HAZARD MITIGATION PLAN UPDATE 2013

MILFORD, CONNECTICUT

Revised August 12, 2013

CITY OF MILFORD

HAZARD MITIGATION PLAN UPDATE 2013

Prepared for the:

CITY OF MILFORD

CONNECTICUT

FOUNDED 1639

MAYOR BENJAMIN BLAKE

CITY OF MILFORD

CITY HALL

110 RIVER STREET

Milford, CT 06460

http://www.ci.milford.ct.us

Milford's Hazard Mitigation Committee, whose members are listed on the following page, has prepared this report. The contents of this report reflect the views of the City of Milford and do not necessarily reflect the official views of the Connecticut Department of Energy and Environmental Protection although a close relationship is maintained with that department and the Federal Emergency Management Agency. Much of the content of this plan is information that members of the committee have gained from workshops, websites and publications from both of those agencies.

2013 Revision Committee Members
Hazard Mitigation Plan Update

Robert Gregory, Former Director of Economic and Community Development
Former Committee Chair and Point of Contact (POC)

William Richards, Deputy Director of Emergency Management
Committee Chair and Point of Contact (POC)
(203)783-3201 wrichards@ci.milford.ct.us

Emmeline Harrigan, Assistant City Planner and Floodplain Manager
(203)783-3245 eharrigan@ci.milford.ct.us

Gary Wassmer, City Engineer
(203)783-3261 gwassmer@ci.milford.ct.us

David Sulkis, City Planner
(203)783-3245 dsulkis@ci.milford.ct.us

Jocelyn Mathiasen, former Director of Permitting and Land Use

Joseph Griffith, Director of Permitting and Land Use
(203)783-3374 jgriffith@ci.milford.ct.us

MaryRose Palumbo, Inland Wetlands Officer
(203)783-3256 mpalumbo@ci.milford.ct.us

Dan DelVecchio, former Battalion Chief, Milford Fire Department

Dan Wassmer, Battalion Chief of Planning, Milford Fire Department
(203)783-3780 dwassmer@ci.milford.ct.us

John Hangen, GIS Coordinator
(203)783-3232 JHangen@ci.milford.ct.us

Meghan McGaffin, GIS Analyst
(203)783-3232 mmcgaffin@ci.milford.ct.us

TABLE OF CONTENTS

I. **INTRODUCTION**

A. Executive Summary 10

B. Purposes of Plan 12

II. **PLAN DEVELOPMENT PROCESS**

A. Adoption 13

B. Plan Committee 13

C. Public Outreach 15

D. Neighboring Communities 18

E. Local, State and Federal Plans and Technical Information 19

F. Plan Revision Priorities 21

III. **HAZARD IDENTIFICATION AND RISK ASSESSMENT**

A. Identifying Hazards 22

B. Profiling Hazards 29

1. Hurricanes and Tropical Storms 29
2. Winter Storms and Nor'easters 43
3. Floods 47
4. Wind Storms 69
5. Sea Level Rise 72
6. Earthquakes 74
7. Other Hazards Considered 78

C. Repetitive Loss Properties 87

D. Setting 90

E. Development Trends 107

IV. **MITIGATION STRATEGY**

A. Goals & Policies 110

B. Identification & Analysis of Mitigation Strategies 111

C. Hazard Mitigation Projects 113

D. Property Protection 128

E. Structural Projects 129

F. Natural Resource Protection 129

G. Prevention 130

H. Mapping Risk Scenarios 133

I. Public Information 134

J. Emergency Services 136

V. **PLAN REVIEW, EVALUATION & IMPLEMENTATION**

A. Implementation 139

B. Monitoring and Evaluation 140

ENDNOTES 143

TABLE OF FIGURES

1. Table of committee meetings 14
2. Photo of Milford, CT website 17
3. Table of Housing Units 22
4. Table of Land Uses and Areas 23
5. Area of Identified Hazards Map 26
6. Table of Natural hazards and Conditions 27
7. Table of Past Weather Events 28
8. Table of Connecticut hurricane historical record 33
9. Photo of Melba street during storm Irene 35
10. Photo of Merwin Avenue during storm Irene 35
11. Graphic of Irene damage along Milford's shoreline 36
12. Graphic of storm Irene storm surge 37
13. Map of storm Sandy substantially damaged properties 38
14. Town map of SLOSH inundation areas 39
15. Municipal Infrastructure in SLOSH Zones 40
16. Photo of storm Sandy damage (East Broadway) 41
17. Fiscal Risk Analysis of Residential Structural Replacement Cost 42
18. List of significant Nor'easters and Winter Storms 45
19. Photo of October 2011 snowfall 46
20. Milford's primary watersheds 47
21. Table of Potential Fiscal Risk for Flood zone Properties 51
22. Aerial photo of Cedar Beach 52
23. Aerial photo of Laurel Beach 53
24. Aerial photo of Wildemere Beach 54
25. Aerial photo of Walnut Beach 55
26. Aerial photo of Silver Beach 56

27. Aerial photo of Fort Trumbull Beach 57
28. Aerial photo of Gulf Beach to Point Lookout 58
29. Aerial photo of Bayview Beach 59
30. Aerial photo of Pond Point Beach 60
31. Aerial photo of Point Beach 60
32. Aerial photo of Morningside Beach 61
33. Photo of bluff erosion (Morningside area) 62
34. Photo of bluff erosion (Morningside area) 62
35. Aerial photo of Hillside area 63
36. Aerial photo of Woodmont area 64
37. Map of Flood Vulnerable Commercial Properties 66
38. Beaverbrook Wastewater Treatment Plant 68
39. Table of Dams Registered with DEEP in Milford, CT 79-80
40. Map of Milford's dams..... 83
41. Approximate locations of homes on well water 85
42. Table of Wildfire History 86
43. NFIP Repetitive Loss Properties Map 89
44. Map of critical facilities and hazards..... 96-98
45. Table of Vulnerable Populations 100
46. Summary of Hazardous Material Risks 102
47. Geology maps..... 104-105
48. Land use map..... 109
49. Table of proposed mitigation strategies and related acronyms 111-112
50. Table of prior hazard mitigation projects and status 115-116
51. Table of Updated Hazard Mitigation Project list 119-124
52. Table of STAPLEE Evaluation of Municipal Mitigation Projects 127
53. Map of watersheds 132

54. Milford Alerts sign up page.....137
55. Map of early warning siren locations..... 138
56. Figure of Mitigation Plan Update Timeline.....140-141

APPENDICES

APPENDIX A ..... DRAFT BOARD OF ALDERMAN RESOLUTION

APPENDIX B ..... HAZARD MITIGATION PLAN COMMITTEE AGENDAS & MINUTES SAMPLES

APPENDIX C ..... HAZARD MITIGATION PLAN PUBLIC MEETING PRESS RELEASE, ATTENDANCE SHEET, POWER POINT PRESENTATION

APPENDIX D..... POST-IRENE PRESS RELEASE & ATTENDANCE SHEET

APPENDIX E ..... POST-SANDY WORKSHOP PRESS RELEASE

APPENDIX F ..... REGIONAL OUTREACH (EMAIL)

APPENDIX G..... RESIDENTIAL FISCAL RISK ANALYSIS METHODOLOGY

APPENDIX H..... FLOOD AUDIT PROGRAM AND SAMPLE

APPENDIX I ..... AMERICAN COMMUNITY SURVEY - VULNERABLE POPULATIONS

APPENDIX J..... BUILDING CODE HIGH WIND STANDARDS

APPENDIX K..... HAZUS ANALYSIS FOR EARTHQUAKE

APPENDIX L ..... CERC TOWN PROFILE AND TRAFFIC COUNTS

APPENDIX M ..... STAPLEE ANALYSIS WORKSHEETS

APPENDIX N..... TECHNICAL AND FINANCIAL RESOURCES

APPENDIX O..... REFERENCES

I. INTRODUCTION

A. Executive Summary

Revision statement: The Executive Summary section is a new addition to Milford's Hazard Mitigation Plan. This section introduces elements that have been changed since the last plan. Plan has been updated to include revision statements for each section. The plan was also reformatted to reflect the order in which elements are presented in the Local Mitigation Plan Review Tool provided by FEMA to aid in the plan's overall organization, flow and cohesion. Date of last plan updated.

The primary purpose of a Natural Hazard Mitigation Plan ("Plan") is to engage the community and other stakeholders to identify natural hazards, conduct risks assessments, and identify capabilities and activities that can be undertaken by a community to prevent loss of life and reduce property damages associated with identified hazards. The Disaster Mitigation Act of 2000[1] requires local communities to have a FEMA-approved mitigation plan in order to be eligible to receive Pre-Disaster Mitigation program grants and post-disaster Hazard Mitigation Grant Program funds under the Hazard Mitigation Assistance program. The City completed its original Hazard Mitigation Plan[2] in 2002, with an update to that plan completed in 2007, with planning processes that took about (2) years for each Plan. The back-to-back Storm Irene and Storm Sandy events (August 28, 2011 and October 29, 2012) significantly delayed this plan update which should have been completed in 2012.

The areas of focus for the updated 2013 Plan include:

- Reformatting the Plan to more closely reflect the order of the Plan Review Tool for ease of review.
- Integrating some of the appendices information in the last plan into the main narrative of the Plan.
- Updating data and informati0n for each applicable hazard where hazard events were experienced since the last Plan
- Additional Risk Assessment based on the FEMA Digital Flood Insurance Rate Maps (DFIRM)[3] updates as related to Coastal Flooding risks, vulnerable structures, and fiscal risk.
- Addition of Sea Level Rise as a Natural Hazard.
- Mitigation project lists have been updated to reflect new proposals and to

indicate where prior identified projects have been achieved.

- Updated technical and financial resource list in the appendices.

Since the last plan update in 2007, Milford has been directly affected by several significant storm events, and many studies have been released regarding sea level rise which changes part of its mitigation strategy to include property acquisition where appropriate and where owners are willing. Active development and redevelopment of housing in non-risk areas is strongly suggested to off-set any losses to the City's grand list and population loss due to population displacement. Flooding has consistently been a source of hazards for the City whether from hurricanes and tropical storms, nor'easters and winter storms, or riverine flooding. The project lists have been updated to reflect new proposals and to indicate where prior identified projects have been achieved.

The City of Milford has been extremely proactive in its hazard mitigation efforts that have led to the elevation of 28 structures since 2008, and includes other efforts such as:

- Home elevations through FEMA Grant Programs
- Application of Flood Mitigation Regulations[4] [5]for new home construction
- Substantial Damage and Substantial Improvement assessments as required by the National Flood Insurance Program (NFIP) that has led to elevations and other flood-compliance retrofit projects[6]
- Promotion of the NFIP for all Milford residents including those at risk in the floodplain fringe
- Participation in the Community Rating System with a current 9 rating
- Continued outreach and education
- Installation of coastal evacuation signs
- Use of the Everbridge system for early flood warning
- Infrastructure improvements including better outlet drainage and upsizing of culverts.
- Improved permitting technology that utilizes GIS to flag building projects in hazard prone areas, as well as staff training in customer relations and cross training in departmental responsibilities.

