

THE TOWN OF HOLLAND

LOCAL NATURAL HAZARDS MITIGATION PLAN

**Final Draft
February 2013**

Adopted by the Holland Board of Selectmen on _____

**Prepared by:
The Holland Natural Hazards Mitigation Planning Committee**

and

The Pioneer Valley Planning Commission

60 Congress Street First Floor

Springfield, MA 01104

(413) 781-6045

www.pvpc.org

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Acknowledgements

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

Amy Bishop, Executive Secretary - Select Board
Paul Foster, Fire Department, Chief
James Gagnon, Fire Captain
Brian Haughey, Police Chief
JoAnne Higgins, Highway Clerk
Brian Johnson, Highway Surveyor

The Holland Board of Selectmen offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Commonwealth of Massachusetts Natural Hazards Mitigation Plan (<http://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.

The Pioneer Valley Planning Commission:

Catherine Ratté, Principal Planner/Project Manager
Josiah Neiderbach, Planner
Ari Simons, GIS Specialist

1 - INTRODUCTION

Hazard Mitigation

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

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

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

Planning Process

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

- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure (i.e., critical facilities, public buildings, roads, homes, businesses, etc.) at the highest risk for being damaged by the identified natural hazards, particularly flooding.

- Identifying and assessing the policies, programs, and regulations the community is currently incorporating to protect against future disaster damages. Examples of such strategies include:
 - Preventing or limiting development in natural hazard areas like floodplains;
 - Incorporating recommendations in existing planning documents including Stormwater Management Plans, Master Plans, Open Space and Recreation Plans, and Emergency/Evacuation Plans that address the impacts of natural hazards; and
 - Requiring or encouraging the use of specific structural requirements for new buildings such as buried utilities, flood-proofed structures, and lightening grounding systems.
- Identifying deficiencies in the current strategies and establish goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Local Natural Hazards Mitigation Plan.

The Holland Natural Hazards Mitigation Planning Committee included the following:

Amy Bishop, Executive Secretary - Select Board
 Paul Foster, Fire Department, Chief
 James Gagnon, Fire Captain
 Brian Haughey, Police Chief
 JoAnne Higgins, Highway Clerk
 Brian Johnson, Highway Surveyor

As part of the planning process, existing community plans were reviewed and appropriate recommendations incorporated into this plan. Reviewed community plans included: Holland Master Plan, Holland Community Emergency Management Plan and the Hamilton Reservoir 604b Final Report.

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

- Select action items which have the ability to significantly mitigate the negative impact of natural hazards on people and property;

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

For example, updating or adopting a local floodplain bylaw would be a relatively low cost action item, which could have a significant impact on mitigating hazards caused by flooding. If adopted by Holland, this bylaw would discourage development in floodplain areas and prevent harm to people and damage to property. Other action items were to implement drainage improvements to control sediment erosion into the Hamilton Reservoir, and moving the tree line on major roads back from the right of way so that falling branches cannot interfere with electrical wires during storms.

The action items selected were all considered to have a low to moderate cost to implement. In some cases grant funding would be sought for implementation given the limited resources available in Holland.

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

Public Committee Meetings

The creation of Holland's Hazard Mitigation Plan began in late 2006, with a full draft plan developed for the town in 2007. This draft was submitted to MEMA, who provided comments that were then incorporated into an updated version of the document. The plan was then submitted to FEMA for conditional approval, which was provided on June 18th, 2008. The plan was then sent back to the town for Selectboard approval. However, approval did not occur, and thus the plan has remained a draft.

For context, information about minutes and outreach are provided for both the 2006-2007 meetings and 2012-2013 meetings, since both sets of meetings were important in the plan development.

Agendas for meeting minutes are provided in Appendix B. The Board of Selectmen and

Chief of the Fire Department were responsible for contacting potentially interested town boards, agencies and others to participate in the committee.

- **December 6, 2006, 9:00-10:30 AM**
Project kickoff and working committee meeting held at Holland Town Hall.
- **January 5, 2007, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.
- **February 27, 2007, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.
- **March 14, 2007, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.
- **November 19, 2012, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.
- **December 12, 2012, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.
- **January 9, 2013, 9:30-11:00 AM**
Working committee meeting held at Holland Town Hall.

Public Meeting with the Board of Selectmen

- **DATE _____ (to be determined)**
The Board of Selectmen adopted the Local Hazard Mitigation Plan. Public hearing held at Holland Town Hall.

Public Outreach

- **September 12, 2007 – Plans available for public comment on PVPC website**
A press release announced that the draft plan had been posted on PVPC's website and was available for public comment at www.pvpc.org . Comments are due no later than November 30, 2007. Press release was covered in the local newspaper article in *The Republican* on September 23, 2007.
- **November 15, 2005 – Hampshire Regional Emergency Planning Council Meeting**
The PVPC presented the planning process that led to the creation of the Local Natural Hazards Mitigation Plans developed for communities throughout our

region. The HREPC is responsible for coordinating the emergency planning activities of the communities within Hampshire County. Although Holland is within Hampden county and not Hampshire, it is important that the larger emergency planning community is aware of the work underway in neighboring communities.

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

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

- **February 2013 – Plans available for public comment on PVPC and Town of Holland websites**

A press release announced that the draft plan had been posted on PVPC's website and the Town of Holland website and was available for public comment at www.pvpc.org and <http://town.holland.ma.us>.

- **March 12, 2013 - Western Regional Homeland Security Advisory Council Meeting**

The PVPC and Town of Holland presented the Hazard Mitigation Plan during a public meeting. An overview of the planning process was provided, as well as a discussion of current mitigation procedures being undertaken and proposed future mitigation steps. There was also time for the public to provide questions and comments.

2 – LOCAL PROFILE¹

Community Setting

The Town of Holland has abundant natural and cultural resources. Holland was settled in the mid 1600s because of the fishing grounds of Lake Siog and the Upper Quinebaug River, the fertile floodplains of the Quinebaug River and the heavily forested hills. Holland still has these valuable natural resources, though they have changed significantly in the last 350 years. Lake Siog is now part of the U. S. Army Corp of Engineers' East Brimfield Impoundment and while providing valuable flood control storage for the Quinebaug River it also is the centerpiece of a beautiful, scenic, and ecologically valuable wetlands complex. The Quinebaug floodplain is now the Hamilton Reservoir, which is the draw for many of the summer and year round residents of Holland. The forested hills are once again an abundant natural resource; they have recovered from being clear-cut in the late 1800s and are again providing valuable timber and wildlife habitat. The long cultural history of Holland is evident in the archeological remnants of the Native American Nipmucks around Lake Siog. This rich heritage continues following European settlement through to the events that occur today in Holland.

Of Holland's 13 square miles or 8,320 acres, two-thirds are forested. Most of the community's large tracts of forest lands occupy the western side of town. Water bodies occupy 501 acres of the town's total land area. Hamilton Reservoir is the largest water body and a natural choice for home-owners seeking peaceful, scenic views. For this reason residential development is focused intensely around Hamilton Reservoir, with side spurs of housing threading along the main thoroughfares into and out of town. Currently, 1,451 acres of land is occupied by residential development in Holland. There is limited commercial activity and the Town Common contains most of these parcels. Isolated commercial enterprises are scattered west of Hamilton Reservoir. In total, there are roughly thirty acres in commercial use. There is a mining operation which occupies a little more than 18 acres on the northern tip of Hamilton reservoir. The presence of Hamilton Reservoir in the center of town is notable not only for its recreational opportunities, but also because the majority of the town's prime agricultural soils lie below the reservoir. There are a few small parcels of cropland on the southwestern side of Holland; and as of 1999, the most recent assessment of land use in the town, this use occupied a total of 260 acres. Furthermore, one should note that 2,125 acres of public and semi-public open space exist within Holland. This figure represents 25% of Holland's total land area. The combination of a large amount of protected open space in the western and northern section of town as well as the large footprint of the Hamilton

¹ The majority of the information for this section was obtained from the Holland Open Space Plan and the Holland Master Plan.

Reservoir in the center of town will most likely concentrate new development along the southwestern area of the Hamilton Reservoir. Holland's Town Center (also referred to as the Town Common) has been the center of community life for almost one hundred years. The Town Center includes the Congregational Church, the parsonage, the town library, Holland Elementary School, and the new Town Hall, which replaced the original building after it was destroyed in a fire. All of these buildings are noteworthy for their civic importance and several, such as the Congregational Church, the parsonage, and the library, have historic significance.

According to the 1999 MacConnell Land use data, the total land area of Holland is approximately 8,373 acres with roughly 13 percent of those acres as developed land. The remaining land is classified as undeveloped with forest as the largest category (76% of all land in town) with 6,348 acres. Open Water is the second largest category with 481 acres compared to cropland and pasture, which represent individually, the third and fourth largest amount of undeveloped land in the town with 184 and 46 acres, respectively.

Infrastructure

Community Services

Despite recent population growth, Holland has retained its character as a small rural town with a strong sense of community. It has limited physical infrastructure and the vast majority of town services are provided by elected officials, volunteers and a handful of staff members. Some typical components of municipal physical infrastructure, like town sewer, were never constructed because of the rural pattern of development and other capital improvements, such as expansion of the library or renovation of Holland Elementary School. As residential development pressure increase, the lack of infrastructure, inadequate, outdated facilities, and the small municipal staff and budget may hinder Holland's ability to protect its natural resources and provide adequate, quality services for its residents.

Roads and Highways

Holland is adjacent to I-84 and within 5.5 miles of the Massachusetts Turnpike (I-90). While there is no exit for I-84 in Holland, exit 74 is in nearby Union, CT. This distance from the turnpike and the lack of a highway exit within town lend Holland a feeling of isolation.

Unlike some of the surrounding communities, such as Sturbridge, Holland has no major thoroughfares running through its land area. In order to get into Holland from the North, commuters coming from the turnpike must travel southeast on Holland/Sturbridge Road. Commuters traveling along Route 20 must travel south along East Brimfield/Holland Road to reach the center of Holland. From the south, Mashpaug Road is the primary means of access to Holland from I-84. Mashpaug Road threads south to north through Holland, crosses over the Hamilton Reservoir (where it serves as the town's causeway) and finally arrives in Holland Center. The presence of the Town Center in a geographically constrained location bears further examination. The southern approach cannot sidestep Hamilton Reservoir, which means that any traffic into the Town Center will have to wind through the more scenic portions of town. In addition, the densest network of roads surrounds the Hamilton Reservoir. The area west of Kimball Hill Road contains the most obvious system of interlocking streets. Finally, the Town of Holland is one of a very small number of towns with no state owned roads. This places the burden of maintaining Holland's roads squarely on the shoulders of its tax payers. The areas with the most access to major thoroughfares, i.e. northeast and southeast Holland, are most distant from the Town Center. Additionally, of the 154 named roads in town, 71% of them are privately owned, significantly complicating the town's ability to properly manage and maintain a road network. Just under half of all named roads are unpaved (46%), most of which are privately owned and in poor condition.

Rail

No rail lines run through Holland.

Public Transportation

Holland is a member of the Worcester Regional Transit Authority and scheduled pick-ups are available.

Public Drinking Water Supply

The Town of Holland has one public well located behind the Elementary School that serves the school and municipal buildings in the town center. The remainder of the Town's population is serviced by private wells.

Sewer Service

There is no public sewer system.

Schools

Public schools serving Holland include the Holland Elementary School, and the Tantasqua Regional High School in Sturbridge.

Natural Resources

Landscape Character

Holland, for both residents and visitors, represents a traditional quaint New England town of by-gone days. Many residents cite the rural atmosphere, the pleasing combination of woods, wetlands and lakes, and rolling hills as the qualities that give Holland its “sense of place”. Holland has a diversity of beautiful views, some preserved architectural heritage, and a rural character that make it stand out from the neighboring towns. However, many of these features can be adversely affected by inappropriate or poorly planned development. Views can be marred by ridge-top development. The pleasing mix of land use, such as forest and traditionally built housing, can change to a monotonous view of tract houses.

Geology

The geology of Holland and the surrounding region is composed of Paleozoic intrusive rocks and metamorphosed sedimentary and volcanic rocks consisting of granite, gneiss, schist, and phyllite. Holland and the surrounding area was subject to the actions of the four known major continental glaciers in North America, the most recent being the Wisconsin glacier that occurred 12,000 to 15,000 years ago. As the glacier receded, it deposited the load of soil, stones, and boulders it had accumulated as it moved southward. This mix of loose, permeable material formed a layer called ablation till. In Holland and surrounding communities, it is estimated that this layer is approximately 3 to 5 meters in depth.

