated to affect less than 1- percent Longmeadow's total land area, resulting in a "small" location of occurrence.

Extent

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.

Dams in Massachusetts are assessed according to their risk to life and property. The state has three 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.

Previous Occurrences

There has not been a dam breech in the history of the Town of Longmeadow.

Probability of Future Events

As Longmeadow's dams age, and if maintenance is deferred, the likelihood of a dam failure will increase. However, the frequency of a dam failure is "low," with a 1 to 10 percent probability in any given year.

Impact

The Hazard Mitigation Committee confirmed that failure of the Laurel and Turner Park Dams would not cause any property damage. The Longmeadow Country Club Dam could impact road and the underground utilities, such as drain, water, sewer and communication lines. In the event of a dam or levee failure, it is estimated that 25% of properties would occur to 100% of the structures. Using the total value of all property in town, $1,951,621,392, it is projected that $487,905,348 of losses could be sustained from a dam failure. This estimate does not factor in rehabilitation costs pertaining to utilities, roads, and other public infrastructure.

Vulnerability

According to this analysis and available data, Longmeadow has a hazard index rating of "4 – low risk" of dam failure or levee breech.

Drought – Low Risk

Hazard Description

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

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

Location

Because of this hazard's regional nature, a drought would impact the entire town, meaning the location of occurrence is "large," or over 50 percent of total land area affected.

Extent

The severity of a drought would determine the scale of the event and would vary among town residents depending on whether the residents' water supply is derived from a private well or the public water system. Ware's Public Water Supply is supplied by six wells; these six wells supply 70 percent of the town's water needs. Massachusetts' wells are permitted according to their ability to meet demand for 180 days at maximum capacity with no recharge; if these conditions extended beyond the thresholds that determine supply capacity the damage from a drought could be widespread due to depleted groundwater supplies. The U.S. Drought Monitor also records information on historical drought occurrence. Unfortunately, data could only be found at the state level. The U.S. Drought Monitor categorizes drought on a D0-D4 scale as shown below.

U.S. Drought Monitor		
Classification	**Category**	**Description**
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed

D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

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.

Annual Drought Status in Longmeadow

Year	Maximum Severity
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 99% of the state
2003	No drought
2004	D0 conditions in 44% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 57% of the state
2009	D0 conditions in 44% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state

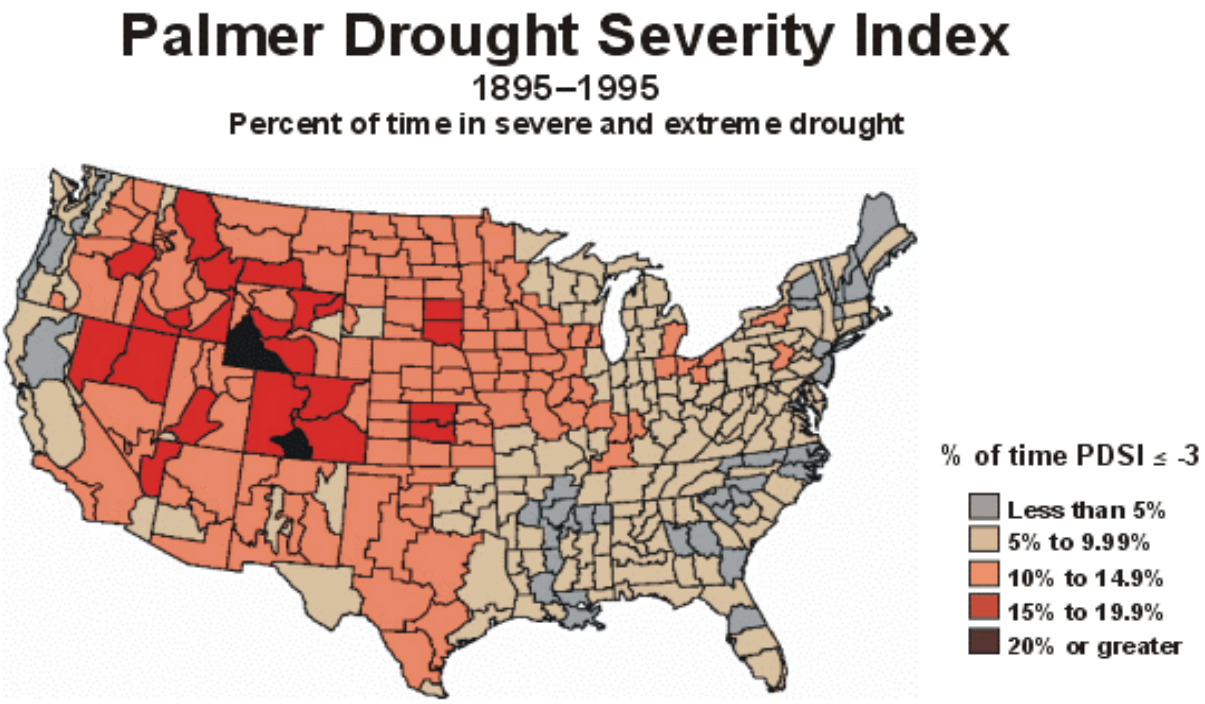
Source: US Drought Monitor

Longmeadow has not been affected by any previous droughts in the state. Longmeadow has had limited experience with severe drought conditions. The town has not experienced a threat to its water supply, and does not anticipate any severe water shortages throughout town.

Probability of Future Events

In Longmeadow, as in the rest of the state, the probability of drought is "moderate," with a 10 to 40 percent chance in any given year.

Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture based economy), and infrastructure, may affect the severity and length of a drought event. 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.



Impact

Due to the water richness of western Massachusetts, Longmeadow is unlikely to be adversely affected by anything other than a major, extended drought. While such a drought would require water saving measures to be implemented, there would be no foreseeable damage to structures or loss of life resulting from the hazard. Because of this, the Hazard Mitigation Committee has determined the impact from this hazard to be "minor," with minimal damage to people and property.

Vulnerability

Based on the above assessment, Longmeadow has a hazard index rating of "4 - low risk" from drought.