Since Milford's last plan 40 elevation applications have been filed under various FEMA grant programs. Twenty two HMGP grants were submitted after Storm Irene but due to Storm Sandy many houses were over 50% damaged making them ineligible for elevation. The

City has offered acquisition to those homeowners and a number of them are considering that option. A summary of mitigation projects is contained in Section IV.

B. Purposes of the Plan

Revision statement: The purpose of the Hazard Mitigation Plan has not changed via this update.

The primary purpose of this hazard mitigation plan update is to identify natural hazard, risks and impacts, existing capabilities and activities that can be undertaken by the City of Milford to prevent loss of life and reduce property damages associated with identified natural hazards.

There is a significant difference between Hazard Mitigation Planning and Emergency Operations Planning. Hazard Mitigation is any action preemptively taken to reduce or eliminate risks to human life and property resulting from hazards thereby also eliminating or reducing the need to respond. The goal of all emergency management activities is to prevent loss of life and property damage.

The four phases of emergency management include: Mitigation, Preparedness, Response and Recovery. The driving forces behind this Plan are to protect life and property. However, careful consideration also must be given to the preservation of history, culture and the natural environment of Milford. Current and future grant programs for mitigation activities require the City to have a mitigation plan.

II. PLAN DEVELOPMENT PROCESS

A. Adoption

Revision statement: Plan has been updated to highlight the adoption process in its own section; however the plan adoption process has not changed. Original adoption date of the plan was revised.

Milford's first Hazard Mitigation Plan (the Plan) was adopted in 2002[7] as a result of the City's participation in FEMA's Project Impact. As required, the Plan was updated in 2007[8] and the current revision has been undertaken in 2012. Formal adoption of the Plan by the Milford Board of Aldermen will take place after FEMA's "Approval Pending Adoption" status. This course of action is recommended in the guidance provided by FEMA. Draft Resolution of Adoption is provided in Appendix A.

B. Plan Committee

Revision statement: The plan has been updated to highlight the plan committee in its own section. This plan update was done without a consultant. The plan has been updated to include details on the planning meetings and a summary of the meeting minutes.

The mayor appointed a committee in the fall of 2011 to update Milford's Natural Hazard Mitigation Plan (HMP). The committee consisted of:

- Robert Gregory (Committee Chair) - Department of Economic and Community Development
- Jocelyn Mathiasen – Director of Permitting and Land Use
- David Sulkis - City Planner
- Emmeline Harrigan - Assistant City Planner and Floodplain Manager
- Dan DelVecchio, Robert Turner and William Richards - Fire Department
- MaryRose Palumbo - Inland Wetlands Officer
- John Hangen and Meghan McGaffin - Management Information Systems (GIS Mapping)
- Gary Wassmer - City Engineer

The committee conducted a regular series of meetings as follows:

2011	2012	2013
Kick off Meeting December 13	January 10 January 24 February 7 February 21 March 6 March 27 April 10 May 8 July 24	January 8 January 25

Figure 1

The Hazard Mitigation Plan Update Committee was formed in December of 2011. Meeting agendas and minutes samples are located in Appendix B. Representatives from Permitting and Land Use, Engineering, Fire, and MIS were appointed to the committee. Robert Gregory, Director of Economic and Community Development was appointed chair. He had chaired the original committee that developed the first plan in 2003 that was supported with funds from Project Impact.

The committee reviewed the plan that was approved in August of 2008 and assigned various sections to members of the committee for updating. In addition to committee meetings, committee members were dealing with aftermath of Storm Irene, preparing HMGP grants to assist homeowners and the new FEMA Risk maps.

Meetings were held with FEMA representatives to review requirements that must be in the revised plan. The chair and the Flood Plain Manager attended a workshop put on by DEEP and FEMA to assist communities in preparing their plans.

The committee met every two weeks through March of 2012 and a revised plan was submitted to DEEP in June of 2012. A critique of the plan was returned to the community in July 2012 and the committee set about to make adjustments to the plan. It was suggested that the City of Milford apply for a grant to hire a consultant to assist with the revision. A grant application was filed by December 31, 2012. Later we were told that we would not have enough hours of staff time to qualify for the 25% match required by the grant rules.

In the midst of the committee's review process Storm Sandy hit in October 2012. All of the members of the committee were involved in actions related to the storm and its aftermath. That delayed our progress as valuable resources were diverted to assisting residents after the storm, but additional revisions to the plan were made and another draft sent for review on January 31,

2013.

In early March 2013, FEMA's joint Field Office in Windsor offered planning resources to assist in our plan preparation. The City accepted and spent two days with FEMA representatives going over every page of the plan. The plan was again revised with an additional version sent on March 28, 2013. DEEP comments were received on April 9, 2013 and plan update was revised and sent back. Additional comments from FEMA were received June 28th 2013 and this draft includes additional material added to respond to those comments.

The members of the committee gathered information from a number of sources including but not limited to the electric public utility United Illuminating, FEMA, Milford Public Works Department, Milford Health Department, Milford Police and Fire Departments, the National Oceanic and Atmospheric Administration, the State Department of Energy and Environmental Protection and produced the Plan as enclosed. Agendas and minutes for the Plan Committee meetings can be obtained from the City's Community Development Department.

C. Public Outreach

Revision statement: The plan has been updated to highlight the public outreach process in its own section. For this revision the public outreach response was increased due to concurrent FEMA updates to the FIRM panels as well as storms Irene and Sandy. These events increased the public's awareness of natural hazards as the economic impact of these events directly affected our residents. References to meetings held in 2001 were removed.

Public Outreach regarding natural hazard risks, particularly in regards to flood risk, continues to be a high priority for Milford. The City's participation as a National Flood Insurance Program (NFIP) community and the Community Rating System (CRS) has led to increased outreach efforts in recent years. The NFIP has had several upgrades to Milford's flood mapping including the 1st digital maps adopted as part of FEMA's Map Modernization Project[9] in 2010 which used Light Detection and Ranging (LIDAR) technology to develop significantly more accurate elevation measurements. In the past two years, FEMA restudied the risk to all Connecticut coastal communities as part of the Digital Flood Insurance Rate Map (DFIRM) update project. The DFIRM update is the first comprehensive update to Milford's Flood Insurance Studies and Rate Maps since the community joined the NFIP program in 1978. Since 1978, changing development patterns have dramatically affected water flow and drainage and annual precipitation levels have been on the rise in the last 100

years according to NOAA historical data.

Milford is subject to a number of flood zone changes as part of this update and has worked hard to alert our property owners of the increased identified risk to their properties and the flood insurance impacts related to the map changes. Using GIS data provided by FEMA on the preliminary areas of change and our existing GIS datasets, our GIS Analysts have determined that almost 800 parcels are being newly mapped into a high risk area for an estimated total of 4,000 high risk properties. Base Flood Elevation (BFE) heights also increased in both Coastal High Hazard (VE) and Special Flood Hazard Area (AE) zones.

To maximize benefit to our residents, the City held two public meetings on April 25 and 26, 2012 to disseminate information about the FEMA map changes and to obtain public input on the Hazard Mitigation Plan Update 2013. Using the GIS data in conjunction with the City's Everbridge Emergency Notification System residents in the areas affected by the DFIRM update were called and invited to an informational meeting. The meetings were well attended with approximately 350 residents attending over the course of the two evenings. (Appendix C)

Because of Tropical Storm Irene, members of the committee had a chance to review mitigation strategies taken before the storm and note the success or areas that needed more attention. Three public meetings were held after the storm for area residents to find out more information about local requirements, state assistance and grant opportunities (Press Release provided as Appendix D). The City's Hazard Mitigation Plan was mentioned at this meeting as well in discussion of the grant opportunities available. Of the three meetings, the last two meetings focused on the Hazard Mitigation Grant Program.

The Milford Health Department, Fire Department and Land Use Department – along with FEMA representatives, participates in several community fairs at venues including the Oyster Festival, Milford Senior Center, Milford Hospital, and Milford's 1st Annual Health, Wellness, and Green Fair. During these events, staff distributed information regarding emergency preparedness and hazard mitigation.

Post-Hurricane Sandy, the City continued its information outreach efforts with two Relief and Recovery Fairs held by the City on Saturdays November 3rd and 10th (Press Release provided as Appendix E). During these workshops information and resources were provided to residents affected by the storm. In addition, FEMA opened a Disaster Recovery Center (DRC) in Milford's Parson's Government Complex in the weeks following the storm to provide assistance to area residents. The DRC was relocated to a former elementary school where it remained until the end of December 2012.

Website Information

Revision statement: Plan has been updated to include a description of Milford's website as a vehicle for public outreach.

The City of Milford delivers information on emergency preparedness and disaster relief to our citizens through the city website. The screen print and outline highlights the many information resources provided to aid residents in their efforts to protect lives and property and to take the necessary safeguards before, during and after natural hazards.

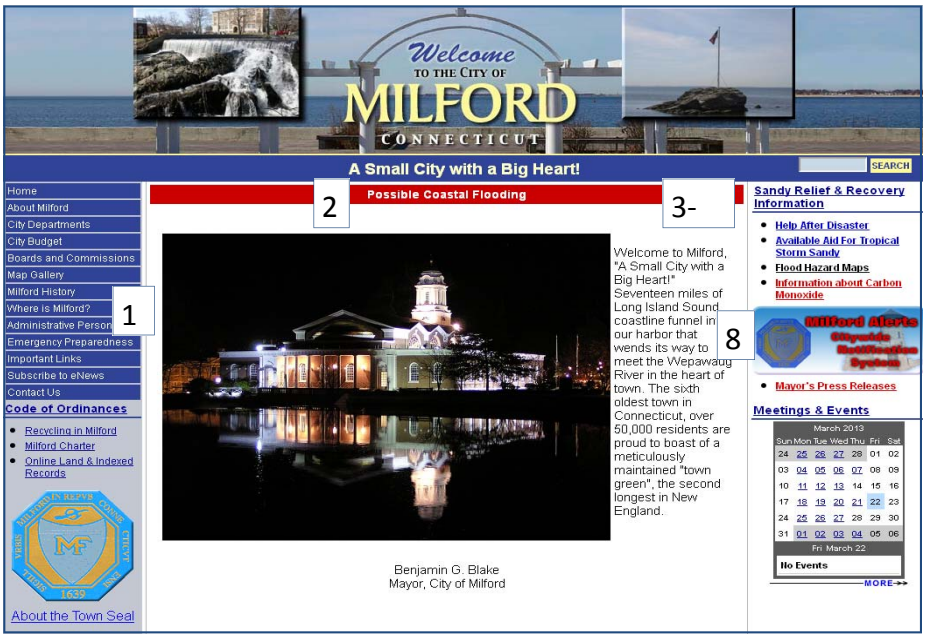


Figure 2

Hazard Mitigation Public Outreach Website Key:

