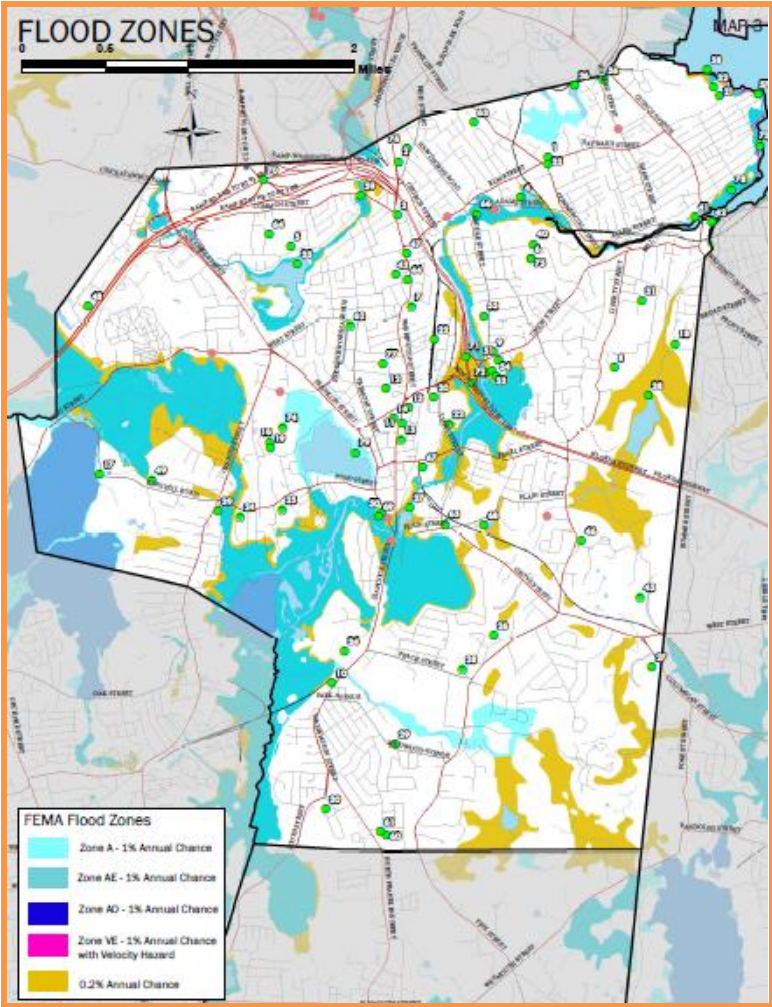


TOWN OF NAHANT HAZARD MITIGATION PLAN UPDATE



**Draft for Review by MEMA & FEMA
June, 2011**



TOWN OF NAHANT HAZARD MITIGATION PLAN

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TOWN OF NAHANT HAZARD MITIGATION PLAN

ACKNOWLEDGEMENTS AND CREDITS

This plan was prepared for the Town of Nahant by the Metropolitan Area Planning Council (MAPC) under the direction of the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR). The plan was funded by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM) Grant Program.

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Robert C. Dwyer	Chief, Nahant Police Department
Dennis Ball	Emergency Management Director

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I. EXECUTIVE SUMMARY

Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, to adopt a local multi-hazard mitigation plan and update this plan in five year intervals.

Planning Process

Planning for the Nahant Hazard Mitigation Plan update was led by the Nahant Local Hazard Mitigation Planning Committee, composed of staff from a number of different Town Departments. This committee discussed where the impacts of natural hazards most affect the Town, goals for addressing these impacts, and hazard mitigation measures that would benefit the Town.

Public participation in this planning process is important for improving awareness of the potential impacts of natural hazards and to build support for the actions the Town takes to mitigate them. The Town hosted two public meetings, the first on April 26 and the second on May 10. The plan also was posted on the Town's website for public review.

Risk Assessment

The Nahant Hazard Mitigation Plan assesses the potential impacts to the Town from flooding, high winds, winter storms, brush fire, and geologic hazards. Flooding, driven by hurricanes, northeasters and other storms, clearly presents the greatest hazard to the Town.

The Nahant Local Committee identified those areas where flooding most frequently occurs, comprising 54 % of the Town's land area, and approximately 744 buildings worth an estimated \$182,339,195.00

Hazard Mitigation Goals

1. Ensure that critical infrastructure sites are protected from natural hazards.
2. Protect existing residential and business areas from flooding.
3. Maintain existing mitigation infrastructure in good condition.
4. Continue to enforce existing zoning and building regulations.

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5. Educate the public about zoning and building regulations, particularly with regard to changes in regulations that may affect tear-downs and new construction.
6. Work with surrounding communities to ensure regional cooperation and solutions for hazards affecting multiple communities such as coastal erosion.
7. Encourage future development in areas that are not prone to natural hazards.
8. Educate the public about natural hazards and mitigation measures.
9. Make efficient use of public funds for hazard mitigation.
10. Protect the Town's ability to respond to various natural hazard events.

Hazard Mitigation Strategy

The Nahant Local Committee identified a number of mitigation measures that would serve to reduce the Town's vulnerability to natural hazard events. These include repairs to existing coastal infrastructure and seawalls, dredging of the Bear Pond tributary drainage areas, updating emergency generating capacity and purchasing new emergency stormwater pumps.

Overall, the hazard mitigation strategy recognizes that mitigating hazards for Nahant will be an ongoing process as our understanding of natural hazards and the steps that can be taken to mitigate their damages changes over time. Global climate change and the accompanying changes to sea level and average temperatures impact the Town's vulnerability, and local officials will need to work together across municipal lines and with state and federal agencies in order to understand and address these changes. The Hazard Mitigation Strategy will be incorporated into other related plans and policies.

Plan Review and Update Process

Table 1 Plan Review and Update

Chapter	Reviews and Updates
III – Planning Process & Public Participation	The Nahant Local Committee placed an emphasis on public participation for the update of the Hazard Mitigation Plan, discussing strategies to enhance participation opportunities at the first local committee meeting. During plan development, the plan was discussed at two public meetings; the first hosted by the LEPC and the second a general public meeting. The plan was also available on the Town's website for public comment.
IV – Risk Assessment	MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. Town staff reviewed critical infrastructure with

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	MAPC staff in order to create an up-to-date list. MAPC also used the most recently available version of HAZUS and assessed the potential impacts of flooding using the latest data.
V - Goals	The Hazard Mitigation Goals were reviewed and endorsed by the Local Hazard Mitigation Committee.
VI – Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the Town.
VII & VIII – Hazard Mitigation Strategy	Mitigation measures from the 2005 plan were reviewed and assessed as to whether they were completed, in-process, or deferred. The Local Committee determined whether to carry forward measures into the 2011 plan or delete them. The 2011 Hazard Mitigation Strategy reflects both new measures and measures carried forward from the 2005 plan. The Committee re-prioritized all of these measures based on current conditions.
IX – Plan Adoption & Maintenance	This section of the plan was updated with a new on-going plan implementation review and five year update process that will assist the Town in incorporating hazard mitigation issues into other Town planning and regulatory review processes and better prepare the Town to update the plan in 2016.

As indicated on Table 15, Nahant has made progress on implementing mitigation measures identified in the 2005 Hazard Mitigation Plan and the 2008 Flood Hazard Mitigation Plan. Many of the measures identified in that plan are now considered on-going aspects of the regular work of Town staff. The Town continues to seek funding to support implementation of many of the identified projects. Moving forward into the next five year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town’s decision making processes.

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II. INTRODUCTION

Planning Requirements under the Federal Disaster Mitigation Act

The Federal Disaster Mitigation Act, passed in 2000, requires that after November 1 2004, all municipalities that wish to continue to be eligible to receive FEMA funding for hazard mitigation grants, must adopt a local multi-hazard mitigation plan and update this plan in five year intervals. This planning requirement does not affect disaster assistance funding.

Massachusetts has taken a regional approach and has encouraged the regional planning agencies to apply for grants to prepare plans for groups of their member communities. The Metropolitan Area Planning Council (MAPC) received a grant from the Federal Emergency Management Agency (FEMA) under the Pre-Disaster Mitigation (PDM) Program, to assist the Town of Nahant and nine other South Shore communities to update their local Hazard Mitigation Plans, which were first adopted in as part of a South Shore Regional Hazard Mitigation Plan. The local Hazard Mitigation Plan updates produced under this grant are designed to individually meet the requirements of the Disaster Mitigation Act for each community.

In order to address multijurisdictional and regional issues, the participating municipalities were afforded the opportunity to meet with their neighboring communities during plan development, and MAPC has also produced a regional document that summarizes the issues and recommendations for the South Shore communities.

What is a Hazard Mitigation Plan?

Natural hazard mitigation planning is the process of determining how to systematically reduce or eliminate the loss of life and property damage resulting from natural hazards such as floods, earthquakes, and hurricanes. Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries, and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects, and other activities.

Previous Federal/State Disasters

The Town of Nahant has experienced 17 natural hazards that triggered federal or state disaster declarations since 1991. These are listed in Table 1 below. The vast majority of these events involved flooding.

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Table 2 Previous Federal/State Disaster Declarations

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
Hurricane Bob (August 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (16 projects)
No-Name Storm (October 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	FEMA Individual Household Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (10 projects)
March Blizzard (March 1993)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 1996)	FEMA Public Assistance Project Grants	All 14 Counties
May Windstorm (May 1996)	State Public Assistance Project Grants	Counties of Plymouth, Norfolk, Bristol (27 communities)
October Flood (October 1996)	FEMA Public Assistance Project Grants	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	FEMA Individual Household Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk

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DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
	Hazard Mitigation Grant Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk (36 projects)
1997	Community Development Block Grant-HUD	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
June Flood (June 1998)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (19 projects)
(1998)	Community Development Block Grant-HUD	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
March Flood (March 2001)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (16 projects)
February Snowstorm (Feb 17-18, 2003)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 22-23, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
Hurricane Katrina (August 29, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
May Rainstorm/Flood (May 12-23, 2006)	Hazard Mitigation Grant Program	Statewide
April Nor'easter (April 15-27, 2007)	Hazard Mitigation Grant Program	Statewide
Flooding (March, 2010)	FEMA Public Assistance FEMA Individuals and Households Program SBA Loan	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester

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DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
	Hazard Mitigation Grant Program	Statewide

(Source: database provided by MEMA)

FEMA Funded Mitigation Projects

Over the last 20 years the Town of Nahant has received funding from FEMA for X mitigation projects under the Flood Mitigation Assistance (FMA) program. These projects totaled \$222,500 with \$166,875 covered by FEMA grants and \$55,625 by local funding. The projects are summarized in Table 3 below.

Table 3 FEMA-Funded Mitigation Projects

Year	Project Title (Funding Source)	Scope of Work	Total Cost	Federal Funding	Local Funding
2005	Bear Pond Drainage Improvements	Upgraded headwall, replaced metal drain pipe, upgraded reinforced concrete vault and tide gate, installed drain manhole, and slip line.	\$132,000.00	\$99,000.00	\$33,000.00
2008	Improvements to Bear Pond Outlet	Project consisted of pouring 6" concrete easement, replacing duckbill valves, and replacing riprap.	\$90,500.00	\$67,875.00	\$22,625.00

(Source: database provided by MEMA)

Community Profile

The Town of Nahant is a resort town of rocky coasts in the southernmost part of Essex County. Used in early colonial days as a grazing area for cattle, sheep and goat flocks owned by Lynn residents, Nahant very soon became a maritime community with a small population devoted to fishing. Settlers were granted land for home sites but only if they also spent time fishing and small boat fishing developed before 1640. Disputed land claims were the hallmark of the town's early years since the Indian Sagamore George apparently sold the same town site to three different sets of people.