Other Hazards

Upon reviewing the State Hazard Mitigation Plan for Massachusetts, and having completed this hazard risk vulnerability assessment, the Hazard Mitigation Committee does not find substantial risk of other hazards, such as ice jams, landslides, erosion, or extreme temperatures.

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

While some hazards are regional in scope, others reveal effects that are more concentrated in nature. As such, there are vulnerable locations with varying exposure to hazard impacts. Most prominently, there is one critical facility that falls within the 100-year floodplain, as shown in the table at the end of this section – the Town's sewage pumping station, which pumps wastewater to Bondie's Island in Springfield.

The Critical Facilities List for the Town of Longmeadow has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Longmeadow'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 Longmeadow.
- The third category contains Facilities/Populations that the Committee wishes to protect in the event of a disaster.
- The fourth category contains Potential Resources, which can provide services or supplies in the event of a disaster.

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

Category 1 – Emergency Response Services

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 (informal; not official)
    - Primary: Fire Station – 44 Williams Street, Longmeadow
    - Secondary: Police Station – 34 Williams Street, Longmeadow

2) Fire Station
    - Fire Station – 44 Williams Street, Longmeadow

3) Police Station
    - Police Station – 34 Williams Street, Longmeadow

4) Department of Public Works
    - 31 Pondside Road, Longmeadow

5) Water Department
    - 20 Williams Street, Longmeadow

6) Fuel Stations
    - Department of Public Works, 31 Pondside Road, Longmeadow

7) Facilities with Backup Power
    - Town Administration Building – 20 Williams Street, Longmeadow
    - Police Station – 34 Williams Street, Longmeadow
    - Fire Station – 44 Williams Street, Longmeadow
    - Department of Public Works – 31 Pondside Road, Longmeadow (limited)
    - Water Pumping Station – Forest Glen Road, Longmeadow
    - Longmeadow High School – 95 Grassy Gutter Road, Longmeadow
    - Center Elementary School – 837 Longmeadow Street, Longmeadow

8) Emergency Shelters
    - Longmeadow High School – 95 Grassy Gutter Road, Longmeadow

9) Helicopter Landing Sites (Lifeflight-Lifestar preapproved)
    - None

10) Communications

- Repeater at Police Station – 34 Williams Street, Longmeadow
- Town communication system housed at municipal water tower (backup power provided by Verizon) – near Academy Drive

11) Hospitals

- None

12) Primary Evacuation Routes

- Route 5 to Interstate 91
- Bliss Road
- Converse Street
- Williams Street
- Wolf Swamp Road
- Frank Smith Road
- Route 192/ Shaker Road

13) Culverts Located on Evacuation Routes

- Route 5 over Raspberry Brook
- Wolf Swamp Road over Wolf Swamp Brook

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 Longmeadow.

1) Water Supply

   The Town of Longmeadow purchases its water from the City of Springfield. The Longmeadow Water system begins at the water pumping station located on Forest Glen Road in Longmeadow. From this pumping station, the Town of Longmeadow is serviced by approximately 96 miles of water distribution mains.

2) Drinking Water Treatment Plants

   Because the Town of Longmeadow purchases its water from the City of Springfield, relevant water treatment plants are owned and run by the City of Springfield.

3) Water Storage

The Town of Longmeadow municipal water tank is located off Academy Drive near Turner Park. The tank has a capacity of one million-gallons and is primarily used to improve pressure to the easterly area of the Town.

4) Waste Water Treatment Plants

Sewage is primarily gravity fed to the Emerson Road Sewer Pumping Station. From the pumping station, the sewage is pumped through a 24" pressure main directly to Springfield Bondi's Island. The sewer plant is protected by an emergency stand-by generator that has the capacity to run the electrical demands for the entire plant.

5) Critical Culverts (roads with stream crossings)

The following roads have stream crossings: Frank Smith Road, Merriweather Drive, Deepwoods Drive, Shaker Road, Mill Road, Longmeadow Street, Avondale Road, Barbara Lane, and Pioneer Drive.

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
    - Wernick Adult Day Health Care – 770 Converse Street
    - Willie Ross School for the Deaf – 32 Norway Street

2) Elderly Housing/Assisted Living
    - Jewish Nursing Home of Western Massachusetts – 770 Converse Street
    - Glenmeadow Retirement Community – 24 Tabor Crossing
    - Emerson Manor – 114 Emerson Road
    - Genesis House – 832 Converse Street
    - Ruth's House – 780 Converse Street

3) Public Buildings/Areas
    - Adult Center / Council on Aging – Greenwood Park Center, 231 Maple Road
    - Veterans Office – Greenwood Park Center, 231 Maple Road
    - Longmeadow Community House – 735 Longmeadow Street
    - Storrs Library – 693 Longmeadow Street

4) Schools
    - Longmeadow High School – 95 Grassy Gutter Road
    - Blueberry Hill School – 275 Blueberry Hill Road
    - Glenbrook Middle School – 110 Cambridge Circle
    - Center School – 837 Longmeadow Street
    - Williams Middle School – 410 Williams Street
    - Wolf Swamp Road School – 62 Wolf Swamp Road
    - Montessori International – 777 Longmeadow Street
    - Willie Ross School for the Deaf – 32 Norway Street
    - Lubavitcher Yeshiva Academy – 1148 Converse Street
    - St. Mary's Elementary School – 56 Hopkins Place
    - Heritage Academy – 594 Converse Street

5) Places of Worship
    - St. Andrews Episcopal Church – 335 Longmeadow Street
    - Saint Mary's Parish – 519 Longmeadow Street
    - First Church of God – 763 Longmeadow Street,
    - Saint Mary's Catholic Church – 519 Longmeadow Street
    - Congregation B'nai Torah – 2 Eunice Drive