1. Emergency preparedness page with links for:
    a. Medical Reserve Corp
    b. Community Emergency Response Teams
    c. State of CT Emergency Credentialing for Health Professionals
    d. Flood and Hurricane information
        i. Shelter guideline
        ii. Mold remediation
        iii. Post-flood home re-entry
        iv. Food safety
        v. Prepare for power outage
    e. Department of Homeland Security
    f. Police and Fire Department
    g. Volunteer forms and information
    h. CT Dept of Public Health
    i. 211 Infoline
2. Emergency Alerts
3. Sandy Relief Information
    a. Press releases
    b. Information on available rental housing
    c. Links to Chamber of Commerce Disaster Relief Services

    d. Carbon Monoxide Safety
    e. Electrical restoration for flooded meters
    f. CT Licensed E1 electrical contractors
    g. Maps and images
    h. Red Cross
    i. United Illuminating Storm center
    j. Milford Board of Education
    k. FEMA
    l. CT Dept. of Emergency Services and Public Protection (DESPP)
    m. Dept. of Homeland Security
    n. Information on required permits for construction and repair, including the "50 percent rule" for substantially damaged/improved homes
4. Link to FEMA Publication 545/July 2008 *Applicant's Guide to the Individuals & Households Program*
5. Link to matrix outlining Sequence of Delivery/ Individuals and Households Program
6. Link to Information about Flood Insurance Rate Maps
    a. Frequently Asked Questions
    b. Copy of presentations from April 25, 26th outreach meetings
    c. Link to National Flood Insurance Program homepage
    d. FEMA Fact sheets (Flood Insurance, Flood Mapping, and Top Ten Facts)
7. Link to page about Carbon Monoxide
8. Link to page about Milford alerts Citywide Notification System
    a. Sign up form
    b. Frequently asked questions

D. Neighboring Communities

Revision statement: Plan has been updated to highlight outreach to neighboring communities in its own section. There have not been any significant infrastructure changes or service area expansions that require new comment by the Regional Water Authority.

A draft of the revised Plan was sent to neighboring communities of Orange, Stratford, and West Haven. A draft was also sent to the South Central Regional Council of Governments (SCRCOG) - our regional planning agency via email (see Appendix F). Comments were requested from all but none were received. SCRCOG is also in the process of developing a Natural Hazard Mitigation Plan for ten of their member communities and those communities, including Milford, that have existing plans have been invited to participate in that planning process. Milford has declined at this time due to the variety of special, localized conditions that necessitate focusing on the development of our own hazard mitigation plan update.

E. Local, State and Federal Plans and Technical Information

Revision statement: Plan has been updated to highlight other plans and technical information in its own section. This plan revision included descriptions of outside meetings and workshops that committee members participated in, references to the State of Connecticut's Hazard Mitigation Plan, City regulations, NFIP regulations and Milford's participation in the State of Connecticut's Emergency Planning and Preparedness Initiative exercise. Also included is reference to the South Central Regional Council of Government Multi-Jurisdiction Plan.

In updating the Hazard Mitigation Plan, local plans and documents were consulted such as the Milford's 2012 Plan of Conservation and Development[10], the Emergency Operations Plan[11], Storm Water Management requirements[12], and the City's Zoning Regulations. The City also incorporates information from the State's Coastal Management Act[13] and FEMA's Flood Insurance Study[14] to provide flood risk information to residents and property owners. The City also felt it important to consult the South Central Regional Council of Government Multi-Jurisdiction Plan[15] for references on identified hazards. Citations have been provided on the last page of this plan update and Appendix N lists additional Technical and Financial Resources.

The City has a number of measures in place to prevent flood damage including regulations and codes that dictate flood-compliant development in Special Flood Hazard Areas (SFHAs) and limits encroachments in more dangerous floodways. The City intends to maintain and strengthen compliance with the NFIP regulations by continuing to administer the local flood damage prevention regulations (Milford Zoning regulations Article IV Section 5.8 Flood Hazard Regulations, and various provisions of the Coastal Area Management and Subdivision Regulations) and enforcing the requirements of the regulations.

The State of Connecticut's Hazard Mitigation Plan Update of 2010[16] has provided Milford with a wealth of information and resources. Of particular value to this Committee is Chapter 2, "Natural Hazard Identification and Evaluation". The City has also consulted the Town of East Haven Mitigation Plan Update 2012[17].

Committee members also obtained information regarding update requirements to the Hazard Mitigation Plan from FEMA at the following meetings:

- The Chair Robert Gregory and Jocelyn Mathiasen met with FEMA representatives, Joan Tweedle and Holly Dominic, who provided guidance in areas that should be addressed in the updated Plan.
- The Chair Robert Gregory and Emmeline Harrigan attended a meeting presented by the Department of Energy and Environmental Protection held February 14, 2012, and had a chance to review other plans with FEMA and State representatives.

After Tropical Storm Irene and the October snowstorm, Governor Dannel Malloy convened a panel to examine and investigate the ability of the State of CT to respond to a natural disaster. Meghan McGaffin (a member of the Hazard Mitigation Plan Update Committee and one of the City's GIS Analysts) testified to the panel on the use of GIS before, during and after storm events. After a number of hearings the panel submitted a report[18] and 82 recommendations to the Governor on how to plan, prepare and mitigate against future hazards.

One of the measures taken after the release of that report was a state-wide exercise called the Emergency Planning and Preparedness Initiative (EPPI). The EPPI exercise was a coordinated effort among federal, state, regional, local, utility and private entities to test the state's ability to endure a Category 3 hurricane, as the final report of the Two Storm Panel referred to the State's Natural Disaster Plan[19] and cited the following passage:

> ***"The State Department of Emergency Management and Homeland Security (DEMHS) considers a strong Category 3 hurricane as the most probable, worst-case disaster scenario facing the state."***

Throughout the spring and summer months of 2012, members of this committee participated in planning and training activities to prepare for the EPPI exercise. The exercise was coordinated in Milford by the Assistant Chief of the Fire Department Robert Healy and our DEMHS liaison William Richards. Preparations for the exercise including researching locations of high risk flood zones, evacuation and sheltering options, best practices for estimating, ordering and processing commodities and how to provide shelter and resources to our displaced residents. During the exercise every City department was represented in daily briefings with the Mayor.

Elements practiced in this exercise were then applied when managing our response to Hurricane Sandy. For example, sheltering and recovery information was augmented on the Milford homepage by the Health Department. In an effort to identify Milford's capabilities to its residents a number of documents were prepared and posted on the City's website (see

Figure 2 above) in an attempt to reduce losses and property damages and maintain public health standards. The City's website will be continually updated.

After testifying to the Two Storm Panel Ms. McGaffin then joined a Storm Assessment Working Group subcommittee of the Connecticut Geospatial Information Systems Council. The Storm Assessment Working Group divided its responsibility to survey varying levels of government on their use of GIS before, during and after Storm Irene and the October snowstorm: state and federal agencies in New England, CT regional planning agencies and councils of government, municipal governments in the Northern half of the state as assumed to be more affected by the October Snowfall and then the municipal governments in the southern half of the CT assumed to be more affected by Irene. After collecting the 53 responses on the best practices and lessons learned about using GIS for storm planning, response and recovery a report[20] and list of recommendations was submitted to the GIS Council. One recommendation was implemented during the EPPI exercise where the GIS staff made an effort to promote and establish awareness of GIS availability to the EPPI planning committee and was then able to integrate their services to the exercise activities.

GIS technology plays an important role in the day-to-day activities of many town departments including police, fire, engineering and planning and zoning. Using data that has been developed for the City in the Hazard Mitigation planning process allowed committee to analyze our critical facilities, areas prone to flooding, areas susceptible to storm surge and to assess our development patterns.

F. Plan Revision Priorities

Revision statement: Plan updated to include a section on Plan Revision Priorities.

The Hazard Mitigation Plan Update Committee will be responsible for monitoring, evaluating, updating and the pursuit of grants that will move forward various projects that are outlined in the Plan. A semi-annual meeting will be scheduled in January and June by the Chair to review progress of the Goals, Policies and Objectives as stated. All objectives that have not been met as of the publication of this plan are considered Future Plans and the Hazard Mitigation Plan Update Committee will follow the matrix listed in the Goal, Policies and Objectives Matrix to guide our efforts until our next plan update. Other meetings will be called as necessary to expedite the process. A Long Term Recovery Committee has been formed with non-profit social service providers and city departments to assist homeowners in their return to normal living.

Since the last plan was adopted in 2008, the City and the State have experienced several natural disasters that have led to revising some of the Plan priorities (refer to Natural Disaster matrix). In addition, new hazards have been identified such as sea level rise where additional modeling, study, and risk assessment will be required. However, initial discussion of this natural disaster threat is also preliminarily discussed in this plan update.

III. HAZARD IDENTIFICATION AND RISK ASSESSMENT

A. Identifying Hazards

Revision statement: Natural hazard risks have remained consistent for Milford. Increased detail has been provided on the types of hazards and their potential impact on the City. This summary has been expanded upon to include a matrix of hazards associated with different types of natural disasters and a matrix of historical severe weather events.

As stated in the Milford Plan of Conservation and Development, as of the 2010 US Census the population of Milford has remained stable at 52,894. The previous 2000 census had the population at 52,305. Milford has 23,924 units of housing of which 71% are single family units. There continues to be high housing permit activity in the City[21]:

Year	Total	Single Family Detached	Single Family Attached	3-4 Family	5+ Family	State Rank by Net Gain
2000	195	148	2	0	45	6th
2001	198	180	0	0	18	6th
2002	125	121	0	4	0	22nd
2003	284	72	0	8	204	3rd
2004	286	65	0	0	221	3rd
2005	322	62	0	0	260	5th
2006	281	49	0	0	232	145th
2007	276	41	0	0	235	79th
2008	266	26	0	0	240	103rd
2009	86	20	0	0	66	168th
2010	90	24	0	0	66	46th
2011	96	NA	NA	NA	NA	20th
Total	2505	808	2	12	1587	

Source: State of Connecticut Department of Economic and Community Development

Figure 3

As of 2011, Milford contained 1,928 different employers which employ 30, 934 people. By looking at land use types, a sense of the type of employment can be understood. This is illustrated in the following table:

Land Use	Number of Parcels	Acres	Percentage of Land Area
Automotive Sales/Service	79	75.46	0.65%
Bank	13	8.94	0.08%
Business Office	180	317.15	2.74%
Commercial Recreation	6	115.47	1.00%
Hotel/Motel	19	48.02	0.41%
Manufacturing/Industrial	257	693.56	5.98%
Marine Sales/Service	4	5.01	0.04%
Miscellaneous Open Space	58	121.36	1.05%
Miscellaneous Un?]Classified	125	61.95	0.53%
Mobile Home	3	0.4	0.00%
Multifamily	529	158.22	1.37%
Municipal/Education Facilities	516	1,082.06	9.34%
Private Institutions (including cemeteries)	116	357.14	3.08%
Public Park	125	1,318.46	11.38%
Assisted Living Facilities/Rest Home	5	14.6	0.13%
Restaurant/Tavern	51	38.69	0.33%
Retail Sales/Service (General)	329	521.27	4.50%
Single Family	15,531	5,012.75	43.25%
State & Federal Facilities	13	51.73	0.45%
Utilities/Parking Facilities	61	164.62	1.42%
Vacant Land	972	847.74	7.31%
TOTAL	19,385	11,589.50	

Figure 4

Of the 23,924 housing units, almost 7,000 are located on parcels in or near flood zones. The zoning along the Milford shoreline is limited to Housing and water dependant uses such as marinas, yacht clubs, beaches and a NOAA Marine fisheries service facility. All other commercial uses are located upland and primarily in business corridors in Downtown, Route 1, and corridors parallel or adjacent to interstate 95.