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Incorporated in 1853, the town was the site of the most massive hotel complex on the Atlantic Coast and the location of an annual regatta. By the end of the 19th century, there was a visible shift away from hotels and toward residences. An era of skyrocketing growth began about 1870 and continued unabated for the next four decades with construction firms putting up hundreds of summer homes for visitors to the town. In the modern era, Nahant has protected its residential status and farming and industrial activities have disappeared. (Source: Town of Nahant website)

The town maintains a website at <http://www.nahant.org/default.shtml>.

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III. PLANNING PROCESS AND PUBLIC PARTICIPATION

Public participation occurred at two levels; the North Shore Multiple Hazard Community Planning Team (regional committee) and the Nahant Multiple Hazard Community Planning Team (local committee). In addition, the town held two meetings open to the general public to present the plan and hear citizen input.

Nahant's Participation in the Regional Committee

On January 15, 2010 a letter was sent notifying the communities of the first meeting of the North Shore Regional Committee and requesting that the Chief Elected Official designate officials to represent the community. The following individual attended representing Nahant on the regional committee:

Michael Halley Emergency Management Director/ Police

The North Shore Regional Committee met on February 8, 2010. At that meeting, Nahant's representative reviewed hazard mitigation strategies with representatives from the neighboring cities and towns of Beverly, Lynn, Peabody, Revere, Salem, Saugus, Swampscott and Winthrop.

The Local Multiple Hazard Community Planning Team

In addition to the regional committee meetings, MAPC worked with the local community representatives to organize a local Multiple Hazard Community Planning Team for Nahant (local committee). MAPC briefed the local representatives as to the desired composition of that team as well as the need for representation from the business community and citizens at large.

The Local Multiple Hazard Community Planning Team Meetings

On August 27, 2010 MAPC conducted the meeting of the Nahant Local Committee. The meeting was organized by Mark Cullinan, Nahant Town Administrator. The purpose of the meeting was to re-introduce the PDM program, develop hazard mitigation goals, review the status of mitigation measures identified in the 2005 hazard mitigation plan, gather information on local hazard mitigation issues and identify priority potential mitigation measures. Table 4 lists the attendees at the team meeting. The agenda for this meeting is included in Appendix A.

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Table 4
Attendance at the Nahant Local Committee Meeting

Name	Representing
<i>August 27, 2010</i>	
Mark Cullinan	Town Administrator
Timothy Lowe	Superintendent, DPW
Edward Hyde	Nahant Fire Chief
Robert C. Dwyer	Nahant Police Chief
Michael J. Halley	EMD/Police

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Public Meetings

The plan was introduced to the public at two public meetings, once during the planning process and once after a final draft plan was completed. The public had an opportunity to provide input to the planning process during meetings of the Board of Selectmen on April 28, 2011 and also at a Planning Board meeting on May 10, 2011. Approximately thirty people attended the Board of Selectmen’s public meeting and about ten attended the Planning Board public meeting. Both meetings were advertised on the town website and in local newspapers prior to the meeting.

The draft plan was also placed on the town’s website for ten days for review and public comments.

**Table 5
Attendance at Public Meetings**

Name	Representing
<u>Board of Selectmen Public Meeting</u>	
Richard Lombard, Chairman	
Elaine Titus, Vice Chair	
Michael P. Manning, Secretary	
Charles H. Riley, Town Counsel	
Mark Cullinan, Town Administrator	
Dennis Ball, EMD	
Sam Cleaves, MAPC	
<u>Planning Board Public Meeting</u>	
Richard Snyder, Chairman	
Cal Hastings, Vice Chair	
Teri Motley, Secretary	
Carl Easton	
Sheila Hambleton	
Daniel Perepelitza	
Sam Cleaves, MAPC	

Other Opportunities for Public Involvement

Website

Draft copies of the Nahant Hazard Mitigation Plan were posted on the Town’s website for review and comment for a ten period. Members of the public could access the draft document and submit comments or questions.

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IV. RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the Town of Nahant as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large scale natural hazard events.

Update Process

In order to update Nahant's risk assessment, MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. MAPC also used the most recently available version of HAZUS (described below).

Overview of Hazards and Impacts

The Massachusetts Hazard Mitigation Plan 2007 (state plan) provides an in-depth overview of natural hazards in Massachusetts. The state plan indicates that Massachusetts is subject to the following natural hazards (listed in order of frequency); floods, heavy rainstorms, nor'easters or winter storms, coastal erosion, hurricanes, tornadoes, wildfires, drought and earthquakes. Previous state and federal disaster declarations since 1991 are summarized in Table 1.

Table 6 summarizes the hazard risks for Nahant. This evaluation takes into account the frequency of the hazard, historical records, and variations in land use. This analysis is based on the vulnerability assessment in the Commonwealth of Massachusetts State Hazard Mitigation Plan, 2007. The statewide assessment was modified to reflect local conditions in Nahant using the definitions for hazard frequency and severity listed below Table 6.

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**Table 6
Hazard Risks Summary**

Hazard	Frequency	Severity
Flood	High	Minor
<i>Dam Failure</i>	Low	Minor
Wind		
<i>Hurricanes</i>	Medium	Serious
<i>Tornadoes</i>	Low	Serious
Winter storms	High	Minor
Brush Fire	Medium	Minor
Geologic		
<i>Earthquakes</i>	Low	Extensive
<i>Landslides</i>	Low	Minor

Definitions used in the Commonwealth of Massachusetts State Hazard Mitigation Plan

Frequency

Very low frequency: events that occur less frequently than once in 1,000 years (less than 0.1% per year)

Low frequency: events that occur from once in 100 years to once in 1,000 years (0.1% to 1% per year);

Medium frequency: events that occur from once in 10 years to once in 100 years (1% to 10% per year);

High frequency: events that occur more frequently than once in 10 years (greater than 10% per year).

Severity

Minor: Limited and scattered property damage; no damage to public infrastructure (roads, bridges, trains, airports, public parks, etc.); contained geographic area (i.e. one or two communities); essential services (utilities, hospitals, schools, etc) not interrupted; no injuries or fatalities.

Serious: Scattered major property damage (more than 50% destroyed); some minor infrastructure damage; wider geographic area (several communities); essential

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Flood Related Hazards

Flooding was the most prevalent serious natural hazard identified by local officials in Nahant. Flooding is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms. Sea level rise has the potential to exacerbate these issues over time.

Regionally Significant Floods

There have been a number of major floods that have affected the South Shore region over the last fifty years. Significant historic flood events in Nahant have included:

- March 1968
- The blizzard of 1978
- January 1979
- April 1987
- October 1991 (“The Perfect Storm”)
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007
- March 2010

Overview of Town-Wide Flooding

The Town of Nahant is subject to two kinds of flooding; coastal flooding where wind and tide leads to flooding along tidal waterways and inland flooding where the rate of precipitation or amount of water overwhelms the capacity of natural and structured drainage systems to convey water causing it to overflow the system. These two types of flooding are often combined as inland flooding is prevented from draining by the push of wind and tide driven water. Both types of flooding can be caused by major storms, known as northeasters and hurricanes. Northeasters can occur at any time of the year but they are most common in winter. Hurricanes are most common in the summer and early fall. Northeasters cover a larger area than hurricanes although the winds are not as high. They also generally last long enough to include at least one high tide, which causes the most severe flooding. Large rain storms or snowfalls can also lead to inland flooding.

The primary flood hazard area in the Town has been the Bear Pond neighborhood. The area that flooded consisted of 52 homes and two businesses. These structures would receive floodwaters up to 10 feet during the 100 year storm about once every 10 years. Another problem in this area was damage to roadways due to stone debris being lifted over the seawall by storm surge wave action and being deposited on the roads about once a year. This flooding has been resolved by the Bear Pond pump station project.

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Other flood hazard areas identified in the Comprehensive Emergency Management Plan include:

- The Causeway.
- Little Nahant Road to Antigo Way, Lowlands, Lower Castle Road, Ward Road and Lower Fox Hill Road.
- Basspoint Road from Gardner to Trimountain.
- Willow Road from Oceanview to Winter Street.
- Willow Road at Furbush Road.

Potential Flood Hazard Areas

Information on potential flood hazard areas was taken from two sources. The first was the National Flood Insurance Rate Maps. The FIRM flood zones (draft) are shown on Map 3 in Appendix B. The second was discussions with local officials. The Locally Identified Areas of Flooding described below were identified by Town staff as areas where flooding is known to occur. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, "Hazard Areas". The numbers do not reflect priority order.

Locally Identified Areas of Flooding

- 1) Nahant Causeway: coastal flooding
- 2) Nahant Road: coastal flooding between Little and Castle Roads
- 3) Basspoint Road: coastal flooding
- 4) Willow Road: coastal flooding
- 5) Willow Road at Furbush Road: coastal flooding

Repetitive Loss Structures

There are 46 repetitive loss structures in Nahant, an increase from the 41 structures identified in the 2005 plan. As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. For more information on repetitive losses see <http://www.fema.gov/business/nfip/replps.shtm>.

Nahant's repetitive loss properties consist of thirty single-family residential structures, with six 2-4 family structures, six other residential structures and four non-residential structures.

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**Table 7
Repetitive Loss Properties Summary**

Structure Type	FEMA Flood Zone	Locally Identified Area of Flooding
2-4 FAMILY	VE	Yes
2-4 FAMILY	VE	Yes
2-4 FAMILY	VE	Yes
2-4 FAMILY	A	No
2-4 FAMILY	VE	Yes
2-4 FAMILY	VE	No
NON RESIDNT	VE	Yes
NON RESIDNT	A	No
NON RESIDNT	VE	No
NON RESIDNT	A	Yes
OTHER RESID	No	No
OTHER RESID	No	No
OTHER RESID	No	No
OTHER RESID	No	No
OTHER RESID	No	No
OTHER RESID	No	No
SINGLE FMLY	No	No
SINGLE FMLY	No	No
SINGLE FMLY	VE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	VE	No
SINGLE FMLY	VE	No
SINGLE FMLY	VE	No
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	0.2 %	No
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	AE	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	VE	Yes

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Structure Type	FEMA Flood Zone	Locally Identified Area of Flooding
SINGLE FMLY	AE	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	No	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	VE	Yes
SINGLE FMLY	No	No

Dams and Dam Failure

There are no dams located within Nahant.

Wind Related Hazards

Wind-related hazards include hurricanes and tornadoes as well as high winds during severe rainstorms and thunderstorms. As with many communities, falling trees that result in downed power lines and power outages are an issue in Nahant. Information on wind related hazards can be found on Map 5 in Appendix B

Hurricanes

Since 1900, 39 tropical storms have impacted New England (NESEC). Massachusetts has experienced approximately 32 tropical storms, nine Category 1 hurricanes, five Category 2 hurricanes and one Category 3 hurricane. This equates to a frequency of once every six years. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. There have been no recorded hurricanes, tropical depressions or tropical storms tracked through Nahant. Both storms passed roughly through the center of the Town. The Town experiences the impacts of the wind and rain of hurricanes and tropical storms regardless of whether the storm track passed through the town. The hazard mapping indicates that the 100 year wind speed is 110 miles per hour.

Some of the hurricanes that have passed through the region include:

Great New England Hurricane*	September 21, 1938
Great Atlantic Hurricane*	September 14-15, 1944
Hurricane Doug	September 11-12, 1950
Hurricane Carol*	August 31, 1954
Hurricane Edna*	September 11, 1954
Hurricane Hazel	October 15, 1954
Hurricane Diane	August 17-19, 1955
Hurricane Donna	September 12, 1960

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Hurricane Gloria
Hurricane Bob
*Category 3

September 27, 1985
August 19, 1991

Given its coastal location, the Town is highly vulnerable to hurricanes. A hurricane is a violent wind and rainstorm with wind speeds of 74-200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits the land. Hurricanes generally occur between June and November.

Tornados

On average, there are six tornadoes that touchdown somewhere in the northeast region every year. Tornadoes are most common in the summer, June through August and most form in the afternoon or evening. Tornadoes are associated with strong thunderstorms. The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC). There have been no recorded tornados within the Town limits.

