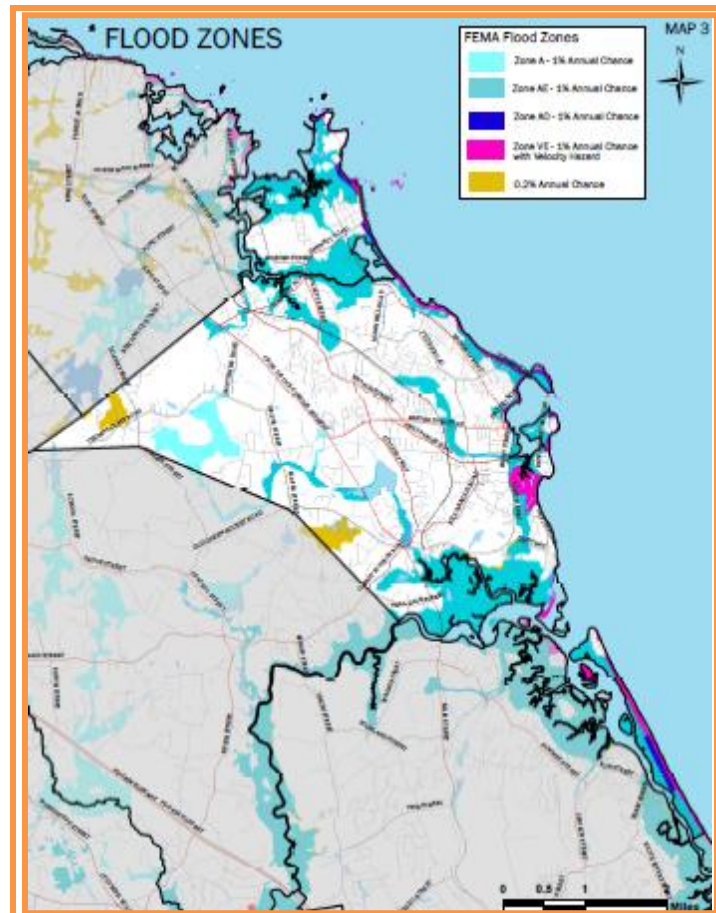


# TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE



**Draft for Review by MEMA & FEMA  
April 19, 2011**

**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
2011 UPDATE**

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# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **ACKNOWLEDGEMENTS AND CREDITS**

This plan was prepared for the Town of Saugus 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.

### **MAPC Officers**

President:	Jay Ash
Vice President:	Michelle Ciccolo
Secretary:	Marilyn Contreras
Treasurer:	Grace Shepard
Executive Director:	Marc. D. Draisen

### **Credits**

Project Manager:	Martin Pillsbury
Lead Project Planner:	Sam Cleaves
Mapping/GIS Services:	Chris Brown

### **Massachusetts Emergency Management Agency**

Acting Director:	Kurt Schwartz
------------------	---------------

### **Department of Conservation and Recreation**

Commissioner:	Edward M. Lambert Jr.
---------------	-----------------------

### **Local Hazard Mitigation Planning Team**

Frank McKinnon	Conservation Commission
Captain Dan McNeil	Saugus Fire Department
Paul O. Penachio	Emergency Management Director
Domenic DiMella	Saugus Police Department
James Waugh	Saugus DPW
Laura Smith	Saugus Building Department
Paul Rupp	CRA: Saugus consultant
Mark Torbin	Saugus Police: Operations Management

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# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **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 Saugus Hazard Mitigation Plan update was led by the Saugus 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, 2011 and the second on XX, 2011 and the plan was posted on the Town's website for public review.

### **Risk Assessment**

The Saugus 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, most especially in the coastal areas where storm driven waves and tides flood adjacent low lying areas.

# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **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.
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.
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. Ensure that hazard mitigation measures are in place to keep major roads open with a particular emphasis on Route 1.

## **Potential High Priority Hazard Mitigation Actions**

- Complete design and construction of Route One drainage system replacement. This is the Town's top priority project. The Town is currently seeking a federal legislative earmark to help fund this project.
- Complete design and reconstruction or removal of the Elm Street Bridge. The Town has applied for Hazard Mitigation grant funding to help complete this task.
- Relieve flooding in East Saugus by updating East Saugus drainage system, dredging Eastern Avenue tidal canals and recalibrating Ballard Street tide gate. This is a top priority project for Saugus.
- Design and adopt a Stormwater Utility mechanism in order to help the town advance stormwater maintenance and preventative practices.



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## Plan Review and Update Process

**Table 1 Plan Review and Update**

<b>Chapter</b>	<b>Reviews and Updates</b>
III – Public Participation	The Saugus 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 presented to the Planning Board and the Board of Selectmen in public meetings. The Board of Selectmen’s meeting was televised.. 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 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, on-going, 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, Saugus made considerable progress in implementing mitigation measures identified in the 2005 Hazard Mitigation Plan. Many of the measures identified in that plan are now considered on-going aspects of the regular work of Town staff from the department head level to the regular work of Public Works staff. Individual projects have begun to be incorporated into the Town’s capital improvement plan and the Town continues to seek FEMA grant funding to implement the home elevation program. 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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# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **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 Saugus and eight other North Shore communities to update their local Hazard Mitigation Plans, which were first adopted in as part of a North 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 North 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 Saugus 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**

<b>DISASTER NAME (DATE OF EVENT)</b>	<b>TYPE OF ASSISTANCE</b>	<b>DECLARED AREAS</b>
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)
December Blizzard (December 1992)	FEMA Public Assistance Project Grants	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk (7 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)

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<b>DISASTER NAME (DATE OF EVENT)</b>	<b>TYPE OF ASSISTANCE</b>	<b>DECLARED AREAS</b>
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
	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

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<b>DISASTER NAME (DATE OF EVENT)</b>	<b>TYPE OF ASSISTANCE</b>	<b>DECLARED AREAS</b>
April Nor'easter (April 15-27, 2007)	FEMA Public Assistance Project Grants	Barnstable, Berkshire, Dukes, Essex, Franklin, Hampden, Hampshire, Plymouth
	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
	Hazard Mitigation Grant Program	Statewide

(Source: database provided by MEMA)

**FEMA Funded Mitigation Projects**

The town of Saugus has received funding from FEMA for three mitigation projects under the Hazard Mitigation Grant Program. These projects totaled \$1,150,000 with \$856,500 covered by FEMA grants and \$287,500 by local funding. The projects are summarized in Table 2 below.

**Table 3 FEMA-Funded Mitigation Projects**

Year	Project Title	Scope of Work	Total Cost	Federal Funding	Local Funding
2006	Drainage Improvements	Complete a drainage analysis for the Bristow Street, Serino Way, Wolcott Road, Greenwood Avenue, Lincoln Avenue, Seagrit Avenue.	\$320,000.00	\$234,000.00	\$80,000.00
2008	Hamilton Street Drainage Improvements	Install storm drain line, man holes and catch basins; perform associated road work.	\$130,000.00	\$97,500.00	\$32,500.00
2009	Shute Brook Culvert Relief	Construct new culvert adjacent to exiting culvert running below Central Street in Saugus	\$700,000.00	\$525,000.00	\$175,000.00

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

(Source: database provided by MEMA)

### **Community Profile**

The Town of Saugus is located in northeastern Massachusetts in Essex County. A coastal community 13 miles from Boston, Saugus has a population of 26,078 according to the 2000 US Census. The Town is 10.99 square miles in area. The town has is served by a town manager form of government with a representative Town Meeting. The town is bisected by Route 1, a major north-south highway, has a large commercial base as well as extensive suburban development. Saugus is also home to the Saugus Iron Works, which is listed on the National Register of Historic Place as is the Town Hall.

The town maintains a website at <http://www.saugus-ma.gov/Pages/index>.

# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **III. PUBLIC PARTICIPATION**

Public participation occurred at two levels; the North Shore Multiple Hazard Community Planning Team (regional committee) and the Saugus 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.

### **Saugus'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 a minimum of two municipal employees and/or officials to represent the community. The following individuals were appointed to represent Saugus on the regional committee:

Paul O. Penachio  
Joseph Attubato

Emergency Management Director  
Department of Public Works Director

The North Shore Regional Committee met on the following date:

February 8, 2010

### **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 Saugus (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 26, 2010, MAPC conducted the meetings of the Saugus Local Committee. The meetings were organized by Paul Penachio, Emergency Management Director. The purpose of the first meeting was to introduce the PDM program, develop hazard mitigation goals, and to gather information on local hazard mitigation issues and sites or areas related to these. The second meeting focused on verifying information gathered by MAPC staff and discussion of existing mitigation practices, the status of mitigation measures identified in the 2005 hazard mitigation plan, and potential mitigation measures. The second meeting concluded with prioritization of proposed mitigation measures as well as measures carried forward from the previous plan. Table 4 lists the attendees at each meeting of the team. The agendas for these meetings are included in Appendix A.



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<b>Table 4 Attendance at the Saugus Local Committee Meeting</b>	
<b>Name</b>	<b>Representing</b>
<i><b>August 26, 2010</b></i>	
Frank McKinnon	Conservation Commission
Captain Dan McNeil	Saugus Fire Department
Paul O. Penachio	Emergency Management Director
Domenic DiMella	Saugus Police Chief
James Waugh	Saugus DPW
Laura Smith	Building Department
Paul Rupp	CRA
Mark Torbin	Saugus Police-Operations Manager

**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 a meeting of the Planning Board XX, 2011 held in the Saugus Town Hall. The final draft of the plan was presented at a Board of Selectmen's meeting held on April 26, 2011. This meeting was also held in the Saugus Town Hall. The Board of Selectmen's meeting was video-taped for showing on the Saugus cable channel and recorded for broadcast on a local radio station.