Settled in 1639, Milford has been active in preserving both its architectural and cultural past, and has two historic districts. Milford also has the River Park National Historic District which was listed on the National Register of Historic Places in 1986.

The City's desire for preservation can only be achieved through understanding the properties and structures that are culturally and historically relevant and that are worth preserving.

Through a grant from the Connecticut Trust for Historic Preservation, the "Historic and Architectural Resources Survey of Milford" was completed in 2006 and referenced in the POCD. With the assistance of the City's GIS staff, the Resources Survey identified 412 sites of Historic, architectural, or cultural significance to the City which includes properties such as the Downs House which was owned by local "minuteman" who fought during the Revolutionary War.

Milford is a coastal community, approximately 24.7 square miles in area, located on the north shore of Long Island Sound, in western New Haven County, Connecticut. Special to the states of Connecticut and Rhode Island is the absence of any county jurisdiction over local government. The City of Milford operates with a Mayoral system of government where the Mayor is the chief elected official and is counter-balanced by a Board of Aldermen (15 from 5 voting districts which contain approximately 10,500 residents each).

The town of Stratford shares our 15 mile-long border with the Housatonic River. Milford's borders are almost entirely waterfront, 37.8 miles when inlets such as Gulf Pond are taken into account. That leaves only 5.3 miles of land-shared border with the town of Orange. To the east, 1.68 miles of the Oyster River forms the border with the City of West Haven.

Milford has a number of watercourses that flow from interior parts of the City to the Sound. The main watercourses include the Wepawaug River, the Indian River, Beaver Brook, Stubby Brook and Tumble Brook. Many of these watercourses flow into extensive tidal wetland areas before they discharge to Long Island Sound. The main tidal estuaries include the Housatonic River, Oyster River, Calf Pen Meadow Creek, Gulf Pond and Milford Harbor.

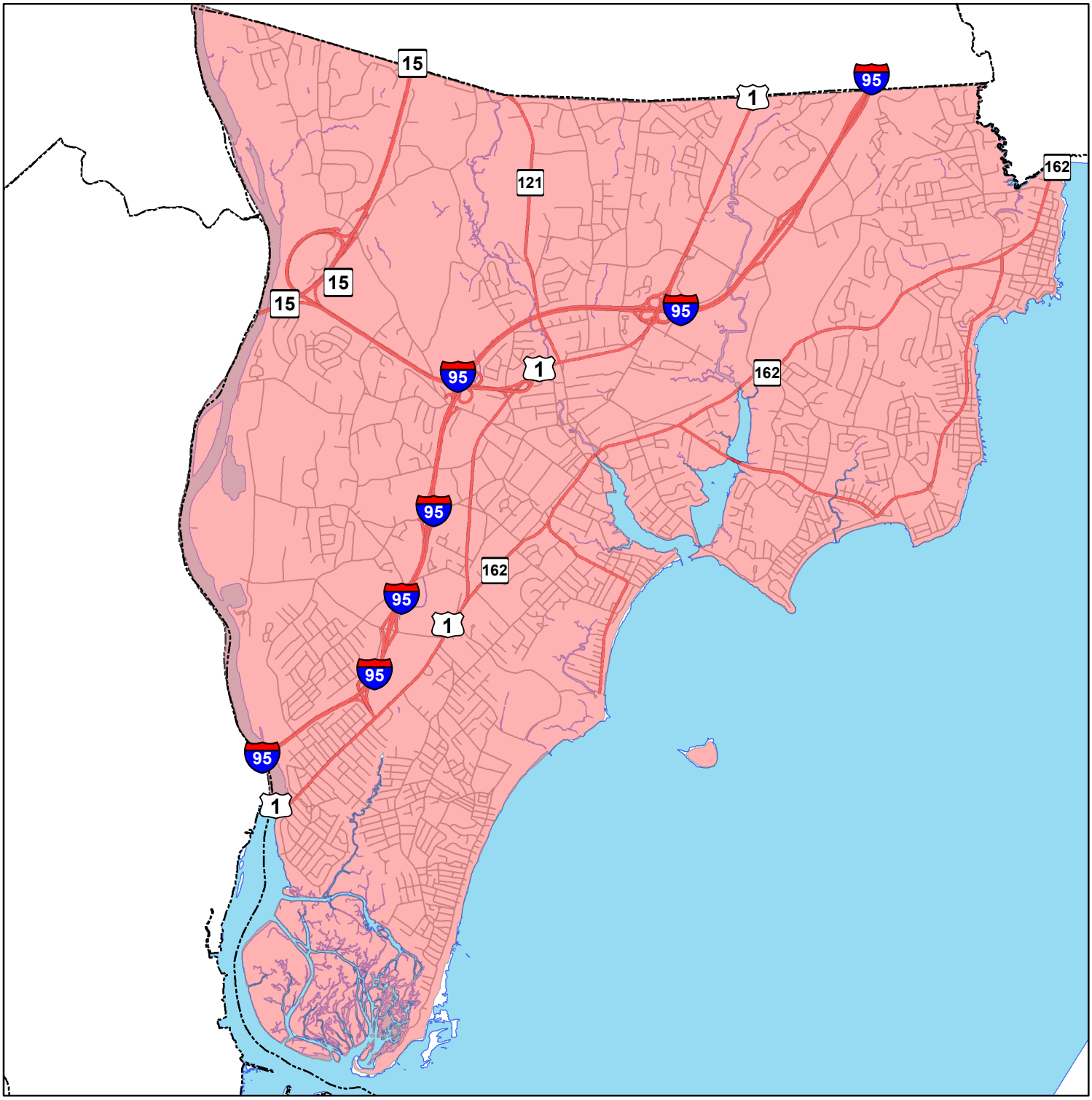
With the presence of so much water surrounding Milford flooding is our primary hazard but other natural hazards such as hurricanes and winter storms are also a concern. Buildings located in flood hazard areas are primarily residential but also include some commercial, industrial, institutional and recreational structures. Most of the structures that are threatened by flooding are located within the 100-year flood plain, but some are in the coastal velocity zone. Location in the velocity zone poses an increased threat to structures due to high wind and potential wave damage, as well as inundation by floodwaters.

Based on the results of the Hazard Mitigation Committee meetings and additional risk assessment research, a Hazard Risk Assessment was developed for the City of Milford. A comprehensive range of hazards including dam failure, droughts, earthquakes, extreme heat, flooding, landslides, tornadoes, wildfire, winter storms and extreme cold were discussed and considered.

Storms Irene and Sandy are two very recent catastrophic events that tested the very purpose of this document, our ability to identify natural hazards and risks, our capabilities and readiness to prevent loss of life and reduce property damages.

Of unanimous concern was the City's historic and routine exposure to flooding hazards from hurricanes and tropical depressions, "nor'easters", and severe thunderstorms. In addition, winter storms expose the City to the combined hazard of heavy snows with additional areas of flooding and ice covered roads due to inadequate storm water drainage systems and structures. However the effects of snow and winter storms are typically of a shorter duration than flood events caused by storms bringing rain and storm surge. The hazard of flooding impacts the entire Milford shoreline and the riverine floodplains. The City is extremely vulnerable to widespread damages that would be caused by a hurricane or other coastal storm.

The City of Milford's geological features make the community particularly vulnerable to an array of natural hazards. These hazards include, but are not limited to; areas of inland flooding, coastal flooding, shoreline change, erosion, hurricanes and tropical storms, summer storms, tornadoes, winter storms and nor'easters, earthquakes, wildfires, and dam failures. The Plan discusses each of these natural hazards in detail with the understanding that a particular hazard effect (i.e. damage from falling trees) can be caused by a variety of hazard events (e.g. high winds) that can be caused by a variety of storms (e.g. hurricanes and tropical storms and winter storms). Given the compact geographic nature of the community and the wide ranging geographic impacts of certain hazards – some hazards have the potential to impact the entire City of Milford. In particular, as shown on the map on the next page, the entire city is vulnerable to winter storms, nor-easters, wind storms, earthquakes, and drought. Specific geographic areas cannot be delineated within the city that experience risk for these events to a greater or lesser degree.



WINTER STORM/NOR'EASTER, WIND STORM, EARTHQUAKE, DROUGHT AND WILDFIRE RISK

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

N

Legend

At Risk Area

This map was produced from the City of Milford Geographic Information System.
The City expressly disclaims any liability that may result from the use of this map.
This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 7/29/2013
Path: C:\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_non-HurricaneFlood risks.mxd

Below is a table depicting a general overview of natural hazards and the conditions that cause them:

Resulting Hazards	Dam Failure	Earthquakes	Hurricanes and Tropical Storms	Sea Level Rise/Shoreline Change	Summer Storms/Tornados	Wildfires	Winter Storms, Nor'easters, Blizzards
Coastal Erosion			x	x	x		x
Coastal Flooding			x	x	x		x
Dam Failure	x	x					x
Falling Trees/Branches		x	x		x	x	x
Fire/Heat			x		x	x	
Flooding from Poor Drainage			x	x	x		
Hail					x		
Ice							x
Inland Flooding	x		x		x		
Lightning			x		x		
Power Failure		x	x		x	x	x
Shaking		x					
Smoke						x	
Snow/Blizzard							x
Storm Surge			x	x	x		x
Wind			x		x		x

Figure 6

PAST WEATHER EVENTS

The National Oceanic and Atmospheric Administration National Climate Data Center provides a Storm Events Database online[22]. Since 2006 the National Weather Service has been entering data on storm events and this data is searchable by state and county. Using this database and focusing on storms listed for Milford, the following table was created to list all recorded storm events since the last plan's adoption in 2008.