Winter Storms

Winter storms are the most common and most familiar of the region's hazards that affect large geographic areas. The majority of blizzards and ice storms in the region cause more inconvenience than they do serious property damage, injuries, or deaths. However, periodically, a storm will occur which is a true disaster, and necessitates intense large-scale emergency response. Occasionally winter storms can also hinder the tidal exchange in tidally restricted watersheds and result in localized flooding within these areas. Ice build-up at gate structures can also damage tide gates and increase the hazard potential as a result of malfunctioning tide gates.

In Massachusetts, northeast coastal storms known as nor'easters occur 1-2 times per year. Winter storms are a combination hazard because they often involve wind, ice and heavy snow fall. The average annual snowfall for most of the Town is 48.1 - 72 inches.

The most significant winter storm in recent history was the "Blizzard of 1978," which resulted in over 3 feet of snowfall and multiple day closures of roadways, businesses, and schools. Historically, severe winter storms have occurred in the following years:

Blizzard of 1978	February 1978
Blizzard	March 1993
Blizzard	January 1996
Severe Snow Storm	March 2001
Severe Snow Storm	December 2003
Severe Snow Storm	January 2005
Severe Snow Storm	December 2010
Severe Snow Storm	January 2011

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Massachusetts experienced a record year for snowfall in 2008. By the end of the February 2008, Boston's Logan International Airport broke a new February record for total precipitation. In March 2008, many cities and towns in Massachusetts exceeded the highest snowfall records. The above-average snowfall that season increased groundwater and surface water levels to a high level, and contributed to flooding experienced in spring 2008.

Snowfall in winter 2010-11 has also approached the record mark with 60.3 inches measured at Logan for the season as of the end of January. Snow came in a series of severe storms, some of which included serious flooding in the South Shore area. The current winter snowfall record is 107.6 inches set in 1996-96.

Information on winter storm related hazards can be found on Map 6 in Appendix B.

Brush Fire Related Hazards

The Fire Department responds to approximately 10 - 12 brush fires of varying sizes annually, ranging from very small mulch fires to small woods fires. Within the past year, there were none that resulted in significant property damage. The most common cause of wildfires is the careless disposal of smoking materials and recreational users near salt marsh areas that have large amounts of dead beach grass, wood and brush. Brush fires in Nahant are responded to as regular fire by the Fire Department. The Town normally utilizes a four wheel drive, 2.5 ton truck with attached 250-gallon tank and pump to fight brush fires. Outdoor burning is allowed by permit from January to April.

The following areas of Town were identified as having the highest potential for brush fires. The numbers correspond to the numbers on Map 8, "Hazard Areas":

- 6) Lowlands Area
- 7) Willow Road at White Way
- 8) Furbush Road
- 9) Bailey's Hill
- 10) East Point Park

Geologic Hazards

Geologic hazards include earthquakes, landslides, sinkhole, subsidence, and unstable soils such as fill, peat, and clay. Although new construction under the most recent building codes generally will be built to seismic standards, there are still many structures which pre-date the most recent building code. Information on geologic hazards can be found on Map 4 in Appendix B.

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Earthquakes

Damage in an earthquake stems from ground motion, surface faulting, and ground failure in which weak or unstable soils, such as those composed primarily of saturated sand or silts, liquefy. The effects of an earthquake are mitigated by distance and ground materials between the epicenter and a given location. An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology (NESEC). According to the Boston College Weston Observatory, in most parts of New England, there is a one in ten chance that, a potentially damaging earthquake will occur in a 50 year time period.

According to the State Hazard Mitigation Plan, New England experiences an average of five earthquakes per year. From 1668 to 2007, 355 earthquakes were recorded in Massachusetts (NESEC). The region has experienced larger earthquakes, including a magnitude 6.0 quake that struck in 1755 off the coast of Cape Anne. More recently, a pair of damaging earthquakes occurred near Ossipee, NH in 1940. There has been one recorded earthquake epicenter in Nahant, located right at the Quincy border, south-west of the route three interchange with route 93. This quake occurred in 1979 and had a magnitude of 2.2, which is close to the smallest quake normally felt by people.

Earthquake Impacts – Earthquakes are a hazard with multiple impacts beyond the obvious building collapse. Buildings may suffer structural damage which may or may not be readily apparent. Earthquakes can cause major damage to roadways, making emergency response difficult. Water lines and gas lines can break, causing flooding and fires. Another potential vulnerability is equipment within structures. For example, a hospital may be structurally engineered to withstand an earthquake, but if the equipment inside the building is not properly secured, the operations at the hospital could be severely impacted during an earthquake. Earthquakes can also trigger landslides.

Landslides

Landslides can result from human activities that destabilize an area or can occur as a secondary impact from another natural hazard such as flooding. In addition to structural damage to buildings and the blockage of transportation corridors, landslides can lead to sedimentation of water bodies.

Portions of Little Nahant and the Causeway areas have been classified as having a low risk for landslides while the rest of Nahant is considered to be at moderate risk. There are no recorded instances of landslides having occurred in the Town of Nahant.

Land Use and Development Trends

Existing Land Use

The most recent land use statistics available from the state are from aerial photography done in 2005. Table 8 shows the acreage and percentage of land in 33 categories. If the

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four residential categories are aggregated, residential uses make up 47.65% of the area of the town (802.64 acres). The highest percentage use is Salt Water Sandy Beach which comprises 27.44% (220.26 acres).

**Table 8
2005 Land Use**

Land Type	Acres	Percent
Crop Land	0	0
Pasture	0	0
Forest	50.96	6.35
Wetland	15.98	1.99
Mining	0	0
Open Land	20.75	2.58
Participation Recreation	22.97	2.86
Spectator Recreation	0	0
Water-Based Recreation	11.43	1.42
Multi-Family Residential	16.48	2.05
High Density Residential	115.56	14.40
Medium Density Residential	172.82	21.53
Low Density Residential	77.29	9.63
Salt Water Wetland	0.63	0.078
Commercial	8.97	1.12
Industrial	0	0
Urban Open	1.490	0.18
Transportation	0	0
Waste Disposal	0	0
Water	1.85	0.23
Cranberry Bog	0	0
Power line	0	0
Saltwater Sandy Beach	220.26	27.44
Marina	4.65	0.58
Golf Course	27.32	3.40
Urban Public	25.71	3.20
Cemetery	6.66	0.83
Orchard	0	0
Nursery	0	0
Forested Wetland	0.51	0.06
Very Low Density Res.	0.34	0.04
Junkyards	0	0
Brushland/Successional	0	0
Total Acres	802.64	100

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Economic Elements

The smallest town in the Commonwealth of Massachusetts, Nahant is 1.04 square miles with a population of 3,632 (2010 U. S. Census). The two main sections of Nahant are connected by another causeway and are known as Big Nahant and Little Nahant. It is largely a bedroom community for Boston and other cities. There is convenient commuter rail service for the fourteen miles to Boston from the neighboring communities of Lynn and Swampscott. Logan Airport is twenty minutes by car to the south. Lobstering is the primary industry on Nahant, employing about 25- 30 people, including those at the Nahant Fish and Lobster Company with few other employers. The Town does include a function hall, a golf course, two restaurants, a bank, a car-repair garage, three convenience stores, a real-estate office, and the Town of Nahant offices. (2008 Nahant Open Space Plan)

Plan participants identified the town's small business center along Nahant Road, across from Short Beach, as an area that is heavily impacted by winter storm events, due to tidal surge and flooding.

Historic, Cultural, and Natural Resource Areas

By the late 1800's, Nahant had grown to become thriving summer resort community featuring many summer estate homes of the Boston well to do. The Town includes several significant historical and cultural landmarks, as well as heritage landscapes, including the following:

- Bailey's Cove-Lewis Cove -Bass Point: Fine ocean views from Bailey's Hill and Bass Point are found here. Bailey's Hill is now protected open space owned by the Town.
- East Point Neighborhood: Once the site of the Henry Cabot Lodge, Jr. summer estate and now the Henry Cabot. East Point also features Lodge Villa on Cliff Street, a National Historic Landmark, the Hammond House, Charles Gibson House and the Village Church.
- Maolis Gardens: Part of the former Tudor Estate, the Gardens once contained an entire amusement park and dining halls.
- Rock Temple: Designed by inventor John Hammond.
- Nahant Country Club: The clubhouse is imbedded in the original 1824 John Tudor estate house.
- Spouting Horn Neighborhood: An area of large estates on Nahant's north coast containing several large estates and coastal features.

Due to its location and spectacular natural beauty, Nahant historically has drawn thousands of visitors from other communities. By the middle of the eighteenth century, it was a major tourist resort and vacation spot for Bostonians escaping the summer heat. Today, the peninsula attracts people for beach-going, jogging, sport fishing, kite flying, windsurfing, kayaking, nature study, and bicycling—to name just a few of the kinds of recreation enjoyed here. Since the peninsula is important as a feeding and resting spot for

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migratory songbirds and shorebirds, as well as a home to a number of nesting species, the conflicting needs between people and wildlife must also be considered.

Nahant has three State-designated Barrier Beaches, one of which is Nahant Beach. The Massachusetts Department of Conservation and Recreation manages a 3,202,000-square-foot reservation along the causeway connecting Nahant and Lynn, which includes Nahant Beach, a bike path, bathroom facilities, and public parking. Use by non-residents of the many other recreational resources, including Lodge Park, Tudor Wharf, Tudor Beach, Marjoram Park, Bailey's Hill, and Short Beach is permitted but as a practical matter is limited due to the lack of public parking. (2008 Nahant Open Space Plan)

Development Trends

The overall growth pattern in Nahant is toward residential rather than commercial use. Some sections of the town are hilly, with complex street patterns and small lots. Other areas, mostly in the Eastern section of Big Nahant, have sizable homes on large lots. There are a few apartment buildings. The largest is the 128-unit Bass Point Apartments, built in 1973 (after a change in the zoning bylaws in 1969), with swimming pool and tennis court. The former J. T. Wilson School on Nahant Road was converted to elderly housing in 1983, and the former Valley Road School was recently acquired by the Nahant Preservation Trust (a nonprofit organization) and is currently used as a Community Center with business office space. Even though the population is in decline, the number of dwelling units is increasing. In the 1960s, it was thought that only one hundred more houses could be built in Nahant, but at least 120 houses were built between then and 1989. Between 1970 and 1980, the number of dwelling units increased about 10 percent (from 1,397 to 1,547), while the population declined by about 5 percent.

As pressure has intensified, land once considered inadequate, unsuitable, or protected by State or Federal statute has been developed. This is plainly visible when looking at houses recently built on stilts or on rock ledges. (2008 Nahant Open Space Plan)

At present, there is concern that the town's zoning bylaw allowing the subdivision of existing lots in the Residential 2 and Residential One Districts into 10,000 square-foot and 30,000 square-foot lots respectively, may threaten the Town's character, increasing density and potentially increasing the number of homes threatened by flooding and storm surge. Current zoning allows for residential development only.

Potential Future Development

MAPC consulted with town staff to determine areas that are likely to be developed in the future, defined for the purposes of this plan as a ten year time horizon. Town staff did not indicate any specific areas that they felt were targeted for potential development.

Information gathered from the 2008 Nahant Open Space Plan does indicate concern over potential subdivision of existing lots into smaller lots and the conversion of existing single-family homes into multi-family units and condominiums. There is also general concern noted that because there are few developable lots, pressure to develop in areas

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prone to flooding and poor drainage could resume, as it did prior to the economic recession beginning in 2008-2009.

Critical Infrastructure in Hazard Areas

Critical infrastructure includes facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, etc.) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). These facilities are listed in Table 10 and are shown on all of the maps in Appendix B.

The purpose of mapping the natural hazards and critical infrastructure is to present an overview of hazards in the community and how they relate to critical infrastructure, to better understand which facilities may be vulnerable to particular natural hazards.

Explanation of Columns in Table 10.

Column 1: ID #: The first column in Table 10 is an ID number which appears on the maps that are part of this plan. See Appendix B.