The first meeting was publicized as a regular meeting of the Saugus Planning Board. In addition, notice was sent to a number of organizations representing residents and businesses in the Town, with particular emphasis on those representing beachfront neighborhoods. The presentation of the final draft was publicized as a regular Selectmen's meeting. The attendance list for each meeting can be found in Table 5.

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**Table 5  
Attendance at Public Meetings**

<b>Name</b>	<b>Representing</b>
<b><u>First Public Meeting</u></b>	
XXX Sam Cleaves	Board of Selectmen MAPC
<b><u>Second Public Meeting</u></b>	
XXX Sam Cleaves	Saugus Planning Board MAPC

**Other Opportunities for Public Involvement**

Website

Draft copies of the Saugus Hazard Mitigation Plan were posted on the Town's website and updated over the course of the planning process. 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 Saugus 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 Saugus'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, urban and wildfires, drought and earthquakes. Previous state and federal disaster declarations since 1991 are summarized in Table 1.

Table 6 summarizes the hazard risks for Saugus. 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 Saugus using the definitions for hazard frequency and severity listed below Table 6.

**Table 6  
Hazard Risks Summary**

<b>Hazard</b>	<b>Frequency</b>	<b>Severity</b>
Flooding	High	Serious
Winter storms	High	Serious
Hurricanes	Medium	Serious
Earthquakes	Low	Extensive
Tornadoes	Low	Serious
Landslides	Low	Minor
Brush fires	Medium	Minor
Dam failures	Low	Serious

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## **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 services are briefly interrupted; some injuries and/or fatalities.

Extensive: Consistent major property damage; major damage public infrastructure damage (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and fatalities.

Catastrophic: Property and public infrastructure destroyed; essential services stopped, thousands of injuries and fatalities.

## **Flood Related Hazards**

Flooding was the most prevalent serious natural hazard identified by local officials in Saugus. 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 Storms**

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

- March 1968
- The blizzard of 1978

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

- 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 Saugus is subject to two kinds of flooding; coastal flooding where wind and tide leads to flooding along the shore and 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.

Information on flood hazard areas was taken from two sources. The first was the National Flood Insurance Rate Maps. The FIRM flood zones 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) East Saugus: coastal flooding
- 2) Elm Street at Saville Street Bridge: flooding
- 3) Route 1 Highway: Essex Street to Walnut St: flooding
- 4) Spring Street area: flooding

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### 5) Intervale Avenue and Stone Street Neighborhood: flooding

#### Repetitive Loss Structures

There are 27 repetitive loss structures in Saugus, an increase from the 12 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>.

The majority of the repetitive loss properties in Saugus are single family homes, though three multi-family homes can be found in the FEMA flood zone A and other areas identified for frequent flooding. The table below shows the breakdown of structure type by FEMA designated and locally identified flood zones.

**Table 7**  
**Repetitive Loss Properties Summary\***

<b>Structure Type</b>	<b>FEMA Flood Zone</b>	<b>Locally Identified Flooding Area</b>
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
Single Family	AE	Yes
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
2-4 Family	A	Yes
Single Family	A	Yes
2-4 Family	A	Yes
Single Family	AE	No
Single Family	AE	No
Single Family	AE	No
Single Family	A	Yes
Single Family	A	Yes
Single Family	AE	No
Single Family	0.2 %	No
Single Family	AE	No

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**Table 7**  
**Repetitive Loss Properties Summary\***

<b>Structure Type</b>	<b>FEMA Flood Zone</b>	<b>Locally Identified Flooding Area</b>
Single Family	A	No
2-4 Family	A	Yes
Single Family	AE	No
Single Family	A	No
Single Family	A	Yes
Single Family	AE	No

\* Note totals for repetitive loss properties in FEMA flood zones and locally identified areas of flooding do not necessarily match the total number of repetitive loss properties in the community as there is considerable overlap between the two types of flood area and not all repetitive loss properties are located in an identified flood zone.

### Sea Wall Failure and Coastal Erosion

Sea wall failure and coastal erosion are related issues increasingly impacting towns along the Massachusetts coast. Rising sea levels have led to increased rates of erosion along beaches and coastlines and the undermining of sea walls, some of which in the Boston region are many decades old. Sea walls protect the buildings behind them from storm damage and their failure can lead to increased property damage. Similarly, intact beaches with dunes dissipate wave energy, protecting buildings behind them. As the beaches erode away, this protection is lost. In some cases, sea walls can accelerate beach erosion.

FEMA has indicated in their latest rules post hazard event reconstruction or repair funding for coastal protection structures will only be made available where the damage can be directly attributed to the storm event. Therefore, in order to receive this funding, the Town must maintain records of maintenance and repair activities that demonstrate the status of each structure.

### Dams and Dam Failure

The Department of Conservation and Recreation (DCR) Office of Dam Safety lists 10 dams in Saugus. Two of the dams are rated as non-jurisdictional, six of these dams are rated as Significant Hazard and two rated as High Hazard.

Dam failure can arise from two types of situations. Dams can fail because of structural problems independent of any storm event. Dam failure can follow an earthquake by causing structural damage. Dams can fail structurally because of flooding arising from a storm or they can overspill due to flooding.

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In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the area in the path of the dam's floodwaters. Dam failure in general is infrequent but has the potential for severe impacts. An issue for dams in Massachusetts is that many were built in the 19<sup>th</sup> century without the benefits of modern engineering or construction oversight.

The Massachusetts DCR has three hazard classifications for dams:

- High Hazard:** Dams located where failure or mis-operation will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).
- Significant Hazard:** Dams located where failure or mis-operation may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.
- Low Hazard:** Dams located where failure or mis-operation may cause minimal property damage to others. Loss of life is not expected.

In general, DCR requires that dams that are rated as low hazard be inspected every ten years while dams that are rated as significant hazards must be inspected every five years. All of the dams listed below are inspected annually.

*Griswold Lower Pond Dam*- Griswold Lower Pond Dam is of earthen construction, a gravity dam. Its length is 137 feet. Its capacity is 25.2 acre feet. Normal storage is 16.5 acre feet. It drains an area of 0.29 square miles. This dam is owned by the Town. DCR lists the Griswold Lower Pond Dam as a Significant Hazard dam

*Griswold Pond Dam* – Griswold Pond Dam is a 500 foot long, 9.5 foot high earthfill embankment. It is Town owned and listed as a significant hazard by DCR.

### **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 Saugus.

Between 1858 and 2000, 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



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has been one recorded Category One hurricane track through Saugus, recorded in 1944. A recorded tropical storm also tracked through the Town in 1923. 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. There have been no recorded tornados within the Town limits.

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.

Information on wind related hazards can be found on Map 5 in Appendix B.

### **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 the northern two-thirds of Saugus is 48-72 inches per year while the southern third averages 36 – 48 inches per year.

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

More recently, 2008 was a record year for snowfall. 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.

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

### **Fire Related Hazards**

The Saugus Fire Department responds to approximately one hundred woods, brush, and grass fires of varying sizes annually. Brush fires are considered a serious hazard in Saugus. Within the past year there were no wildfires that resulted in significant property damage. The Town's wildfires tend to be in the more remote wooded areas. The most common cause of these fires has been unattended children playing with matches and campfires. 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) Land located off end of Gianna Drive and power line Right of Way
- 7) Lynn Water and Sewer Commission Property
- 8) Pranker's Pond area

### **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.

#### Earthquakes

According to the State Hazard Mitigation Plan, New England experiences an average of five earthquakes per year. From 1627 to 1989, 316 earthquakes were recorded in Massachusetts. Most have originated from the La Malbaie fault in Quebec or from the Cape Anne fault located off the coast of Rockport. The region has experienced larger earthquakes, of magnitude 6.0 to 6.5 in 1727 and 1755. Other notable earthquakes occurred here in 1638 and 1663 (Tufts University). There have been no recorded earthquake epicenters within Saugus.

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

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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.

The majority of the Town has been classified as having a low risk for landslides. According to State data, there is a moderate landslide risk in about one third of the Town, primarily in East Saugus.

### **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 five residential categories are aggregated, residential uses make up 34.96 % of the area of the Town (7,256.83) acres). The highest percentage is forested lands which comprises 27.18 % which is 1,972.46 acres.

**Table 8  
2005 Land Use**

<b>Land Type</b>	<b>Acres</b>	<b>Percent</b>
Crop Land	0.0000	0
Pasture	7.7598	0.1
Forest	1972.4578	27.18
Wetland	184.7683	2.55
Mining	39.7309	0.58
Open Land	257.9748	3.55
Participation Recreation	64.0469	0.88
Spectator Recreation	0.0000	0
Water-Based Recreation	1.5249	0.02
Multi-Family Residential	259.0138	3.57
High Density Residential	1322.8827	18.23
Medium Density Residential	863.5306	11.9
Low Density Residential	80.2623	1.1
Salt Water Wetland	569.3280	7.84
Commercial	483.6312	6.66

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<b>Land Type</b>	<b>Acres</b>	<b>Percent</b>
Industrial	53.5474	0.74
Urban Open	36.8213	0.5
Transportation	138.5027	1.9
Waste Disposal	57.5423	0.79
Water	332.1710	4.58
Cranberry Bog	0.0000	0
Power line	95.1459	1.31
Saltwater Sandy Beach	8.7549	0.12
Marina	2.5035	0.03
Golf Course	47.1803	0.65
Urban Public	73.7596	1.02
Cemetery	21.8422	0.3
Orchard	0.0000	0
Nursery	5.1449	0.07
Forested Wetland	203.1446	2.8
Very Low Density Res.	11.0734	0.15
Junkyards	0.0000	0
Brushland/Successional	62.7842	0.87
<b>Total Acres</b>	<b>7256.8302</b>	<b>100</b>

For more information on how the land use statistics were developed and the definitions of the categories, please go to <http://www.mass.gov/mgis/lus.htm>.