Event	Flash Flood	Thunderstorm/ Wind	Hurricane/ Tropical Storm	Storm Surge/Tide	Heavy Snow	High Wind	Strong Wind	Coastal Flood	Blizzard	Ice Storm	Winter Weather	Excessive Heat
Date												
8/7/2008	x	x										
9/6/2008			x									
12/19-20/2008					x							
2/12/2009						x						
3/1/2009					x							
10/7/2009							x					
10/18/2009								x				
12/19/2009					x							
1/28/2010							x					
3/31/2010								x				
6/24/2010		x*										
8/23/2010							x					
10/1/2010							x					
12/26/2010									x			
1/7/2011					x							
01/11-12/2011					x							
01/26-27/2011					x							
02/01-02/2011										x		
2/7/2011											x	
7/22/2011												x
8/28/2011			x	x				x				
10/29-30/2011											x	
12/27/2011						x						
1/21/2012					x							
06/04-05/2012								x				
10/29-30/2012			x	x				x				
Total	**1**	**2**	**3**	**2**	**8**	**2**	**4**	**5**	**1**	**1**	**2**	**1**

Figure 7 *tornado in Bridgeport, CT

By using the matrix of Event and Hazards combined with the Storm Events data we can take a more holistic and broad view of the spectrum of events and hazards that affect Milford. Hurricanes, Winter Storms and Nor'easters, Floods and Windstorms all rise to the surface as likely scenarios requiring mitigation planning. All of these hazards are exacerbated by the increased risk impacts of Sea Level Rise.

Only very recently have sea level rise projection data become available. The CT Department of Energy and Environmental Protection has designed a Coastal Hazards Map[23] with GIS data available. Using the same LIDAR technology for the DFRIM panel update, DEEP developed sea level rise inundation scenarios and planning horizons. While these data are estimates and are subject to many environmental, climatological and local development scenarios the Committee will be using these data to anticipate future needs for mitigation. Events such as dam failures and earthquakes are not seen as being as likely events based on historical patterns but still can cause significant damage.

B. Profiling Hazards

The plan has been updated for clarification. The previous plan included a chapter on Flood Mitigation Measures (III) that did not address just flood mitigation strategies and then the plan continued to profile earthquakes and windstorms as hazards. This was felt to be confusing so the plan was reformatted to keep all identified hazards together within the Profiling Hazards chapter and previous subsections on Future Land Use Trends, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects and Public Information has been moved to separate chapter that discusses overall mitigation strategies. Profiled hazards have been updated to include specific mitigation measures where appropriate. Subsections on Wind Storms and Earthquakes have been moved to this chapter. Subsections 6 and 7 have been added to profile Sea Level Rise, Avalanches, Dam Failures, Drought, Levee Failure, Landslides, Tsunami, Volcanoes and Wildfire.

1. Hurricanes and Tropical Storms

Revision statement: Plan has been updated to include damages and costs associated with storms Sandy and Irene. Updates include technical information from the National Weather Service, National Atmospheric and Oceanic Administration and FEMA and a GIS-based fiscal risk assessment. Mitigation strategies have been included in this section. Plan now cites the 2010 CT Hazard Mitigation Plan and includes a description of hurricane categories. Includes identification of hazard location and probability of future occurrences.

Hurricanes are the most dangerous natural disaster that Milford encounters. The most dangerous effects of a hurricane on the Southern New England coastline have been from the storm surge, high velocity wave action, and extremely high winds. The entire Milford community is at risk from wind danger. Based on the Applied Technology Council Wind Speed finder tool[24] Milford has a 10 year Mean Recurrence Interval wind speed of 77 mph,

exceeding the 75 mph designation for hurricane force winds. Areas identified by SLOSH and FEMA Risk maps identify areas at risk for storm surge and flooding. The natural cove of Long Island Sound makes Milford particularly vulnerable for hurricane damage in addition to extensive shoreline damage. As with most intense storms, hurricanes can leave the area without utilities for many days creating very hazardous conditions for rescue workers and individuals in the affected areas.

The official hurricane season (for New England) begins on June 1 and ends November 30. The most vulnerable time of the year is mid-August through September.

The unique coastline between Connecticut and Rhode Island on the north and Long Island on the south funnels hurricane winds and surge effects into increasingly shallower coastal areas. This funneling effect and the faster than normal storm speed of New England hurricanes fuse together to generate severe local flooding along many of the heavily populated coastal communities.

Understanding how hurricanes are categorized is very important when looking at mitigation strategies. However, it is noted that hurricane categories are defined by wind speed. When looking at storm surge levels based on hurricane category as done later in this Plan it must be noted that reported storm surge levels have exceeded modeled impacts.

The following descriptions are from the 2010 Connecticut Natural Hazard Mitigation Plan Update. Within the State's Plan Update are the return period estimations calculated by NOAA which describe the frequency at which a certain category of hurricane would likely appear within 75 nautical miles (nm) of a given location. As the plan states, "In simpler terms, a return period of 20 years for a Category 3 or greater hurricane passed within 75 nm (86 miles) of that location about five times. We would then expect, on average, an additional five Category 3 or greater hurricanes within that radius over the next 100 years".

That same calculation and storm track history[25] was used by the City of Milford to derive return periods within 75 nm of Milford. The return periods calculated for Milford have been included with the category descriptions from the State's Plan Update. While the State Plan Update does not include return periods for Tropical Storms, in light of the damage caused by Irene and Sandy it was felt to be important to include that calculation in Milford's Plan Update.

Tropical Storm: A system in which the maximum sustained surface wind ranges from 34 to 63 knots (39 – 73 mph).

In the past 100 years 17 storms (Sandy added by user) at or greater than a tropical storm have passed with 75 nm of Milford, therefore our return period is 5.8 years. Simply stated, Milford is susceptible to Tropical storm occurrence approximately every 5.8 years.

Category One Hurricane: Sustained winds 74-95 miles per hour (mph) (64-82 knots (kt) or 119-153 kilometers per hour (km/hr)).

Damaging winds are expected. Some damage to building structures could occur, primarily to unanchored mobile homes (mainly pre-1994 construction). Some damage is likely due to poorly constructed signs. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possibly death. Numerous large branches of healthy trees will snap. Some trees will be uprooted, especially where the ground is saturated. Many areas will experience power outages with some downed power poles.

In the past 100 years 6 storms of a category 1 or greater have passed within 75 nm of Milford, therefore our return period is 16.76 years. Hurricane Belle is identified as the last Category 1 hurricane to make landfall near Milford 36 years ago in 1976. The sustained winds for Sandy within Connecticut were 70 mph, short of the 74 required to be considered a hurricane. However hurricane force gusts and the combined impact of a nor'easter make Sandy difficult to categorize. As the last Cat 1 storm hurricane occurred in 1976, Milford is 20 years past due being affected by a storm of this magnitude.

Category Two Hurricane: Sustained winds 96-110 mph (83-95 kt or 154-177 km/hr). *Very strong winds will produce widespread damage*. Some roofing material, door, and window damage of buildings will occur. Considerable damage to mobile homes (mainly pre-1994 construction) and poorly constructed signs is likely. A number of glass windows in high-rise buildings will be dislodged and become airborne. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possibly death. Numerous large branches will break. Many trees will be uprooted or snapped. Extensive damage to power lines and poles will likely result in widespread power outages that could last a few to several days.

In the past 100 years 4 storms of a category 2 or greater have passed within 75 nm of Milford, therefore our return period is 25 years. The last Cat 2 storm was Hurricane Gloria in 1985. Therefore, Milford is 13 years past due being affected by a storm of this magnitude.

Category Three Hurricane: Sustained winds 111-130 mph (96-113 kt or 178-209 km/hr).

Dangerous winds will cause extensive damage. Some structural damage to houses and buildings will occur with a minor amount of wall failures. Mobile homes (mainly pre-1994

construction) and poorly constructed signs are destroyed. Many windows in high-rise buildings will be dislodged and become airborne. Persons struck by windborne debris risk injury and possibly death. Many trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.

There is no history of a Category Three or greater hurricane along the Connecticut coastline therefore the return period is null. There may be some debate about the exact measurements for the Unnamed Storm of 1938 as it is generally assumed to have been a Category 3 as it struck Connecticut, however the data supplied by Historical Hurricane Track tool used for this analysis show this storm transitioning to a Category 2 about 100 nm east of Atlantic City NJ and 130nm south of Milford. Determining the relative anticipated frequency of a Cat 3 is difficult, however, as evidenced by the State EPPI exercise (as discussed in Chapter IIE, Local, State & Federal Plans and Technical Information) the State of Connecticut anticipates that some probability is expected.

Category Four Hurricane: Sustained winds 131-155 mph (114-135 kt or 210-249 km/hr).

Extremely dangerous winds causing devastating damage are expected. Some wall failures with some complete roof structure failures on houses will occur. All signs are blown down. Complete destruction of mobile homes (primarily pre-1994 construction). Extensive damage to doors and windows would be likely. Numerous windows in high-rise buildings will be dislodged and become airborne. Windborne debris will cause extensive damage and persons struck by the wind-blown debris will be injured or killed. Most trees will be snapped or uprooted. Fallen trees could cut off residential areas for days to weeks. Electricity will be unavailable for weeks after the hurricane passes.

There is no history of a Category Four hurricane along the Connecticut coastline therefore the return period is null and a storm of this magnitude, while possible, is not likely

Category Five Hurricane: Sustained winds greater than 155 mph (135 kt or 249 km/hr).

Catastrophic damage is expected. Complete roof failure on many residences and industrial buildings will occur. Some complete building failures with small buildings blown over or away are likely. All signs blow down. Complete destruction of mobile homes. Severe and extensive window and door damage will occur. Nearly all windows in high-rise buildings will be dislodged and become airborne. Severe injury or death is likely for persons struck by wind-blown debris. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months.

There is no history of a Category Five hurricane along the Connecticut coastline therefore the return period is null and a storm of this magnitude while possible is not likely

Connecticut Hurricane Historical Record

Source: American Red Cross – Milford Chapter, Disaster Plan 3/04, updated 01/13

Date	Name	Damage
September 21, 1938	Unnamed	Sustained winds of 95mph, 30'-40' storm surge, tide 15' above sea level, $100 million in damage, and 262 deaths.
September 14, 1944	Unnamed	2 million in damage.
August 31, 1954	Hurricane Carol	90 mph, tide 12'above sea level, 3800 homes destroyed $200 million in damage, 19 deaths.
September 11, 1954	Hurricane Edna	Heavy rain and major flooding.
August 17-20, 1955	Hurricane Diane	Heavy rain, $170 million in damage.
September 12, 1960	Hurricane Donna	6' tidal surge, heavy rain, $5 million in damage.
September 21, 1961	Hurricane Esther	Heavy storm damage.
September 27, 1985	Hurricane Gloria	2 deaths, $20 million in damage.
August 19, 1991	Hurricane Bob	Sustained hurricane force winds, many trees and power lines downed.
September 16, 1999	Tropical Storm Floyd	Flooding in western part of State. Level III operations established.
August 28, 2011	Hurricane/ Tropical Storm Irene	Flooding and power outages throughout the state but most heavy in central to western.
October 29, 2012	Hurricane/ Tropical Storm Sandy	Significant storm surge, power outages, and coastal flooding.