6) Historic Buildings/Sites
    - None

7) Apartment Complexes (5 units or more)
    - None

8) Major Employers (Industrial Parks, Factories, etc.)
    - None

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas			
Hazard Type	**Hazard Area**	**Critical Facilities Affected**	**Evacuation Routes Affected**
Flooding (100-year)	Area near Connecticut River / Fannie Stebbins Memorial Wildlife Refuge	Longmeadow Sewage Pumping Station	None
Flooding (localized)	Longmeadow Street, Blueberry Hill Road, Bliss Road/Bliss Court, Captain Road, Williams Street, Wilmbleton Drive, Frank Smith Road over Wolf Swamp Brook, and Brookwood Drive	EPA Tier II critical facility (committee has determined this is not a hazard), Blueberry Hill School, Department of Public Works building	Route 5, Bliss Road, Williams Street
Wildfire/Brushfire	Agricultural areas	None	None
Hazardous Materials	Interstate 91 (particularly near Longmeadow Curve)	None	Interstate 91

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

5: MITIGATION STRATEGIES

Town's Capability to Implement Mitigation Strategies

The Town of Longmeadow is well equipped to implement the proposed mitigation strategies. The Town has a full-time Town Manager, a robust Department of Public Works, including a Town Engineer, and a community of skilled, talented and engaged residents willing to serve on Town Boards and Committees. Because the Town is essentially 'built-out' there is very little building happening, other than renovations and additions. The Town's existing development regulations have been reviewed and found to be doing their job. In addition to the very competent and hard-working Town staff, the Town has a very experienced Planning Board which reviews all proposed developments and assures that buildings are built to the current zoning requirements.

In addition to the Town's own strong capabilities, the Town is very engaged with the Pioneer Valley Planning Commission (PVPC) which facilitates development of regional economic development, housing, land use, transportation and other plans for development in the region.

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

Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to the following hazards: flooding, severe snowstorms/ice storms, severe thunderstorms, hurricanes, tornadoes, wildfires/brushfires, earthquakes, dam failures, and drought.

For the extent of this analysis, the Committee reviewed and incorporated content from the following Town documents for relevant information that corresponded to mitigation strategies:

- Continuity of Operations Plan, created in 2010
- Open Space and Recreation Plan
- Community Development Plan

- Zoning By-Laws, as revised April
- Subdivision Rules and Regulations, as revised March
- Comprehensive Emergency Management Plan

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

General Mitigation Measures

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

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

One of these general hazard-related strategies and measures does not fall specifically under the category of "mitigation," but is instead a tool for preparedness. The Hazard Mitigation Planning Committee recognizes that this strategy is also important for the Town, and has included it here:

Action Item: *Continue annual updates to Longmeadow Continuity of Operations Plan.*

Responsible Department/Board: *Emergency Management Director*

Action Item: *Continue annual updates to Longmeadow Shelter Plan.*

Responsible Department/Board: *Emergency Management Director*

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

Responsible Department/Board: Emergency Management Director

Flooding

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

Current Mitigation Measures

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

Existing Flood Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
Drainage Replacement		Determining a priority list of necessary drainage system replacements and other construction projects to effectively manage flooding.	Very effective for managing flood control needs.	Funding needed to do replacements.
General Bylaws	Post-Construction Stormwater Management Ordinance	Post development peak discharge rates not to exceed predevelopment peak discharge rates; maximize groundwater recharge.	Effective for reducing peak flows.	None.
	Stormwater Management and Land Disturbance Bylaw	Requires Erosion and Sediment Control Plan to minimize peak rate of runoff and maximize groundwater recharge.	Effective for reducing peak flows.	None.
	Wetlands Control Bylaw	No development within 100 feet of any brook, creek, river, stream, pool or lake without permit from conservation commission.	Effective.	None.
Zoning Bylaw	Flood Plain Zone	Overlay district to protect areas delineated as part of the 100-year floodplain by regulating uses and special permit requirements.	Very effective for preventing incompatible development within the flood prone areas.	None.
	Moving of Earth	Moving soil, sand, or gravel can occur only under special	Effective in tandem with	None.

Existing Flood Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
		conditions, including planning board approval of subdivision plan.	Stormwater Management and Land Disturbance Bylaw.	
	Site Plan Review	Review Criteria/Design Guidelines that include protection from flood hazards considering such factors as elevation of buildings, drainage, storage of buoyant material, etc.	Very effective and used to improve flooding on Chandler Avenue.	None.
	Special Permit	Some uses require special permit approval, and must meet environmental standards.	Very effective for preventing incompatible development, though never tested.	None.
Subdivision Regulations	Definitive Plan	100-year floodplain, wetlands, waterbodies, conservation areas, storm drainage, erosion control, proposed sewage disposal must all be shown.	Effective.	None.
	Additional Requirements	Environmental Impact Analysis may be required to protect public against any possible harm to natural resources.	Effective.	None.
	Design Standards	Protection of Natural Features.	Effective.	None.
Longmeadow Open Space and Recreation Plan (2012)		The OSRP seeks to preserve natural resources in the town, including the floodplain; wetlands, groundwater recharge areas, farms and open space that have natural flood absorption characteristics, rivers, streams and brooks to ensure development in proximity to these resources is analyzed and appropriately addressed. The Plan also identifies key goals and strategies to protect open space.	Effective in identifying sensitive resource areas, including floodplains. Encourages forest, farmland protection, help conserve the town's flood storage capacity.	Update plan and implement relevant goals and policies within plan.
Community Preservation Act		Provides funding for the preservation of open space.	Not effective.	None.
Taking of Tax Delinquent Properties		The Town's Conservation Commission takes control of tax	Effective.	None.

Existing Flood Hazard Mitigation Measures			
Existing Strategy	**Description**	**Effectiveness**	**Potential Changes**
	delinquent properties near the Connecticut River, converts them to open space and protects them from development		
National Flood Insurance Program Participation	Allows property owners to purchase flood insurance from the government against future losses. Longmeadow participates in the program.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	Encourage eligible citizens to enroll in program.

Future Mitigation Measures

Several future actions have been identified in the above table, which have been compiled below:

Action Item: Replace portions of drainage system on Stormwater Management Project List, pending availability of funding.