#### Economic Elements

While Saugus does not have a quantitative measure of the impact of specific businesses, industries, or areas on its local economic conditions, there are several economic drivers within the Town that face potential damage during a coastal natural hazard flooding event. These were businesses located along the waterfront, most especially in the East Saugus area.

#### Historic, Cultural, and Natural Resource Areas

The Boardman House (circa 1687), also known as the Scotch-Boardman House or the Bennett-Boardman House, is a historic house located at 17 Howard Street. It is a National Historic Landmark.

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Saugus Iron Works National Historic Site is also a National Historic Site. It is the site of the first integrated ironworks in North America, constructed in the mid 1600s. It includes a reconstructed blast furnace, forge, and rolling mill.

Saugus Town Hall was built in 1875 and added to the National Register of Historic Places in 1985.

Designed in 1934 by Charles Eliot, the Breakheart Reservation offers birding, fishing, hiking, access to Pearce and Silver Lakes and the Saugus River as well as views of Boston and southern New Hampshire from its seven hills. The Reservation, managed by the MA Department of Conservation and Recreation, was added to the National Register of Historic Places in 2003.

### **Development Trends**

**Build out Analysis** – In 2000, the Metropolitan Area Planning Council, under contract to the Executive Office of Environmental Affairs (EOEA) prepared a build out analysis for every community in the Boston region. A build out analysis is a tool to help communities understand the potential impacts of future growth that might occur given the amount of developable land remaining and how that land is zoned.

The following table summarizes the results of that build out analysis for Saugus. The analysis starts with available land in each zoning district and makes projections of additional housing units as well as commercial/industrial space according to each district's minimum lot size and other regulations. The projections only account for as of right development and do not include development by special or comprehensive permit that could increase the amount of development.

Additional Residents	2,006
Additional Students (K-12)	258
Additional Residential Units	781
Additional Developable Land Area (sq. ft.)	37,443,250
Additional Developable Land Area (acres)	860
Additional Commercial/Industrial Buildable Floor Area (sq. ft.)	9,862,103
Additional Water Demand at Build out (gallons/day)	890,137
Residential	150,479
Commercial and Industrial	739,658
Additional Solid Waste (tons/year)	1,029
Non-Recyclable	732
Recyclable	297
Additional Roadway at Build out (miles)	9

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### Recent and 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. These areas are shown on Map 2, "Potential Development" and are described below. The letter for each site corresponds to the letters on Map 2.

- A) Overlook Ridge: Approximately 100 acres of mixed use; 25 % built out. 3,000 residential units at full build out
- B) Pleasant Hill Condominiums; 2-3 acres, fully constructed, 90% units sold
- C) Stone Cliff Heights Subdivision: cluster subdivision. 47 houses, 50% constructed
- D) Twin Springs Subdivision: 20 houses, 60 % constructed
- E) 720 – 770 Broadway Commercial Development: 7-8 acres, 2 buildings: 55,000 and 80,000 SF each
- F) Aggregate Industries: possible future development

### Future Development in Hazard Areas

Table 9 shows the relationship of these parcels to two of the mapped hazards. This information is provided so that planners can ensure that development proposals comply with flood plain zoning and that careful attention is paid to drainage issues.

<b>Table 9: Relationship of Potential Development to Hazard Areas</b>		
<b>Parcel</b>	<b>Landslide risk</b>	<b>Flood Zone</b>
Overlook Ridge	Moderate Susceptibility	18.0188% in AE 1.0924% in A
Pleasant Hill Condominiums	Low	No
Stone Cliff Heights Subdivision	Low	No
Twin Springs Subdivision	Moderate Susceptibility	No
720 - 770 Broadway Commercial Development	Low	No
Aggregate Industries	Moderate Susceptibility	No

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### **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:

<b>A</b>	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
<b>AE</b>	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
<b>AH</b>	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
<b>AO</b>	River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
<b>AR</b>	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
<b>A99</b>	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
<b>V</b>	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.
<b>VE, V1 - 30</b>	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.

**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".

**Column 7: Average Snow fall:** See Map 6 in Appendix B.

**Column 8: Hurricane Surge Areas:** *higher number = greater risk*

The following explanation of hurricane surge areas was taken from the US Army Corps of Engineers web site: "Hurricane storm surge is an abnormal rise in sea level accompanying a hurricane or other intense storm. Along a coastline a hurricane will cause waves on top of the surge. Hurricane Surge is estimated with the use of a computer model called SLOSH. SLOSH stands for Sea Lake and Overland Surge from Hurricanes. The SLOSH models are created and run by the National Hurricane Center. There are about 40 SLOSH models from Maine to Texas. The SLOSH model results are merged with ground elevation data to determine areas that will be subject to flooding from various categories of hurricanes. Hurricane categories are defined by the Saffir-Simpson Scale."

According to the Saffir-Simpson Scale, the least damaging storm is a Category 1 (winds of 74-95 miles per hour) and the most damaging storm is a Category 5 (winds greater than 155 miles per hour).



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<b>ID</b>	<b>NAME</b>	<b>TYPE</b>	<b>Landslide Risk</b>	<b>Within FEMA Flood Zone</b>	<b>Locally ID'ed Flooding Area?</b>	<b>Average Annual Snow Fall</b>	<b>Hurricane Surge Areas (Category)</b>
1	Lynnhurst School	School	Low Susceptibility	No	No	Low	0
2	Oaklandvale School	School	Low Susceptibility	No	No	High	0
3	Saugus Police Emergency/ EOC	Police Station	Low Susceptibility	No	No	High	0
4	Saugus Fire Dept Dispatch	Fire Station	Low Susceptibility	No	No	High	0
5	Blessed Sacrament Church	Place of Worship	Low Susceptibility	No	No	High	0
6	Greater Grace Christian Academy	Place of Worship	Low Susceptibility	No	No	High	0
7	Christian Learning Center	School	Low Susceptibility	No	No	High	0
8	Medical Treatment Center	Medical Facility	Low Susceptibility	No	No	High	0
9	Douglas Waybright	School	Low Susceptibility	No	No	High	0
10	Saugus High School	School	Low Susceptibility	No	No	High	0
11	Veteran's Elementary School	School	Moderate Susceptibility	No	Intervale Avenue and Stone Street Neighborhood	Low	0
12	Emergency Management	EOC	Low Susceptibility	No	No	High	0

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<b>ID</b>	<b>NAME</b>	<b>TYPE</b>	<b>Landslide Risk</b>	<b>Within FEMA Flood Zone</b>	<b>Locally ID'ed Flooding Area?</b>	<b>Average Annual Snow Fall</b>	<b>Hurricane Surge Areas (Category)</b>
	Agency / EOC						
13	Saugus Elks Club	Place of Assembly	Low Susceptibility	No	No	High	0
14	Knights Of Columbus	Gathering Hall	Low Susceptibility	No	No	High	0
15	Evans Elementary School	School	Low Susceptibility	No	No	High	0
16	Belmonte Saugus Middle School	School	Low Susceptibility	No	No	High	0
17	Veterans Memorial	School	Moderate Susceptibility	No	Intervale Avenue and Stone Street Neighborhood	Low	0
18	Hammersmith House Nursing Home	Nursing Home	Moderate Susceptibility	No	No	Low	0
19	Vineyard Metro North Church	Place of Worship	Moderate Susceptibility	No	No	High	0
20	Ballard Elementary School	School	Moderate Susceptibility	No	East Saugus	Low	3
21	Saugus Fire Station	Fire Station	Moderate Susceptibility	No	No	High	0
22	Harbor Side Health Care	Nursing Home	Moderate Susceptibility	No	East Saugus	Low	4
23	Saint Margaret's Church	Place of Worship	Moderate Susceptibility	No	No	Low	0
24	Methodist Church	Place of	Moderate	No	No	Low	0

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<b>ID</b>	<b>NAME</b>	<b>TYPE</b>	<b>Landslide Risk</b>	<b>Within FEMA Flood Zone</b>	<b>Locally ID'ed Flooding Area?</b>	<b>Average Annual Snow Fall</b>	<b>Hurricane Surge Areas (Category)</b>
		Worship	Susceptibility				
25	Heliport At Blessed Sacrament Church	Heliport	Low Susceptibility	No	No	High	0
26	Department of Public Works	Municipal Office	Low Susceptibility	No	No	High	0
27	Fuel Depot at DPW	Fuel Depot	Low Susceptibility	No	No	High	0
28	Heliport At Saugus High School	Heliport	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
29	Stop & Shop # 16	Food	Low Susceptibility	No	No	High	0
30	Heliport At Belmonte Saugus Middle School	Heliport	Moderate Susceptibility	No	No	High	0
31	East Saugus Methodist Church	Religious	Moderate Susceptibility	No	No	Low	0
32	Town Boat Landing	Boat Landing	No	AE	No	High	1
33	Heliport Across From Fox Hill Yacht Club	Heliport	Moderate Susceptibility	AE	No	Low	1
34	RESCO Waste Disposal Plant	Wastewater Treatment	Moderate Susceptibility	AE	No	Low	4
35	Heliport Anna Parker Play Ground	Heliport	Moderate Susceptibility	No	No	High	0