Figure 8

There are four components of a hurricane that produce damage: wind speed, storm surge, rain, and wave action. The most common element associated with hurricanes is wind speed. The highest wind speeds occur in a ring around the center, or eye of a hurricane. This ring usually extends 10-30 miles from the center of the hurricane. Some scientists also speculate that tornadoes are often present inside this ring, causing localized, extensive damage were they to strike land. Outside of this ring, gale force winds can extend outward to 100 miles from the center.

FEMA technical guides indicate that wind can cause damage starting at 50mph[26]. Moderate damage, such as broken windows and missing shingles, begins around 80mph. Structural damage and destruction occurs when winds exceed 100mph. Sometimes, the wind speed alone is enough to cause extensive damage and destruction to buildings. Mobile homes,

being lightly constructed and often not anchored, are usually completely destroyed by winds during a hurricane. In addition to the force of the wind, debris picked-up and hurled can damage, destroy, and kill. It is not uncommon for lumber to be hurled through trees and buildings by the force of the wind.

While the winds cause damage, the most dangerous component of a hurricane is the storm surge. About 90% of the deaths that occur during a hurricane are caused by storm surge trapping and drowning people. Storm surge is a great dome of water that is pushed ahead of the center of the storm. When it strikes land, water can push houses off foundations, toss boats around like toys, and sweep barrier islands clean of all structures and features.

On top of this surge comes additional hammering from wave action. This wave action acts like a giant battering ram, and can batter through dunes, concrete barriers, houses, and just about anything else in its path.

The worst-case scenario for Milford would involve a hurricane that combines with a stalled frontal boundary to bring excessive rainfall to an already saturated ground. When a frontal boundary stalls near the East Coast during the hurricane season, it is usually accompanied by several days of rain that allows for the ground to become soaked prior to the actual landfall of the hurricane. This causes tree roots to become unstable, adding to the likelihood of falling/uprooted trees when the hurricane winds arrive.

HURRICANE GLORIA

In terms of recent history, the most significant hurricane to hit Milford was Hurricane Gloria (Category 1) in September of 1985. Milford was directly hit by the eye of Hurricane Gloria causing coastal and inland flooding. As in the past occurrences of street flooding the worst areas were Cedar Beach, Wildermere Beach, Walnut Beach, Silver Beach, Bayview Beach, Woodmont Beach, Field Court, Melba Street, Beachland Avenue, Point Beach Drive and Hillside Avenue. In these areas street closures and property damage was moderate to major. Loss of power due to the storm lasted up to one week in some areas. The effects of long term power outage became a primary concern. This drew more attention to and planning for alternative power sources. Emergency operation plans were updated to address long term power outages. Steps are being taken to form agreements with private vendors to supply emergency generators. Businesses critical to local infrastructure and long term recovery were placed on a high priority utility restoration list. Examples are grocery stores that include gasoline stations and banking, governmental buildings such as Fire Stations, Police

Headquarters, City Hall and the Parson's Government Center. Efforts are ongoing to obtain grant funding for installation of emergency generators in these critical buildings. In 2011 the emergency generator at Fire Headquarters was replaced with a larger unit allowing the Health Department (located next door) to be added to the system. Funding for this project was provided by the CT Division of Emergency Management and Homeland Security. Availability of emergency power is a major consideration when choosing buildings to be used as shelters.

HURRICANE/TROPICAL STORM IRENE

On August 28, 2011, Irene hit Connecticut centered on Stamford near the border of New York. Milford, located to the east of the storm, was subject to approximately 4 inches of rain over a 24-hour period with sustained winds of 40 miles per hour (mph) with 60 mph gusts. Storm Irene moved slowly – taking about 12 hours to move across the state. During that time, high tide contributed to a four feet above normal tide combined with the storm surge caused by the winds. Milford experienced extensive flooding and property damage with over 500 structures estimated to have been damaged by the storm.

Melba Street - *Figure 9*

Merwin Avenue – *Figure 10*

As the area had experienced rainfall for the week leading up to the storm, some properties were damaged by falling trees due to saturated ground conditions. The tree fall caused long-lasting power outages in Milford ranging from 3-5 days. About 50% of the town was without power, 13,350 of 26,174 customers. Milford experienced extensive flooding and property damage with over 500 structures estimated to have been damaged by the storm.

The properties located closest to Long Island Sound experienced damage due to wave

action with most water ward facades at the 1st floor level requiring repair. These include the Melba Street and Point Beach neighborhoods. Where wave heights were particularly high, 2nd floor levels required repair as well. Properties adjacent to the tidal marsh areas reached flood heights ranging from 1 to 5 ft (up to elevation 9.8). Substantial Damage Estimates for the area confirm that approximately 45 structures sustained substantial damage and will need to be mandatory retrofit or reconstructed to be flood compliant.

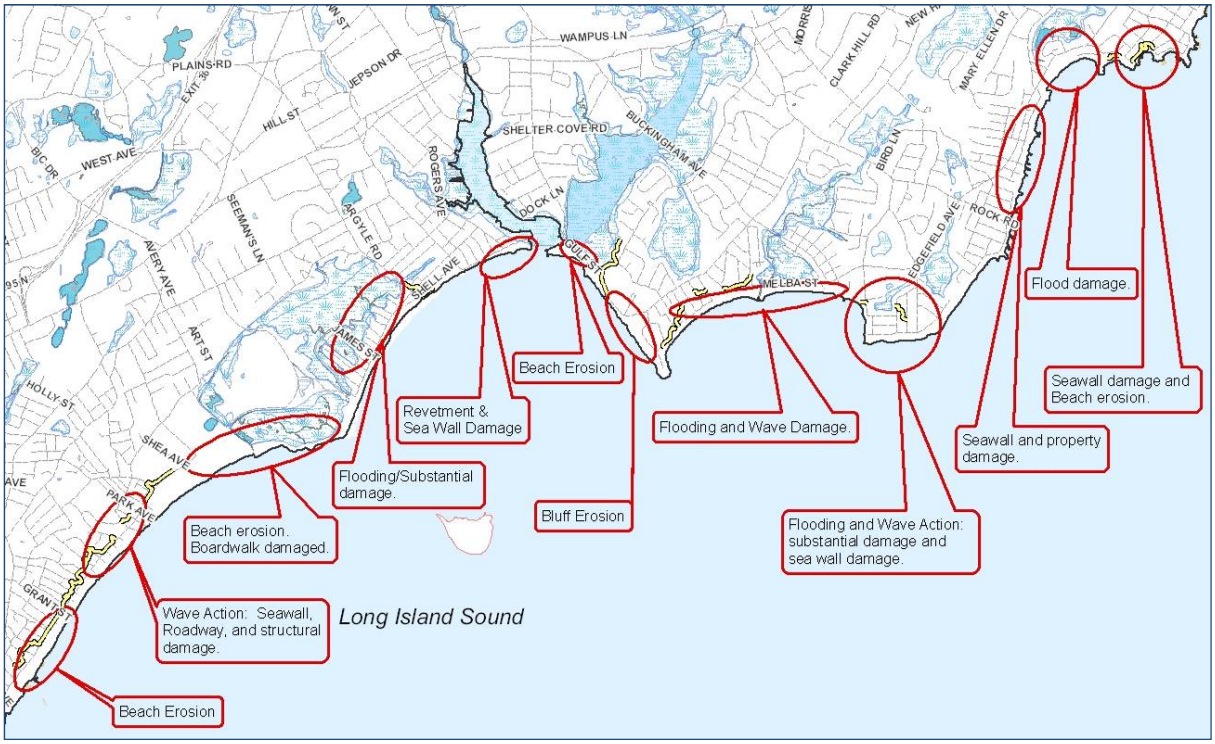


Figure 11 Irene damage along Milford's shoreline

In some circumstances, this will require elevation with new foundations and some property owners have chosen to tear down the structure and rebuilt or sell the property to someone else willing to do that. It is unclear how many property owners will walk away from their homes. Twenty-five (25) property owners have applied for grants funds through the Hazard Mitigation Grant Program to elevate their structures above the flood risk.

Wave action also caused bluff erosion along Point Lookout and sea wall and revetment damage Citywide. Beach erosion occurred west to east from Laurel Beach, Gulf Beach, Bayview Beach, along Beach Avenue, and Woodmont Beach.

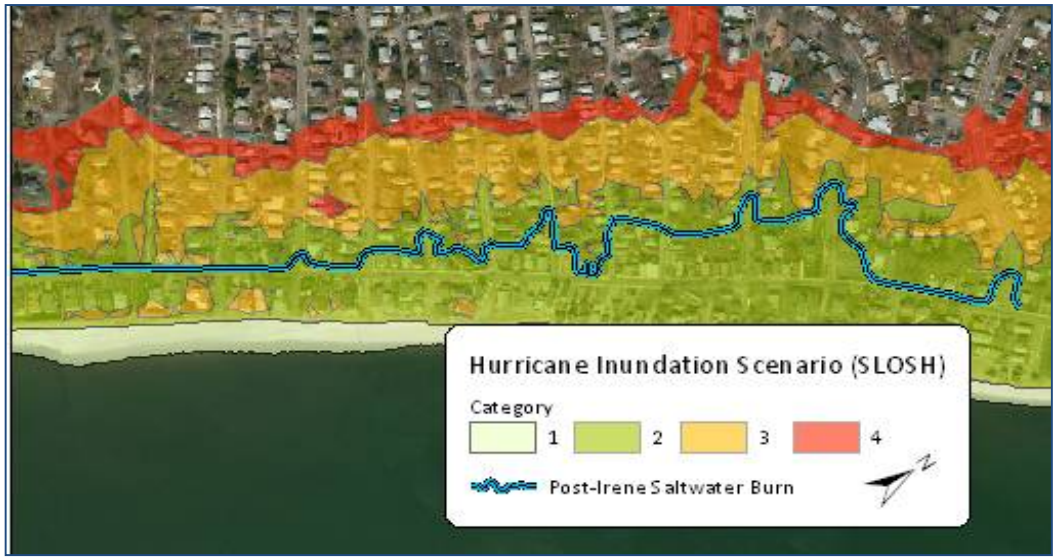


Figure 12 Storm Irene Storm Surge (East Broadway neighborhood)

Irene's storm surge extended to Category 3 and 4 Hurricane modeled surge levels even though Irene was only categorized as a Tropical Storm due to wind strength based on surveying conducted by the Engineering Department. Irene did not have the amount of rainfall categorized by a 100-year storm. It is estimated that approximately 540 structures were damaged by Irene and recovery continues to be ongoing.