Holland's glacial history is easily recognized in its carved north to northeast-trending ridges and steep sloping hills. Holland's highest elevations typically have summits of exposed bedrock, capable of resisting glacial scouring. The fertile floodplains were formed by the recession of the Wisconsin glacier, depositing layers of sand and clay along a sinewy path of rushing glacial melt water.

Soils

The Soil Survey of Hampden and Hampshire Counties, Massachusetts, Eastern Part provides detailed maps and descriptions of the specific soil types present in Holland. Although USDA soil maps can provide only the approximate location of specific soil types, these maps are useful when making informed decisions concerning possible development, especially concerning the preservation of Prime Farmland Soils.

Prime Farmland Soils

The United States Department of Agriculture defines prime farmland as "land that is best suited to produce food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply, needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmland produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment". Specific soil types are associated with areas of prime farmland. These soil types possess the following qualities: acceptable levels of acidity or alkalinity, few or no rocks, permeability to air and water, not excessively erodable, and possessing a slope range of mainly 0 to 6 percent.

Holland's largest areas of Prime Farmland Soils are located in the northern section of the town. These areas include: an area of Merrimac sandy loam (MeB) on both sides of Brimfield Road at the border of Holland and Brimfield, an area of Sudbury fine sandy loam (SuA) located directly below Lost Lake, and an area of Paxton fine sandy loam (PaB) west of Rattlesnake Mountain (United States Department 1989 Soil Map 14, 15).

Topography

Holland is dominated by two distinctive landform features; Hamilton Reservoir and rolling forested hills. The juxtaposition of these features provides Holland its pleasing mix of open vistas over water and closed forest scenery. This topography has its origins in the glaciers that blanketed the region more than 15,000 years ago. Many of Holland's natural resources and distinctive features originate from this period. For example gravel deposits found throughout town were formed by alluvial outwash from when the glaciers melted. Various highpoints found in town are recessional moraines and

outcrops of ledge exposed during glaciation. The complex drainage pattern found in town, with numerous wetlands, is also the result of the ice sheets that passed over the area. The resulting topography, soil composition, and drainage patterns not only provide important natural resources, such as gravel, but are also the basis for the numerous natural habitats found throughout the Town of Holland.

Vegetation

Holland is almost entirely covered by forest (85%), which provides an abundance of timber, opportunities for recreation, wildlife habitat, the benefits of climate moderation, and the protection of water quality. The forest types found in Holland today largely result from the soil types, elevation, and past land use history. West and south facing slopes typically support oak-hickory forest, while the north facing slopes are dominated by stands of hemlock. Blocks of white pine occur on sandy outwash soils and abandoned agricultural fields.

The forest and intermixed agricultural land also provide a visually pleasant landscape for residents and visitors too. The town's forests are mainly closed-canopied and middle-aged, having a great diversity of species, but no diversity of horizontal or vertical structural.

Large blocks of contiguous forestland such as those in Holland are important resources for several reasons. First they represent an area with a low degree of fragmentation. Wildlife species that require a certain amount of deep forest cover separate from people's daily activities tend to migrate out of fragmenting landscapes. New frontage lots and subdivisions can often result in a widening of human activity, an increase in the populations of plants and animals that thrive alongside humans (i.e. raccoons and squirrels) and a reduction in the species that have larger home ranges and unique habitat needs. Large blocks of forest provide clean water, air, and healthy wildlife populations.

Since European settlement, Holland had a predominately agrarian history. Although agriculture has declined substantially over time, farms and farmland still play an important role in Holland by maintaining the town's agricultural heritage, serving as a sustainable form of economic development, and protecting open space lands from development.

Water Resources

Holland is part of the Quinebaug River watershed, which flows north through town and then combines with the French and Middle Rivers to form the Thames River. This system flows southward through Connecticut into the Long Island Sound. Holland has a great variety of water resources. These resources not only provide for important recreational

opportunities and beautiful vistas, but also important wildlife habitats and drinking water sources. It is important in planning for Holland's water resources to recognize that many of these resource areas cross town, county, and state boundaries. It is essential then, that planning for the significant water resources is at a landscape or regional scale. This does not mean however, that it is unimportant for Holland to identify and assess the water resources that lie, either partially or wholly, within its town boundary.

Major Water Bodies

Probably the most defining feature of Holland is the 413-acre Hamilton Reservoir. In 1865 the Quinebaug River was dammed, creating Hamilton Reservoir. The present dam was constructed in 1956, after a flood caused the previous dam to rupture and flood large areas of town. Hamilton Reservoir plays an important role in Holland. It provides year-round flood protection, beautiful vistas, and is the source for a considerable amount of the economic activity in the town, mostly from recreation related activities. The town has rights of way on small areas of land for access to Hamilton Reservoir with one developed boat ramp; in addition there are numerous private and commercial ramps and marinas.

Adding to the variety of water resources in Holland are the numerous ponds, streams, and brooks found throughout the town. These areas provide recreational opportunities, wildlife habitat, and scenic beauty. Lake Siog is the next largest body of water in town after Hamilton Reservoir. It is widely used for fishing, swimming, and boating, with a public boat ramp providing access. There is a small town-owned beach, which is undeveloped.

There are other ponds in town, including Lost Lake, a beautiful lake located in deep woods, accessible only by foot through pine woodland. Many of the streams and brooks in town, such as May Brook and Stevens Brook, have native trout populations and are popular areas for fishing. Located on the Quinebaug River is a designated canoe trail, with a total of four miles of trail between Lake Siog Park north to East Brimfield Reservoir in Brimfield and Sturbridge. This trail offers a pleasant trip through a variety of habitats, with areas to stop and picnic or swim.

Aquifers

It is important that any town ensure protection of its aquifers as vital water resources. The protection of aquifers is vital because they are sources, or potential sources, of quality drinking water. A high quality, medium flow aquifer is located in the general area of Lake Siog and surrounding wetlands. Currently this aquifer does not provide public water for the Town of Holland, as all water in town is supplied by private wells. However, this aquifer may provide ground water for numerous private wells in Holland

and Brimfield. The recharge area of the aquifer is located in the Town of Brimfield as well as in Holland. This aquifer is overlaid by impermeable layers of gneiss and schist, thus making contamination unlikely from land use located directly above this aquifer. However, land use changes in the recharge areas can lead either to aquifer contamination or a reduction of recharge capacity. This aquifer serves as an example of the necessity of planning for natural resource management and protection both at a local level and at a landscape level. It is essential that Holland and Brimfield work collaboratively to ensure the protection of this shared resource.

Wetlands

Like many towns in the area, Holland has a wealth of wetlands, covering approximately 11% of the town's land area. Wetlands provide many functions that contribute to maintaining the quality of the environment, such as control of local flooding, pollution filtration, and recreational and scenic opportunities. Wetlands are also vital in helping to maintain the biological diversity found in Holland. Many of the species found in Holland are dependent on wetlands for some part of their life cycle. The U.S. Fish and Wildlife Service national Wetlands Inventory Program has delineated and mapped many of the major wetlands found in Holland. They include a wide variety of wetland types including flood plain forests, cattail marshes, red maple swamps, and vernal pools. Many of these wetlands occur in mosaics with more than one type of wetland occurring in the complex.

Beaver Dams

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

Lake Siog

Lake Siog, or Holland Pond, is the only natural pond in town. The Army Corps of Engineers owns the surrounding wetlands and has a public access boat ramp for the community to use.

Floodways

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

Floodways include the watercourses (rivers and streams) and adjacent relatively low-lying areas subject to periodic flooding (the 100-year flood zone and 500-year flood zone). These adjoining lands are flood hazard zones and they vary in their predicted flood frequency. The 100-year flood zone has a one in 100 statistical probability (or one percent chance) of being flooded in a single year or is predicted to be flooded one year out of a 100-year period; while the 500-year flood zone is based on a 500-year period. Most of the floodways in Holland are narrow, fewer than 400 feet wide, because the town's hilly topography and rocky terrain do not permit the formation of broad floodplains, but the floodplain around Lake Siog is broad and wide. Holland's floodways are corridors that pass flowing water downstream, eventually into the Quinnebaug River.

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

- (1) The Quinnebaug River—north from Holland Pond (Lake Siog) extending east towards and along the length of Brimfield Road;
- (2) Holland Pond (Lake Siog) and its tributaries;
- (3) Stevens Brook along Stafford Road and into Hamilton Reservoir;
- (4) May Brook, present in the southeastern section of Town, has a 500 year floodplain that covers portions of Town.

Evacuation routes are the only critical facilities located within the floodplain.

Environmental Concerns

The major environmental challenges in Holland are related to the quality of both surface and ground water. Hamilton Reservoir is a valuable natural resource that plays a central role in maintaining the community's identity and economic well-being. The numerous seasonal and year-round residences adjacent to the reservoir provide substantial property tax revenues to the town without requiring a significant amount of municipal expenditures (schools, public safety, services, etc.).

Thousands of seasonal visitors come to Holland each year to enjoy the recreational opportunities provided by the reservoir. These visitors help support local business establishments that might not be viable without the revenue generated by this seasonal influx. It is clear that threats to the environmental health of Hamilton Reservoir can translate into threats to the town's community identity and financial stability. In 1983, the Diagnostic/Feasibility Study for Hamilton Reservoir described numerous conditions that have led to the degradation of the water quality at Hamilton Reservoir. These conditions include:

- The soil types around the reservoir are not well-suited for underground sewage disposal;
- Due to slope and soil conditions, 80% of the immediate shoreline of the reservoir has the potential for significant bank erosion;
- Stormwater run-off is the greatest contributor to sedimentation of the reservoir;
- Approximately 450 septic systems were within 100 feet of the shoreline in 1983; and,
- The shallow depth of the reservoir exacerbates the negative conditions that are currently degrading water quality.

Much of the dense residential development surrounding the reservoir is located on steep slopes and on soils that are subject to moderate to severe erosion. Dirt roads and driveways serve a significant number of these residences. During periods of heavy rain, storm run-off carries soil from these unimproved roads into the reservoir leading to sedimentation. Due to its relatively shallow depth, the reservoir is especially vulnerable to the negative effects of sedimentation.

Pollution from residential sources also poses a serious threat to water quality at Hamilton Reservoir and ground water. Inadequate or faulty septic systems can release effluent into ground water, then into the reservoir's waters. In addition to posing a threat to human health, the effluent often contains phosphates. Increased levels of phosphates result in increased vegetation growth. Controlling rampant weed growth in the reservoir is costly and often requires introducing chemicals into the aquatic ecosystem. Hamilton Reservoir already has seen these effects and is listed as impaired water by the U. S. Environmental Protection Agency for noxious aquatic weeds.

3 – HAZARD IDENTIFICATION & ANALYSIS

Natural Hazard Identification

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

Floods

The average annual precipitation for Holland and surrounding areas in northwestern Massachusetts is 45 inches. There are three major types of storms that bring precipitation to Holland. Continental storms that originate from the west continually move across the region. These storms are typically low-pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. Precipitation from coastal storms, also known as nor'easters, that travel into New England from the south constitute the second major storm type. In the late summer or early fall, the most severe type of these coastal storms, hurricanes, may reach Massachusetts and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods can be classified as either *flash floods*, which are the product of heavy, localized precipitation in a short time period over a given location or *general floods*, which are caused by precipitation over a longer time period in a particular river basin. There are several local factors that determine the severity of a flooding event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Floods occur more frequently and are one of the most costly natural hazards in the United States.

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

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

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large “sponges” to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

Severe Snowstorms/Ice Storms

Severe winter storms can pose a significant risk to property and human life because the rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can disrupt utility service, phone service and make roadways extremely hazardous. Severe winter storms can be deceptive killers. The types of deaths that can occur as a result of a severe winter storm include: traffic accidents on icy or snow-covered roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold temperatures. Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt. Power and telephone lines, trees, and telecommunications structures can be damaged by ice, wind, snow, and falling trees and tree limbs. Icy road conditions or roads blocked by fallen trees may make it difficult to respond promptly to medical emergencies or fires. Prolonged, extremely cold temperatures can also cause inadequately insulated potable water lines and fire sprinkler pipes to rupture and disrupt the delivery of drinking water and cause extensive property damage. The snowstorm that occurred in late October 2011 resulted in widespread power outages throughout the region and took over a week to repair in many areas.