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<b>ID</b>	<b>NAME</b>	<b>TYPE</b>	<b>Landslide Risk</b>	<b>Within FEMA Flood Zone</b>	<b>Locally ID'ed Flooding Area?</b>	<b>Average Annual Snow Fall</b>	<b>Hurricane Surge Areas (Category)</b>
36	Post Office HQ	Federal Office	Moderate Susceptibility	No	No	Low	0
37	Sweetser Corner Housing Authority	Elderly Housing	Moderate Susceptibility	No	No	Low	0
38	Town Hall	Municipal Office	Low Susceptibility	No	No	High	0
39	Center Congregation	Place of Worship	Low Susceptibility	No	No	High	0
40	Public Library	Municipal Office	Low Susceptibility	No	No	High	0
41	Summer Street Church	Place of Worship	Low Susceptibility	No	No	High	0
42	Synagogue	Place of Worship	Low Susceptibility	No	No	High	4
43	Youth & Rec. Dep.	Day Care	Moderate Susceptibility	No	No	High	0
44	Saugus Assembly Of God	Place of Worship	Moderate Susceptibility	No	No	High	0
45	Saugus Senior Center	Senior Center	Moderate Susceptibility	No	No	Low	0
46	Verizon	Switching Station	Moderate Susceptibility	No	No	Low	0
47	Church Of Nazarene	Place of Worship	Moderate Susceptibility	No	No	Low	0
48	Jehovah Witness	Place of Worship	Low Susceptibility	No	No	High	0

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49	Walgreens Pharmacy	Pharmacy	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
50	Stanly W Day Pumping Station	Sewer Pump Station	Moderate Susceptibility	AE	No	Low	2
51	Lincoln Ave Bridge	Bridge	Moderate Susceptibility	AE	No	Low	0
52	Belden Bly Bridge	Bridge	Moderate Susceptibility	0.2 PCT ANNUAL CHANCE FLOOD HAZARD	No	Low	1
53	Kasabuski Skating Rink	Skating Rink	Low Susceptibility	No	No	High	0
54	Shaw's Supermarket/Target	Supermarket	Low Susceptibility	No	No	High	0
55	Hockey Town USA Skating Rink	Skating Rink	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
56	Cell Towers on Days Inn	Cell Tower	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
57	Cell Towers on	Cell Tower	Low	No	Route 1	High	0

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	Stone Hill Corporation.		Susceptibility		Highway: Essex Street to Walnut St		
58	Cell Tower	Cell Tower	Low Susceptibility	No	No	High	0
59	Radio tower Police/Fire	Communication Tower	Low Susceptibility	No	No	High	0
60	Jehovah Witness Church	Place of Worship	Low Susceptibility	No	No	High	0
61	Hannaford's	Food	Low Susceptibility	AE	Route 1 Highway: Essex Street to Walnut St	High	0
62	Rite-Aid	Pharmacy	Low Susceptibility	No	No	High	0
63	Fox Hill Yacht Club	Yacht Club	Moderate Susceptibility	AE	No	Low	1
64	Lobsterman's Landing	Pier	Moderate Susceptibility	AE	No	Low	1
65	Birch Pond Reservoir	Reservoir	Low Susceptibility	A	No	High	0
66	Walden Pond Dam	Dam	Low Susceptibility	No	No	Low	0
67	Walden Pond Reservoir	Reservoir	Low Susceptibility	A	No	Low	0
68	Hawke's Pond	Reservoir	Low	A	No	High	0

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			Susceptibility				
69	Hawke's Pond Dam	Dam	Low Susceptibility	No	No	High	0
70	Radio tower Police	Communication Tower	Low Susceptibility	No	No	High	0
71	Heritage Heights Elderly Housing	Elderly Housing	Low Susceptibility	No	No	High	0
72	Laure Gardens/Towers Elderly Housing	Elderly Housing	Low Susceptibility	No	No	High	0
73	Electrical Sub Station	Electric Sub Station	Low Susceptibility	No	No	High	0
74	Radio Tower At Square 1 Mall	Radio Tower	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
75	Mass Electric Power Station	Electric Station	Low Susceptibility	No	No	High	0
76	Cell Tower	Cell Tower	Low Susceptibility	No	No	High	0
77	Sachem Manor	Elderly Housing	Low Susceptibility	No	No	High	0
78	Saugus Animal Hospital	Animal Services	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0

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79	Animal Medical Center	Animal Services	Low Susceptibility	No	No	High	0
80	Saugus High School	Emergency Dispensing station	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
81	School Administration	Municipal Office	Low Susceptibility	No	No	High	0
82	Bristow St Sewer Pumping Substation	Sewer Pumping Substation	Moderate Susceptibility	AE	East Saugus	Low	1
83	Laurel St Sewer Pumping Substation	Sewer Pumping Substation	Moderate Susceptibility	No	No	Low	0
84	Lynnhurst Sewer Pumping Substation	Sewer Pumping Substation	Low Susceptibility	No	No	Low	0
85	Rte 1N Sewer Pumping Substation	Sewer Pumping Substation	Low Susceptibility	No	Route 1 Highway: Essex Street to Walnut St	High	0
86	MBTA Drawbridge	Bridge	No	AE	No	High	0
87	MBTA Bridge	Bridge	Moderate Susceptibility	AE	No	Low	1
88	Spillway for Reservoir	Flood Protection	Low Susceptibility	No	No	Low	0
89	Spillway for Hawke's Pond	Flood Protection	Low Susceptibility	No	No	High	0



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## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

### **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 Saugus, 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 11**  
**Estimated Damages from Hurricanes**

	<b>100 Year</b>	<b>500 Year</b>
<b>Building Characteristics</b>		
Estimated total number of buildings	8,578	8,578
Estimated total building replacement value (Year 2002 \$) (Millions of Dollars)	\$2,109	\$2,109
<b>Building Damages</b>		
# of buildings sustaining minor damage	828	2,966
# of buildings sustaining moderate damage	68	1,159
# of buildings sustaining severe damage	3	201
# of buildings destroyed	2	146
<b>Population Needs</b>		
# of households displaced	22	361
# of people seeking public shelter	4	75
<b>Debris</b>		
Building debris generated (tons)	7,201	35,174
Tree debris generated (tons)	4,393	15,477
# of truckloads to clear building debris	112	783
<b>Value of Damages (Thousands of dollars)</b>		
Total property damage	\$19,320.80	\$184,434.61

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**Table 11  
Estimated Damages from Hurricanes**

	<b>100 Year</b>	<b>500 Year</b>
Total losses due to business interruption	\$2,053.81	\$24,338.96

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 12  
Estimated Damages from Earthquakes**

	<b>Magnitude 5.0</b>	<b>Magnitude 7.0</b>
<b>Building Characteristics</b>		
Estimated total number of buildings	8,578	8,578
Estimated total building replacement value (Year 2002 \$)(Millions of dollars)	\$2,109	\$2,109
<b>Building Damages</b>		
# of buildings sustaining slight damage	1,411	1,115
# of buildings sustaining moderate damage	405	3,200
# of buildings sustaining extensive damage	51	2,438
# of buildings completely damaged	6	1,643
<b>Population Needs</b>		
# of households displaced	43	2,660
# of people seeking public shelter	9	562
<b>Debris</b>		
Building debris generated (tons)	NA	NA
<b>Value of Damages (Millions of dollars)</b>		
Total property damage	\$108.92	\$1,471.39
Total losses due to business interruption	\$6.59	\$170.35

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### Estimated Damages from Flooding

MAPC did not use HAZUS-MH to estimate flood damages in Saugus. 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 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.

Saugus is 11.51 square miles or 7,366.64 acres. Approximately 623.30 acres have been identified by local officials as areas of flooding. This amounts to 8.58813 % of the land area in Saugus. The number of structures in each flood area was estimated by applying the percentage of the total land area to the number of structures (8,578) in Saugus; the same number of structures used by HAZUS for the hurricane and earthquake calculations. HAZUS uses a value of \$245,862 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 \$18,095,462- \$90,477,216. 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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<b>Table 13: Estimated Damages from Flooding</b>							
<b>ID</b>	<b>Flood Hazard Area</b>	<b>Approximate Area in Acres</b>	<b>% of Total Land Area</b>	<b># of Structures</b>	<b>Replacement Value</b>	<b>Low Estimate of Damages</b>	<b>High Estimate of Damages</b>
1	East Saugus	198.7689	2.7387	235	\$57,777,570	\$5,777,775	\$28,888,785
2	Elm Street at Saville Street Bridge	24.7506	0.3410	29	\$7,129,998	\$713,000	\$3,564,999
3	Route 1 Highway: Essex Street to Walnut Street	271.2458	3.7373	320	\$78,675,840	\$7,867,584	\$39,337,920
4	Spring Street Area	70.8343	0.9760	84	\$20,652,408	\$2,065,241	\$10,326,204
5	Intervale Avenue and Stone Street Neighborhood	57.7021	0.7950	68	\$16,718,616	\$1,671,862	\$8,359,308
	<b>Totals</b>	<b>623.30</b>	<b>8.58813</b>	<b>736</b>	<b>\$180,954,432</b>	<b>\$18,095,462</b>	<b>\$90,477,216</b>

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## **TOWN OF SAUGUS HAZARD MITIGATION PLAN**

### **V. HAZARD MITIGATION GOALS**

The Saugus Local Multiple Hazard Community Planning Team met on August 26, 2010. At that meeting, the team reviewed and discussed the goals from the 2005 Hazard Mitigation Plan for the Town of Saugus. 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 Saugus Hazard Mitigation Plan:

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.
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.
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. Ensure that hazard mitigation measures are in place to keep major roads open with a particular emphasis on Route 1.