Column 2: Name: The second column is the name of the site. If no name appears in this column, this information was not provided to MAPC by the community.

Column 3: Type: The third column indicates what type of site it is.

Column 4: Landslide Risk: The fourth column indicates the degree of landslide risk for that site. This information came from NESEC. The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to <http://pubs.usgs.gov/pp/p1183/pp1183.html>.

Column 5: FEMA Flood Zone: The fifth column addresses the risk of flooding. A "No" entry in this column means that the site is not within any of the mapped risk zones on the Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone as follows:

Column 6: Locally-Identified Flood Area: The locally identified areas of flooding were identified by town staff as areas where flooding occurs. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, "Hazard Areas".

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Table 9: Relationship of Critical Infrastructure to Hazard Areas							
ID	NAME	TYPE	Landslide	Within FEMA Flood Zone	Locally Identified Area of Flooding	Average Annual Snow Fall	Hurricane Surge Areas (Category#)
1	Town Hall	Municipal Office	Moderate Risk	No	No	Low	0
2	Spindrift Elderly Housing	Elderly Housing	Moderate Risk	No	No	Low	0
3	Nahant Police Station	Police Station	Moderate Risk	No	No	Low	0
4	Jesmond Nursing Home	Nursing Home	Moderate Risk	No	No	Low	0
5	Nahant No. 79 Substation	Hazardous Materials	Moderate Risk	AE	Nahant Road	Low	1
6	Nahant Fire Station	Fire Station	Moderate Risk	AE	No	Low	2
7	Johnson School (PK -6)	School	Moderate Risk	No	No	Low	0
8	Lowlands Waster water Pump Station	Pumping Station	Moderate Risk	AE	Nahant Road	Low	1
9	DPW Office/Garage	Municipal Office	Moderate Risk	No	No	Low	4
10	Periwinkle Preschool Inc	Child Care	Moderate Risk	No	No	Low	0
11	The Causeway	Barrier Beach	Low Susceptability	AE	Nahant Causeway	Low	2
12	Short Beach	Beach	Moderate Risk	VE	Nahant Road	Low	2
13	Communication Tower	Communication Tower	Moderate Risk	No	No	Low	0
14	Emergency Dispensing Station	Emergency Dispensing Station	Moderate Risk	No	No	Low	0
15	EOC	EOC	Moderate Risk	No	No	Low	0
16	Calgon Station	Water Treatment	Low Risk	AE	No	Low	2
17	Ward Bath house	State Police Substation	Low Risk	VE	No	Low	4
18	DCR Maintenance Facility	State Office	Low Risk	AE	No	Low	2

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Vulnerability Assessment

The purpose of the vulnerability assessment is to estimate the extent of potential damages from natural hazards of varying types and intensities. A vulnerability assessment and estimation of damages was performed for hurricanes, earthquakes, and flooding. The methodology used for hurricanes and earthquakes was the HAZUS-MH software. The methodology for flooding was developed specifically to address the issue in many of the communities where flooding was not solely related to location within a floodplain.

Introduction to HAZUS-MH

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The following overview of HAZUS-MH is taken from the FEMA website. For more information on the HAZUS-MH software, go to <http://www.fema.gov/plan/prevent/hazus/index.shtm>

“HAZUS-MH is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing and evaluating mitigation plans and policies as well as emergency preparedness, response and recovery planning.

HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods and earthquakes on populations.”

There are three modules included with the HAZUS-MH software: hurricane wind, flooding, and earthquakes. There are also three levels at which HAZUS-MH can be run. Level 1 uses national baseline data and is the quickest way to begin the risk assessment process. The analysis that follows was completed using Level 1 data.

Level 1 relies upon default data on building types, utilities, transportation, etc. from national databases as well as census data. While the databases include a wealth of information on the Town of Nahant, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is “subject to a great deal of uncertainty.”

However, for the purposes of this plan, the analysis is useful. This plan is attempting to only generally indicate the possible extent of damages due to certain types of natural disasters and to allow for a comparison between different types of disasters. Therefore,

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this analysis should be considered to be a starting point for understanding potential damages from the hazards. If interested, communities can build a more accurate database and further test disaster scenarios.

Estimated Damages from Hurricanes

The HAZUS software was used to model potential damages to the community from a 100 year and 500 year hurricane event; storms that are .01% and .005% likely to happen in a given year and roughly equivalent to a Category 2 and Category 4 hurricane. The damages caused by these hypothetical storms were modeled as if the storm track passed directly through the Town, bringing the strongest winds and greatest damage potential.

Though there are no recorded instances of a hurricane equivalent to a 500 year storm passing through Massachusetts, this model was included in order to present a reasonable “worst case scenario” that would help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as we enter into a period of more intense and frequent storms.

Table 10
Estimated Damages from Hurricanes

	100 Year	500 Year
Building Characteristics		
Estimated total number of buildings	1,354	1,354
Estimated total building replacement value (Year 2002 \$) (Millions of Dollars)	331	331
Building Damages		
# of buildings sustaining minor damage	213	496
# of buildings sustaining moderate damage	35	266
# of buildings sustaining severe damage	2	69
# of buildings destroyed	2	54
Population Needs		
# of households displaced	8	132
# of people seeking public shelter	2	27
Debris		
Building debris generated (tons)	1,394	7,302
Tree debris generated (tons)	683	1,899
# of truckloads to clear building debris	29	219
Value of Damages (Thousands of dollars)		
Total property damage	\$5,332.38	\$56,417.96
Total losses due to business interruption	\$575.61	\$6,742.94

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Estimated Damages from Earthquakes

The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter had been at the geographic center of the study area. For the purposes of this plan, two earthquakes were selected: magnitude 5.0 and a magnitude 7.0. Historically, major earthquakes are rare in New England, though a magnitude 5 event occurred in 1963.

Table 11
Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics	1,354	1,354
Estimated total number of buildings		
Estimated total building replacement value (Year 2002 \$)(Millions of dollars)	\$331	\$331
Building Damages		
# of buildings sustaining slight damage	238	174
# of buildings sustaining moderate damage	69	509
# of buildings sustaining extensive damage	9	388
# of buildings completely damaged	1	254
Population Needs		
# of households displaced	9	496
# of people seeking public shelter	1	99
Debris		
Building debris generated (tons)	NA	NA
Value of Damages (Millions of dollars)		
Total property damage	\$16.98	\$210.20
Total losses due to business interruption	\$0.74	\$19.42

Estimated Damages from Flooding

MAPC did not use HAZUS-MH to estimate flood damages in Nahant. In addition to technical difficulties with the software, the riverine module is not a reliable indicator of flooding in areas where inadequate drainage systems contribute to flooding even when

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those structures are not within a mapped flood zone. In lieu of using HAZUS, MAPC developed a methodology to give a rough approximation of flood damages.

Nahant is 1.24 square miles or 793.6 acres. 440.2498 acres have been identified by local officials as areas of flooding. This amounts to 54.83120 % of the land area in Nahant. The number of structures in each flood area was estimated by applying the percentage of the total land area to the number of structures (1,354) in Nahant; the same number of structures used by HAZUS for the hurricane and earthquake calculations. HAZUS uses a value of \$244,460.80 per structure for the building replacement value. This was used to calculate the total building replacement value in each of the flood areas. The calculations were done for a low estimate of 10% building damages and a high estimate of 50% as suggested in the FEMA September 2002 publication, "State and Local Mitigation Planning how-to guides" (Page 4-13). The range of estimates for flood damages is \$18,233,919.50 - \$91,169,597.00. These calculations are not based solely on location within the floodplain or a particular type of storm (i.e. 100 year flood).

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Table 12: Estimated Damages from Flooding							
ID	Flood Hazard Area	Approximate Area in Acres	% of Total Land Area	Estimated # of Structures	Replacement Value	Low Estimate of Damages	High Estimate of Damages
1	Nahant Causeway	239.5932	29.8403	404	\$98,762,163.00	\$9,876,216.30	\$49,381,081.00
2	Nahant Road	85.5484	10.6547	145	\$35,643,146.00	\$3,564,314.60	\$17,821,573
3	Basspoint Road	12.7932	1.5933	22	\$5,407,925.60	\$540,792.56	\$2,703,962.80
4	Willow Road	85.9291	10.7021	145	\$35,643,146.00	\$3,564,314.60	\$17,821,573
5	Willow Road at Furbush Road	16.3859	2.0408	28	\$6,882,814.40	\$688,281.44	\$3,441,407.20
	Totals	440.2498	54.83120	744	\$182,339,195.00	\$18,233,919.50	\$91,169,597.00

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V. HAZARD MITIGATION GOALS

The Nahant Local Multiple Hazard Community Planning Team met on February 8, 2011. At that meeting, the team reviewed and discussed the goals from the 2005 Hazard Mitigation Plan for the Town of Nahant. After some discussion, the existing goals were found to still be reflective of the Town's objectives with regard to addressing hazard mitigation in the community.

The following ten goals were endorsed by the Committee for the 2011 update of the Nahant Hazard Mitigation Plan:

1. Prevent and reduce the loss of life, injury, public health impacts and property damages resulting from all major natural hazards.
2. Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.
3. Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.
4. Prevent and reduce the damage to public infrastructure resulting from all hazards.
5. Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.
6. Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.
7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.
8. Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

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VI. EXISTING MITIGATION MEASURES

Existing Multi-Hazard Mitigation Measures

Comprehensive Emergency Management Plan (CEMP) – Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies. These plans contain important information regarding flooding, hurricanes, tornadoes, dam failures, earthquakes, and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to all of the hazards discussed in this plan.

Communications Equipment – Nahant has full police and fire radio coverage and is in the process of upgrading to ultra-high band width frequencies. Incident command units are available through Essex County and MEMA.

Emergency Power Generators – The Town maintains emergency power generators in several important public facilities and emergency shelters. These include the Johnson Elementary School (emergency shelter), the Fire Station and the DPW facility.

Massachusetts State Building Code – The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing, and snow loads.

Local Emergency Management Planning Committee (LEPC) – The Fire Department leads the LEPC, which meets on a quarterly or as-needed basis.

Existing Flood Hazard Mitigation Measures

National Flood Insurance Program (NFIP) – Nahant participates in the NFIP with 193 policies in force as of March 31, 2011. FEMA maintains a database on flood insurance policies and claims. This database can be found on the FEMA website at <http://www.fema.gov/business/nfip/statistics/pcstat.shtm>

The following information is provided for the Town of Nahant:

Flood insurance policies in force (as of March 31, 2011)	193
Coverage amount of flood insurance policies	\$44,027,200
Premiums paid	\$328,021
Total losses (all losses submitted regardless of the status)	361
Closed losses (Losses that have been paid)	2970
Open losses (Losses that have not been paid in full)	0
CWOP losses (Losses that have been closed without payment)	64
Total payments (Total amount paid on losses)	\$4,363,912.88

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The Town complies with the NFIP by enforcing floodplain regulations, maintaining up-to-date floodplain maps, and providing information to property owners and builders regarding floodplains and building requirements.

Since the 2005 plan, the policies in force have decreased by 19 and the total losses have increased by 21. The total payments, as of December 21, 2004, were \$4,226,126.07, approximately \$137,786 less than the most recent figure.

Public Works Operations/Maintenance Activities – The Public Works Department actively maintains the Town’s storm drain system. The following specific activities serve to maintain the capability of the drainage system through the reduction of sediment and litter build up and proper maintenance and repair.

- *Street sweeping* – All streets are swept weekly.
- *Catch basin cleaning* – All 200 basins are cleaned once every two years.
- *Roadway treatments* – Streets are treated with a 50/50 mix of sand and salt.
- The Town programs infrastructure special projects into its Capital Improvements Plan.
- Routine maintenance and systematic replacements are part of the DPW’s operating budget.
- The Town has replaced several dysfunctional catch basins the last 10 years with new deep-sump catch basins.