Hurricanes

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. In Massachusetts, major hurricanes occurred in 1904, 1938, 1954, 1955, 1960 and 1976. Very recently, Tropical Storm Irene and Hurricane Sandy affected the state in 2011 and 2012, respectively, causing power outages and flooding throughout the region.

Tornadoes

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

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Hampden County. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through the towns of West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed three people and resulted in hundreds of injuries across the state.

Prior to 2011, there have been two smaller tornados that also hit the region since 1950, one in Sturbridge and one in Monson. Both were ranked F1 (Moderate Damage) on the Fujita Scale of Tornado Intensity. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.). Since the 1950s, there have been close to twenty-eight tornadoes in Hampden and Hampshire County.

Of additional concern are microbursts, which often do tornado-like damage and can be mistaken for tornadoes. In contrast to the upward rush of air in a tornado, air blasts rapidly downward from thunderstorms to create microbursts.²

Wildland Fires/Brushfires

According to FEMA, there are three different classes of wildland fires: *surface fires*, *ground fires* and *crown fires*.³ The most common type of wildland fire is a surface fire

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

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

There were ten outdoor fires reported in Holland in 2004.⁴ As a point of comparison, there were fifteen total fires reported in the same time period, including structural, vehicular and outdoor fires.

Earthquakes

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.⁵ 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.⁶

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

⁴ Massachusetts Fire Incident Reporting System, 2004

⁵ Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

⁶ Federal Emergency Management Agency Web site: www.fema.gov/hazards/earthquakes/quake.shtm.

**Table 3-1: New England Earthquakes
with a Magnitude of 4.2 or more, 1924 - 2007**

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

**Table 3-2: 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
<i>Total Number of Earthquakes within the New England states between 1638 and 1989 is 2262.</i>		

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

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

Dam Failure

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

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

The Massachusetts Department of Conservation and Recreation (MA DCR) is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). Until 2002, DCR was also responsible for conducting dam inspections but then state law was changed to place the responsibility and cost for inspections on the owners of the dams. However, the new regulations have not been issued, so the DCR is still conducting inspections, but only of dams classified as high hazard.

The state has three hazard classifications for dams:

- *High Hazard:* Dams located where failure or improper operations will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard:* Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard:* Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

The inspection schedule for dams is as follows:

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

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

The Massachusetts Department of Conservation and Recreation (formerly Department of Environmental Management) recognizes two dams in Holland: Hamilton Reservoir Dam and an unnamed dam due north of Alexander Road.

Table 3-3: Dams in Holland

Dam	MEMA	DCR
Hamilton Reservoir Dam	High Hazard	Significant Hazard
Alexander Road Dam- due north of Alexander road west of Sturbridge Road	Not listed	High Hazard

The 100-year floodplain covers about 8.0 percent, or approximately 672 acres of the town, while the 500-year floodplain covers 1.3 percent or 105 acres.

Drought

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector.⁶

In Massachusetts, six major droughts have occurred statewide since 1930.⁷ They range in severity and length, from three to eight years. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels.

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

When evaluating the region's risk for drought on a national level, utilizing a measure called the Palmer Drought Severity Index, Massachusetts is historically in the lowest percentile for severity and risk of drought.⁸ However, global warming and climate change may have an effect on drought risk in the region. With the projected temperature increases, some scientists think that the global hydrological cycle will also intensify. This would cause, among other effects, the potential for more severe, longer-lasting droughts.

Man-Made Hazards – Hazardous Materials

Technologic, or man-made, disasters are commonly defined as emergencies characterized by a sudden threat to lives, property, public health and the environment, arising from a failure of critical infrastructure systems or the release, or potential release, of oil, radioactive materials, or hazardous chemicals or bio-hazards, into the air, land or water. These emergencies may occur from transportation accidents, unusual events at facilities that use or manufacture chemicals or biological hazards, or as a result of natural or man-made events. While these incidents are most often accidental, intentional acts of sabotage, or terrorism, must increasingly be considered as a discrete category of technological disaster.⁹

⁷ US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.

⁸ National Drought Mitigation Center – <http://drought.unl.edu>

⁹ Commonwealth of Massachusetts State Hazard Mitigation Plan, 2004

Critical Infrastructure Threats

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

Oil, Chemical, Bio-Hazards Spills and Accidents

Almost 14,000 oil spills are reported each year in the U.S., mobilizing thousands of specially trained emergency response personnel and challenging the best-laid contingency plans. Although many spills are contained and cleaned up by the party responsible for the spill, some spills require assistance from local and state agencies, and on occasion, the Federal Government. Similarly, the safe handling of industrial chemicals became a significant priority for disaster managers worldwide following the 1984 accident at Union Carbide’s Bhopal, India, factory that killed more than 2,000 people. The most recent, and severe, chemical spills in Massachusetts occurred on April 27, 2003 when a barge heading north in Buzzard’s Bay toward the Cape Cod Canal ran aground, causing its hull to rupture. This accident resulted in the spill of approximately 98,000 gallons of heating oil into the Bay. The spill closed shell fishing areas and beaches, causing thousands of dollars in loss wages and property damage.

Building Fires

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

Natural Hazard Analysis Methodology

In order to review the likelihood of a specific hazard occurring, to identify the location of occurrence, and to assess the impacts of the hazard event, a *Hazard Identification and Analysis Matrix* was prepared to organize the information that was gathered for this project. The matrix is organized into the following sections: Type of Hazard, Frequency of Occurrence, Severity of Impacts and Hazard Index. The Hazard Index was completed to rank the hazards according to the frequency of occurrence and the amount of potential damage likely to occur. The Hazard Index forms the basis for concentrating the future mitigation efforts outlined in this plan. A description of each of the matrix categories is provided below. The completed Matrix is shown on Table 3-6.

Type of Hazard

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

Frequency of Occurrence

The frequency or likelihood of occurrence for each natural hazard was classified according to Table 3-4. The committee estimated the annual probability that a future event will occur through reflection on past occurrences. The Town has not kept detailed records of the location and extent of previous occurrences of natural hazards. Therefore, it is not possible to statistically quantify future probability.

Table 3-4: Frequency of Occurrence and Annual Probability of Given Natural Hazard

Frequency of Occurrence	Annual Probability
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

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

Location of Occurrence

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

Table 3-5: Location of Occurrence and Percentage of Town Impacted of Given Natural Hazard

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

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

Severity of Impacts

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

Table 3-6: Severity of Impacts and Magnitude of Multiple Impacts of Given Natural Hazard

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

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

Hazard Index

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

Table 3-7: Hazard Identification and Analysis Worksheet for Holland

Type of Hazard	Frequency of Occurrence	Location of Occurrence	Impact	Hazard Risk Index Rating
Flooding (100-yr base flood)	High	Large	Critical	1
Flooding (non-FEMA mapped areas)	Moderate	Small	Limited	4
Severe Snowstorms/Ice Storms	Very High	Large	Critical	2
Severe Thunderstorms (Microbursts) which cause wind damage	Moderate	Small	Limited	3
Hurricanes	Moderate	Large	Critical	2
Tornadoes	Moderate	Large	Critical	2
Wildfire/Brushfire	High	Small	Minor	2
Earthquakes	Low	Large	Limited	3
Dam Failures	Very Low	Medium	Catastrophic	3
Drought	Low	Large	Critical	4
Man-made Hazards: Hazardous Materials*	Very Low	Medium	Catastrophic	4

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

* Tennessee Gas pipeline

Vulnerability Assessment

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

In order to determine estimated losses due to natural and man made hazards in Holland, each hazard area was analyzed with results shown below. Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The value of all structures in the Town of Holland, including exempt structures such as schools and churches, is \$314,276,700 as of 2006. The median value of a home in Holland is \$195,000 according to the 2000 Census. The data below was calculated using FEMA's Understanding Your Risks: Identifying Hazards and Estimating Losses, August 2001. In addition, the Committee completed the Vulnerability Assessment Worksheets which provided more data to estimate the potential losses.

Past and Potential Hazards

Flooding (100-year base flood): Low-medium Risk

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

The Town has not kept detailed records of the location and extent of previous occurrences of flooding. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee, most specifically, from the Highway Department. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

According to the Community Information System (CIS) of FEMA, there are 102 one to four family structures and zero other structures located within the Special Flood Hazard Area (SFHA) in Holland as of May 6, 1999, the most current record in the CIS for the

Town of Holland. Utilizing the Town's median home value of \$195,000, a preliminary damage assessment was generated. An average household size of 2.45 persons was used to calculate the number of people living in the floodplain.¹⁰ The total damage estimate for the 102 structures located within the SFHA in Holland is \$19,890,000, and 245 people affected. The damage estimate is a rough estimate and likely reflects the worst case scenario.

General flooding can occur throughout town, most notably along any road that traverses a waterway including both causeways on Mashapaug Road, East Brimfield Road, Stafford Road and Alexander Road. Additional locations where undersized culverts cause flooding include Kimball Hill Road, Maybrook Road and Sturbridge Road. With roughly 46 percent of the roads unpaved with little if any structural facilities for stormwater management, the slightest bit of rain can cause road washouts which lead to significant sedimentation downstream, particularly in Hamilton Reservoir where sediment loading has become a major source of lake impairment.

Flooding (Non-FEMA mapped areas): Low-medium Risk

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

Brandon Street

Brandon Street is outside of the FEMA mapped 100-year base flood but floods on a regular basis due to both spring runoff and heavy rains. One person was evacuated by boat in the flood of October 2005. There are approximately 10 structures that could be affected by flooding. Cost estimates for 100 percent damage to 100 percent of the structures at \$195,000 median home value is \$1,950,000. Costs for repairing or replacing any dams, bridges, power lines, telephone lines and contents of structures are not included.

East Brimfield Road

East Brimfield Road is outside of the FEMA mapped 100-year base flood, with annual flooding at Kaitbenski's gravel pit. There are no structures within the flood prone area. Costs for road repair and stormwater infrastructure are unavailable.

¹⁰ Figure courtesy of 2000 U.S. Census.

Severe Snowstorms/Ice Storms: Medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of severe snowstorms and ice storms. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

Three types of winter events are heavy snow, ice storms and extreme cold which cause concern. Occasionally heavy snow years will collapse buildings. Ice storms have disrupted power and communication services. Forests have been severely damaged. Extreme cold can affect the elderly more significantly than others. Loss of life due to the extreme winter weather has not been recorded in Holland's recent history. Such random events are difficult to set a cost to repair or replace any of the structures or utilities affected.

The area has been subject to extremely heavy snow falls as recorded in the early 1900s and into the 1950s and 1960s. Extreme cold plagued the area in 1988 when temperatures remained below zero degrees for a month in November and December. The loss of power and subsequent loss of water (private wells on pumps) is the greatest risk the town faces from this type of hazard.

Hurricanes/Severe Thunderstorms: Medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of hurricanes and severe thunderstorms. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

Holland's location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes. The Town has experienced small blocks of downed timber and uprooting of trees onto structures. Hurricanes can and do create flooding. Estimated wind damage 5 percent of the structures with 10 percent damage \$1,571,384. Estimated flood damage 10 percent of the structures with 20 percent damage \$6,285,534. Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included. The 1938 hurricane was a major event causing wind damage and flooding statewide. Other risks caused by hurricanes and severe thunderstorms include disruption of phone and power service and road washout on evacuation routes.

Tornadoes: Medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of tornadoes. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

Risk of tornadoes is considered to be medium. While tornados occurred in the Pioneer Valley recently in 2011 and caused widespread damage, over the long run tornadoes rarely occur in this part of the country; therefore, assessing damages is difficult. Estimated damages to 10% of structures with 20 percent damages \$6,285,534. Estimated cost does not include building contents, land values or damages to utilities. According to the Hazard Mitigation Committee, a tornado/microburst passed through the Army Corp of Engineers flood control land along the north shore of Holland Pond several years ago. 16 incidents of tornado activity (F3 or less) occurred in Hamden County between 1956 – 1992.

Wildfires/Brush Fires: Medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of wildfires. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

As timber harvesting is reduced, wood roads close, debris builds up on the ground, potential for wildfire increases town-wide. Minimal forest fire protection exists throughout town. Town is dependant on on-call volunteer fire fighters and accessibility can be a problem at higher, forested elevations. The fire department does respond to wildfires each year however there have not been any reports of loss of life or damage to property. Wildfires have been reported in the past twenty years on Rattlesnake Mountain, Vinten Road and Long Hill Road.