Responsible Department/Board: Department of Public Works

Proposed Completion Date: DPW will apply for HMPG funding based on FEMA grant cycles, and based on the flooding locations listed in this plan. List of locations will be assessed and updated on an annual basis.

Action Item: Implement key recommendations of the 2012 Longmeadow Open Space and Recreation Plan dealing with protection of floodplain, forests, and farmland.

Responsible Department/Board: Conservation Commission, Planning Board, Select Board, and Head Assessor

Proposed Completion Date: Continuous as part of Town's operations, see Open Space and Recreation Plan for specific completion dates

Action Item: Educate citizens living in the floodplain about the NFIP, pending availability of funding.

Responsible Department/Board: Building Inspector, Conservation Commission

Proposed Completion Date: Continual program as part of Town's operations, will be assessed for effectiveness on an annual basis

What is the NFIP's Community Rating System?

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

Severe Snow/Ice Storm

Winter storms can be especially challenging for emergency management personnel. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected. Even though the storm has usually been forecast, there is no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

Current Mitigation Measures

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

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

Existing Severe Snow/Ice Storm Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
General Bylaws	Keeping public ways cleared for travel	Prohibits anyone from putting snow or ice on public way that has been cleared for travel	Effective.	None.
	Keeping sidewalks clear for travel and fire hydrants clear for use by Fire Department	Owners of property adjacent to which there is a hard surfaced sidewalk that is under the control of the Town shall clear the sidewalk of ice and snow within twenty-four (24) hours after the precipitation ceases to fall.	Effective. Property owners are ticketed by police for failure to comply.	None.
Zoning Bylaw	Use regulations and co-location requirements for Wireless Communications facilities	Structures shall not exceed 190 feet (a requirement designed to avoid FAA lighting regulations for structures over 200 feet), and are required to be as minimally invasive to the environment as possible. Where possible different cell companies will co-locate equipment on same tower. Regulations enumerate specific design guidelines.	Effective for preventing damage in the case of a severe storm.	None.
Subdivision Regulations	Required improvements for approved subdivision	Telephone and electric lines, and service connections must be placed underground.	Effective for preventing power loss.	None.
	Design Standards	Street grade regulations (minimum 0.5% and maximum 6%); also minimum sight distances specified for intersections.	Effective.	None.
State Building Code		The Town has adopted the Massachusetts State Building Code.	Effective.	None.
Emergency preparedness with Columbia Gas, WMECO, Tennessee Gas,		Shelters have backup power.	Very effective in case of power loss.	None.
Tree Management		List of street trees created annually for Town and local Utility. Continue creation of annual list of street trees for	Very effective, preventative collaboration.	Continue creation of annual list and tree prunings.

	maintenance and pruning, and implement maintenance and pruning--to mitigate injury and property damage potentially caused by trees/branches falling in the event of severe wind and/or snow.		

Future Mitigation Measures

One future action has been identified in the above table, which is shown below:

Action Item: Continue creation of annual list of street trees for maintenance and pruning.

Responsible Department/Board: Local Emergency Planning Committee, Tree Warden

Proposed Completion Date: Annually, as part of Town's operations

Hurricanes/Severe Wind

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

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

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

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

Tornadoes/Microbursts

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

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

Existing Severe Wind Hazard Mitigation Measures (Including Hurricane, Tornado, Microburst Hazards)				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
Zoning Bylaw	Use regulations	Mobile homes/trailers are not allowed in residential districts	Somewhat effective for preventing damage to susceptible structures	None.
	Use regulations for Wireless Communications facilities	Structures shall not exceed 190 feet, and are required to be pre-engineered to fail at a pre-determined height and "fold in half" in the event of catastrophic failure. Regulations enumerate other specific design guidelines.	Effective for preventing damage in the case of a severe storm.	None.
	Site Plan Review/Approval Process	Utilities must be placed underground, unless applicant proves impractical.	Effective for preventing power loss.	None.
Subdivision Regulations	Required improvements for approved subdivision	Telephone and electric lines, and service connections must be placed underground.	Effective for preventing power loss.	None.
State Building Code		The Town has adopted the MA State Building Code.	Effective.	None.

Emergency Preparedness with Columbia Gas, Tennessee Gas, and WMECO	Regular annual meetings with utility companies on emergency preparedness.	Effective.	Continue annual meetings; secure phone numbers for contact during emergencies.
Tree Management	List of street trees created annually for Town and Town and WMECO.	Very effective, preventative collaboration.	None.

Future Mitigation Measures

One future action has been identified in the above table, which is shown below:

Action Item: Continue annual meetings with utility companies and secure phone numbers for contact during emergencies.

Responsible Department/Board: Local Emergency Planning Committee

Proposed Completion Date: Continual program as part of Town's operations, will be monitored on an annual basis

Wildfire/Brushfire

Although somewhat common, the vast majority of brushfires in Town are small and quickly contained. However, as with any illegal fire or brushfire, there is always the risk that a small brushfire could grow into a larger, more dangerous wildfire, especially if conditions are right. Therefore, it is important to take steps to prevent wildfires and brushfires from turning into natural disasters.

Current Mitigation Measures

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

Existing Wildfire/Brushfire Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
Subdivision Regulations	Definitive Plan	The Fire Chief, along with the Planning Board, is involved in the review of the definitive plan; plans must include location of hydrants and account for adequate fire flow.	Effective.	None.
	Required Improvements for Approved Subdivision	Fire Department reviews all subdivision plans and applicant and Fire Department must sign a fire protection agreement that meets standards on water supplies for suburban and rural fire fighting.	Effective.	None.
Burn Permits		Residents must obtain burn permits, and personnel provide information on safe burn practices. Because of dense population and limited open space, there is not much burning in town.	Somewhat effective.	Expand facility at which yard waste can be disposed.
Public Education/ Outreach		The Fire Department has an ongoing educational program in the schools.	Effective.	None.
Board of Health Regulations on Emissions		Regulations discourage burning.	Effective.	None.

Future Mitigation Measures

One future action has been identified in the above table, which is shown below:

Action Item: Expand facility at which yard waste can be disposed.