Town of Nahant Master Plan – The most recent Nahant Master Plan was adopted in 1986. The Town is currently working with a consultant to complete an updated Master Plan.

Conservation/Recreation Open Space Plan – The Town of Nahant Open Space and Recreation Plan was completed in 2008. The plan identifies a number of open space parcels and actions to improve environmental quality, which could also benefit hazard mitigation efforts.

Community Preservation Act- The Town adopted the Community Preservation Act in 2004.

Floodplain Zoning District – Zoning is intended to protect the public health and safety through the regulation of land use. The Nahant Zoning Bylaw includes a Flood Plain District (Section 10). The purposes of this district are:

1. To provide that lands in the Town of Nahant, subject to seasonal or periodic flooding, as described hereinafter, shall not be used in such a manner as to endanger the health or

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safety of the occupants thereof, or of the public generally, or as to burden the public with cost resulting from unwise individual choices of land use.

2. To assure the continuation of the natural flow pattern of the water courses within the Town and to minimize the impact of coastal storms, in order to protect persons and property against the hazards of flood inundation.

The Floodplain District is an overlay district and is defined as all lands in the Town which are within the boundaries of the areas designated as "A", or "V" zones, as delineated on a map entitled, "Flood Insurance Rate Map", dated September 28, 1984. Certain areas shown on the map as within or not within the flood plain may be subject to a Determination of Applicability by the Conservation Commission, in accordance with the state Wetlands Protection Regulations.

Within the District, no new construction of buildings, or substantial improvements to, or relocation of existing buildings shall be undertaken except as provided through a Special Permit issued by the Zoning Board of Appeals. "Substantial improvements", as used in this Section 10 is any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50% of the actual cash value of the structure, either before the improvement is started or, if the structure has been damaged and is being restored, before the damage occurred. No dwelling lawfully existing prior to the adoption of the Flood Plain District regulations may be altered or enlarged by the addition of more than 20% of the existing ground coverage, and no existing structures in the Coastal High Hazard Area designated as IV-311 on the Map shall be expanded except by Special Permit.

Reconstruction, substantial improvements and relocations are permitted by Special Permit within the Flood Plain District, if they are:

- (a) located landward of the reach of high tide;
- (b) elevated on adequately anchored piles with lowest floor level, including basement, at or above base flood elevation as shown on the FIRM map, with space below lowest floor free of obstructions.
- (c) All new or replaced utilities and facilities, such as sewer, septic, gas, electrical and water systems are to be located and constructed to minimize flood damage and adequate drainage shall be provided so as to reduce exposure to flood hazards.
- (d) No fill shall be used for structural support, and there must be a certification by the registered architect or engineer that the structure is secured to pilings in such a manner as will withstand velocity waters and hurricane wave wash.

In addition, all development activity in the District must meet all other applicable codes and regulations.

Site Plan Review- Section 9.09- Site Plan Review applies within the B-1 and B-2 zoning districts to all proposed change of uses involving at least 1,000 square feet of gross floor area within an existing structure and greater than 500 square feet of gross floor area in

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new structures. All projects must, in addition to other requirements, meet the following conditions:

- Minimize tree and soil removal. All grade changes must be in keeping with the surrounding neighborhood.
- Surface drainage must not adversely impact neighboring properties or the public storm drain system.
- All open and enclosed spaces must be designed to facilitate building evacuation and maximize access by emergency personnel and equipment.
- Projects must minimize impacts from all new structures and hard-surface ground coverage on all light, air and water resources.

Natural Resource Protection District – Section 4.10

The Natural Resource District is intended for natural resource and recreation uses in accordance with the following purposes:

1. The preservation and maintenance of protected wildlife and wetlands resource areas and habitats.
2. The protection of the Town against the costs which may be incurred when unsuitable development occurs in swamps, marshes, along water courses, in areas of high impact due to overcrowding of land and undue concentration of population, or on slopes subject to erosion.
3. To preserve and increase the amenities of the Town and foster enjoyment of its remaining natural resources as recreational values.
4. To conserve natural conditions, wildlife and open space for the education, passive and active recreation and general welfare of the public.

Allowed uses, by Special Permit granted by the Zoning Board of Appeals include the following:

- Boathouses and other non-profit recreational uses;
- Utility lines where other access is not feasible;
- Environmental restoration or reclamation projects.

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Subdivision Control Regulations- Section 4.13 of the Rules Governing the Subdivision of Land state that lots shall be prepared and graded in such a manner that the development of one shall not cause detrimental drainage on another.

Section 4.14 (B)- Easements: mandates that stormwater easements must be provided where a waterway crosses a subdivision.

Section 4.19- Floodplains and Wetlands: subdivision must meet requirements of MGL Chapter 131, Section 40 and the Nahant Flood Plain District, where applicable.

Section 4.18, Natural Features, calls for the due regard and preservation of natural features within the proposed subdivision and the prohibition on the taking of larger trees from the site, unless found not to be in conflict with lot drainage concerns and allowed by the Planning Board.

Stormwater Management and Construction Site Management Ordinance – Stormwater Management Plan – Nahant has an up to date Stormwater Management Plan that meets its NPDES MS4 permit requirements, including bylaws to address onsite stormwater management and runoff.

DCR Dam Safety Regulations – The state has enacted dam safety regulations mandating inspections and emergency action plans. All new dams are subject to state permitting. There are no dams located within Nahant.

Dam Maintenance and Safety – There are no dams located within the Town.

Public Education –The Emergency Management Department provides some information on flooding, fire safety and snow hazards, respectively, on its website. The Town also offers information and outreach on stormwater management and water conservation at its stormwater management homepage.

Existing Wind Hazard Mitigation Measures

Massachusetts State Building Code – The town enforces the Massachusetts State Building Code whose provisions are generally adequate to protect against most wind damage. The code's provisions are the most cost-effective mitigation measure against tornados given the extremely low probability of occurrence. If a tornado were to occur, the potential for severe damages would be extremely high.

Tree-trimming program – The Town and National Grid conduct tree maintenance on public property. The Town has equipment to trim and remove trees as needed.

Existing Winter Hazard Mitigation Measures

Snow disposal –The Town conducts general snow removal operations with its own equipment. Where necessary, snow is removed and dumped on other Town properties.

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Existing Brush Fire Hazard Mitigation Measures

Burn Permits – The Nahant Fire Department follows the State guidelines for outdoor burning. Outdoor burn season is from January 15 through May 1 and a permit is required.

Subdivision/Development Review – The Fire Department is involved in all development project reviews.

Existing Geologic Hazard Mitigation Measures

Massachusetts State Building Code – The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0). Section 1612.1 states that the purpose of these provisions is “to minimize the hazard to life to occupants of all buildings and non-building structures, to increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake”. This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be “prudent and economically justified” for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to a Table 1612.2.5. Group II includes buildings which have a substantial public hazard due to occupancy or use and Group III are those buildings having essential facilities which are required for post-earthquake recovery, including fire, rescue and police stations, emergency rooms, power-generating facilities, and communications facilities.

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Table 13- Nahant Existing Mitigation Measures			
Type of Existing Mitigation Measures	Area Covered	Effectiveness/ Enforcement	Improvements/ Changes Needed
MULTIPLE HAZARDS			
Comprehensive Emergency Management Plan (CEMP)	Town-wide.	Emphasis is on emergency response.	None. Plan is up to date.
Communications Equipment	Town-wide.	Effective	Add Reverse 911 capacity.
Massachusetts State Building Code	Town-wide.	Effective for new construction.	None.
Emergency Power Generators	Town-wide.	Effective.	Install fixed, natural gas fueled generator at Town Hall. Upgrade other critical facility generators as needed.
Participation in the Local Emergency Planning Committee (LEPC)	Town-wide.	A forum for inter-departmental cooperation on natural and manmade disasters.	The LEPC would like to investigate additional training for air crash response and oil spill containment in conjunction with Revere and Winthrop LEPC's.
FLOOD HAZARDS			
Participation in the National Flood Insurance Program (NFIP)	Areas identified on the FIRM maps.	There are 235 policies in force.	Encourage all eligible homeowners to obtain insurance.
Public Works Operations/Maintenance Activities	Town-wide.	Effective.	Need for more resources to address anticipated increase in stormwater infrastructure.
Master Plan	Town-wide	In draft.	Incorporate hazard mitigation and sea level rise mitigation into final adopted draft.
Open Space Plan	Town-wide	Effective.	None.
Zoning – Floodplain District	Town-wide.	Effective for redevelopment and new construction.	None.

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Table 13- Nahant Existing Mitigation Measures			
Type of Existing Mitigation Measures	Area Covered	Effectiveness/ Enforcement	Improvements/ Changes Needed
Site Plan Review	Town-wide	Effective.	None.
Wetlands By-Law	Resource Areas	Effective.	None.
DCR Dam Safety Regulations	Dams	NA	NA
Floodplain/Coastal Areas Open Space Preservation	Flood Hazard Areas	Effective.	Continue to identify acquisition opportunities through Community Preservation Act funding and Urban Open Space grants.
Subdivision	Town-wide	Effective.	Consider matching MA Stormwater Standards
Public Education	Town-wide	Somewhat Effective.	Consider increasing outreach to repetitive loss property owners.
WIND HAZARDS			
The Massachusetts State Building Code	Town-wide.	Effective for most situations except severe storms	None.
Tree trimming program	Town-wide.	Satisfactory.	None.
WINTER HAZARDS			
Snow Disposal Site	As necessary	Satisfactory.	None.
BRUSH FIRE HAZARDS			
Burn Permit	Town-wide.	Effective.	None.
Development Review	Town-wide.	Effective.	None.
GEOLOGIC HAZARDS			
The Massachusetts State Building Code	Town-wide.	Effective	None.

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VII. MITIGATION MEASURES FROM THE 2005 & 2008 PLANS

Review and Update Process

At a meeting of the Nahant Hazard Mitigation Committee, Town staff reviewed the mitigation measures identified in the 2005 North Shore Regional Multi-Hazard Mitigation Plan Nahant Annex and determined whether measures identified in each the plan had been implemented or deferred. For implemented projects, they were categorized as either complete or in-process, with the latter referring to projects begun but not yet completed. In process measures are carried forward into the 2011 Nahant Hazard Mitigation Plan. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into the 2011 Nahant Hazard Mitigation Plan. The decision on whether to delete or retain a particular measure was based on the committee’s assessment of the continued relevance or effectiveness of the measure and whether the deferral of action on the measure was due to the inability of the Town to take action on the measure.

Table 14			
Mitigation Measures from the 2005 Plan			
Mitigation Measures	Priority	Implementation Responsibility	2011 Status
Complete work on Marginal Road stone revetment.	High (Years 1-2)	DPW	Complete: finished in 2005
Reset sea wall at Forty Steps Beach.	High (Years 1-2)	DPW	In-process: repairs partially done; Nahant’s top mitigation priority.
Complete re-pointing Tudor Beach/Town Wharf sea wall.	High (Years 1-3)	DPW	In-process: 50% complete; this project is continued when town budget allows
Dredge Bear Pond tributaries.	Medium (Years 2-4)	DPW	In-process: a Notice of Intent as a Limited Project under MA Wetlands Protection Act has been filed.
Repair Wilson Road seawall.	Medium (Years 2-4)	DPW	Complete: MA DCR completed
Reconstruct Nahant Causeway	High TBD	MA DCR	In-process: MA DCR started 3-year reconstruction in June, 2010.

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The Town of Nahant has made considerable progress implementing the mitigation measures identified in the 2005 Hazard Mitigation Plan and the 2008 Flood Hazard Mitigation Plan. Though the Town is hindered by many of the same constraints faced by other communities in the region including limited funding and staff resources available to pursue these actions, progress has been steady on the highest priority projects. For many of the above measures, progress will be relatively slow and incremental as they are implemented during the development review process as redevelopment occurs in flood plains and other hazard vulnerable areas, or as funding sources become available for public infrastructure projects, land acquisition, and other similar measures. Given the hazard risk level in the Town, the rate of progress is appropriate to the need.