Dam Failure: Low-medium Risk

The Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR) identified three dams in Holland. Table 3-3 lists these dams and their classification. Two of these dams are classified as Significant or High Hazard dams due to the likelihood that loss of life or damage to homes and infrastructure would occur from dam failure. The 1955 failure of the Hamilton Reservoir Dam led to the ACOE purchasing flood control land around Holland Pond.

Earthquakes: Medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of earthquakes. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

There is moderate potential for serious damage to building and infrastructure. Structures are mostly of wood frame construction, estimated loss 20 percent of town assessed structural valuation \$62,855,340. Costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures are not included. According to the Hazard Mitigation Committee, an earthquake or deep tremor caused the loss of three wells on Brandon Street in 2005.

Drought: Low-medium Risk

The Town has not kept detailed records of the location and extent of previous occurrences of drought. The following information about the location and extent of previous occurrences have been provided by members of the Hazard Mitigation Planning Committee. It is also difficult to estimate the probability of future events and dependent on whether or not mitigation actions in this plan are implemented. The implementation schedule is also dependent on the availability of funding.

Holland has had limited experience with severe drought conditions. Drought will increase the risk of wildfire, especially in areas of high recreational use. In Massachusetts, six major droughts have occurred statewide since 1930.¹¹ They ranged in severity and length from three to eight years. In many of these droughts, water-supplies were found to be inadequate. The greatest threat in Holland from drought is

¹¹ U.S. Geological Survey Water-supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., U.S. Geological Survey.

the potential for loss of private wells and the one public well in the town center. No secondary or tertiary water supply sources exist in town.

Man-Made Hazards - Hazardous Materials: Low-medium Risk

Holland relies on the Holland Fire Department for responding to incidents involving hazardous materials. There are no major roads through town that serve as trucking routes for cargo trucks. There are no registered Tier II Hazardous Material Sites in Holland. The greatest threat of this type would be an explosion or leak of natural gas from the Tennessee Gas pipeline that crosses town north of Hamilton Reservoir.

4 – CRITICAL FACILITIES

A critical facility is defined as a building, structure, or location which:

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

Critical Facilities within Hazard Areas

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

The Critical Facilities List for the Town of Holland has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Holland’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 Holland. The third category contains Facilities/Populations that the Committee wishes to protect in the event of a disaster. The fourth category contains Potential Resources, which can provide services or supplies in the event of a disaster. The Critical Facilities Map at the end of this Plan identifies these facilities.

Category 1 – Emergency Response Services

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

1. Emergency Operations Center

Holland Public Safety Complex (primary) – 7 Sturbridge Road

Holland Elementary School (alternate) – 28 Sturbridge Road

2. Fire Station

Holland Public Safety Complex – 7 Sturbridge Road

3. Police Station

Holland Police Department (Town Hall) – 27 Sturbridge Road

4. Department of Public Works

Holland Highway Department – 7 Sturbridge Road

5. Water Department

A public well is located at the Senior Center; otherwise there is not public water supply or

public water department.

6. Emergency Fuel Stations

Holland Public Safety Complex – 5,000 gallon tank /gasoline and 1,000 gallon tank/diesel

7. Emergency Electrical Power Facility

Holland Public Safety Complex – 60kw diesel generator

8. Emergency Shelters (not Red Cross Approved)

none

Red Cross Approved Shelters

Tantasco Regional High School – Brimfield Road, Sturbridge

Brimfield Elementary School – Wales Road, Brimfield

9. Dry Hydrants - Fire Ponds - Water Sources

5 dry hydrants and 1 cistern - center of town and perimeter of Hamilton Reservoir

Holland Subdivision regulations require construction of cisterns for fire protection.

10. Transfer Station

none

11. Utilities

none

12. Helicopter Landing Sites

Hitchcock Field, behind Town Hall

Linda and Joe Collette, 4 Barney Road

13. Communications

Cell Towers :

AT&T Wireless (includes Fire Department communication system) – 41 Leno Road

Telephone Crossboxes:

Sand Hill Road

Union Road

14. Primary Evacuation Routes

Brimfield Road

Sturbridge Road

Stafford Road

Mashpaug Road

Maybrook Road

East Brimfield Road

15. Bridges Located on Evacuation Routes

All evacuation routes have bridges.

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 Holland.

1. Water Supply

Holland residents rely on private well water for their residential and commercial water needs.

2. Sewer Infrastructure (Pump Stations)

Holland residents rely on private septic systems to treat wastewater.

3. Problem Culverts

Mashapaug Road – undersized causeway

Kimball Hill Road – undersized culvert

Maybrook Road – culvert clogs

Alexander Road- bridge acts as dam during high flows and culvert is undersized

Hamilton Reservoir Dam spillway – undersized

Stafford Road – bridge acting like dam

Mashapaug Road Little Causeway –culvert undersized

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

Holland Elementary School, Sturbridge Road – 325 students and 35 staff

Holland Senior Center, Brimfield Road – 50 seniors and 5 staff

Springfield Girls Camp, Brimfield Road – 60 campers and 4 staff

2. Elderly Housing/Assisted Living

none

3. Recreation Areas

Holland Elementary School Playground

Hitchcock Field

Lake Siog Town Beach

Leadmine Wildlife Management Area

Army Corps of Engineers Lands (flood control, conservation, recreation)

Holland Rod and Gun Club

State Owned Fishing Pier and Boat Launch at Hamilton Reservoir

Springfield Girls Club Summer Camp Area

Palmer Beagle Club

- 4. Schools**
Holland Elementary School, Sturbridge Road – 325 students and 35 staff
- 5. Churches**
Holland Congregational Church – Holland, MA
- 6. Historic Buildings/Sites**
Holland Library – 25 Sturbridge Road
Old section of Holland Elementary School
Congregational Church
Webber House, Brimfield Road
- 7. Apartment Complexes**
15 Maybrook Road
- 8. Employment Centers**
Howlett Lumber, East Brimfield Road
Holland Town Hall, Sturbridge Road
- 9. Camps**
Springfield Girls Camp – Brimfield Road
- 10. Mobile Home Parks**
None

Category 4 – Potential Resources

Contains facilities that provide potential resources for services or supplies.

- 1. Food/Water**
Shaw’s Super Market, Sturbridge
Walmart, Sturbridge
Stop and Shop, Sturbridge
- 2. Hospitals/Medical Supplies**
Brooks Pharmacy, Sturbridge
Harrington Memorial, Southbridge
Mary Lane Hospital, Ware
Wing Memorial Hospital, Palmer
Brooks Pharmacy, Southbridge
Bay State Medical Center, Springfield
Walmart, Sturbridge
- 3. Fuel**
Amerigas, Palmer
Osterman Propane, Southbridge

Vincent Oil, Sturbridge

4. Gas

Roberts Auto Clinic, Mashapaug Road

5. Building Materials Suppliers

County Line – Farm Hardware Center
Howlett Lumber – East Brimfield Road

6. Heavy & Small Equipment Suppliers

Poirer, Brimfield
Kaitbenski, Sturbridge

7. Gravel Pits

Kaitbenski, Sturbridge
Soper, Holland
Hull Forest Products, Union, CT

8. Contractors/Snow Removal/Plowing

Kaitbenski, Sturbridge
Town of Holland

9. Miscellaneous Resources

Emergency Broadcast & Television:

WSRS 96.1 Worcester
WTAG 580 AM Worcester
WORC 1310 AM Worcester
WGBY Springfield
WGGB Springfield

Transportation:

Buses – Laidlaw Transportation, Co., Brimfield
Worcester Regional Transit Authority, Sturbridge

Beds, Cots, Blankets:

National Guard
American Red Cross

Table 4-1 Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year Flood)	100-year FEMA floodplain	<ul style="list-style-type: none"> - Mashapaug Road Causeway and Little Causeway - East Brimfield Road bridge/box culvert - Stafford Road bridge - Alexander Road bridge/box culvert - Sturbridge Road at bridge/box culvert 	<p>Mashapaug Road</p> <p>East Brimfield Road</p> <p>Stafford Road</p> <p>Alexander Road</p> <p>Sturbridge Road</p>
Flooding	Brandon Street	Road	None
	East Brimfield Road	Road	East Brimfield Road

5 – CURRENT MITIGATION STRATEGIES

Flooding

The Critical Facilities, Infrastructure, 1999 Land Use & Natural Hazards Map for the Town of Holland shows the 100-year flood zone identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a one percent chance of occurring in any given year. The 100-year flood zone covers mostly narrow bands of level floodplain land along the Quinnebaug River running north from Holland Pond, Holland Pond and its minor tributaries, Stevens Brook along Stafford Road and Holland Pond, and Laughing Brook in the southeastern section of Town. The flood zones are widest in the areas abutting and surrounding Holland Pond (Lake Siog), and narrow when running along the brooks and tributaries that thread across Holland's landscape.

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

Management Plans

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

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Community leaders should ensure that Holland is enrolled in the National Flood Insurance Program.
- Strict adherence should be paid to land use and building codes, (e.g. Wetlands Protection Act), and new construction should not be built in flood prone areas.
- Ensure that flood control works are in good operating condition at all times.
- Natural water storage areas should be preserved.

- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

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

- Place EOC personnel on standby during stage of flood 'watch' and monitor NWS/New England River Forecast Center reports.
- Ensure that public warning systems are working properly and broadcast any information that is needed at this time.
- Review mutual aid agreements.
- Monitor levels of local bodies of water.
- Arrange for all evacuation and sheltering procedures to be ready for activation when needed.
- Carry out, or assist in carrying out needed flood-proofing measures such as sand bag placement, etc.
- Regulate operation of flood control works such as floodgates.
- Notify all Emergency Management related groups that will assist with flood response activities to be ready in case flood 'warning'.

Evacuation Options

The majority of land subject to the 100-year floodplain in town, which is located along the Quinnebaug River running north from Holland Pond, Holland Pond and its minor tributaries, Stevens Brook along Stafford Road and Holland Pond, and Laughing Brook in the southeastern section of Town. There is currently no shelter facility within Holland available for flooding victims.

Approximately 100 people would be expected to be impacted by a 100-year flood, of which four may need transportation. Emergency management personnel should assess existing floodplain and dam failure data to determine an appropriate evacuation plan.

In addition, Holland has several bridges/box culverts situated either in or near the 100-year floodplain, which could make evacuation efforts as a result of dam failure more difficult. Some of the roads that residents would most likely take to reach safety travel through flood-affected areas.

Flood Control Structures

One of the most significant events to occur in Holland in recent times was the flood of 1955. In August of that year, over 18 inches of rain fell and caused severe flooding that destroyed the original dam that created Hamilton Reservoir. The owners of the dam were unable to make the necessary repairs and this led to the town taking over control of the dam and its surrounding facilities. The dam was rebuilt with governmental assistance and the reservoir once again became a major site for recreation and water sports. In an effort to prevent a repeat of the destruction caused by the 1955 flood, the Army Corps of Engineers and the federal government purchased approximately 170 large parcels of land to absorb potential floodwaters.

The 1956 reconstruction of Hamilton Reservoir Dam sited the elevation of the dam higher than its previous construction and slightly higher than the elevation of the Mashapaug Road causeway. Significant sediment loading in the reservoir since the reconstruction of the dam has led to a loss of flood storage capacity within the reservoir. This coupled with the higher dam elevation has created flooding of the Mashapaug Road causeway during significant storm events.

Land Use Regulations that Mitigate Impacts from Flooding¹²

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

Subdivision Rules and Regulations

Holland's 1976 Subdivision Rules and Regulations govern the subdivision of land. Holland's Subdivision Regulations state that, "The subdivision control law has been enacted for the purpose of protecting the safety, convenience and welfare of the inhabitants of the cities and towns in which it is, or may hereafter be, put in effect by regulating the laying out and construction of ways in subdivisions, providing access to the public ways, and ensuring sanitary conditions in subdivisions and in proper cases parks and open areas. The powers of a planning board and of a board of appeal under the subdivision control law shall be exercised with due regard for the provision of

¹² All bulleted items and direct quotes in the Leverett Local Natural Hazards Mitigation Plan are taken from the Town of Leverett's zoning bylaw and subdivision regulations. Other references to those documents contained herein are paraphrases of the same.

adequate access to all of the lots in a subdivision by ways that will be safe and convenient for travel for lessening congestion in such ways and in the adjacent public ways; for reducing danger to life and limb in the operation of motor vehicles; for securing safety in the case of fire, flood, panic and other emergencies; for insuring compliance with the applicable zoning ordinances or bylaws for securing adequate provisions for water, sewage, drainage and other requirements where necessary in a subdivision; and for coordinating the ways in a subdivision with each other and with the public ways in the city or town in which it is located and with the ways in neighboring subdivisions. Such powers may also be exercised with due regard for the policy of the Commonwealth to encourage the use of solar energy and protect the access to direct sunlight of solar energy systems. It is the intent of the subdivision control law that any subdivision plan filed with the planning board shall receive the approval of such board if said plan conforms to the recommendations of the Board of Health and the reasonable rules and regulations of the Planning Board pertaining to subdivisions of land provided, however, that such board may, when appropriate, waive as provided for in section 81R, such portions of the rules and regulations as is deemed advisable." (Section 81-M of Chapter 4 1, M. G. L.)." The Subdivision Rules and Regulations contain several provisions that mitigate the potential for, and impact of, flooding, including:

Section II Procedure for the Submission and Approval of Plans, Definitive Plan [IN PART]:

The Definitive Plan shall contain the following information:

M. Proposed layout of storm drainage.

H. The plan shall show any areas within the flood plain district, wetland areas and unusual topographic features within one hundred (100) feet of the subdivision perimeter.