Responsible Department/Board: Department of Public Works

Proposed Completion Date: 2017

Earthquake

Although there are five mapped seismological faults in Massachusetts, there is no discernible 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 for which to plan.

Most buildings and structures in the state were constructed without specific earthquake resistant design features. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation efforts for other natural hazards identified in this plan may be applicable during the Town's recovery from an earthquake.

Current Mitigation Measures

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

Existing Earthquake Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
Zoning Bylaw	Use regulations for Wireless Communications facilities	Structures shall not exceed 190 feet, and are required to be pre-engineered to fail at a pre-determined height and "fold in half" in the event of catastrophic failure. Regulations enumerate other specific design guidelines.	Very effective for preventing damage to nearby structures in the case of an earthquake.	None.
State Building Code		The Town has adopted the State Building Code.	Effective for new buildings and substantial renovations.	None.

Future Mitigation Measures

No potential changes to the Town's current strategies have been identified in the above table, and discussion with the Natural Hazards Mitigation Committee confirms that no future mitigation measures are needed.

Dam Failure

Dam failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has nowhere to flow.

Current Mitigation Measures

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

Existing Dam Failure Hazard Mitigation Measures			
Existing Strategy	**Description**	**Effectiveness**	**Potential Changes**
New Dam Construction Permits	State law requires a permit for the construction of any dam.	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).	Effective. The responsibility for this is now on dam owners, who may not have sufficient funding to comply. The municipality owns 2 dams within the Town, and other is a responsible private owner.	None.

Future Mitigation Measures

Recent changes in legislation have shifted some of the responsibility of dam safety onto dam owners. The Town recognizes the need to adjust to this change. No potential changes to the Town's current strategies have been identified in the above table, and discussion with the Natural Hazards Mitigation Committee confirms that no future mitigation measures are needed. It should be noted that the Town is in the potential inundation area should there be a failure of the Holyoke Dam, Knightville Dam, or Quabbin Dam. However, because these dams are located outside of the Town of Longmeadow, there are no mitigation strategies to address them.

Drought

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

Current Mitigation Measures

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

Existing Drought Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
General Bylaws	Restrictions on boring of wells	Permits from Department of Public Works and Board of Health are required to drill wells.	Effective.	None.
Subdivision Regulations	Definitive Plan	Proposed septic or sewer and water supply must be shown.	Somewhat effective for determining water supply and quality, preventing contamination.	None.
	Additional Requirements	Hydrology Study and Drainage Calculation; Sanitary Sewer Study; Water Study; Development Impact Statement;	Effective for determining water supply, quality prior to development.	None.
Stormwater Management Ordinance		Provides for recharge of groundwater sources.	Effective.	None.
Longmeadow Open Space and Recreation Plan		Makes recommendation to protect Town's water supply.	Effective to support water conservation/protection efforts.	Implement recommendations.

Future Mitigation Measures

One future action has been identified in the above table, which is shown below:

Action Item: Implement the goals and strategies of the Longmeadow Open Space and Recreation Plan dealing with protection of floodplain, forests, and farmland.

Responsible Department/Board: Conservation Commission, Planning Board, Town Manager, Agricultural Commission

Proposed Completion Date: Continuous as part of Town's operations, see Open Space and Recreation Plan for specific completion dates

Hazardous Materials

There are no significant hazardous materials or large hazardous material facilities in existence within the Town of Longmeadow, meaning it would be unlikely for an evacuation to ever be necessary because of an explosion or spill. However, because there is no way to anticipate where and when a hazardous materials spill or explosion could take place, the Town has some regulations currently in place to address hazardous materials.

Table Existing Hazardous Materials Hazard Mitigation Measures				
Existing Strategy		**Description**	**Effectiveness**	**Potential Changes**
State Code 527CMR Fire Prevention Regulations	Requirement of license and fees for storage	A person shall not keep, store, sell or make other commercial use of petroleum, a petroleum product or any explosive or inflammable fluid or material if he does not have a license to do so.	Effective.	None.
Tier II Facilities Reporting		There are only 2 small facilities – DPW and Verizon.	Effective.	None.
LEPC Annual Exercise		Exercises range from tabletop scenario to full-scale exercise.	Effective.	None.
Post analysis review after actual events		Review of what went well; what did not.	Effective.	None.

Future Mitigation Measures

No potential future changes have been identified by the Town Hazard Mitigation Committee.

6: PRIORITIZED IMPLEMENTATION SCHEDULE

Summary of Critical Evaluation

The Longmeadow Hazard Mitigation Planning Committee reviewed each of the recommendation future mitigation measures identified, and used the following factors to prioritize mitigation projects. This list of factors is derived from FEMA's STAPLE+E criteria.

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

Project Prioritization and Methodology

Prioritization was based on the factors included In the STAPLE+E criteria, with particular focus on each of the following factors:

- **Application to multiple hazards** – Strategies are given a higher priority if they assist in the mitigation of several natural hazards.

- **Time required for completion** – Projects that are faster to implement, either due to the nature of the permitting process or other regulatory procedures, or because of the time it takes to secure funding, are given higher priority.

- **Estimated benefit** – Strategies which would provide the highest degree of reduction in loss of property and life are given a higher priority. This estimate is based on the Hazard Identification and Analysis Chapter, particularly with regard to how much of each hazard's impact would be mitigated.

- **Cost effectiveness** – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of time of power outages during a winter storm. Strategies that have identified potential funding streams, such as the Hazard Mitigation Grant Program, are also given higher priority.

These criteria were discussed by the Hazard Mitigation Committee for each strategy. The Committee came to a consensus through conversation about the overall priority of each strategy, based on holistically examining how effectively each strategy met these criteria. For example, strategies that would not have a significant benefit to property or people, address only one or two hazards, or would require funding and time resources that are impractical are given very low priority. Strategies that would be extremely beneficial projects, contribute to mitigation of multiple hazards and the protection of people and property, were given the highest priority.