VIII. HAZARD MITIGATION STRATEGY

What is Hazard Mitigation?

Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, education programs, infrastructure projects and other activities. FEMA currently has three mitigation grant programs: the Hazards Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation program (PDM), and the Flood Mitigation Assistance (FMA) program. The three links below provide additional information on these programs.

<http://www.fema.gov/government/grant/hmgp/index.shtm>

<http://www.fema.gov/government/grant/pdm/index.shtm>

<http://www.fema.gov/government/grant/fma/index.shtm>

Hazard Mitigation Measures can generally be sorted into the following groups:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.
- **Public Education & Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate

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disclosure, hazard information centers, and school-age and adult education programs.

- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.
- **Emergency Services Protection:** Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

(Source: *FEMA Local Multi-Hazard Mitigation Planning Guidance*)

Regional and Inter-Community Considerations

Some hazard mitigation issues are strictly local. The problem originates primarily within the municipality and can be solved at the municipal level. Other issues are inter-community issues that involve cooperation between two or more municipalities. There is a third level of mitigation which is regional; involving a state, regional, or federal agency or an issue that involves three or more municipalities.

Inter-Community Considerations

Nahant, along with the neighboring communities of Revere and Winthrop are in close proximity to Logan International Airport which is the nation's 19th busiest airport with an average of 924 flights arriving or departing each day for 2010. (Wikipedia)

As a consequence, Nahant emergency personnel have expressed a desire to work with both Revere and Winthrop emergency responders to be trained in how all three communities can serve as staging areas for air accidents occurring either at Logan Airport or in the surrounding Atlantic Ocean.

Regional Issues

Climate Change and Sea Level Rise – The entirety of Massachusetts's coastal environment faces potential risk from Climate Change and associated sea level rise. Models incorporating current trends indicate a gradual rise in global temperature, with a consequent increase in the volume of water in the world's ocean due to thermal expansion as the water warms and the addition of water from melting ice sheets and glaciers. Projections for sea level rise by the end of this century range from four to 33 inches. Higher temperatures and higher sea levels will result in a greater frequency and intensity of storms and higher flood levels.

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Attempts to mitigate climate change or adapt to its potential impacts are largely outside the scope of this Hazard Mitigation Plan, which relies primarily on historic trends to assess risk and vulnerability. The potential changes to the State's storm damage profile caused by Climate Change will be well outside of historic trends, making those trends uncertain predictors of future risk and vulnerability at best. Coastal Cities, Towns and Regional Planning Agencies will need to advocate for a statewide response that includes using the best available information to map and model climate change and sea level rise data related to coastal hazards in Massachusetts and disseminate this information for use in hazard mitigation planning and land use policy development.

Regional Partners - In many communities, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are a complex system of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including but not limited to the Town of Nahant, the Department of Conservation and Recreation (DCR), and Massachusetts Department of Transportation (MDOT). The planning, construction, operations, and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies must be considered the communities regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do, including budgetary and staffing constraints and numerous competing priorities. In the sections that follow, the plan includes recommendations for activities where cooperation with these other agencies may be necessary. Implementation of these recommendations will require that all parties work together to develop solutions.

Process for Setting Priorities for Mitigation Measures

The decisions on priorities were made at a meeting of the local committee. Priority setting was based on local knowledge of the hazard areas, including impacts of hazard events and the extent of the area impacted and the relation of a given mitigation measure to the Town's identified goals. In addition, MAPC asked the local committee to take into consideration factors such as the number of homes and businesses affected, whether or not road closures occurred and what impact closures had on delivery of emergency services and the local economy, anticipated project costs, whether the town currently had the technical and administrative capability to carry out the mitigation measures, whether any environmental constraints existed, and whether the town would be able to justify the costs relative to the anticipated benefits.

The listing of high, medium, and low potential mitigation measures is provided in the sections below and summarized in Table 17.

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High Priority Mitigation Measures

Flooding, Drainage Infrastructure and Seawalls

A) Forty Steps Beach: finish repairs to seawall. The town has partially completed repairs to the seawall and has applied for a hazard mitigation grant in order to complete the project. The Hazard Mitigation Team identified this as the Town's top hazard mitigation priority project. This was a top priority project in the 2005 Nahant Hazard Mitigation Plan as well.

B) Tudor Beach/Town Wharf Seawall: finish repairs and repointing of seawalls. Also a continued high priority project from the 2005 Hazard Mitigation Plan, the Town has been able to complete about 50% of the repairs needed.

C) Bear Pond tributaries: Complete the dredging of Bear Pond tributaries in order to allow additional storm water storage capacity. Bear Pond receives almost all drainage from the village area of Nahant. Another continued project from its 2005 Plan, the Town has filed a Notice of Intent under the MA Wetlands Protection Act to permit the project.

D) Wilson Road Seawall: MA DCR has indicated that they would repair this seawall, which is located in the village near the Tides Restaurant. This is another priority project carried over from the 2005 Nahant Hazard Mitigation Plan.

E) Reconstruct the Nahant Causeway: A high priority project identified in the 2005 Plan, MA DCR began reconstruction of the Causeway and its drainage system in June of 2010. Date of project completion is estimated to be June, 2013.

Measures to Ensure Compliance with NFIP

F) Floodplain District Management: Continue to enforce the Floodplain Zoning District and associated building regulations for floodplain areas. Update this district to remain consistent with FEMA guidelines and floodplain mapping.

G) Floodplain Mapping: Maintain up to date maps of local FEMA identified floodplains. The Town anticipates receiving updated National Flood Insurance Rate maps in 2011.

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Multi-hazard/Emergency Service Protection

- H) Emergency Power Generators: Replace two older (1983) mobile generator units with new towable, mobile, multi-phase diesel-fuel generators, primarily for sewer lift station backup capacity.
- I) Pumps: Purchase new 10-inch diesel, trailer mounted water pump, six submersible 1.5 –inch electric pumps and three three-inch gasoline-fueled water pumps—all pumps for emergency water removal and post-event pump out needs.
- J) Purchase a new ladder/pumper truck to replace 31-year old current apparatus. Fulfills brush and residential fire-fighting needs in a densely developed but isolated community where local response is critical.
- K) Update Police, Fire and DPW handheld radio units to ultra high frequency: 15 new units needed for Police, 15 for Fire and 7 for DPW.
- L) Install a new, fixed, natural gas fueled emergency generator at Town Hall.

Medium Priority Mitigation Measures

Flooding, Drainage Infrastructure and Seawalls

- M) Identify more resources for more frequent maintenance of Town-owned drainage facilities and infrastructure.
- N) Complete Master Plan update, including section on climate change awareness and preparation.
- O) Research and implement coastal storm emergency preparedness and outreach programs such as MA Coastal Zone Management Storm Smart Program.
- P) Consider committing to the voluntary flood plain management activities within the National Flood Insurance Program's Community Rating System.
- Q) Repetitive Loss Area Property Owner Outreach: Targeting flood information outreach to repetitive loss area property owners would get valuable information to property owners in the Town who have historically experienced the greatest impact from flood events while also giving the Town an opportunity to learn from people in these areas about the causes and extent of flooding.

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R) Acquisition of Vacant Flood Prone Lands: Acquire priority open space parcels in floodplain areas in order to maintain flood storage and water infiltration capacity. These parcels may also be used for general conservation and recreation purposes.

Multi-hazard/Emergency Service Protection

S) Investigate options to install a Reverse 911 system for emergency services messaging. The Town is interested in looking at a text message based system based on mobile phone use.

Lower Priority Mitigation Measures

Multi-hazard/Emergency Service Protection

T) Identifying options to increase manpower available to respond to pre and post hazard mitigation response.

U) Increasing outreach to Town residents on stormwater, emergency preparedness and storm event response

V) Investigate options to make all public safety buildings earth-quake resistant.

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Introduction to Potential Mitigation Measures (Table 17)

Description of the Mitigation Measure – The description of each mitigation measure is brief and cost information is given only if cost data were already available from the community. The cost data represent a point in time and would need to be adjusted for inflation and for any changes or refinements in the design of a particular mitigation measure.

Priority – The designation of high, medium, or low priority was done at the meeting of the Local Multiple Hazard Community Planning Team meeting. The designations reflect discussion and a general consensus developed at the meeting but could change as conditions in the community change. In determining project priorities, the local team considered potential benefits and project costs.

Implementation Responsibility – The designation of implementation responsibility was done by MAPC based on a general knowledge of what each municipal department is responsible for. It is likely that most mitigation measures will require that several departments work together and assigning staff is the sole responsibility of the governing body of each community.

Time Frame – The time frame was based on a combination of the priority for that measure, the complexity of the measure and whether or not the measure is conceptual, in design, or already designed and awaiting funding. Because the time frame for this plan is five years, the timing for all mitigation measures has been kept within this framework. The identification of a likely time frame is not meant to constrain a community from taking advantage of funding opportunities as they arise.

Potential Funding Sources – This column attempts to identify the most likely sources of funding for a specific measure. The information on potential funding sources in this table is preliminary and varies depending on a number of factors. These factors include whether or not a mitigation measure has been studied, evaluated or designed, or if it is still in the conceptual stages. MEMA and DCR assisted MAPC in reviewing the potential eligibility for hazard mitigation funding. Each grant program and agency has specific eligibility requirements that would need to be taken into consideration. In most instances, the measure will require a number of different funding sources. Identification of a potential funding source in this table does not guarantee that a project will be eligible for, or selected for funding. Upon adoption of this plan, the local committee responsible for its implementation should begin to explore the funding sources in more detail.

Additional information on funding sources – The best way to determine eligibility for a particular funding source is to review the project with a staff person at the funding agency. The following websites provide an overview of programs and funding sources.

Army Corps of Engineers (ACOE) – The website for the North Atlantic district office is <http://www.nae.usace.army.mil/>. The ACOE provides assistance in a

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number of types of projects including shoreline/streambank protection, flood damage reduction, flood plain management services and planning services.

Massachusetts Emergency Management Agency (MEMA) – The grants page <http://www.mass.gov/dem/programs/mitigate/grants.htm> has a useful table that compares eligible projects for the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program.

United States Department of Agriculture – The USDA has programs by which communities can get grants for firefighting needs. See the link below for some example.

<http://www.rurdev.usda.gov/rd/newsroom/2002/cfg.html>

Abbreviations Used in Table 15

FEMA Mitigation Grants includes:

FMA = Flood Mitigation Assistance Program.

HMGP = Hazard Mitigation Grant Program.

PDM = Pre-Disaster Mitigation Program

ACOE = Army Corps of Engineers.