Section 4000 Required Improvements

Section 4111. Reduce, to the extent possible:

(c) number of mature trees removed;

(d) extent of waterways altered or relocated;

(f) erosion and siltation

(g) flood damage;

Section III Design Standards - Grades

a. Grades of streets shall be not less than 0.5 %. Grades shall not be more than 6.0% for principal streets nor more than 8.0% for secondary streets.

Section III Design Standards - Drainage

a. Storm drains, culverts and related facilities shall be designed to permit the unimpeded flow of all natural water courses, to ensure adequate drainage at all low points along streets, to control erosion and to intercept storm water runoff at intervals reasonable related to the extent and grade of the area being drained and to the maximum extent feasible storm water shall be re-charged to the ground rather than piped off the premises. Peak stream flows and runoff at the boundaries of the development on a twenty five (25) year frequency storm shall be no more than five (5) percent higher following development than prior to the development.

f. Proper connections shall be made with any existing drains in adjacent streets or easements which prove adequate to accommodate the drainage flow from the subdivision. In the absence of such facilities, or inadequacy of the same, it will be the responsibility of the developer to extend drains from the subdivision as required to properly dispose of all drainage from said subdivision in a manner determined to be proper by the Board.

Water velocities in pipes and gutters shall be between two (2) and ten (10) feet per second, and not more than five (5) feet per second on ground surfaces.

b. Storm drains shall be based on a 25 year frequency storm, and culverts shall be based on a 50 year frequency storm, with consideration given to damage avoidance for a 100 year storm.

Section III Design Standards - Utilities

a. The placement of electric, telephone or other utility lines and equipment shall be underground and so located as to not be in the traveled way or a roadway, or create an adverse impact on ground water levels.

b. In as much as is possible all main lines for water, sewer, and utilities shall be located in the sidewalk area or easements parallel to the right-of-way.

c. Connections for sewer, drain, gas, oil, electric and telephone service from the main structure in the way to the exterior line of the way shall be constructed for each lot whether or not there is a building thereon.

Section 4500 Other Improvements - Driveway Entrances

In order to keep surface water from roadways from draining onto individual lots, driveway entrances shall be constructed so that they slope towards the

roadway for a minimum distance of four (4) feet, at not less than one inch per foot.

Holland Zoning By-Laws

The Town of Holland has established a set of bylaws designed in part to “To promote the health, safety, convenience and general welfare of its inhabitants, to lessen the danger from fire and congestion, and to improve the town under the provisions of the General Laws, Chapter 40A, the use, construction, repair, alteration and height of buildings and structures and the use of premises in the town of Holland, Mass., are hereby restricted and regulated as hereinafter provided..” The Zoning By-Laws include several provisions that mitigate the potential for flooding, including:

Section VIII Special Permits - 8.430 Erosion Control

Erosion of soil and sedimentation into streams and water bodies shall be minimized by using the following erosion control practices:

a. Areas exposed or disturbed due to stripping of vegetation, soil removal, or regrading shall be stabilized permanently within six months of occupancy of a structure or of completion of its construction, whichever comes earlier.

b. During construction, temporary vegetation and/or mulching shall be used to protect exposed areas from erosion. Until a disturbed area is stabilized permanently, sediment in runoff water shall be trapped by using staked hay bales, silt fencing, sedimentation traps, or any combination of these techniques sufficient to prevent sediment from reaching any property line or any stream or water body. These erosion control devices shall be inspected and, if necessary, repaired on a weekly basis, as well as before and after major storms.

c. All slopes exceeding fifteen percent which result from site grading shall either be covered with four inches of topsoil and planted with a vegetative cover sufficient to prevent erosion and be properly maintained, or be stabilized by a retaining wall and vegetative cover. Any problem arising from lack of maintenance, disease or other cause shall be corrected within one growing season.

d. Dust control shall be used during grading operations if the grading is to occur within 200 feet of an occupied residence or place of business. dust control methods may consist of grading fine soils on calm days only or of dampening the ground with water.

e. Permanent erosion control and vegetative measures shall be in accordance with erosion, sedimentation and vegetative practices recommended by the Soil Conservation Service, except that only plants native to New England shall be used for all areas except mown lawn.

Section 7.73 Site Plan Requirements [in part]

b. Existing and proposed topography of the site and topography of areas within 100 feet of the site, showing contours, location of wetlands, streams, water bodies, drainage swales, area subject to flooding and unique natural land features.

c. Existing and proposed structures including dimensions and elevations.

d. The location of proposed streets, parking and loading areas, driveways, walkways, access and egress points.

e. the location and a description of proposed septic systems, water supply, storm drainage systems, utilities and waste and other refuse disposal systems.

f. The location and a description of proposed open space or recreation areas and landscape features, including the location and description of screening, fencing and planting.

g. A complete list of chemicals, pesticides, fuels and other potentially toxic or hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use.

Section 6.3 Flood Plain District.

Section 6.31 [Establishment of District] The Flood Plain District is herein established as an overlay district. The underlying permitted uses are allowed provided that they meet the following additional requirements as well as those of the Massachusetts State Building Code dealing with construction in flood plains. The Flood Plain District includes all special flood hazard areas designated as Zone A, A1-30 on the Holland Flood Insurance Rate Maps, dated July 5, 1984 on file with the Town Clerk, Planning Board and Building Inspector. These maps as well as the accompanying Holland Flood Insurance Study are incorporated herein by reference. In Zone A the permit granting authorities shall obtain, review and reasonably utilize the best available floodway data to prohibit encroachments in floodway which would result in

any increase in the base flood discharge. In Zones A1-30, and AE along watercourses that have not had a regulatory floodway designated, no new construction, substantial improvement, or other development shall be permitted unless it is demonstrated that the cumulative effect of the proposed development when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.4430. Use Regulations.

Section 6.32 [Regulations] In the Floodway designated on the Floodway Boundary and Floodway Map the following provisions shall apply:

a. All encroachments, including fill, new construction, substantial improvements to existing structures, and other development are prohibited unless certification by a registered professional engineer or architect is provided by the applicant demonstrating that such encroachment shall not result in any increase in flood levels during the occurrence of the 100-year flood.

b. Any encroachment meeting the above standard shall comply with the flood plain requirements of the State Building Code.

Section 6.34 Health Regulations pertaining to the Flood Plain District. The Board of Health, in reviewing all proposed water and sewer facilities to be located in the Flood Plain District established under the zoning bylaw, shall require that:

a. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system, and

b. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the systems into the flood waters.

Section 6.35 [Alteration of Watercourses].

b. Prior to the alteration or relocation of any watercourses, adjacent communities will be notified.

c. The flood carrying capacity within an altered or relocated watercourse shall be maintained.

Section 6.2 Special Conservancy District

Section 6.21 Purpose. To conserve the unique landscape, wetland and ecological features, and high quality groundwater associated with the land in this district by limiting multi-unit development to low density institutional, educational and recreational uses.

[no other regulations in zoning bylaw, supply in meetings]

Section 6.02 Open Space Communities [in part]

e. The maximum number of dwelling units permitted in a residential cluster development shall be calculated according to the following procedures:

1. The maximum number of dwelling units permitted shall be the maximum number of lots complying with the dimensional requirements of Section V, Table 2, which could be accommodated by the net developable acres remaining after the area of all wetlands has been subtracted from the total acreage of the property.

2. Under the supervision of the Conservation Commission and in accordance with the provisions of the Wetlands Protection Act, M.G.L. Chapter 131, Section 40, and Town of Holland General By-Laws Chapter 15, all wetlands shall be identified and their area subtracted from the acreage of the total parcel to determine the net developable acres.

f. The required open land within an Open Space-Community shall be determined as follows:

1. At least fifty percent of the net acreage remaining after the area of all wetlands has been subtracted shall be retained as open land.

2. Open land shall be configured in order to protect shoreline areas.

Section 7.5 Earth Removal and Extractive Operations

7.51 Standards for Size of Operations: Non commercial Earth Removal and Extraction operations of less than 300 cubic yards and/or the movement of topsoil and subsoil for personnel landscaping or residential property may have the following requirements waived in part or in full by the Planning Board.

7.52 Standards for Operation of Earth Removal and Extractive Operations [in part]:

b. No removal or extraction shall take place within 300 feet of an existing public way if the extractive operations is below the grade of the centerline of the road.

c. No removal or excavation shall take place within 30 feet of an adjacent property line or within 100 feet of a wetland.

e. No area shall be excavated or filled so as to cause the accumulation of free standing water unless the Planning Board shall permit the creation of a pond upon the approval of the Conservation Commission.

f. Excavation for removal of earth, sand, gravel and other soils shall not extend closer than five (5) feet above the annual high groundwater table. A monitoring well may be required to be installed by the property owner to verify groundwater elevations.

7.53 Standards for Restoration of Earth Removal and Extractive Operations

b. The land shall be left so that natural storm drainage shall leave the property at the original natural drainage points, and so that the total discharge at peak flow as well as the area of drainage of any one point is not increased.

7.8 Common Driveways

7.81 Purpose: Enhance the safety and welfare of residents of common driveways and

Clarify the rights and responsibilities of builders and residents of common driveways, and of the Town of Holland, and to

Provide access to no more than six (6) lots over a common driveway, rather than by individual driveways on each lot, in order to:

Enhance public safety by reducing the number and frequency of points at which vehicles may enter upon the ways used public ways, particularly arterial streets as defined in the subdivision Rules and Regulations, Holland, Massachusetts;

Preserve, protect and enhance environmentally sensitive land, such as well recharge areas, wetlands and floodplains, by reducing the area of land that is cleared, excavated, filled and/or covered with impervious surface;

Encourage the protection and preservation of significant natural features and vistas.

1. Dimensions [in pertinent part]:

a. A common driveway shall have a minimum roadway width of 14 feet to a maximum of 24 feet, in addition to an easement of sufficient width to assure proper drainage and maintenance.

b. A common driveway shall not exceed 1000 feet in length.

c. The slope or grade of a common drive shall in no place exceed 8% if unpaved or 12% if paved.

g. A fire hydrant is required if the terminus of the common driveway is greater than 500 feet from an existing hydrant on a public way;

2. Construction [in pertinent part]:

b. Drainage shall be adequate to dispose of surface runoff, prevent erosion and runoff onto adjoining roads.

c. Any additional storm drainage generated by the new driveway shall not run onto any adjacent property, and to the extent feasible all storm water shall be recharged on-site;

a. The common driveway, at its intersection with the street, must provide a leveling-off area with a slope no greater than 1% for the first 20 feet and a slope no greater than 5% for the next 30 feet.

3. Alignment and Design [in pertinent part]:

h. Common driveway design shall to the greatest extent possible minimize adverse impact to wetlands, farmland, or other natural resources; allow reasonable, safe, and less environmentally damaging access to lots characterized by slopes or ledges; and result in the preservation of rural character through reduction of number of access ways; and retention of existing vegetation and topography.

River and Stream Protection

The Town of Holland follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the town Conservation Commission.

Holland Open Space and Recreation Plan

Holland's Open Space Plan has expired and in order to prioritize the acquisition of lands that could mitigate

National Flood Insurance Program

The Town of Holland participates in the National Flood Insurance Program. As of 2006, there were thirty-five policies in effect in Holland for a total of \$6,018,200 worth of insurance. The town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps that a town has taken to control flood losses.