City infrastructure was also affected by Irene. Following the storm, the City hired an engineering consulting firm, HAKS Engineers, who prepared a Shoreline Damage Assessment and Restoration Recommendation Report dated September 2, 2011. This report's executive summary provides a snapshot of damages to City infrastructure as follows:

Area	**Estimated Repair Cost**
Walnut Beach Area (7 streets ROW repair)	$1,848,000
Fort Trumbull Beach Revetment	$10,210,000
Gulf Street Pier	$352,800
Point Lookout Flapper Valve	$100,800
Beachland Avenue @Melba Street	$302,400
Fairview Beach Areas (2 streets ROW repair)	$285,600
Total Project Cost	*$13,100,000*

HURRICANE/SUPERSTORM SANDY

Occurring just 14 months after Irene, Sandy made landfall on October 29, 2012 near

Atlantic City, New Jersey. The tri-state area experienced the hardest hit from the storm with the greatest losses to life and property in New York City, Long Island and coastal New Jersey. The storm impacted Milford with higher storm surge and flood heights than occurred with Irene by approximately 1.5 feet. The wave action demolished 4 structures – two of which were left as little more than a pile of rubble. Over 13,000 customers lost power.

Sandy damaged an estimated 1,000 structures compared with Irene's 540 – many of which are have been newly mapped into flood zone on FEMA's DFIRM update. At this time, over 700 structures have been assessed for damage estimates with approximately 175 structures over 50% substantially damaged and requiring elevation or other flood-compliance mitigation.

Milford established a Long Term Recovery Committee that is comprised of City, State and Federal Departments and Agencies, Volunteer Organizations Active in Disasters (VOAD) such as the Salvation Army, American Red Cross and United Way, and faith based organizations. Recently, the Milford Disaster Case Management Partnership was created, consisting of Human Services, Economic and Community Development, Health Department, Milford School District, and the United Way of Milford. These agencies and organizations are working with The Salvation Army and American Red Cross to better manage the needs of the Milford citizens affected by Super Storm Sandy. The Disaster Case Management group will address immediate needs, looking at the impact of the two storms, and will also address long-term needs and implementation including preparation for rebuilding when monies become available.

Below is a map showing post-Sandy substantial damage estimates on those structures which have been inspected.

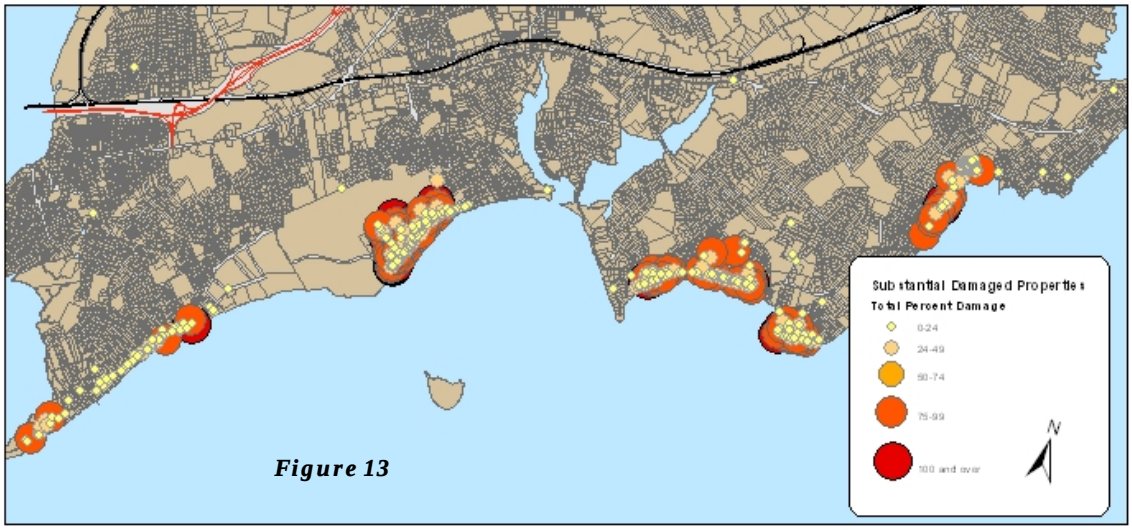
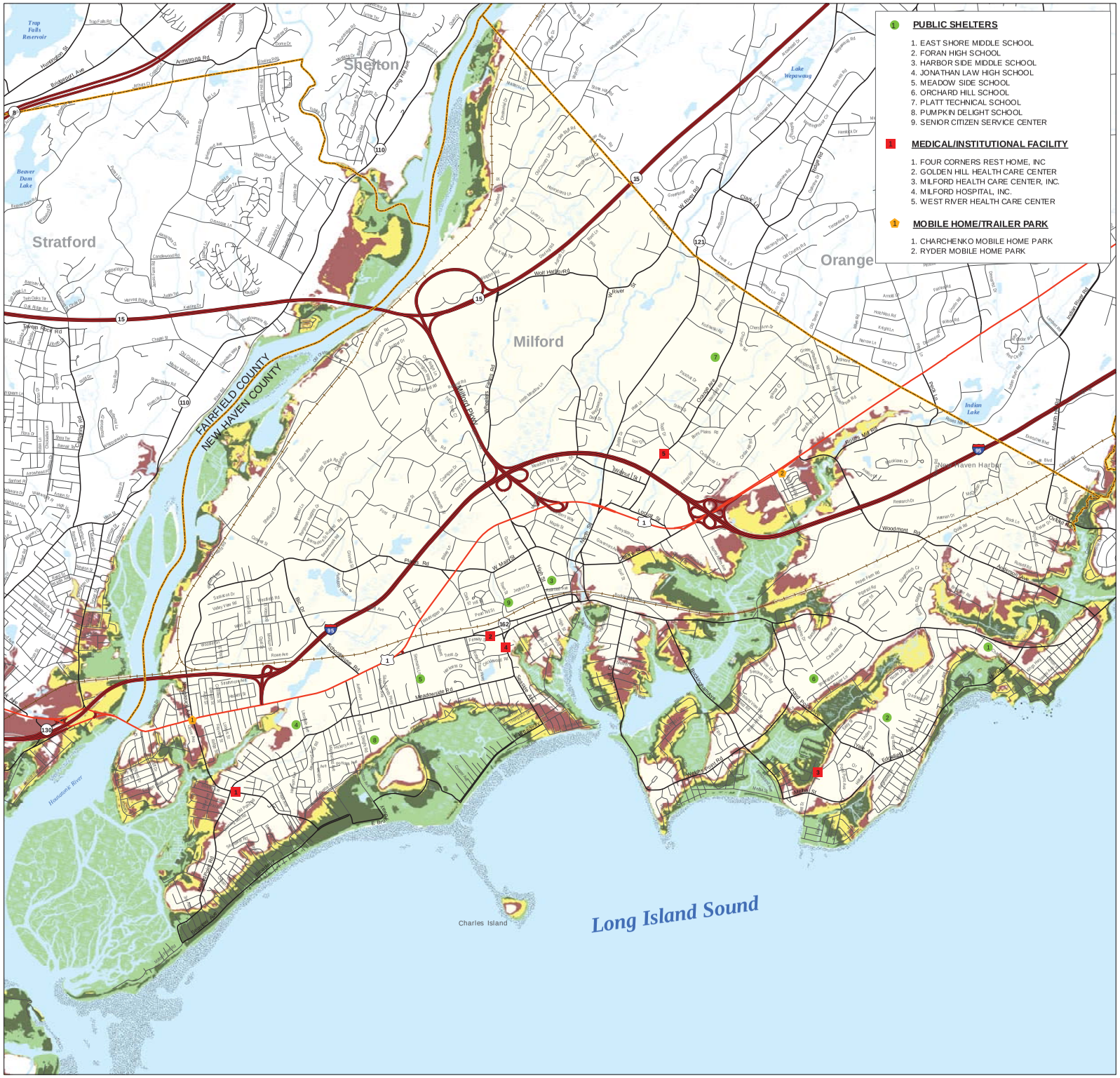


Figure 13



PUBLIC SHELTERS

1. EAST SHORE MIDDLE SCHOOL
2. FORAN HIGH SCHOOL
3. HARBOR SIDE MIDDLE SCHOOL
4. JONATHAN LAW HIGH SCHOOL
5. MEADOW SIDE SCHOOL
6. ORCHARD HILL SCHOOL
7. PLATT TECHNICAL SCHOOL
8. PUMPKIN DELIGHT SCHOOL
9. SENIOR CITIZEN SERVICE CENTER

MEDICAL/INSTITUTIONAL FACILITY

1. FOUR CORNERS REST HOME, INC
2. GOLDEN HILL HEALTH CARE CENTER
3. MILFORD HEALTH CARE CENTER, INC.
4. MILFORD HOSPITAL, INC.
5. WEST RIVER HEALTH CARE CENTER

MOBILE HOME/TRAILER PARK

1. CHARCHENKO MOBILE HOME PARK
2. RYDER MOBILE HOME PARK

LEGEND

Hurricane Surge Inundation

- Category 1
- Category 2
- Category 3
- Category 4

Transportation

- Interstate Highway
- US Highways
- State/Local Highways
- Local Road
- Railroad
- Airport

Political

- Town Boundary
- State Boundary

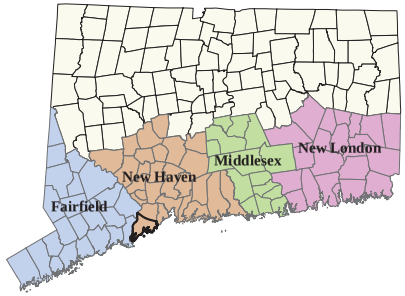
Facility Location Key

- Public Shelter
- Medical/Institutional Facility
- Mobile Home/Trailer Park

Hydrographic Features

- Water
- Intermittent Water
- Flats
- Rocks
- Inundated Area
- Marsh
- Cranberry Bog
- Dam
- Fish Hatchery
- Aqueduct
- Sewage Pond
- Water Tank

LOCATION MAP



NOTES & SOURCES

Hurricane surge elevations were determined by the National Hurricane Center using the NY3 and PV2 SLOSH model basins, and assumed peak hurricane surge arriving at mean high water.

The hurricane surge inundation areas shown on this map depict the inundation that can be expected to result from a worst case combination of hurricane landfall location, forward speed, and direction for each hurricane category.

The source of basemap transportation features such as roads and railroads is Tele Atlas 2008. The source of other basemap features is the Connecticut DEEP.

The primary ground elevation data source was LiDAR data created by Terrapoint LLC for FEMA. That data was supplemented where needed by ground surface LiDAR data created by Terrapoint LLC for the State of Connecticut. The vertical accuracy of all LiDAR data is approximately +/- 1 foot, and the horizontal accuracy is approximately +/- 3 feet.

The horizontal projection of this map is Connecticut State Plane NAD83 feet. All elevation data was referenced to the NAVD88 vertical datum.