Throughout this planning process, the Town of Longmeadow Hazard Mitigation Committee has worked to analyze actions and/or projects that the Town considered to reduce the impacts of hazards identified in the risk assessment, and identified the actions and/or projects that the jurisdiction intends to implement. The strategies identified in this plan are believed by the local Hazard Mitigation Committee to be the ones needed in Longmeadow to address the vulnerabilities identified in this plan.

Cost Considerations

While financial estimates are currently not available for the implementation strategies listed, cost was a factor in prioritization. The Town took into account several aspects of cost, including:

- Town staff time for grant application and administration
- Consultant design and construction cost
- Town staff time for construction, maintenance, and operational activities

As noted above, strategies that have identified potential funding streams, such as the Hazard Mitigation Grant Program, were given higher priority. In addition, cost effectiveness of strategies was also considered, in order to maximize the effect of mitigation efforts using limited funds. For example, regular tree maintenance is a relatively low cost operational strategy that can significantly reduce the length of time of power outages during a winter storm.

Type of Hazard	Hazard Risk Index Rating
Flooding	3
Severe Snow/Ice Storms	2
Hurricanes/Tropical Storms	4
Severe Thunderstorms/Tornado/Microburst	4
Wildfire/Brushfire	5
Earthquake	5
Dam Failure	5
Drought	5
Man-Made Hazard: Hazardous Materials	4

Prioritized Implementation Schedule – Action Plan

NOTE: The Town of Longmeadow is essentially 'built-out' and there is not any significant new building happening. Severe snow/ice storms and flooding are the two hazards that the local Hazard Mitigation committee has identified as risks to Longmeadow throughout this hazard mitigation planning process. The Town also identified numerous capabilities in place that are successfully mitigating the negative consequences of severe snow and ice and flooding (which could be caused by tornados, hurricanes, and thunderstorms) in the Town.

Mitigation Action	Responsible Department/Board	Proposed Completion Date/ Reporting Date	Funding Source	Estimated Cost
Assure correct application and compliance with the Building code which adheres to the most current International Building Code requirements by making sure the Building Inspector attends training and maintains certifications Mitigates: snow emergencies	Town Manager and Building Inspector	1 year from Plan Approval date	Local	low
Incorporate risk assessment and hazard mitigation principles into future municipal planning efforts Mitigates: All hazards	Town Manager and Planning Board	18 months from start date when plans need to be updated and funding is secure	State DLTA, Local	low
Ensure that all identified shelters have sufficient back-up utility service in the event of primary power failure. While this is not a Mitigation Action, it is included here to highlight the Town's commitment to providing sheltering for residents. Facilities with Backup Power Town Administration Building – 20 Williams Street, Longmeadow Police Station – 34 Williams Street, Longmeadow Fire Station – 44 Williams Street, Longmeadow Department of Public Works – 31 Pondside Road, Longmeadow (limited) Water Pumping Station – Forest Glen Road, Longmeadow Longmeadow High School – 95 Grassy Gutter Road,	Emergency Management Director	The Town applied for a generator from FEMA in 2014 and will continue to assess and replace generators as needed. Completion date: 2020	Town Staff/Volunteers/ Hazard Mitigation Grant Program	Low $10,000-50,000

Longmeadow Center Elementary School – 837 Longmeadow Street, Longmeadow Mitigates: All Hazards				
Improve Stormwater Drainage System Capacity, by installing upgraded culverts to mitigate flooding with anticipated increase in severe weather events. Culverts located on evacuation routes: Rte 5 over Raspberry Brook and Wolf Swamp Rd over Wolf Swamp Brook Critical Culverts: Frank Smith Rd, Merriweather Dr., Deepwods Dr., Shaker Rd., Mill Rd., Longmeadow St., Avondale Rd., Barbara Lane, and Pioneer Dr. Mitigates: All flood related hazards-storms, tornados, hurricanes, etc	Department of Public Works	DPW will apply for HMPG funding based on FEMA grant cycles, and based on the flooding locations listed in this plan. Anticipate completion date for first project 18 months after start	HMPG and municipal funds for 25% match	High-over $100,000
Increase Hazard Education and Risk Awareness by developing and implementing an educational program for citizens living in the floodplain about the NFIP so that they continue to maintain their insurance coverage. Mitigates: All Hazards	Building Inspector, Conservation Commission	The Town will educate residents and property owners on an annual basis using Town funds-April-June 2017	Town Staff/Volunteers, possible donations for area businesses	Low
Implement the key recommendations in the 2012 Longmeadow Open Space and Recreation Plan dealing with protection of floodplain, forests, and farmland, specifically: -identify funding for management of diseased trees (will help mitigating impacts of severe wind and snow storms, as unhealthy trees are more likely to have branches break off and cause injury and/or property damage) -develop plan for management of tree belt (will help with mitigating impacts of storms to assure that trees are not likely to cause injury or property damage in the event of severe wind or snow) -seek permanent protection of privately owned parcels abutting the river (will assist with mitigating impact of	Conservation Commission, Planning Board, Select Board, and Head Assessor	Town staff and volunteers will pursue implementation of these recommendations starting in 2015 using local and state DCR Park funds as available. Completion date: 2020	Town Staff/Volunteers	Low

flooding) by purchasing land when/if it comes for sale, using transferring development rights, or other public/private initiatives Mitigates: All Hazards				
Expand facility at which yard waste can be disposed-- The Town will annually assess the feasibility of expanding the facility based on the possibility of securing funding and site suitability. Expansion will increase capacity of yard waste, delivered by residents, which can pose a wildfire hazard during dry periods, and also encourage and facilitate individual property owners removal of dead and damaged yard waste which could cause injury or property damage in the event of severe wind and/or rain/snow. Mitigates: Snow and Ice Hazards	Department of Public Works	Start Oct 2016-Jan 2017	Town Staff	Low
Conduct winter weather risk awareness activities informing the public about severe winter weather impacts, encouraging the creation of family home preparedness kits Mitigates: Severe winter storms hazards	Council on Aging and EMD	Start October 2017 and done Dec 2017	Town Staff and possible mini grant from WRHSAC	Low
Continue annual meetings with utility companies and secure phone numbers for contact during emergencies. Mitigates: All Hazards	Local Emergency Planning Committee	3 months after plan approval	Town Staff/Volunteers	Low
Continue annual updates to Longmeadow Continuity of Operations Plan Mitigates: All Hazards	Emergency Management Director	3 months work each year Oct-Dec 2016	Town Staff	Low

7: PLAN REVIEW, EVALUATION, ADOPTION & IMPLEMENTATION

Plan Adoption

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

The implementation of the Longmeadow Local Natural Hazards Mitigation Plan will begin following its formal adoption by the Longmeadow Select Board after it has been conditionally approval by FEMA. Those town departments and boards responsible for implementation of the plan as described in Sections 5 and 6 of this plan will be notified of their responsibilities immediately following approval. The Longmeadow Hazard Mitigation Committee will oversee the implementation of the plan.