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

Table 4-1: Existing Flood Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Flood Control Structures	Two dams	Flood inundation zones below dams	Effective for preventing flooding below dams	Raise causeway and dredge reservoir for greater storage capacity in Hamilton Reservoir. Increase size of box culvert on Sturbridge Road.
Subdivision Rules and Regulations				
Submission Requirements	Requires identification of flood plains, wetlands and storm drainage	Entire town	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	None
Design Standards	Peak stream flows and runoff on 25-year storm can be 5% higher than pre-development	Entire town	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure	Consider requiring post-development peak discharge rates do not exceed pre-development rates either at the point of discharge or down gradient property boundary
	Allow connection to existing drains on adjacent streets or easements	Entire town	Not effective since minimal stormwater infrastructure exists	Require all storm runoff to be treated on site

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Driveway Entrances	Purpose to keep drainage from roadways from draining onto individual lots	Entire town	Not effective at preventing down gradient flooding	Purpose should be to keep water from individual lots and driveways on-site and not onto roadways. Consider requiring on-site retainage and infiltration for all stormwater.
Zoning Bylaws				
Special Permits - Erosion Control	Requires erosion and sediment control through outlined erosion control practices	Special permit uses	Somewhat effective for controlling surface runoff and erosion problems	None
Site Plan Review	Requires drainage, utilities, hydrology and potentially hazardous materials to be stored on site to be identified	Entire town	Somewhat effective for controlling surface runoff and erosion problems	None
Flood Hazard District	Delineated areas are protected by strict use regulations	Zone A and A1-30 on Holland flood insurance rate maps	Somewhat effective for minimizing impacts of development on flood levels within flood plain	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Special Conservancy District	Purpose is to protect open space in district on south shore of Hamilton Reservoir	District on south shore of Hamilton Reservoir	Effective	None
Open Space Communities	Wetlands are subtracted from the parcel acreage to determine the net developable acres. At least 50% of the net acreage, after wetlands, must be set aside as open space.	Entire town	Effective at protecting wetlands and open space	None
Earth Removal and Excavation	Requires on-site retainage of all stormwater	Entire town	Effective	None
Common Driveways	Prohibits drainage onto adjacent properties and roadways	Entire town	Somewhat effective	
Other Tools				
Town of Holland Open Space and Recreation Plan	Completed plan will inventory natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, aquifer recharge areas, farms and open space, rivers, streams and brooks.	Entire town	Effective in identifying sensitive resource areas, including floodplains	Maintain an updated OSRP to remain eligible for state grants, particularly Self Help Grants
Participation in the National Flood Insurance Program	As of 2006, there were thirty-five homeowners with flood insurance policies	Areas identified by the FEMA maps	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program	The town should evaluate whether to become a part of FEMA's Community Rating System

Severe Snowstorms/Ice Storms

Winter storms can be especially challenging for emergency management personnel even though the storm has usually been forecast. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected.¹³

Management Plans

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

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

To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 4-1 can also be considered as mitigation measures for severe snowstorms/ice storms.

The CEM Plan for Holland lists the following generic preparedness measures for severe winter storms:

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

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

- Implement public information procedures during storm ‘warning’ stage.
- Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and special needs).

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms. The Town of Holland Subdivision Rules and Regulations set grade limits on streets and restrictions on utility placement (Section III.7), which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms:

Section 7.8 Common Driveways [in part]

1. Dimensions

a. A common driveway shall have a minimum roadway width of 14 feet to a maximum of 24 feet, in addition to an easement of sufficient width to assure proper drainage and maintenance.

b. A common driveway shall not exceed 1000 feet in length.

c. The slope or grade of a common drive shall in no place exceed 8% if unpaved or 12% if paved.

d. The common drive shall intersect a public way at an angle of not less than 80 degrees.

e. Alignment and sight distances should be sufficient to support a design speed of 15 mph;

f. The common driveway shall be capable of providing access for emergency vehicles (WB 50) with either a "hammer head", T' or "Y" configuration in lieu of a cul-de-sac for reverse direction in a single movement; .

Section III Design Standards

a. Grades of streets shall be not less than 0.5 %. Grades shall not be more than 6.0% for principal streets nor more than 8.0% for secondary streets.

Section III.7 Design Standards, Utilities

a. The placement of electric, telephone or other utility lines and equipment shall be underground and so located as to not be in the traveled way or a roadway, or create an adverse impact on ground water levels.

b. In as much as is possible all main lines for water, sewer, and utilities shall be located in the sidewalk area or easements parallel to the right-of-way.

c. Connections for sewer, drain, gas, oil, electric and telephone service from the main structure in the way to the exterior line of the way shall be constructed for each lot whether or not there is a building thereon.

Other Mitigation Measures

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service. The Public Safety Complex is served by a generator that will provide electric power in the event of primary power failure.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snowloads. The Town of Holland designates an official(s) responsible for building inspection in its zoning bylaw. And has provisions in place for meeting inspection requirements.

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

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Subdivision Regulations – Roads	Standards include street grade regulations (0.5% to 8% maximum)	Entire town	Effective	None
Subdivision Regulations – Driveways	Standards include grade regulations of 8% max for unpaved and 12% max for paved	Entire town	Effective	None
Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground	Entire town	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development	Work with utility companies to underground existing utility lines in locations where repetitive outages occur
State Building Code	The Town of Holland has adopted the Massachusetts State Building Code	Entire town	Effective	None

Hurricanes

Of all the natural disasters that could potentially impact Holland, 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).¹⁴ The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 4-1 can also be considered hurricane mitigation measures. High winds that oftentimes accompany hurricanes can also damage buildings and infrastructure. The Holland Comprehensive Emergency Management (CEM) Plan identifies the following areas as being most vulnerable to the hazards associated with hurricanes: all areas surrounding the Hamilton Reservoir, including most of the town's residential properties and municipal infrastructure.

Town of Holland telecommunications facilities bylaw, restrictions on development, and mobile home and State Building Code regulations, as listed below, are equally applicable to wind events such as hurricanes and tornadoes. Furthermore, requiring all utilities to be buried underground will prevent power outages during a high-wind event.

Management Plans

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

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

¹⁴ Comprehensive Emergency Management Plan for the Town of Leverett, August 1999.

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

- Ensure that warning/notification systems and equipment is ready for use at the 'hurricane warning' stage.
- Review mutual aid agreements.
- Designate suitable wind and flood resistant shelters in the community and make their locations known to the public.
- Prepare for coordination of evacuation from potentially impacted areas including alternate transportation systems and locations of special needs facilities.
- Activate warning/notification systems to inform public of protective measures to be taken including evacuation where appropriate.

Evacuation Options

There is currently no emergency shelter planned for the Town of Holland in the case of a hurricane. Some of the roads that residents of Holland would likely transverse to evacuate the town would likely be affected by floods and debris due to severe weather. Emergency management personnel should assess existing floodplain data to determine an appropriate evacuation plan.

Zoning

Section 6.5. Wireless Telecommunications Facilities Bylaw

Section 6.52. Purpose. The purpose of the Wireless Communications Facilities Overlay district is to establish a district in which wireless communications facilities may be permitted with minimal impact upon the public health, safety and general welfare. This bylaw has been created to:

(a) protect the general public from hazards associated with wireless communications facilities;

(b) minimize visual impacts from wireless communication facilities;

(c) prevent an adverse impact. on local property values or the rural and residential character or Holland and;

(d) promote shared use of existing facilities and structures to reduce the need for new facilities. This section does not apply to satellite dishes and antennas for residential use.

[District Delineation]: The Wireless Communications Facilities Overlay District (WCFOD) shall include all land in the Town of Holland with the following exceptions:

- 1. Residential*
- 2. Special Conservancy*

6.54 Siting, Design and Construction Guidelines [provides, in part]:

b. All towers shall be designed to be constructed to the minimum height necessary to accommodate anticipated and future use. No wireless communications facility shall exceed 190 feet in height as measured from the ground level at the base of the tower.

e. The setback of a tower from the property line of the lot on which it is located shall be at least equal to the height of the pre-engineered fault measured at the finished grade of the tower base. No wireless communications facility shall be located within 300 feet of an existing residential building and 750 feet from any historic district.

f. All towers shall be pre-engineered to fail at a pre-determined height enabling the structure to collapse upon itself in the event of a catastrophic failure

m. Grading or construction which will result in final slopes of fifteen percent or greater on fifty percent or more of lot area or on thirty thousand square feet of more of a single lot, even if less than half the lot area, shall be allowed only upon demonstration that adequate provisions have been made to protect against erosion, soil instability, uncontrolled surface water runoff, or environmental degradation. All such slopes exceeding fifteen percent which result from site grading or construction activities shall either be covered with topsoil to a depth of four inches and planted with vegetative cover sufficient to prevent erosion or be retained by a wall constructed of masonry, reinforced concrete or treated pile or timber.

Restrictions on Development

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

Mobile Homes

According to the Town of Holland Zoning Bylaws, mobile homes are not an allowed use in all districts and campers are allowed in instances compliant with M.G.L. Chapter 40A.

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction that adheres to the State Building Code, which, when followed, results in buildings that withstand high winds. The Town of Holland has measures in place to fulfill its regulatory duties, as they are established by the state building code.

Tornadoes

Worcester County and areas just to its west, including portions of Hampden County, have been dubbed the “tornado alley” of the state because the majority of significant tornadoes in Massachusetts’s weather history have occurred in that region.¹⁵ The latest example of this occurred with the F3 tornado that blew across eastern Hampden County and western Worcester County in May of 2011. 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.¹⁶ Like earthquakes, the location and extent of potential damaging impacts of a tornado are completely unpredictable. Most damage from tornadoes comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail.

Management Plans

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

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.

¹⁵ Comprehensive Emergency Management Plan for the Town of Holland, January 1999.

¹⁶ www.ibhs.org.

- Maintain plans for managing tornado response activities. Refer to the non-institutionalized, special needs and transportation resources listed in the Resource Manual.

The CEM Plan for Holland includes the following generic preparedness measures for tornadoes:

- Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- Periodically test and exercise tornado response plans.
- Put Emergency Management on standby at tornado 'watch' stage.

Evacuation Plans

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

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

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Zoning - Wireless Telecommunications	Includes height and setback requirements to protect surrounding properties.	Residential and Special Conservancy Districts	Effective	None
Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground	Entire town	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Work with utility companies to underground existing utility lines in locations where repetitive outages occur
State Building Code	Construction governed by Massachusetts State Building Code	Entire town	Effective	None

Wildfires/Brushfires

Hampshire and Hampden Counties have approximately 469,587 acres of forested land, which accounts for 63 percent of total land area. Forest fires are therefore a potentially significant issue. In Holland approximately 76 percent of the town's total land area is in forest, or about 6,348 acres, and is therefore at risk of fire. There were ten outdoor fires reported in Holland in 2004¹⁷ brushfires reported in Holland in 2004. As a point of comparison, there were fifteen fires reported in the same time period, including structural, vehicular and outdoor fires.

Management Plans and Regulatory Measures

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

Burn Permits

Burn permits are issued by the Holland Fire Department the morning of the intended burn. Permits are issued from approximately January 15th – May 1st depending on weather conditions.

Zoning Bylaws

The Town of Holland has a section in its Zoning Bylaw (Section 7.6 Supplemental Water Supply) that was designed to guarantee an adequate supply of water for the purposes of fighting wild and structural fires. Furthermore, uses requiring a Site Plan Review shall submit copies to Holland's Fire Chief for review (Section 7.7 Site Plan Review).

Section 7.6 Supplemental Water Supply [in part]:

7.64 Prior to construction, plans will be reviewed and stamped by a Certified Fire Protection Engineer. When plans are submitted to the Fire Chief, they must be accompanied by a five-year bond equaling the replacement cost of the entire system as determined by the Fire Chief.

7.66 Prior to construction, the developer/builder will provide the Fire Department's water supply account with funds necessary to cover all costs of maintenance for five (5) year after completion and acceptance. This amount will be determined by the Fire Chief. Should the full amount not be utilized, the remaining balance will be returned to the developer by the town at the end of the five-year period (Prior Code 5161-3).

¹⁷ Massachusetts Fire Incident Reporting System, 2004

7.68 All cisterns are to be designed in accordance with the current edition of NFPA 1231

Section 7.7 Site Plan Review [in part]:

c. Copies of the Site Plan will be distributed by the Planning Board to the Building Inspector, the Conservation Commission, the Board of Health, the Economic Development Board and the Highway, Police and Fire Departments who shall review the application and submit recommendations to the Planning Board. Failure to make recommendations within 45 days of the referral shall be deemed to mean lack of opposition.