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## TOWN OF SAUGUS HAZARD MITIGATION PLAN

### 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* – Saugus would like to establish a Reverse 911 system for distribution of emergency messages. Incident command units are available through MA State Police, MA Department of Fire Services and MEMA.

*Emergency Power Generators* – The Town maintains emergency power generators in several important public facilities and emergency shelters.

*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 emergency management coordinator leads the LEPC, which meets on an as-needed basis.

#### Existing Flood Hazard Mitigation Measures

National Flood Insurance Program (NFIP) – Saugus participates in the NFIP with 319 policies in force as of the November 30, 2010. 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 Saugus:

Flood insurance policies in force ( as of May 31, 2010)	319
Coverage amount of flood insurance policies	\$69,707,100
Premiums paid	\$399,789
Total losses (all losses submitted regardless of the status)	281
Closed losses (Losses that have been paid)	211
Open losses (Losses that have not been paid in full)	0
CWOP losses ( Losses that have been closed without payment)	70
Total payments (Total amount paid on losses)	\$1,357,502.65

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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 increased by 55, and the total losses have increased by 87. The total payments, as of December 21, 2004, were \$549,275.69, approximately \$800,000 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 once annually.
- *Catch basin cleaning* – All are cleaned at least once annually.
- *Roadway treatments* – Streets are treated with a mix of sand and salt.

*Conservation/Recreation Open Space Plan* – The Town of Saugus Open Space and Recreation Plan is listed as being current the MA Division of Conservation Services through January of 2011. The plan identifies a number of open space parcels prioritized for acquisition that would also benefit hazard mitigation efforts.

*Floodplain Zoning District* – Section 4.6: Lands in Saugus that are subject to seasonable and periodic flooding that must be developed, preserved, and maintained to assure the natural flow of watercourses. These are made up of the following categories:

A. Flood Plain District- Lands that are shown on the FEMA Flood Boundary and Floodway Map dated January 19, 1983, as amended; and lands shown as Flood Plain on the official Zoning Map of the Town of Saugus.

B. Flood Plain-Fringe- Lands in Saugus shown as Zones A, A-2, A-3, A-4, A-7, and A-9 on the Town of Saugus Flood Rate Insurance Map dated January 19, 1983, as amended, except for those that are included in the Flood Plain District as defined in Section 4.6A.

Section 6.5.3 - Base flood elevation is required for proposals or other developments greater than 10 lots or 1 acre, whichever is less, within unnumbered A zones.

Section 6.5.4- Neighboring communities must be notified of, using the NFIP State Coordinator, of any proposed alteration or relocation of a watercourse.

Section 12.4- Special permit applications within the Flood Plain Districts must also meet the following conditions, in addition to the Town’s general special permit conditions:

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

1. The application must have been referred to and reported on, within 35 days, by the Board of Health, Conservation Commission and Planning Board;
2. The proposed use must not be detrimental to the public health, safety and welfare;
3. The proposed use must comply with all requirements of the underlying zoning district.

*Subdivision Rules and Regulations* 4.E.1- The Saugus Subdivision Rules and Regulations contains provisions that require that lots shall be prepared in such a manner that development of one shall not cause detrimental drainage on another and that drainage easements must be provided as needed.

*Stormwater Bylaw* – The purpose of the Stormwater Bylaw (section 32050) is in part to mitigate flooding through site design and structural improvements that promote the infiltration of stormwater on site or otherwise retain stormwater in areas of new development where there is a significant increase in impervious surfaces and/or a change in drainage patterns.

*Wetlands Protection By-Law* – The purpose of the Wetlands Protection By-Law is to further protect the Town's shores, ponds, rivers, and wetlands for, among other reasons, flood control, erosion and sedimentation control, and public safety. In addition to requiring review of all development, excavation, or fill activities in or within 100 feet of any wetland, shoreline, coastal feature, etc and also any land subject to tidal action, coastal storm flowage, or flooding, the Bylaw also allows for a 50-foot no-disturb provision within the 100 foot buffer zone.

*The Comprehensive Emergency Management Plan (CEMP)* - The CEMP shows inundation areas and the number of homes and people that might be affected.

*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. The Emergency Management is required to inspect dams as part of the CEMP updating process. The Lynn Water and Sewer Commission are also required to inspect their dams.

### **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 conducts its own tree maintenance and also uses its own equipment to trim and remove trees as needed.

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### **Existing Winter Hazard Mitigation Measures**

Snow disposal –The town conducts general snow removal operations with its own equipment. Approximately 30% of snow removal is done by the DPW and 70% by local contractors. The Town uses a 50/50 sand/snow mix.

### **Existing Brush Fire Hazard Mitigation Measures**

*Burn Permits* – The Town does not issue permits for outdoor burning.

*Subdivision/Development Review* – The Fire Department participates in the review of new subdivisions and development projects.

### **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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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
<b>MULTIPLE HAZARDS</b>			
Comprehensive Emergency Management Plan (CEMP)	Town-wide.	Emphasis is on emergency response.	None.
Communications Equipment	Town-wide.	Effective	Equipment upgrade.
Massachusetts State Building Code	Town-wide.	Effective for new construction.	None.
Emergency Power Generators	Town-wide.	Effective.	Upgrade generators as needed; provide generators at additional locations; provide alternative fuel sources and generator power source flexibility.
Participation in the Local Emergency Planning Committee (LEPC)	Town-wide.	A forum for inter-departmental cooperation on natural and manmade disasters.	None.
<b>FLOOD HAZARDS</b>			
Participation in the National Flood Insurance Program (NFIP)	Areas identified on the FIRM maps.	There are 1,445 policies in force.	Encourage all eligible homeowners to obtain insurance.
Public Works Operations/Maintenance Activities	Town-wide.	The DPW cleans catch basins once a year and sweeps all	More employee hours needed for preventive maintenance; consider

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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
		streets twice per year. Somewhat Effective.	Stormwater Utility.
Open Space Plan	Town-wide	Somewhat Effective.	Update.
Zoning – Floodplain District	<ul style="list-style-type: none"> <li>• Development in Floodplain districts must be in compliance with MGL Ch. 131, Sec. 40, Article 24, the Saugus Wetlands Protection Bylaw, Mass. State Building Code regulations for flood resistant construction, DEP wetlands regulations.</li> <li>• In the floodway, all encroachments and development are prohibited unless a registered engineer certifies that there will not be any increase in base flood water surface elevations or velocities.</li> <li>• In Zone A, A1-30 and AE,</li> </ul>	Effective for new construction.	None.



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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
	<p>along watercourses that have not had a regulatory floodway designated, the best available Federal, state or local data shall be used to prohibit encroachments in floodways that would result in any increase in flood levels during the occurrence of the base flood discharge.</p> <ul style="list-style-type: none"> <li>• Base flood elevation data is required for subdivision proposals or other developments greater than 10 lots or 1 acre within unnumbered A zones.</li> <li>• In a Flood Plain District, if a special permit is required for a use, the reviewing and permit granting authorities shall base their</li> </ul>		

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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
	<p>decision on the following criteria: danger to life and property due to increased flood heights or velocities; the danger of damage downstream, the susceptibility of the proposed facility and its contents to flood damage; the availability of alternative locations not subject to flooding; the relationship of the proposed use to the comprehensive plan and flood plain management plan for the area; the safety of access of emergency vehicles to the property in times of flood; the expected heights, velocity, duration, rate of rise, and sediment transport of the</p>		

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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
	<p>flood waters expected at the site.</p> <ul style="list-style-type: none"> <li>Site plan review must include an environmental impact study which identifies potential impacts of the development on on-site or off-site flooding.</li> </ul>		
Salt Water Marsh and River Basin Planning Committee	Town Manager appoints a committee of 7 to review, investigate, and recommend plans to realize the greatest potential usage of the Saugus Salt Water Marshes.	Effective.	None.
Waterways Commission	<ul style="list-style-type: none"> <li>Commission established to develop policies for the planning, development and management of Saugus' waterways.</li> <li>Commission is charged with developing a Saugus Waterways Plan for approval by Town meeting.</li> </ul>	Effective.	None.
Subdivision Rules & Regulations	Town-wide	Effective for new construction.	Consider updating subdivision drainage regulations to match MA

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<b>Table 14- Saugus Existing Mitigation Measures</b>			
<b>Type of Existing Mitigation Measures</b>	<b>Area Covered</b>	<b>Effectiveness/ Enforcement</b>	<b>Improvements/ Changes Needed</b>
			Stormwater Performance Standards.
Stormwater By-Law	Town-wide	Effective.	None.
Wetlands Protection By-Law	Resource Areas	Effective.	None.
Hillside Protection Bylaw	One of the purposes of this bylaw is to minimize water run-off and soil erosion problems as a result of grading of steep slopes.  Applies to R-1, R-2, B-e, R-4, B-1, B-2, B-3, I-I and I-2 zoning districts	Effective	.None.
<b>WIND HAZARDS</b>			
The Massachusetts State Building Code	Town-wide.	Effective for most situations except severe storms	None.
Tree trimming program	Town-wide.	Satisfactory.	None.
<b>WINTER HAZARDS</b>			
Snow Disposal Site	As necessary	Satisfactory.	None.
<b>BRUSH FIRE HAZARDS</b>			
Development Review	Town-wide.	Effective.	None.
<b>GEOLOGIC HAZARDS</b>			
The Massachusetts State Building Code	Town-wide.	Effective	None.