DHS/EOPS = Department of Homeland Security/Emergency Operations

EPA/DEP (SRF) = Environmental Protection Agency/Department of Environmental Protection (State Revolving Fund)

USDA = United States Department of Agriculture

Mass DOT = Massachusetts Department of Transportation

DCR = MA Department of Conservation and Recreation

DHCD = MA Department of Housing and Community Development

DOER = MA Department of Energy Resources

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Table 15 Nahant Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Measure Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
High Priority						
A) Flood Hazard	Forty Steps Beach Seawall *	Structural Projects	Public Works	2011-2013	\$150,000	Nahant/FEMA
B) Flood Hazard	Tudor Beach/Town Wharf Seawall*	Structural Projects	Public Works	2011-2013	TBD	Nahant/FEMA
C) Flood Hazard	Bear Pond tributaries*	Structural Project	Public Works	2011 - 2014	\$100,000	Nahant/FEMA
D) Flood Hazard	Wilson Road Seawall*	Structural Projects	Public Works	2011-2014	TBD	Nahant/ FEMA
E) Flood Hazard	Reconstruct Nahant Causeway *	Structural Projects	DCR	2010-2013	NA	DCR
F) NFIP Compliance	Floodplain Management	Prevention	Public Works/Building/Planning	2011-2016	TBD	Nahant
G) NFIP Compliance	Floodplain Mapping	Prevention	Planning/Public Works/Conservation	2011-2016	TBD	Nahant

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Table 15 Nahant Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Measure Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
H) Multi-hazard	Purchase five mobile emergency power generators	Emergency Services Protection	Public Works, EMD	2011-2016	\$12,500	Nahant/FEMA
I) Multi-hazard	Purchase new mobile water pumps, various sizes	Emergency Services Protection	Public Works	2011-2016	\$75,000	Nahant/FEMA
J) Fire	New fire ladder and pumper truck	Emergency Services Protection and Natural Resource Protection	Fire	2011-2014	\$700,000 - \$1,000,000	Nahant
K) Multi-hazard	Update hand held radio units	Emergency Services Protection	Police, Fire, Public Works, EMD	2011-2013	\$30,000	Nahant/FEMA
L) Multi-Hazard	Install new emergency power generator at Town Hall, upgrade fire and emergency shelter generators	Emergency Services Protection	Public Works, EMD	2011-2014	\$25,000	Nahant/FEMA

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Table 15 Nahant Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Measure Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
M) Multi-hazard	Construct new Public Safety Facility	Emergency Services Protection	Fire/Police/EMD	2011-2016	\$6,000,000 to \$8,000,000	Nahant/FEMA
Medium Priority						
N) Flood Hazard	Town drainage infrastructure maintenance resources	Natural Resource Protection	Public Works	2011-2016	TBD	Nahant
O) Flood Hazard	Master Plan update with climate change section	Prevention	Planning	2011-2016	TBD	Nahant/DOER/DHCD
P) Flood Hazard	Research and implement storm emergency preparedness	Prevention	Planning/ Public Works/Fire	2011-2016	TBD	Nahant
Q) Flood Hazard	Consider adopting NFIP CRS Program	Prevention	Planning/Public Works/Building	2011-2016	TBD	Nahant/FEMA
R) Flood Hazard	Repetitive loss owner outreach	Public Education and Awareness	Planning/Public Works/Building	2011-2016	TBD	Nahant
S) NFIP Compliance	Acquisition of Vacant Flood Prone Lands	Prevention / Natural Resource Protection	Planning	2011- 2016	TBD	Nahant/FEMA/DCR / Community

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Table 15 Nahant Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Measure Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
						Preservation Act
T) Multi-hazard	Investigate and install Reverse 911 option	Emergency Services Protection	Fire/Police/EMD	2011-2014	TBD	Nahant
Lower Priority						
U) Multi-hazard	Identify ways to increase manpower emergency response resources	Emergency Services Protection	Fire Department/ Police/EMD/ Public Works	2011-2016	TBD	Nahant
V) Earthquake	Investigate options to make municipal buildings more earthquake resistant	Property Protection	Building Department	2011-2016	TBD	Nahant
W) Multi-hazard	Upgrade Harbormaster Patrol boat and dockage	Emergency Services Protection	EMD	2011-2016	\$80,000	Nahant

* Mitigation measures carried forward from the 2005 Nahant Hazard Mitigation Plan.

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IX. PLAN ADOPTION AND MAINTENANCE

Plan Adoption

The Nahant Hazard Mitigation Plan was adopted by the Town Council on [ADD DATE]. See Appendix D for documentation. The plan was approved by FEMA on [ADD DATE] for a five-year period that will expire on [ADD DATE].

Plan Maintenance

MAPC worked with the Nahant Hazard Mitigation Planning Team to prepare this plan. This group will continue to meet on an as-needed basis to function as the Local Hazard Mitigation Implementation Group, with one town official designated as the coordinator. Additional members could be added to the local implementation group from businesses, non-profits and institutions.

Implementation Schedule

Bi-Annual Meeting on Progress– The coordinator of the Hazard Mitigation Implementation Team will coordinate a progress meeting in years two and four of the plan. The meeting will be held with the Local Emergency Planning Committee because many of the members overlap the members of the Hazard Mitigation Planning Team and Implementation Group. At the meetings members will discuss any changes or revisions to the plan that may be needed, progress and accomplishments for implementation, and any new hazards or problem areas that have been identified.

This information will be used to prepare a report or addendum to the local hazard mitigation plan. The Hazard Mitigation Implementation Team will have primary responsibility for tracking progress and updating the plan.

Develop a Year Four Update – During the fourth year after initial plan adoption, the coordinator of the Hazard Mitigation Implementation Team will convene the team to begin to prepare for an update of the plan, which will be required by the end of year five in order to maintain approved plan status with FEMA. The team will use the information from the year four biannual review to identify the needs and priorities for the plan update.

Prepare and Adopt an Updated Local Hazard Mitigation Plan – FEMA’s approval of this plan is valid for five years, by which time an updated plan must be approved by FEMA in order to maintain the town’s approved plan status and its eligibility for FEMA mitigation grants. Because of the time required to secure a planning grant, prepare an updated plan, and complete the approval and adoption of an updated plan, the local Hazard Mitigation Planning Team should begin the process by the end of Year 3. This will help the Town avoid a lapse in its approved plan status and grant eligibility when the current plan expires.

At this point, the Hazard Mitigation Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the

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plan or to hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The update of the Nahant Hazard Mitigation Plan will be forwarded to MEMA and DCR for review and to FEMA for approval.

Integration of the Plans with Other Planning Initiatives

Upon approval of the Nahant Hazard Mitigation Plan by FEMA, the Local Hazard Mitigation Implementation Team will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. At a minimum, the plan will be reviewed and discussed with the following departments:

- Fire / Emergency Management
- Police
- Public Works / Highway
- Engineering
- Planning and Community Development
- Conservation
- Parks and Recreation
- Health
- Building

Other groups that will be coordinated with include large institutions, Chambers of Commerce, land conservation organizations and watershed groups. The plans will also be posted on a community's website with the caveat that the local team coordinator will review the plan for sensitive information that would be inappropriate for public posting. The posting of the plan on a web site will include a mechanism for citizen feedback such as an e-mail address to send comments.

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X. LIST OF REFERENCES

In addition to the specific reports listed below, much of the technical information for this plan came from meetings with Town department heads and staff.

Town of Nahant, Code of the Town of Nahant.

Town of Nahant, Zoning Bylaw of the Town of Nahant.

Town of Nahant Comprehensive Emergency Management Plan.

MA Coastal Hazards Commission, Preparing For the Storm: Recommendations for Management of Risk from Coastal Hazards in Massachusetts, May 2007.

FEMA, Local Multi-Hazard Mitigation Planning Guidance; July 1, 2008.

FEMA, Flood Insurance Rate Maps for Nahant, MA, 2010.

FEMA Flood Insurance Study, 1984

Metropolitan Area Planning Council, Geographic Information Systems Lab.

Metropolitan Area Planning Council, Regional Plans and Data.

Massachusetts StormSmart Coasts, website: <http://ma.stormsmartcoasts.org/>

New England Seismic Network, Boston College Weston Observatory, website: <http://aki.bc.edu/index.htm>

Northeast States Emergency Consortium, website: <http://www.nesec.org/>

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TOWN OF NAHANT HAZARD MITIGATION PLAN

**APPENDIX A
MEETING AGENDAS**

TOWN OF NAHANT HAZARD MITIGATION PLAN

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TOWN OF NAHANT HAZARD MITIGATION PLAN



Don Boyce
DIRECTOR



Richard Sullivan
COMMISSIONER



Marc D. Draisen
EXECUTIVE DIRECTOR

NORTH SHORE HAZARD MITIGATION PLANNING TEAM

Beverly
Lynn
Nahant
Peabody
Revere
Salem
Saugus
Swampscott
Winthrop

THE COMMONWEALTH OF MASSACHUSETTS

Deval Patrick, Governor

MASSACHUSETTS EMERGENCY MANAGEMENT AGENCY

400 WORCESTER ROAD, FRAMINGHAM, MA 01702-5399 508-820-2000 FAX 508-820-1404

DEPARTMENT OF CONSERVATION AND RECREATION

251 CAUSEWAY STREET, SUITE 600-900, BOSTON, MA 02114-2104 617-626-1250 FAX 617-626-1351

METROPOLITAN AREA PLANNING COUNCIL

60 TEMPLE PLACE, 6TH FLOOR, BOSTON, MA 02111 617-451-2770 FAX 617-482-7185

North Shore Hazard Mitigation Planning Team

First Meeting

Monday, February 8, 10:00 AM

Saugus Public Safety Building
2nd Floor Training Room
27 Hamilton Street, Saugus, MA
(Map & directions attached)

AGENDA

10:00 WELCOME & INTRODUCTIONS

10:05 OVERVIEW OF HAZARD MITIGATION PLANNING & GRANTS

- State Hazard Mitigation Plan & FEMA Grants–Sarah White, MEMA
- Regional & Local Mitigation Plans - Martin Pillsbury, MAPC

10:20 UPDATING THE NORTH SHORE HAZARD MITIGATION PLAN

- FEMA Requirements & Grant Eligibility
- Review of Scope of Work & Schedule –MAPC
- Questions & Discussion – Local issues & Priorities

10:50 GETTING STARTED: MAPPING AND CRITICAL FACILITIES DATABASE FOR THE NORTH SHORE PLAN UPDATE

- Susan Brunton, GIS Analyst, MAPC

11:15 NEXT STEPS / ADJOURN

If you have any questions please contact Martin Pillsbury at MAPC:
617-451-2770, ext. 2012 or mpillsbury@mapc.org

TOWN OF NAHANT HAZARD MITIGATION PLAN

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TOWN OF NAHANT HAZARD MITIGATION PLAN

Meeting Agenda Local Multiple Hazard Community Planning Team Nahant, MA

August 27, 2010

10:00 am – 12:00 pm
Nahant Town Hall

1. Introductions and Overview of Project Scope
2. Introduce Nahant Hazard Mitigation Planning map series and digitized ortho photo. Identify Flood and Fire Hazard Areas, areas of recent/future potential development, primary employers, historic and cultural sites.
3. Review and Assess Plan Goals. (see over)
4. Discuss Public Involvement and Outreach. (see over)
5. Set Next meeting to:
 - Review Existing Mitigation Measures.
 - Review Mitigation Measures from the 2005 Plan.
 - Discuss Potential Mitigation Measures.
 - Prioritize Mitigation Measures.

Project Overview - MAPC received a grant to update *Hazard Mitigation Plans* for the communities of Beverly, Lynn, Nahant, Peabody, Revere, Salem, Saugus, Swampscott and Winthrop. MAPC is working with the nine communities to update plans to mitigate potential damages of natural hazards such as floods, winter storms, hurricanes, earthquakes, and wild fires, before such hazards occur. The federal *Disaster Mitigation Act of 2000* requires that all municipalities adopt a *Pre-Disaster Mitigation Plan* for natural hazards and update those plans every five years, in order to remain eligible for FEMA Hazard Mitigation Grants.

This FEMA planning program is separate from new or ongoing homeland security initiatives, and is focused solely on addressing natural hazards, although some of the data collected for this plan may be useful for other aspects of emergency planning as well.

TOWN OF NAHANT HAZARD MITIGATION PLAN

Public Participation

1. MAPC presents at a tow advertised public meetings: Planning Board and Board of Selectmen
2. Post on Town/City website with a set public review period.
3. Distribute to specified organizations or boards/commissions for their review.

2005 Goals

1. Prevent and reduce the loss of life, injury, public health impacts and property damages resulting from all major natural hazards.
2. Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.
3. Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.
4. Prevent and reduce the damage to public infrastructure resulting from all hazards.
5. Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.
6. Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.
7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.
8. Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

TOWN OF NAHANT HAZARD MITIGATION PLAN

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APPENDIX B HAZARD MAPPING

The MAPC GIS (Geographic Information Systems) Lab produced a series of maps for each community. Some of the data came from the Northeast States Emergency Consortium (NESEC). More information on NESEC can be found at <http://www.serve.com/NESEC/>. Due to the various sources for the data and varying levels of accuracy, the identification of an area as being in one of the hazard categories must be considered as a general classification that should always be supplemented with more local knowledge. The documentation for some of the hazard maps was incomplete as well.