Public Education/Outreach

The Holland Fire Department performs a fire safety program once a year at Holland Elementary School.

Restrictions on Development

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

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

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Burn Permits	Residents are permitted to obtain burn permits over the phone	Entire town	Effective	None
Subdivision Review: Fire Safety	Fire Department is involved in the review of subdivision plans	Entire town	Effective	None
Public Education/Outreach	The Fire Department has an ongoing educational program in the schools and for seniors	Entire town	Effective	None

Earthquakes

Although there are five mapped seismological faults in Massachusetts and one that runs through the nearby communities of Hampden, Wilbraham and Ludlow, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for. Most buildings and structures in the state were constructed without specific earthquake resistant design features.

Earthquakes can involve several potentially devastating secondary effects including:

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

Management Plans

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

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

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

The Holland CEM Plan lists the following generic preparedness measures for earthquakes:

- Earthquake response plans should be maintained and ready for immediate use.
- All equipment, supplies and facilities that would be needed for management of an earthquake occurrence should be maintained for readiness.
- Emergency Management personnel should receive periodic training in earthquake response.
- If the designated Emergency Operations Center (EOC) is in a building that would probably not withstand earthquake impact, another building should be chosen for an earthquake EOC.
- Mass Care shelters for earthquake victims should be pre-designated in structures that would be most likely to withstand earthquake impact.

Evacuation Options

There are currently no shelter facilities planned by the Town of Holland for victims of earthquakes. This was written in notes, unsure what it means? The maximum peak population affected by an earthquake is estimated at 2,179 people.

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 6th Edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, of many buildings and structures do not have specific earthquake resistant design features. According to the 2000 U.S. Census, 65 percent of the housing in Holland was built before 1970. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

Restrictions on Development

There are no seismic-related restrictions on development.

Table 5-5: Existing Earthquake Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
State Building Code	Town has adopted the Massachusetts State Building Code	Entire town	Effective	None

Dam Failures

Dam failure is a highly infrequent occurrence, but a severe incident could prove deadly. Since 1984, three dams have failed in and around Massachusetts, and two have come close to failing. One of these dam failures resulted in death and destruction.

There are over 2,500 dams in Massachusetts. Of these, the Army Corps of Engineers, working with DCR, has classified over 50 dams as “structurally unsafe”. Three hundred dams, including more than forty of the unsafe dams, are designated as ‘high hazard dams’. High hazard dams are those located upstream of an area where lives and property would be lost in the event of a dam failure. Many of the Commonwealth’s dams were constructed in the early 19th Century, during the early stages of the industrial revolution, and date back to a time when dams had no standardized construction regulations. Some of the Commonwealth’s dams are even older, and date back to the 18th Century.

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

Type 1: Slowly developing condition

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

Type 2: Rapidly developing condition

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

Type 3: Practically instantaneous failure

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

Management Plans and Regulatory Measures

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

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam over-spill or failure.

- Emergency Management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams, which impact Holland. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.
- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.
- Determine minimum notification time for down stream areas.

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

- Pre-place adequate warning/notification systems in areas potentially vulnerable to dam failure impact.
- Pre-place procedures for monitoring dam site conditions at first sign of any irregularity that could precipitate dam failure.
- Identify special needs populations, evacuations routes, and shelters for dam failure response.
- Acquire, and have in readiness, such equipment and supplies as sandbags, temporary dykes, and other items which would be used to lessen or deflect dam failure impact.

Evacuation Options

The Holland CEM Plan identifies the Hamilton Reservoir Dam as the greatest potential threat (from a dam) to the residents of Holland. The Hamilton Reservoir Dam is classified as a High Hazard dam. The Holland CEM Plan does not note any potential for dam hazards emanating from dams upstream of the town. Failure of the dam would greatly affect Sturbridge Road.

Permits Required for New Dam Construction

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

Dam Inspections

The DCR requires that dams rated as Low Hazards are inspected every ten (10) years and dams that are rated as Medium/Significant Hazards are inspected every five (5) years. High Hazard Dams must be inspected every two years. In 2005, DCR issued regulations that place the responsibility for complying with DCR's inspection schedule on dam owners. For this reason, the town should develop a program for notifying dam owners of their responsibilities and duties and taking steps to ensure that dam owners in Holland have complied with DCR's inspection rules and regulations.

Zoning

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

Restrictions on Development

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

Table 5-6: Existing Dam Failure Hazard Mitigation Measures

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

Drought

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

Management Plans

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

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

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

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

Land Development Regulations that Mitigate Impacts of Drought

Holland's Subdivision Rules and Regulations have several sections governing flood and stormwater management and proper drainage. The regulations protecting these features of the landscape can also be seen as preventing drought, as they promote the natural processes of infiltration and groundwater recharge.

Man-Made Hazards/Hazardous Materials

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

Management Plans

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

Land Development Regulations that Mitigate Impacts of Hazardous Materials

The Holland Zoning Bylaw requires as part of Site Plan Requirements a complete list of chemicals, pesticides, fuels and other potentially toxic or hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use.

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

Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Site Plan Requirements	Requires a complete list of potentially toxic or hazardous materials to be used or stored on site	Entire town	Effective	None

Table 5-8: All Existing Mitigation Measures

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Flooding	Flood Control Structures	Two dams	Flood inundation zones below dams	Effective for preventing flooding below dams	Raise causeway and dredge reservoir for greater storage capacity in Hamilton Reservoir. Increase size of box culvert on Sturbridge Road.
Flooding	Subdivision Rules and Regulations: Submission Requirements	Requires identification of flood plains, wetlands and storm drainage.	Entire town	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	None
Flooding	Subdivision Rules and Regulations: Design Standards	Peak stream flows and runoff on 25-year storm can be 5% higher than pre-development. Allow connection to existing drains on adjacent streets or easements.	Entire town Entire town	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure. Not effective since minimal stormwater infrastructure exists.	Consider requiring post-development peak discharge rates do not exceed pre-development rates either at the point of discharge or down gradient property boundary. Require all storm runoff to be treated on site.
Flooding	Subdivision Rules and Regulations: Driveway Entrances	Purpose to keep drainage from roadways from draining onto individual lots.	Entire town	Not effective at preventing down gradient flooding.	Purpose should be to keep water from individual lots and driveways on-site and not onto roadways. Consider requiring on-site retainage and infiltration for all stormwater.

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Flooding	Zoning Bylaws: Special Permits - Erosion Control	Requires erosion and sediment control through outlined erosion control practices.	Special Permit Uses	Somewhat effective for controlling surface runoff and erosion problems.	None
	Site Plan Review	Requires drainage, utilities, hydrology and potentially hazardous materials to be stored on site to be identified.	Entire Town	Somewhat effective for controlling surface runoff and erosion problems.	None
Flooding	Zoning Bylaws: Flood Hazard District	Delineated areas are protected by strict use regulations.	Zone A and A1-30 on Holland Flood Insurance Rate Maps	Somewhat effective for minimizing impacts of development on flood levels within flood plain.	None
Flooding	Zoning Bylaws: Special Conservancy District	Purpose is to protect open space in district on south shore of Hamilton Reservoir.	District on south shore of Hamilton Reservoir	Effective	None
Flooding	Zoning Bylaws: Open Space Communities	Wetlands are subtracted from the parcel acreage to determine the net developable acres. At least 50% of the net acreage, after wetlands, must be set aside as open space.	Entire Town	Effective at protecting wetlands and open space.	None

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Flooding	Zoning Bylaws: Earth Removal and Excavation	Requires on-site retainage of all stormwater.	Entire Town	Effective	None
Flooding	Zoning Bylaws: Common Driveways	Prohibits drainage onto adjacent properties and roadways.	Entire Town	Somewhat effective	
Flooding	Town of Holland Open Space and Recreation Plan	Completed plan will inventory natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, aquifer recharge areas, farms and open space, rivers, streams and brooks.	Entire town.	Effective in identifying sensitive resource areas, including floodplains.	Maintain an updated OSRP to remain eligible for state grants, particularly Self Help Grants.
Flooding	Participation in the National Flood Insurance Program	As of 2006, there were thirty-five homeowners with flood insurance policies	Areas identified by the FEMA maps	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program	The town should evaluate whether to become a part of FEMA's Community Rating System
Severe Snowstorms/Ice Storms	Subdivision Regulations –Roads	Standards include street grade regulations (0.5% to 8% maximum)	Entire town	Effective	None

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Severe Snowstorms/Ice Storms	Subdivision Regulations – Driveways	Standards include grade regulations of 8% max for unpaved and 12% max for paved	Entire town	Effective	None
Severe Snowstorms/Ice Storms	Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground	Entire town	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development	Work with utility companies to underground existing utility lines in locations where repetitive outages occur
Severe Snowstorms/Ice Storms	State Building Code	The Town of Holland has adopted the Massachusetts State Building Code	Entire town	Effective	None
Hurricane & Tornado	Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground	Entire town	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development	Work with utility companies to underground existing utility lines in locations where repetitive outages occur
Hurricane & Tornado	State Building Code	Construction governed by Massachusetts State Building Code	Entire town	Effective	None

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Hurricane & Tornado	Zoning - Wireless Telecommunications	Includes height and setback requirements to protect surrounding properties	Residential and Special Conservancy Districts	Effective	None
Wildfire/Brushfire	Burn Permits	Residents are permitted to obtain burn permits over the phone.	Entire town	Effective	None
Wildfire/Brushfire	Subdivision Review: Fire Safety	Fire Department is involved in the review of subdivision plans	Entire town	Effective	None
Wildfire/Brushfire	Public Education/Outreach	The Fire Department has an ongoing educational program in the schools and for seniors	Entire town	Effective	None
Earthquake	State Building Code	Town has adopted the Massachusetts State Building Code	Entire town	Effective	None
Dam Failure	Permits required for new dam construction	State law requires a permit for the construction of any dam	Entire town	Effective	None

Mitigation Measure Category	Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Dam Failure	Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Entire town	Low. The DCR does not have adequate staff and resources to inspect dams according to the required schedule.	<p>Adequate staff and resources should be given to DCR to ensure the inspection schedules are maintained</p> <p>Identify sources of funding for dam safety inspections</p> <p>Incorporate dam safety into development review process</p>
Dam Failure	Evacuation Plans	Comprehensive evacuation plans would ensure the safety of the citizens in the event of dam failure	Inundation areas in town	Effective	None
Man-Made Hazard/Hazardous Materials	Site Plan Requirements	Requires a complete list of potentially toxic or hazardous materials to be used or stored on site	Entire town	Effective	None

6 – FUTURE MITIGATION STRATEGIES

Goal Statements and Action Items

As part of the natural hazards mitigation planning process that will be undertaken by the Holland Natural Hazards Planning Committee, existing gaps in protection and possible deficiencies will be identified and discussed. The committee will then develop general Goal Statements and Action Items that, when implemented, will help to reduce risks and future damages from natural hazards. The Goal Statements, Action Items, town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of natural hazard are described below.

Several of the Action Items have multiple benefits because, if implemented, these Action Items will mitigate or prevent damages from more than one type of natural hazards. For example, updating the Subdivision Regulations to require new utility lines be placed underground will prevent property damage and loss of service in the event of high winds (tornado or hurricane) or severe snow and ice storms.

General Mitigation Action Items

Goal Statement: To mitigate the long term consequences of natural disasters in the Town of Holland and minimize loss of life and injury to residents. In addition we strive to provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.

Action Item: Collect, periodically update, and disseminate information on which local radio stations provide emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2013

Flooding

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

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

Action Item 1: Control sediment erosion into lake with drainage improvements above the lake.

Responsible Department/Board: Highway Department, Town Council,
Proposed Completion Date: 2020

Action Item 2: Dredge Hamilton Reservoir to increase flood storage capacity.

Responsible Department/Board: Board of Selectmen, Highway Department, Conservation Commission, Lake Oversight Commission
Proposed Completion Date: 2030

Action Item 3: Install erosion control/drainage projects to control sediment erosion into lake on the streets above the lake.

Responsible Department/Board: Department of Public Works, Conservation Commission
Proposed Completion Date: 2020

Action Item 4: Make improvements to private streets and East Brimfield Road to reduce flooding hazards.

Responsible Department/Board: Conservation Commission, Board of Selectmen, Highway Department
Proposed Completion Date: 2014

Action Item 5: Develop a Beaver Management Strategy.