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**VII. MITIGATION MEASURES FROM THE 2005 PLAN**

**Review and Update Process**

At a meeting of the Saugus Hazard Mitigation Committee, Town staff reviewed the mitigation measures identified in the 2005 North Shore Regional Pre-Disaster Mitigation Plan Saugus Annex and determined whether each measure had been implemented or deferred. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into the 2011 Saugus 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.

<p style="text-align: center;"><b>Table 15</b> <b>Mitigation Measures from the 2005 Plan</b></p>			
<b>Mitigation Measures</b>	<b>Priority</b>	<b>Implementation Responsibility</b>	<b>2011 Status</b>
Review and implement recommendations from Shute Brook Study	High	DPW	Completed. Undersized culvert replaced.
Review and implement recommendations from Phase II storm water management study (underway)	Medium	DPW	Completed: September 2010
Equip Fire Department with a brush truck	High	Fire Department	Completed. New brush truck purchased.
Construct new water line along the side of Route 1	High	DPW	Ongoing. South bound lanes project design completed from Lynn Fells Parkway to Walnut Street. North bound lanes design from Essex Street to Walnut Street not complete. Seeking federal

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<b>Table 15</b> <b>Mitigation Measures from the 2005 Plan</b>			
<b>Mitigation Measures</b>	<b>Priority</b>	<b>Implementation Responsibility</b>	<b>2011 Status</b>
			earmark to complete design and construction.
Equip the Emergency Management Center and town hall with back-up power generators	High	Town Meeting, Town Administrator	Ongoing.

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## **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/hmmp/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 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

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include protection of warning system capability, protection of critical facilities, 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

*Shoreline Environment* – The coastal shoreline of the North Shore area is a dynamic environment where forces of erosion and deposition of sand are constantly at work changing the beach profile. This process disregards municipal boundaries as sand and other materials are moved along the coast. Shoreline protection measures such as sea walls, jetties, and others have an impact on this process with the potential of building up sand in some areas while stripping it away from others. Municipalities along the North Shore should work to understand how these processes are at work locally and consider mutually beneficial means of protecting their shore side communities from the impacts of storm damage.

#### 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.

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.



## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

*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 Saugus, 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 16.

### **High Priority Mitigation Measures**

#### ***Flooding, Drainage Infrastructure, and Dams***

Complete design and construction of Route One drainage system replacement. This is the Town's top priority project. The Town is currently seeking a federal legislative earmark to help fund this project.

Complete design and reconstruction or removal of the Elm Street Bridge. The Town has applied for Hazard Mitigation grant funding to help complete this task.

Relieve flooding in East Saugus by updating East Saugus drainage system, dredging Eastern Avenue tidal canals and recalibrating Ballard Street tide gate. This is a top priority project for Saugus.

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

Design and adopt a Stormwater Utility mechanism in order to help the town advance stormwater maintenance and preventative practices.

Provide additional resources for storm preparation and response: flooding preparation and evacuation best-practices.

Collaborate with the Lynn Water and Sewer Commission to replace the Spring Street 48-inch culvert with a larger, pre-cast concrete culvert.

Upgrade drainage lines along Lynnhurst Street from Stockade Road to Elm Street.

Replace undersized drainage line along Intervale Avenue.

### ***High Winds and Hurricanes***

Public Education: Continue active public education programs related to flood and hurricane awareness and mitigation measures. Work with the Emergency Management Coordinator and the Saugus Saltwater Marsh and River Basin Planning Committee to disperse educational materials in the community and help organize attendance at information meetings. In proportion to the potential risk, consider creating educational information on other potential natural hazards impacting Saugus such as winter storms, tornadoes, and earthquakes.

Purchase new bucket truck and chipper for downed trees and on-going tree maintenance.

### ***Winter Storms***

Purchase a new sander and 5-ton dump truck to assist in winter safety and snow removal practices.

### ***Multi-hazard and Communications***

Install town-wide Reverse 911 emergency communications system.

Install fixed, natural gas fueled generators at Town Hall and Senior Center.

Replace Police Station radio repeater.

Replace Emergency Management Department's radio console.

Update hand held radios at the Police Department.

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

### ***Brush Fires***

Design and implement a fire road access improvement program. This could be done in conjunction with the Lynn Water and Sewer Commission.

Acquire a high pressure floating pump for pumping surface water from ponds.

### ***Measures to Ensure Compliance with NFIP***

Floodplain Management: Continue to enforce the Floodplain Zoning District (Section 470) and associated building regulations for floodplain areas. Update this district to remain consistent with FEMA guidelines and floodplain mapping.

Floodplain Mapping: Maintain up to date maps of local FEMA identified floodplains.

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.

### **Medium Priority Mitigation Measures**

#### ***Flooding, Drainage Infrastructure and Dams***

FEMA Training: Key town staff should participate in MEMA or FEMA trainings related to hazard mitigation planning and implementation.

### ***Brush Fires***

Purchase 500 feet of new 2-inch hose and 500 feet of 1.5-inch forest fire hose

### **Low Priority Mitigation Measures**

#### ***Flooding, Drainage Infrastructure and Dams***

Develop town-based GIS wetlands mapping capacity that would include all local wetlands delineations.

Finish mapping the location of all outfalls and catch basins into the Town's GIS data base.

## TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE

### *Earthquakes*

Municipal Building Assessment: Investigate options to make all public municipal buildings earthquake resistant.

### **Introduction to Potential Mitigation Measures (Table 16)**

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.

## **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

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 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/cfq.html>

### **Abbreviations Used in Table 16**

FEMA Mitigation Grants includes:

FMA = Flood Mitigation Assistance Program.

HMGP = Hazard Mitigation Grant Program.

PDM = Pre-Disaster Mitigation Program

ACOE = Army Corps of Engineers.

MHD = Massachusetts Highway Department.

EOT = Executive Office of Transportation.

DCR = Department of Conservation and Recreation

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

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## TOWN OF SAUGUS HAZARD MITIGATION PLAN

**Table 16**  
**Saugus Potential Mitigation Measures**

<b>Hazard Area</b>	<b>Mitigation Measure</b>	<b>Measure Type</b>	<b>Implementation Responsibility</b>	<b>Time Frame</b>	<b>Estimated Cost</b>	<b>Potential Funding Sources</b>
<b>High Priority</b>						
Flood Hazard	Complete design and construction of Route One drainage system replacement.	Structural Projects	Public Works	2011-2013	Estimated total design and construction project costs: \$ 3-4 million	Legislative Earmark/FEMA/ Saugus
Flood Hazard	Complete design and reconstruction or removal of the Elm Street Bridge.	Structural Projects	Public Works	2011-2013	TBD	Saugus/FEMA
Flood Hazard	Update East Saugus drainage system, dredging Eastern Avenue tidal canals and recalibrating Ballard Street tide gate.	Structural Projects	Public Works	2011-2015	TBD	Saugus/FEMA
Flood Hazard	Design and adopt a Stormwater Utility mechanism.	Prevention	Public Works	2011-2014	TBD	Saugus
Flood Hazard	Replace the Spring Street 48-inch culvert with a larger, pre-cast concrete culvert.	Structural	Public Works	2011-2014	TBD	Saugus/Lynn Water and Sewer Commission

**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
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<b>Table 16 Saugus Potential Mitigation Measures</b>						
<b>Hazard Area</b>	<b>Mitigation Measure</b>	<b>Measure Type</b>	<b>Implementation Responsibility</b>	<b>Time Frame</b>	<b>Estimated Cost</b>	<b>Potential Funding Sources</b>
Flood Hazard	Upgrade drainage lines along Lynnhurst Street from Stockade Road to Elm Street.	Structural Projects	Public Works	2011-2015	TBD	Saugus
Flood Hazard	Replace undersized drainage line along Intervale Avenue.	Structural Projects	Public Works	2011-2015	TBD	Saugus
High Winds and Hurricanes	Continue active public education programs related to flood and hurricane awareness and mitigation measures	Public Education	Public Works/ Conservation	2011-2015	Ongoing	Saugus
Winter Storms	Purchase a new sander and 5-ton dump truck.	Emergency Services	Public Works	2011-2015	TBD	Saugus
Multi-Hazard/ Communications	Install town-wide Reverse 911 emergency communications system.	Emergency Services.	Public Works	2010-2015	TBD	Saugus



**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
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<b>Table 16</b> <b>Saugus Potential Mitigation Measures</b>						
<b>Hazard Area</b>	<b>Mitigation Measure</b>	<b>Measure Type</b>	<b>Implementation Responsibility</b>	<b>Time Frame</b>	<b>Estimated Cost</b>	<b>Potential Funding Sources</b>
Multi-Hazard/ Communications	Install fixed, natural gas fueled generators at Town Hall and Senior Center.	Emergency Services	Public Works	2010-2015	TBD	Saugus/ FEMA
Multi-Hazard/ Communications	Replace Police Station radio repeater.	Emergency Services	Police Department	2011-2013	TBD	Saugus/FEMA
Multi-Hazard/ Communications	Replace Emergency Management Department radio console	Emergency Services	Emergency Management	2011-2013	\$36,000	Saugus/FEMA
Multi-Hazard/ Communications	Update 60 hand held radios at the Police Department	Emergency Services	Police Department	2011- 2013	\$75,000	Saugus/FEMA
<b>Medium Priority</b>						
Flood Hazard	Key town staff should participate in MEMA or FEMA trainings	Prevention / Property Protection	Fire, Emergency Management, Police and DPW	Ongoing	TBD	Saugus
Brush Fires	Purchase 500 feet of new 2-inch and 500 feet of 1.5-inch forestry hose	Natural Resource Protections	Fire Department	2011-2014	TBD	Saugus

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## **TOWN OF SAUGUS HAZARD MITIGATION PLAN**

### **IX. PLAN ADOPTION AND MAINTENANCE**

#### **Plan Adoption**

The Saugus Hazard Mitigation Plan was adopted by the Board of Selectmen 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 Saugus 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 Survey on Progress– The coordinator of the Hazard Mitigation Implementation Team will prepare and distribute a biannual survey in years two and four of the plan. The survey will be distributed to all of the local implementation group members and other interested local stakeholders. The survey will poll the members on 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 plan or to hire another consultant. However the Hazard Mitigation Implementation Team

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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 Saugus 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 Saugus 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 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.