Plan Monitoring and Evaluation

The Longmeadow Emergency Management Director will call meetings of all responsible parties to review plan progress an annual basis in each of the following years: 2015, 2016, 2017, 2018, 2019, 2020 and as needed (*i.e.*, following a natural disaster). The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Additionally, notification of these meetings will be disseminated through regional media outlets. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting. Meetings will be organized and facilitated by the Emergency Management Director. Meetings will entail the following actions:

- Review events of the year to discuss and evaluate major issues, effectiveness of current mitigation, and possible mitigation for future events deduced by reexamining the probability, extent, impact, and vulnerability from natural hazards.
- Review and evaluate progress toward implementation of the current mitigation plan based on reports from responsible parties.
- Amend current plan to improve mitigation practices or add new mitigation actions based on updated natural hazard assessment and public input.

Participants of these meetings, including members of the public in attendance, will be surveyed regarding the efficacy of the plan, as well as additional revisions that should be made. 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. The committee will review and update the Longmeadow Local Natural Hazards Mitigation Plan every five years. In 2018, the Hazard Mitigation Committee and members of the public will convene to begin the critical review process necessary to update the plan and subsequent meetings will be held to craft the final document. The next updated plan will be submitted to MEMA and FEMA in the spring of 2018.

Incorporation of Existing Plans and Other Information

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

- ***Longmeadow Comprehensive Emergency Management Plan*** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Longmeadow 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.

- ***Longmeadow Open Space and Recreation Plan, 2012*** – this Plan was used to identify the natural context within which 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.

- ***Longmeadow Community Development Plan, 2004***—this Plan was used to identify any action items that might prove successful, based on previous planning efforts.

- ***Longmeadow Zoning Bylaw*** - The Town's Zoning Bylaw was used to gather and 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.

- ***Subdivision Rules and Regulation –*** These rules and regulations were used to gather and 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.

- ***State of Massachusetts' Hazard Mitigation Plan*** - This plan was used to ensure that the Town's Hazard Mitigation Plan is consistent with the State's Plan.

Incorporation of Hazard Mitigation Plan into Other Planning Documents

The entities involved in the updating and maintenance of the above documents will be made aware of the existence of the Hazard Mitigation Plan, so that they can utilize the data and information that is included in this plan and integrate it into their plan updates.

During the period of updating the plan, first in 2018, new technical studies, plans, and reports will be analyzed and, if appropriate, will assist in guiding the formation of the revised document.

CERTIFICATE OF ADOPTION

TOWN OF LONGMEADOW, MASSACHUSETTS

SELECTBOARD

A RESOLUTION ADOPTING THE LONGMEADOW

LOCAL NATURAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Longmeadow established a Committee to prepare the Local Natural Hazards Mitigation Plan; and

WHEREAS, several public planning meetings were held in 2012 and 2013 regarding the development and review of the Local Natural Hazard Mitigation Plan; and

WHEREAS, the Longmeadow Local Natural Hazard Mitigation Plan contains several potential future projects to mitigate hazard damage in the Town, and

WHEREAS, a duly-noticed public hearing was held by the Longmeadow Select Board on May 2, 2016 2016 to formally approve and adopt the Local Natural Hazard Mitigation Plan.

NOW, THEREFORE BE IT RESOLVED that the Longmeadow Select Board adopts the Longmeadow Local Natural Hazard Mitigation Plan.

ADOPTED AND SIGNED this May 2, 2016

Chair Person

Vice Chair Person

ATTEST

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
University of Massachusetts/Amherst……..……..……...413/545-0111
Natural Resources Conservation Services (NRCS)……..……...413/253-4350
MA Historical Commission……..……...617/727-8470
U.S. Army Corps of Engineers……..……..……...978/318-8502
Northeast States Emergency Consortium, Inc. (NESEC).....781/224-9876
National Oceanic and Atmospheric Administration: National Weather Service; Tauton, MA.…...508/824-5116
US Department of the Interior: US Fish and Wildlife Service 413/253-8200
US Geological Survey 508/490-5000

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) .....Massachusetts Emergency Management Agency
406 Public Assistance and Hazard Mitigation .....Massachusetts Emergency Management Agency
Community Development Block Grant (CDBG)…….....DHCD, also refer to RPC
Dam Safety Program.....MA Division of Conservation and Recreation
Disaster Preparedness Improvement Grant (DPIG) .....Massachusetts Emergency Management Agency
Emergency Generators Program by NESEC‡ .....Massachusetts Emergency Management Agency
Emergency Watershed Protection (EWP) Program.....USDA, Natural Resources Conservation Service Flood Mitigation Assistance Program (FMAP) .....Massachusetts Emergency Management Agency

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

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

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

3) Internet Resources

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	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.

Sponsor	Internet Address	Summary of Contents
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
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 – 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	Town Manager
BOH	Board of Health
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

Appendix C – Natural Hazard Profiling Methodology[4]

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

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

Previous Occurrences

Whether or not previous hazard events had occurred is indicated. Specific previous occurrences are described within the hazard identification and vulnerability assessments narrative in Chapter 3.