Responsible Department/Board: Board of Health, Fire Department, Highway Department
Proposed Completion Date: 2014

Action Item 6: Consider adding flood prevention and mitigation to the purpose section of the Subdivision Rules and Regulations.

Responsible Department/Board: Planning Board
Proposed Completion Date: 2014

Action Item 7: Consider implementing standards in the Subdivision Rules and Regulations to require temporary and permanent erosion control measures for streams and surface water bodies.

Responsible Department/Board: Planning Board, Conservation Commission

Proposed Completion Date: 2014

Action Item 8: Consider adding more specific impacts to address in the Special Permit process including topographic change, removal of cover vegetation, risk of erosion or siltation and increased stormwater runoff.

Responsible Department/Board: Planning Board, Conservation Commission

Proposed Completion Date: 2014

Action Item 9: The town should evaluate whether to become a part of FEMA's Community Rating System.

Responsible Department/Board: Board of Selectmen, Emergency Management Director

Proposed Completion Date: 2014

Action Item 10: Raise Mashapaug Road causeway to reduce flood hazard.

Responsible Department/Board: Board of Selectmen, Highway Department

Proposed Completion Date: 2020

Severe Snow Storms/Ice Storms

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

Action Item: Move the tree line back on major roads (Sturbridge Road, Stafford Road, Brimfield Road, East Brimfield Road, Mashapaug Road, and Sandhill Road) in order to reduce conflict with electrical wires.

Responsible Department/Board: Tree Warden, Emergency Management Director, Board of Selectmen, Utility

Proposed Completion Date: 2020

Hurricanes and Tornadoes

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

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

Action Item1 : Study and implement most effective method of debris management.

Responsible Department/Board: Board of Selectmen, Planning Board

Proposed Completion Date: 2015

Action Item 2 Move the tree line back on major roads (Sturbridge Road, Stafford Road, Brimfield Road, East Brimfield Road, Mashapaug Road, and Sandhill Road) in order to reduce conflict with electrical wires

Responsible Department/Board: Tree Warden, Emergency Management Director, Board of Selectmen, Utility

Proposed Completion Date: 2020

Wildfires/Brushfires

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

Action Items: None

Earthquakes

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

Action Item: None

Dam Failure

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

Action Item: Continue to implement dam safety inspections.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: Ongoing

Drought

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

Action Item: Prepare a pamphlet on water conservation strategies to be distributed to residents of Holland.

Responsible Department/Board: Board of Selectmen

Proposed Completion Date: 2014

Man-Made Hazards/Hazardous Materials

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

Action Item: None

Prioritized Implementation Schedule

Summary of Critical Evaluation

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

- Ability to reduce disaster damage
- Social acceptability
- Ability to complete or be combined w/other actions
- Technical feasibility / potential success
- Impact on the environment
- Administrative workability
- Ability to meet regulations
- Political acceptability
- Ability to save or protect historic structures
- Legal implementation

- Ability to meet other community objectives
- Economic impact
- The duration of its implementation period
- Environmental compatibility

Project Prioritization

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

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

**PRIORITIZED IMPLEMENTATION SCHEDULE
(ACTION PLAN)
IMPLEMENTATION STRATEGY FOR PRIORITY MITIGATION ACTIONS**

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

MITIGATION ACTION	RESPONSIBLE DEPARTMENT/BOARD	PROPOSED COMPLETION DATE	POTENTIAL FUNDING SOURCE(S)	ESTIMATED COST
Control sediment erosion into lake with drainage improvements above the lake.	Highway Department, Town Council	2020	HMPG	N/A
Move the tree line back on major roads (Sturbridge Road, Stafford Road, Brimfield Road, East Brimfield Road, Mashapaug Road, and Sandhill Road) in order to reduce conflict with electrical wires.	Tree Warden, Emergency Management Director, Board of Selectmen, Utility	2020	Utility, HMPG	N/A
Dredge Hamilton Reservoir to increase flood storage capacity.	Board of Selectmen, Highway Department, Conservation Commission, Lake Oversight Commission	2030	HMGP, DCR	N/A
Install erosion control/drainage projects to control sediment erosion into lake on the streets above the lake	DPW, Conservation Commission	2020	HMGP, DCR	N/A
Make improvements to private streets and East Brimfield Road to reduce flooding hazards.	Conservation Commission, Board of Selectmen, Highway Department,	2014	HMPG, MassWorks	N/A
Develop a Beaver Management Strategy.	Board of Health, Fire Department, Highway Department	2014	Town	N/A
Consider adding flood prevention and mitigation to the purpose section of the Subdivision Rules and Regulations.	Planning Board	2014	Town, DLTA	N/A

MITIGATION ACTION	RESPONSIBLE DEPARTMENT/BOARD	PROPOSED COMPLETION DATE	POTENTIAL FUNDING SOURCE(S)	ESTIMATED COST
Consider implementing standards in the Subdivision Rules and Regulations to require temporary and permanent erosion control measures for streams and surface water bodies.	Planning Board, Conservation Commission	2014	Town, DLTA	N/A
Consider adding more specific impacts to address in the Special Permit process including topographic change, removal of cover vegetation, risk of erosion or siltation and increased stormwater runoff.	Planning Board, Conservation Commission	2014	Town, DLTA	N/A
The town should evaluate whether to become a part of FEMA's Community Rating System.	Board of Selectmen, Emergency Management Director	2014	Town	N/A
Raise Mashapaug Road causeway to reduce flood hazard.	Board of Selectmen, Highway Department	2020	HMGP, DCR, MassWorks	N/A
Study and implement most effective method of debris management.	Board of Selectmen, Planning Board	2015	Town	N/A
Prepare a pamphlet on water conservation strategies to be distributed to residents of Holland.	Select Board	2014	Town	N/A
Continue to implement dam safety inspections	Emergency Management Director	Ongoing	Town	
Collect, periodically update, and disseminate information on which local radio stations provide emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.	Emergency Management Director	2013	Town	N/A

7 – PLAN ADOPTION & IMPLEMENTATION

Plan Adoption

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

Plan Implementation

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

Plan Monitoring and Evaluation

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

The Holland Natural Hazards Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan. At a minimum, the committee will review and update the plan every five years as required by FEMA, beginning in the fall of 2018. The meetings of the committee will be organized and facilitated by the Emergency Management Director or the Holland Board of Selectmen.

CERTIFICATE OF ADOPTION

TOWN OF HOLLAND, MASSACHUSETTS

BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE HOLLAND

HAZARD MITIGATION PLAN

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

WHEREAS, several public planning meetings were held between _____ 2006 and _____ 2013 regarding the development and review of the Holland Hazard Mitigation Plan; and

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

WHEREAS, a duly-noticed public hearing was held by the Holland Board of Selectmen on _____, 2013 to formally approve and adopt the Holland Hazard Mitigation Plan.

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

ADOPTED AND SIGNED this _____, 2013.

_____, Chair Holland Board of Selectmen

_____ Holland Board of Selectmen

_____ Holland Board of Selectmen

ATTEST

APPENDICES

Appendix A

TECHNICAL RESOURCES

1) Agencies

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

US Department of the Interior: US Fish and Wildlife Service	413/253-8200
US Geological Survey	508/490-5000

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP)	Massachusetts Emergency Management Agency
406 Public Assistance and Hazard Mitigation	Massachusetts Emergency Management Agency
Community Development Block Grant (CDBG).....	DHCD, also refer to RPC
Dam Safety Program.....	MA Division of Conservation and Recreation
Disaster Preparedness Improvement Grant (DPIG)	Massachusetts Emergency Management Agency
Emergency Generators Program by NESEC*	Massachusetts Emergency Management Agency
Emergency Watershed Protection (EWP) Program.....	USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMAP).....	Massachusetts Emergency Management Agency
Flood Plain Management Services (FPMS).....	US Army Corps of Engineers
Mitigation Assistance Planning (MAP).....	Massachusetts Emergency Management Agency
Mutual Aid for Public Works.....	Western Massachusetts Regional Homeland Security Advisory Council
National Flood Insurance Program (NFIP)*	Massachusetts Emergency Management Agency
Power of Prevention Grant by NESEC*	Massachusetts Emergency Management Agency
Roadway Repair & Maintenance Program(s).....	Massachusetts Highway Department
Section 14 Emergency Stream Bank Erosion & Shoreline Protection	US Army Corps of Engineers
Section 103 Beach Erosion.....	US Army Corps of Engineers
Section 205 Flood Damage Reduction.....	US Army Corps of Engineers
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 NH BEM 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. The NH Office of Energy & Planning can provide additional information regarding participation in the NFIP-CRS Program.

3) Websites

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

Appendix B

Documentation of the Planning Process

Holland Hazard Mitigation Planning Committee

Meeting #1

AGENDA

December 6, 2006 at 9:00 AM
Holland Town Hall

1) Introduction

2) Purpose of Committee

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

3) What is Hazard Mitigation Planning?

- PowerPoint Presentation on Hazard Mitigation

4) Step 1: Organize Hazard Mitigation Team

- Establish a chairperson/point of contact

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

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

6) Question and Answer Period

Holland Hazard Mitigation Planning Committee

Meeting #2

AGENDA

January 5, 2007 at 9:30AM
Holland Town Hall

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

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

2) Develop Base Map with Critical Facilities

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

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

3) Question and Answer Period

4) Set Goals for Next Meeting

Holland Hazard Mitigation Planning Committee

Meeting #3

AGENDA

February 27, 2007 at 9:30 AM
Holland Town Hall

1) Review Identification of Hazards

- Past and Potential
- Critical Facilities

2) Analyze Development Trends

- Looking at Community Change
- Map out Development Patterns

3) Existing Protection Measures

- Review of Draft Existing Protection Measures

4) Question and Answer Period

5) Set Goals for Next Meeting

**Holland Hazard Mitigation Planning Committee
Meeting #4**

AGENDA

**March 14, 2007 at 9:30 AM
Holland Town Hall**

1) Identify What's in Place & Identify gaps in the current protection

- Review Draft Existing Protection Measures
- Identify gaps in existing protection

2) Review of Draft Goal Statements

3) Brainstorm Mitigation Actions

- What actions can be taken?
- Evaluating Action Feasibility

4) Prioritize Final List of Actions

- Select Actions which Best Suit Community's Needs
- Include actions that can be implemented quickly

5) Question and Answer Period

6) Set Goals for Next Meeting

Holland Hazard Mitigation Plan update for re-submission
Meeting #1
11/19/2012

To do:

- 1) Re-convene Hazard Mitigation committee
- 2) Update Hazard data
- 3) Review and revise as necessary Priority ranking of hazards
- 4) Affirm critical facilities
- 5) Determine if any additional mitigation strategies should be added to “current mitigation strategies” chapter
- 6) Affirm and/or revise as necessary Future Mitigation strategies
- 7) Public involvement
- 8) Plan maintenance

**Holland Hazard Mitigation Plan update for re-submission
Meeting #2
12/12/2012**

To do:

- 1) Receive comments from Committee
- 2) Finalize Public involvement plans and activities
- 3) Plan maintenance—determine roles and responsibilities

**Holland Hazard Mitigation Plan update for re-submission
Meeting #3
1/9/2013**

To do:

- 1) Finalize plan

MEDIA RELEASE

CONTACT: Catherine Ratté, PVPC Principal Planner, (413) 781-6045
Josiah Neiderbach, PVPC Land Use and Environmental Planner, (413) 781-6045
JoAnne Higgins, Town of Holland, (413) 245-7108 x106

FOR IMMEDIATE RELEASE
February 27, 2013

Town of Holland to Present Draft Hazard Mitigation Plan at Public Forum

Residents of the Town of Holland are invited to a public forum **Tuesday, March 12** at 6:30 p.m. to learn about and provide feedback on a draft hazard mitigation plan for the town. The meeting will be held on the second floor of Holland Town Hall in the Assessor's Office.

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 Holland. Municipal officials from the Town of Holland and staff from the Pioneer Valley Planning Commission will be available to answer questions and listen to comments on the draft plan.

The draft plan, which is posted at www.pvpc.org and <http://town.holland.ma.us>, was produced by the Town along with the Pioneer Valley Planning Commission.

This planning effort is being undertaken to help the Town of Holland 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 JoAnne Higgins from the Town of Holland (assessor@townofholland.necoxmail.com) at (413) 245-7108 x106, or PVPC's Catherine Ratté (cratte@pvpc.org) or Josiah Neiderbach (jneiderbach@pvpc.org) at (413) 781-6045.

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Appendix C

List of Acronyms

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

Past and Potential Hazards/Critical Facilities Map