# **TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

## **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 Saugus, General By-laws

Town of Saugus, Zoning By-law

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 Saugus, MA, 2010

Metropolitan Area Planning Council, Geographic Information Systems Lab

Metropolitan Area Planning Council, Regional Plans and Data

Camp Dresser McKee, conversations with town engineering consultant

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**APPENDIX A  
MEETING AGENDAS**

**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
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**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
2011 UPDATE**



*Don Boyce*  
DIRECTOR



*Richard Sullivan*  
COMMISSIONER



*Marc D. Draisien*  
EXECUTIVE DIRECTOR

**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, 6<sup>TH</sup> 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  
2<sup>nd</sup> Floor Training Room  
27 Hamilton Street, Saugus, MA  
(Map & directions attached)

**AGENDA**

**NORTH SHORE  
HAZARD MITIGATION  
PLANNING TEAM**

Beverly  
Lynn  
Nahant  
Peabody  
Revere  
Salem  
Saugus  
Swampscott  
Winthrop

**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](mailto:mpillsbury@mapc.org)

**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
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**Meeting Agenda  
Local Multiple Hazard Community Planning Team  
Saugus, MA**

August 26, 2010

9:30 – 11:30 am  
Saugus Town Hall

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1. Introductions and Overview of Project Scope
2. Introduce Saugus 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.

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***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 SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE**

### Public Participation Options

1. Public web-based survey
2. Series of presentations by Town/City staff to local groups.
3. **MAPC presents at a public meeting – existing board or commission\***
4. **Post on Town/City website with a set public review period.**
5. **Distribute to specified organizations or boards/commissions for their review.**
6. Create a summary document and distribute in community

### Sample 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 SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE

## 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: Potential 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.

**Map 3: Flood Zones** – The map of flood zones used the FEMA NFIP Flood Zones as its source. 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 municipally owned and protected open space.

**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.

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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.

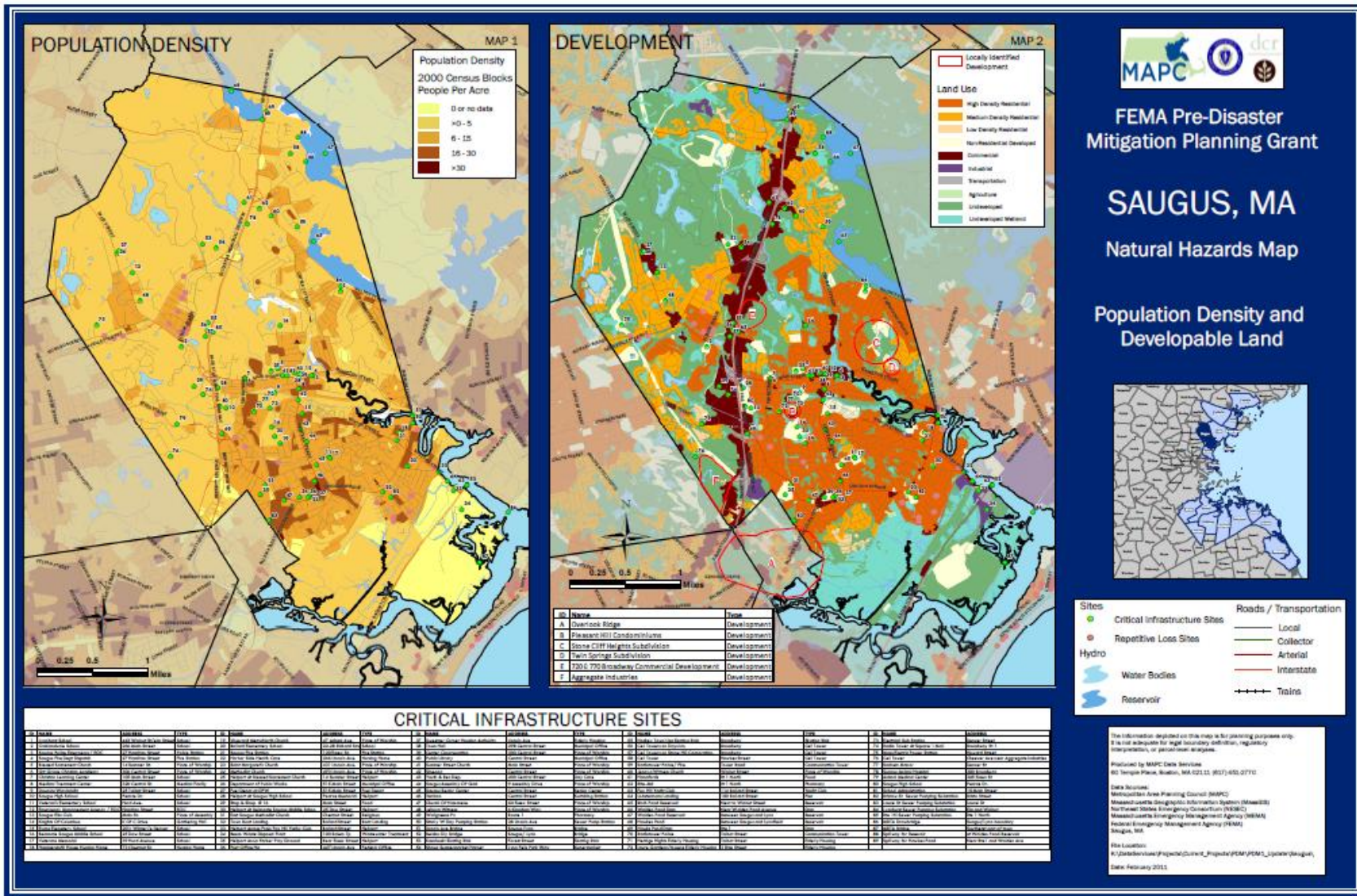
***Map 7: Composite Natural Hazards*** - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100 year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and hurricane 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.

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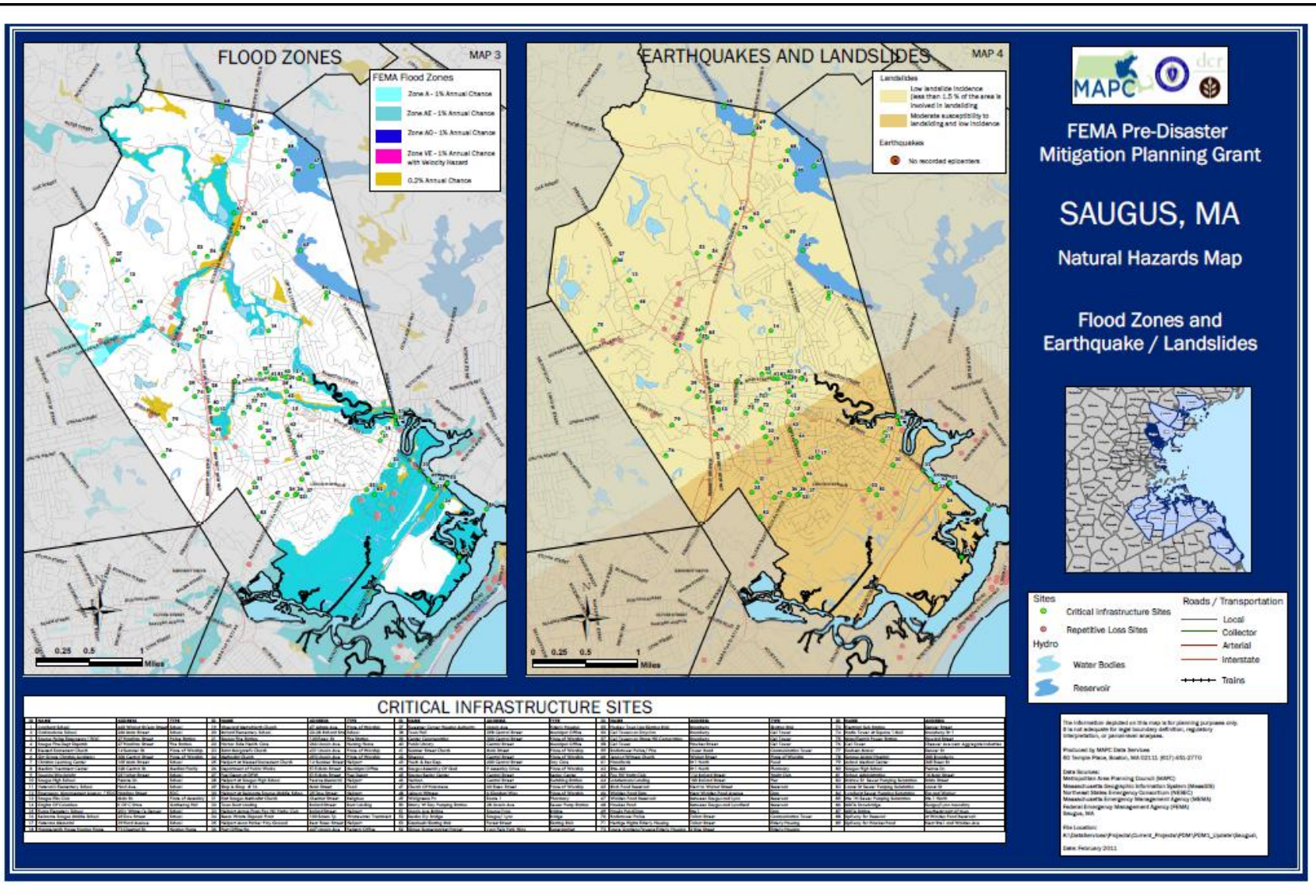
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# TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE



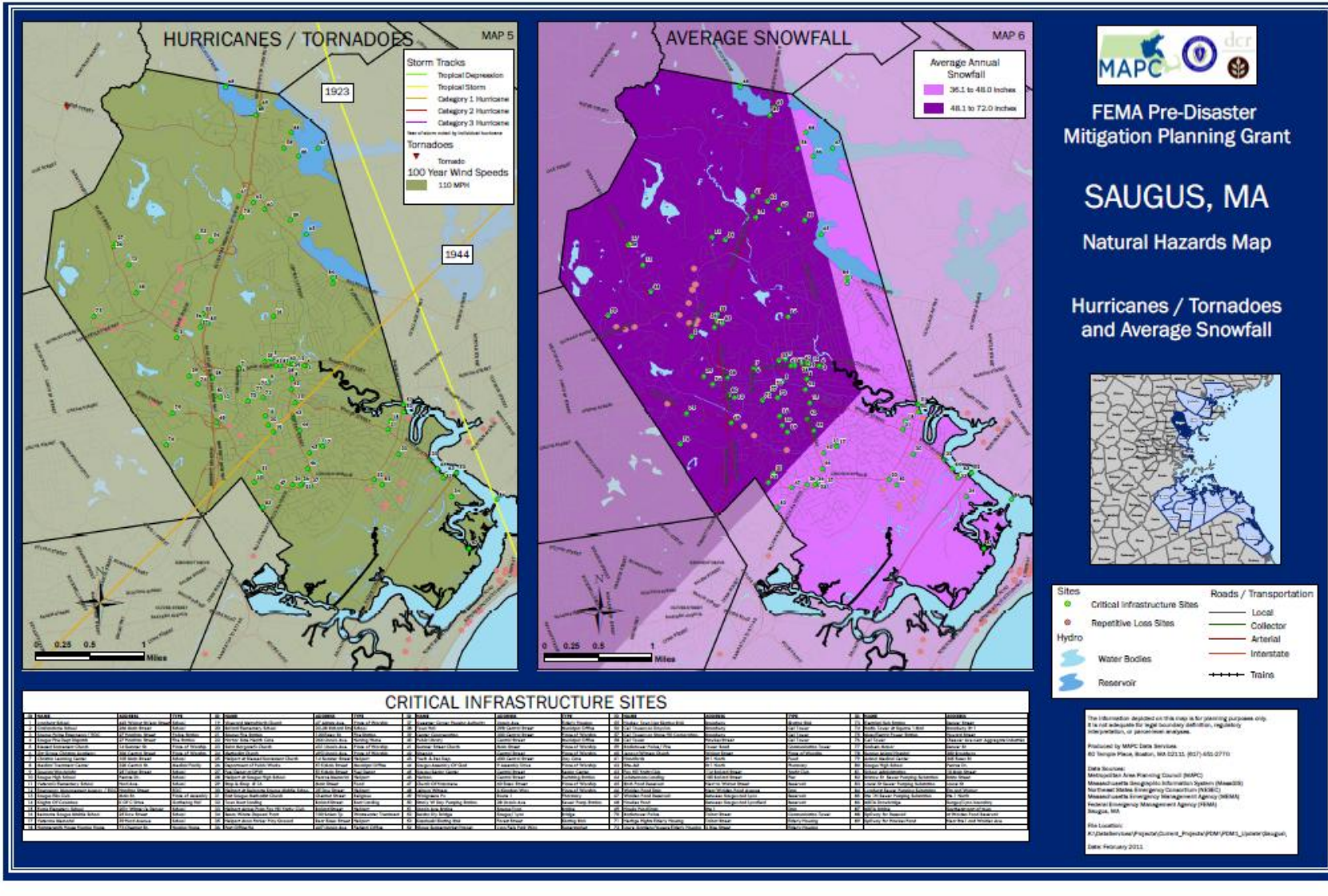


# TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE



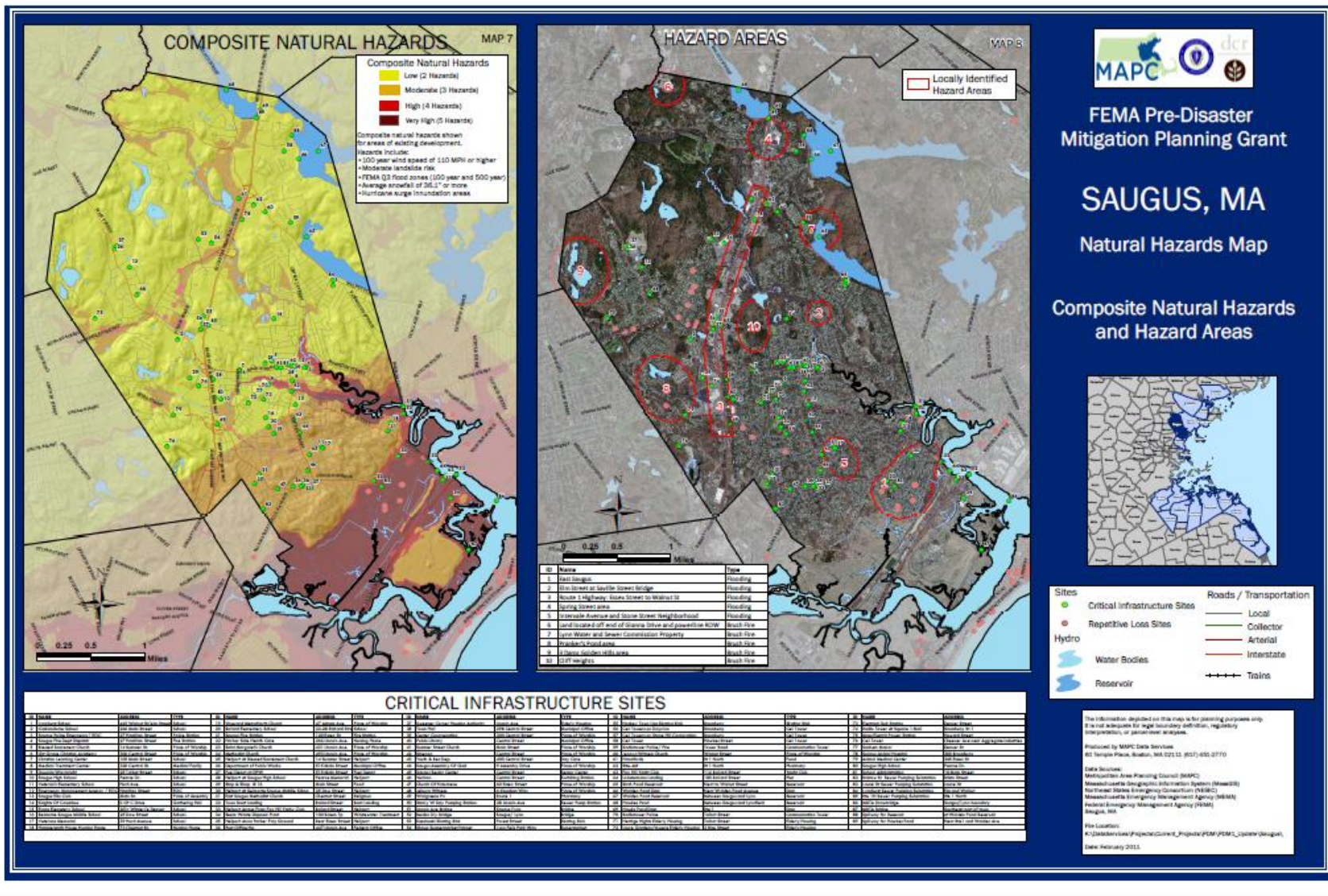


# TOWN OF SAUGUS HAZARD MITIGATION PLAN 2011 UPDATE





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**APPENDIX C  
DOCUMENTATION OF PUBLIC PARTICIPATION**

Saugus BOS agenda of 4/26/11 insert here

Saugus PB agenda insert here; Date TBD

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**TOWN OF SAUGUS HAZARD MITIGATION PLAN  
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**APPENDIX D  
DOCUMENTATION OF PLAN ADOPTION**

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