Location of Occurrence

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

Location of Occurrence, Percentage of Town Impacted by 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

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

Impacts

The impacts describes the potential magnitude of damage an affected area could potentially suffer. Impacts are classified according to the following scale:

Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
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.

Probability of Future Events

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

Frequency of Occurrence and Annual Probability of Given Natural Hazard	
Frequency of Occurrence	**Probability of Future Events**
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

Hazard Risk Index Rating

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

The Hazard Ratings are labeled as follows:

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

Appendix D – Past & Potential Hazards/Critical Facilities Map

Appendix E – Documentation of the Planning Process

Town of Longmeadow
Hazards Mitigation Planning, Meeting #1
Tuesday, December 04, 2012
2 p.m.

1) Hazards Mitigation Planning Overview

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

2) Organize Hazard Mitigation Planning Team

3) Identify Critical Facilities

- The following list contains items that should be clearly identified in the narrative and on the map, as they apply to your community:

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

4) Homework for next meeting

- Think about critical facilities and the evacuation routes potentially affected by hazard areas. (Chapter 4)
- Review pages 9-26 in Chapter 3 and provide additional details and information about hazards wherever possible.

5) Schedule next meeting

- Agenda and posting of meetings

Town of Longmeadow, Hazard Mitigation Planning
Meeting #2
January 16, 2013
Fire Station 1-3 pm

1. Review Revised List of Critical Facilities and Map (Chapter 4)

2. Review Critical Facilities and Evacuation Routes Potentially Affected By Hazard Areas (Chapter 4)

3. Discuss history of following natural hazard events (Chapter 3, pages 9-26 of draft plan):
   - Flooding (100-year)
   - Flooding (localized)
   - Severe Snow/Ice Storm
   - Hurricanes/Severe Wind
   - Tornadoes/Microbursts
   - Wildfires/Brushfires
   - Earthquakes
   - Dam Failure
   - Drought
   - Man-Made Hazards—Hazardous Materials

4. Review Vulnerability Assessment Methodology and Potential Loss Estimates (Chapter 3)

5. Profile Hazards (Chapter 3 and Appendix C)

Homework for next meeting

- Think about development trends and come prepared to discuss. Local zoning districts, planned and proposed subdivisions and other common developments. Is planned development at risk by natural hazards? Are there mitigation measures that can be taken to prevent loss of life, property damage, and disruption of governmental services and general business activities. (Chapter 2, page 7 of draft)
- Review Chapter 5 and think about which mitigation strategies make sense, and what needs to be added.

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

Longmeadow Hazard Mitigation Team

AGENDA
January 30, 2013
8:00 a.m.
Longmeadow Fire Department

1. Review revised Chapter 5: Mitigation Strategies and discuss National Flood Insurance Program and Community Rating System

2. Review vulnerability/risk assessment maps

3. Prioritize mitigation strategies and review Chapter 6: Prioritized Implementation Schedule

4. Discuss public outreach strategy and next steps

Appendix F – Public Outreach

PRESS RELEASE

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

FOR IMMEDIATE RELEASE
December 04, 2012

Pre-Disaster Mitigation Plans Under Development

The Pioneer Valley Planning Commission is beginning the process of drafting pre-disaster mitigation plans for the communities of Granville, Longmeadow, Montgomery, Russell, and Wales and is updating plans for Agawam, Easthampton, Hampden, Southwick, and Ware.

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.

Individuals interested in their community's Hazard Mitigation plan can contact PVPC to request information on their community's plan development. 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. For additional information, please contact Catherine Ratté at (413) 781-6045 or cratte@pvpc.org.

For Pioneer Valley Planning Commission Regional Reporter-Dec 2012

PVPC working with member communities to mitigate the long term consequences of natural hazards

PVPC is working with 10 member municipalities to update and/or develop new Hazard Mitigation plans. Granville, Longmeadow, Montgomery, Russell, and Wales are all developing their first Hazard Mitigation plans; while Agawam, Easthampton, Hampden, Southwick, and Ware are working on updates.

PVPC was also engaged by the University of Massachusetts Amherst campus to write their campus Hazard Mitigation plan, and PVPC has just submitted a grant application to MEMA to update plans for Hadley, Hatfield, Holyoke, Ludlow, Monson, Northampton, South Hadley, Southampton, Westhampton, and Wilbraham.

Having a FEMA approved Hazard Mitigation plan makes each municipality eligible to apply for Hazard Mitigation grant funds to address identified top community priorities to mitigate the long-term consequences of natural disasters.

For more information, please contact Catherine Ratté at cratte@pvpc.org or 413/781-6045.

MEDIA RELEASE

CONTACT: Catherine Ratté, Pioneer Valley Planning Commission
Josiah Neiderbach, Pioneer Valley Planning Commission
Eric Madison, Fire Chief, Town of Longmeadow
Yem Lip, P.E., Town Engineer, Town of Longmeadow

FOR IMMEDIATE RELEASE
May 24, 2013

Town of Longmeadow Local Natural Hazards Mitigation Plan Public Engagement Event

The Town of Longmeadow, along with the Pioneer Valley Planning Commission, has produced a DRAFT hazard mitigation plan for the town. Residents of the Town of Longmeadow are invited to a public forum to learn about and provide feedback on the DRAFT plan on June 4th from 6:30pm – 7:30pm in the Longmeadow Fire Department Conference Room.

The event will include an introduction to the planning process, a summary of existing mitigation initiatives, and an outline of recommended strategies for addressing natural hazards in the Town of Longmeadow. Municipal officials from the Town and staff from the Pioneer Valley Planning Commission will be available to answer questions and listen to comments on the DRAFT plan.

All members of the public are welcome to attend the event.

The DRAFT plan is also posted at: www.pvpc.org and Town website www.longmeadow.org.

This planning effort is being undertaken to help the Town of Longmeadow assess the risks faced 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 hazard mitigation plan was developed with funding provided by the Federal Emergency Management Agency and assistance from the Massachusetts Emergency Management Agency. For additional information, please contact Catherine Ratté at cratte@pvpc.org and Josiah Neiderbach at jneiderbach@pvpc.org , or 413-781-6045.