The map series consists of four panels with two maps each plus one map taken from the State Hazard Mitigation Plan.

Map 1.	Population Density
Map 2.	Potential Development
Map 3.	Flood Zones
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Hazard Areas

Map 1: Population Density – This map uses the US Census block data for 2000 and shows population density as the number of people per acre in seven categories with 60 or more people per acre representing the highest density areas.

Map 2: Development – This map shows potential future developments, and critical infrastructure sites. MAPC consulted with town staff to determine areas that were likely to be developed or redeveloped in the future. The map also depicts current land use.

Map 3: Flood Zones – The map of flood zones used the FEMA NFIP Flood Zones as depicted on the FIRMs (Federal Insurance Rate Maps) as its source. At the time this plan was developed, these flood zones had not yet been officially adopted and were therefore considered draft. This map is not intended for use in determining whether or not a specific property is located within a FEMA NFIP flood zone. The currently adopted FIRMs for Nahant are kept by the Town. For more information, refer to the FEMA Map Service Center website <http://www.msc.fema.gov>. The definitions of the flood zones are described in detail on this site as well. The flood zone map for each community also shows critical infrastructure and repetitive loss areas.

TOWN OF NAHANT HAZARD MITIGATION PLAN

Map 4: Earthquakes and Landslides – This information came from NESEC. For most communities, there was no data for earthquakes because only the epicenters of an earthquake are mapped.

The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to <http://pubs.usgs.gov/pp/p1183/pp1183.html>.

Map 5: Hurricanes and Tornadoes – This map shows a number of different items. The map includes the storm tracks for both hurricanes and tropical storms. This information must be viewed in context. A storm track only shows where the eye of the storm passed through. In most cases, the effects of the wind and rain from these storms were felt in other communities even if the track was not within that community. This map also shows the location of tornadoes with a classification as to the level of damages. What appears on the map varies by community since not all communities experience the same wind-related events. These maps also show the 100 year wind speed.

Map 6: Average Snowfall - - This map shows the average snowfall and open space. It also shows storm tracks for nor'easters, if any storms tracked through the community.

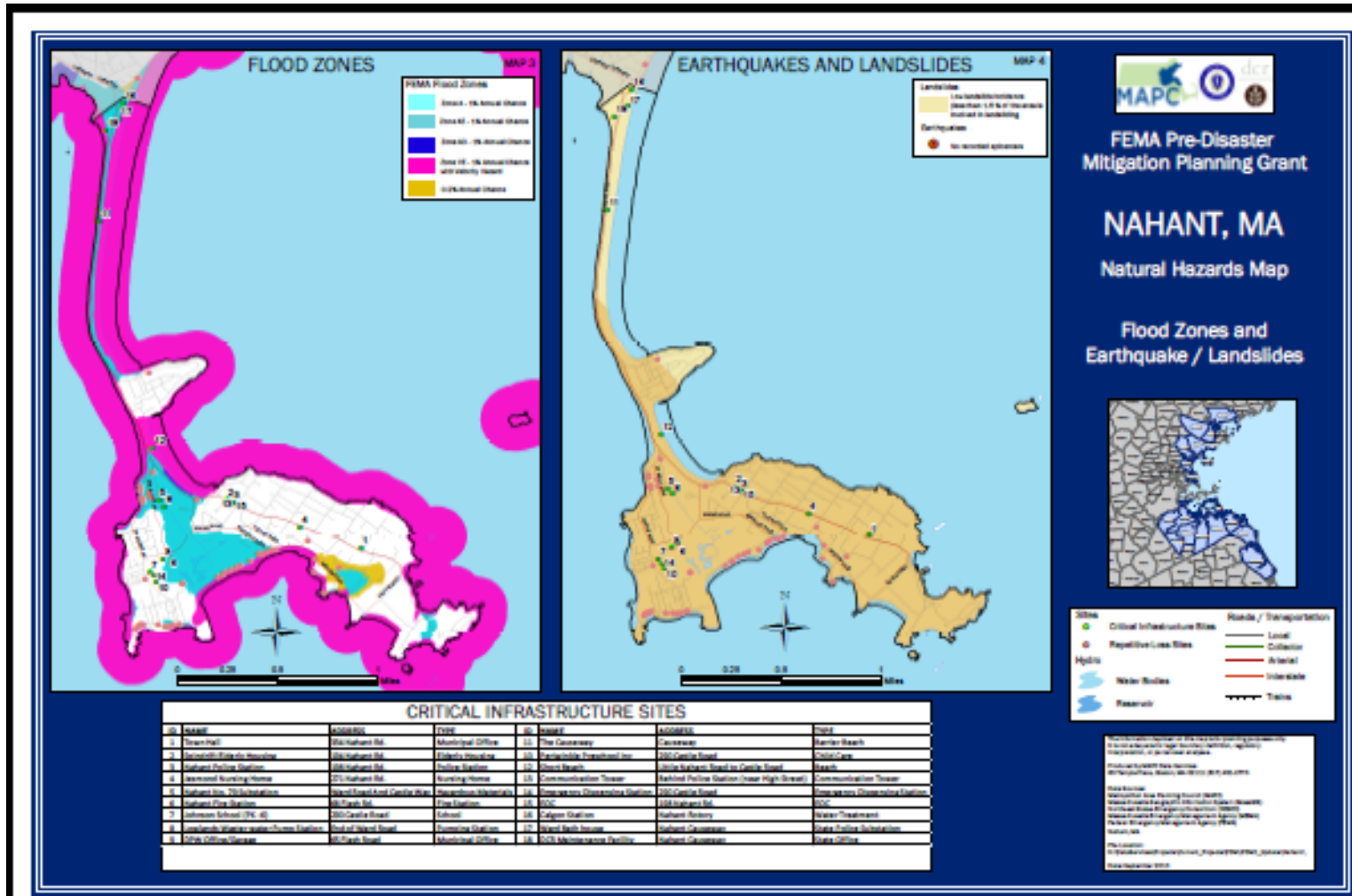
Map 7: Composite Natural Hazards - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100 year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and hurricane surge inundation areas. Areas with only one hazard were considered to be low hazard areas. Moderate areas have two of the hazards present. High hazard areas have three hazards present and severe hazard areas have four hazards present.

Map 8: Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph dated April, 2008. The critical infrastructure sites are also shown. The source of the aerial photograph is Mass GIS.

TOWN OF NAHANT HAZARD MITIGATION PLAN

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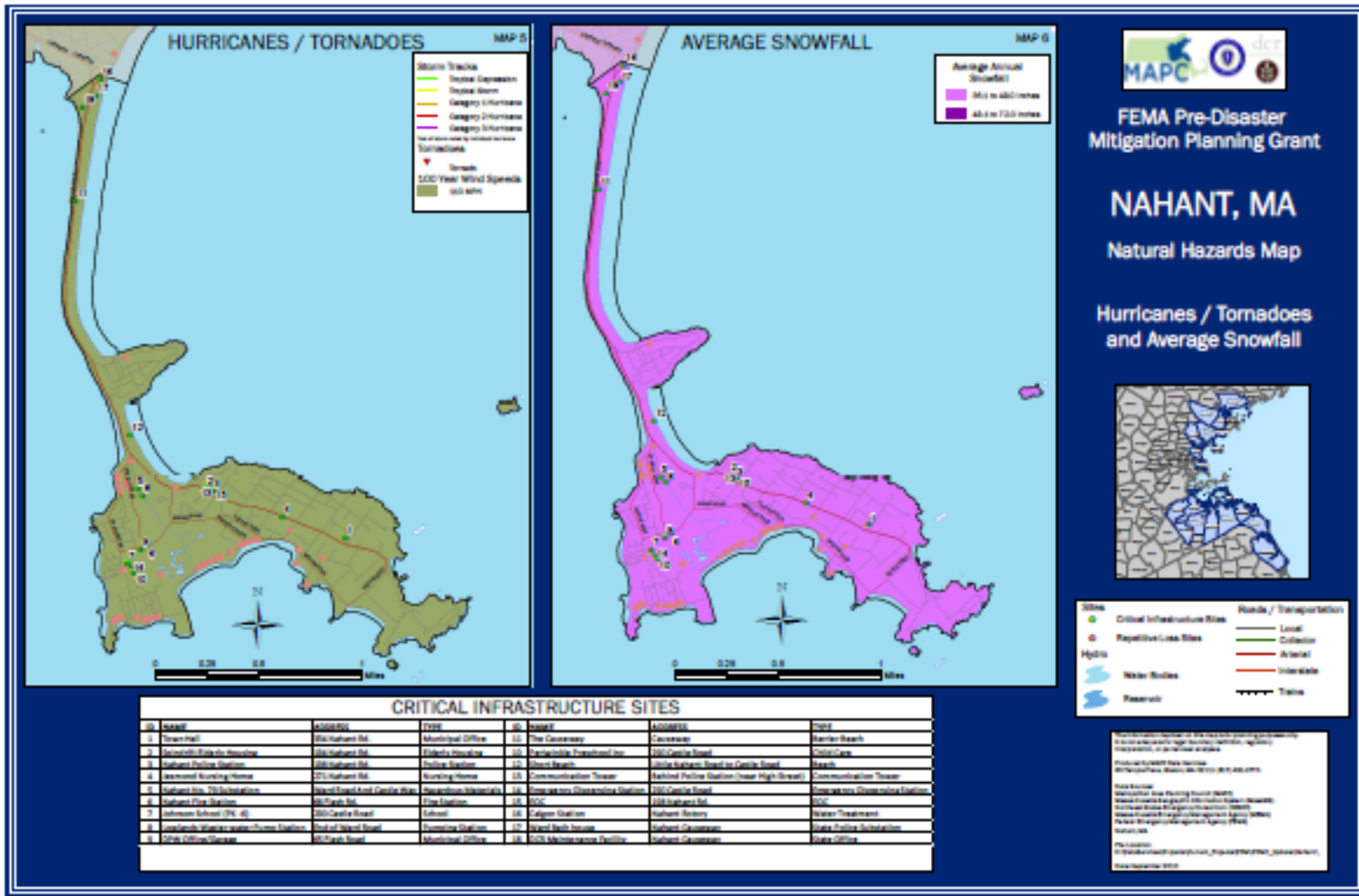
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**APPENDIX C
DOCUMENTATION OF PUBLIC PARTICIPATION**

TOWN OF NAHANT HAZARD MITIGATION PLAN

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TOWN OF NAHANT HAZARD MITIGATION PLAN

Agenda

**Board of Selectmen/Board of Health
April 28, 2011**

**Chairman: Richard J. Lombard
Vice Chairman: Elaine R. Titus
Secretary: Michael P. Manning
Town Administrator: Mark P. Cullinan
Town Counsel: Charles H. Riley, Jr.**

Time	Action	Tab	
			Opening Remarks/Announcements
	Approve	1	Minutes 4/7/11
	Discuss	2	FinCom/Moderator
	Approve	3	One day liquor license Barefoot Black Tie
	Approve	4	MWRA Assistance Program
	Discuss	5	FEMA Predisaster Plan Presentation 8:00pm

Town Administrator Report

	Appoint	6	Alternative Energy-Jim Callahan, Matt Dam

Town Counsel Report

	Approve	7	Comcast Contract 8:15pm

New Business

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Board of Health

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Executive Session

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Miscellaneous Correspondence & Reports & Announcements

	Announce	8	Scholarships on web site
	Announce	9	Winner of Charles Kelley Scholarship – Kelsey Barrasso

TOWN OF NAHANT HAZARD MITIGATION PLAN

Add PB 5/10 agenda here

TOWN OF NAHANT HAZARD MITIGATION PLAN

**APPENDIX D
DOCUMENTATION OF PLAN ADOPTION**

TOWN OF NAHANT HAZARD MITIGATION PLAN

DOCUMENTATION OF PLAN ADOPTION

[To be added to final plan after adoption by the town]