TITLE

Connecticut Hurricane Evacuation Study
Hurricane Surge Inundation Mapping
August 2012
Milford

Feet

4,000 2,000 0 4,000

US Army Corps of Engineers
New England District

FEMA

NOAA

VULNERABLE STRUCTURAL LOSS DUE TO HURRICANE

The National Oceanic and Atmospheric Administration (NOAA) distribute a GIS data set called SLOSH. See page 39 for a town-wide map indicating SLOSH areas. The Sea, Lake and Overland Surge from Hurricanes (SLOSH) data includes Hurricane Surge Inundation areas for category 1 through 4 hurricanes striking the coast of Connecticut with a peak hurricane surge arriving at high mean water. The hurricane surge elevation data used to define these areas were calculated by the National Hurricane Center using the SLOSH Model. The SLOSH model hurricane surge elevations have an accuracy of +/- 20 percent. The hurricane surge inundation areas depict the inundation that can be expected to result from a worst case combination of hurricane landfall location, forward speed, and direction for each hurricane category.

Hurricane Surge Inundation area data are developed to assist federal, state and local emergency management officials planning for and responding to hurricanes.

The following figure 14 shows a break down of City infrastructure located in SLOSH zones:

Type of Facility	SLOSH Zone Category			
	One	Two	Three	Four
Animal Shelter		1	1	1
Beaverbrook Wastewater Treatment Facility		1	1	1
Elementary School			1	1
Housatonic Wastewater Treatment Facility			1	1
Library			1	1
Lisman Landing Marina		1	1	1
Middle School			1	1
Other	2	7	13	15
Pump Stations	3	11	17	19
Recreation Facilities	4	14	14	17
Approximate Insured Value	$ 4,574,992	$ 64,185,024	$ 95,232,077	$ 99,208,271

Figure 15

Utilizing the City's GIS analysis capabilities, a general fiscal risk analysis was generated to demonstrate the potential impacts of overland flooding impacts due to hurricanes based on the modeled storm surges per category within the SLOSH data set. The GIS staff analyzed all properties receiving substantial damage estimates by examining associated assessor records. All

properties receiving a substantial damage estimate of 25% or more have an assessed construction grade of 6 or less.

Figure 16 Example of residential damage from Hurricane Sandy

A SLOSH inundation coverage percentage was calculated for each parcel within each SLOSH category. Parcels modeled to have at least 50% of their area covered by storm surge were then analyzed further. Assessed replacement costs of residential structures graded 6 or less, on parcels modeled with at least 50% surge inundation were then aggregated by hurricane category.

The assessor calculates replacement costs for structures as part of the valuation process. Replacement cost of a structure does not take land value into account as was felt to be a more accurate picture of Milford's fiscal risk rather than property assessment or appraisal values.

All values represent replacement cost for the residence. Over 4,600 City structures are vulnerable in the event of a Category 4 hurricane with aggregated property values close to $1.3 billion, at an average of $272,733 per structure. The methodology for this analysis can be found in Appendix G.

Fiscal risk analysis for residential structural replacement costs by hurricane category						
	CAT 1	CAT 2	CAT 1 & 2 Combined	CAT 3	CAT 1 thru 3 Combined	Cat 4
Count	645	1434	2163	1024	3504	757
Avg. Value	$ 224,986	$ 281,057	$ 266,864	$ 266,843	$ 270,588	$ 256,422
Total Value	$ 144,666,379	$ 403,036,407	$ 576,693,565	$ 272,447,616	$ 946,789,072	$ 194,111,553
EFY	1980	1988	1986	1983	1985	1989
AYB	1927	1952	1945	1941	1946	1945

	Total SLOSH Coverage over 50%
Count	4660
Avg. Value	$ 272,733
Total Value	$ 1,269,573,409
EFY	1987
AYB	1948

Residential structures graded 6 or less on parcels with at least 50% coverage of NWS SLOSH model data

5891 Residential structures grade 6 or lower in SLOSH Zones

4660 Residential structures grade 6 or lower where 50% of the parcel is covered by SLOSH data

Figure 17 Fiscal Risk Analysis of Residential Structural Replacement Cost

HURRICANE/TROPICAL STORM MITIGATION MEASURES

Milford proposes the following mitigation measures for hurricanes and tropical storms:

- Building codes: Due to Milford's status as a coastal community, the City's Building Department has Building Code Regulations[27] in place that requires construction methodology (glazing, strapping, and anchoring) to withstand 120 mile an hour winds. All construction in the Milford has to adhere to these requirements.
- Zoning regulations: The City's Zoning Regulations have been in effect since 1930 and updated on a continual basis. The Flood Hazard regulations have been a part of the Zoning regulations since 1978 for flood-compliant design and appropriate site design for new construction for SFHA and Coastal High Hazard zones to withstand storm surge conditions. These regulations are updated as needed for Milford's continual participation in the NFIP.

- Implement dune restoration and other coastal protection projects consistent with the CT Coastal Management Act.
- Acquire shorefront land for open space acquisition where appropriate.
- Implement a formal Tree Hazard Management Program to encourage responsible planting practices and minimize future storm damage to buildings, utilities, and streets.
- Distribute hurricane preparedness information including pet sheltering plans through information provided by the City's Health Department, Emergency Management and Animal Control Department.
- Encourage the purchase of flood insurance at the time of property research related to purchase, renovation, and reconstruction through the Planning & Zoning office.
- Continue to conduct substantial damage assessments as required by NFIP after each disaster so that structures can be brought into flood-compliance whether through elevation or retrofit.

2. Winter Storms and Nor'easters

Revision statement: Historical information has been updated. Mitigation strategies have been included in this section. Hazard location has been identified as well as probability of future occurrences.

Winter storms are a common natural disaster which can affect Milford. Based on our historical record (as shown in Figure 7) a winter storm event occurs yearly. These types of storms can cause a myriad of dangerous problems for our coastal community. Winter storms of varying degrees of intensity pass through New England from as early as October through April. The entire city is affected by this hazard due to the large size of nor'easters and winter storm systems which can easily impact the entire state in comparison with the small size of Milford (24.7 sq miles).

Winter storms are usually associated with high accumulations of snow. However, there are other characteristics of these storms that can create equally hazardous conditions. These include severe ice conditions, high winds and extremely dangerous coastal wave action.

A Nor'easter is a term given to a storm system that develops near the Atlantic Coast, intensifies, and produces high winds, waves, tides, and rainfall along the coast. Like a

hurricane, a Nor'easter's winds rotate counter clock-wise (hence the term Nor'easter – the direction the winds come from). These storms occur most frequently in the winter months, but may occur at any time. It has been determined that winter storms and nor'easters could impact the same vulnerable city infrastructure and populations as those identified in the sections on hurricanes, wind storms and floods in this plan update (Ch III, Secs B1, B3, B4). Residential property losses from Winter Storms and Nor-Easters would be similar to the type of estimated dollar value damages from floods, hurricanes, and tropical storms due to their comparable characteristics. These dollar figures can be seen in the Flood damage estimates in Figure 21 ($1.6 billion) and Hurricane and Tropical Storm loss estimates in Figure 17 ($1.2 billion).

Nor'easters differ from hurricanes in two important aspects: wind speed/size and movement. A Nor'easter's winds generally do not exceed 60-90mph, and the systems are generally smaller than hurricanes. Even more important in terms of damage is movement. While hurricanes move at a rate of 5 to 30mph, Nor'easter's often do not have any rate of movement. A storm surge from a hurricane usually lasts only a few hours. A Nor'easter often hangs over an area, and can hold tides for up to 30 hours or 5 tidal cycles. Because of these characteristics a Nor'easter can cause incredible damage even though it is not as powerful as a hurricane.

Along with high accumulations of snow, winter storms in Connecticut can pack 36 to 73 miles per hour winds and bring in storm surge which can exceed 4 feet. Extreme cold weather, ice and snow can damage utilities and structures and prevent travel.

Roof collapses are a significant danger during snowstorms. Two such events occurred within a month of each other in 2011. One building was vacant and the other had 30 workers inside, all who escaped without harm. Combined, these two structures were valued at approximately $1.5 million . Many businesses in the City have flat roofs which could be susceptible to collapse. A formal assessment has not been conducted to review the number of flat roofs at risk, their age or construction type. It is recommended that the City study this risk for the next plan update to determine potential property loss estimates. All 14 of Milford's schools, both wastewater treatment plants, City Library, Police Station, City Hall, Parson's Government Center and Public Works Complex all have flat roofs which have an elevated risk for damage due to snow pack. Capital Improvement Projects since 2008 have included window and roof replacements for City schools.

Some of the more significant winter storms and Nor'easters in Milford include:

Blizzard of '78	February 1978
Nor'easter of '84	March 29-30, 1984
The Halloween Nor'easter	October 1991
Great Nor'easter of December (Storm Beth)	December 11-15, 1992
Storm of the Century '93	March 10-14, 1993
Blizzard of '96	January 7-10, 1996
Nor'easter of October '96	October 19, 1996
Winter Storm Emily	March 2001
Storm Alfred	October 30, 2011
January Blizzard	January 2011

Figure 18 List of significant Nor'easters and Winter Storms

Prior to 1991, the last significant coastal storm occurred in 1984. Since 1991, the frequency and severity of coastal storms has increased.

On October 30, 2011 the state was surprised by a severe snow storm. This storm was anticipated to be just an early snow storm. Snow storms early in the fall are highly uncommon for southern Connecticut. The wet, heavy nature of the snowfall accumulating on fully foliaged trees resulted in the downing of trees blocking roads and causing the loss of power. Entire neighborhoods became inaccessible due to the downed trees and emergency responders were issued chain saws to allow them to cut a path to the emergency scene.

Power outages were so numerous and widespread that utility crews were overwhelmed. The utility companies did not have the manpower needed initially and some residents remained without power for up to two weeks. As a result of reviewing emergency response procedures used during the October snowstorm, plans have been created teaming public works/private tree companies with utility crews forming a "Make Safe" approach when removing electrical wires from downed trees. This allows the roads to be cleared by the tree crews after the power crews have made the area safe from electrical hazards.

Figure 19. Leaf-on October snowfall Credit: Pam Landry, Milford Patch 10/30/2011

Public works/private tree crews have increased the amount of warm weather trimming of trees near roadways and power lines. Winter storms and Nor'easters can cause disruption of community activities and create dangerous road conditions and loss of power. Loss of power and heat can result in the need for shelters to be opened. Vulnerable populations for this event are similar to those vulnerable in hurricanes and floods. Please also see critical facilities map discussed in Chapter D (Setting).

NOR-EASTER AND WINTER STORM MITIGATION MEASURES

As the hazards due to nor'easters and winter storms are similar to hurricanes, the mitigation measures are similar with perhaps a higher priority for proper tree management policies.

3. Floods

Revision statement: Plan has been revised to include FEMA updates. Geographic analysis of the City has been updated to reflect awareness of topographic elements that contribute to flooding. Descriptions on overall hazards from flooding have been expanded upon. A description of a significant flood in 1982 and its impact on mitigation strategy has been included. Revision statements for each subheading are including as revisions on this section have been extensive. A subsection on flood mitigation strategies has been updated to be more specific. References to the DEP Flood Alert system have been removed. The date of the most recent update to the City's Emergency Operations Plan has been included. Location of hazard identified.

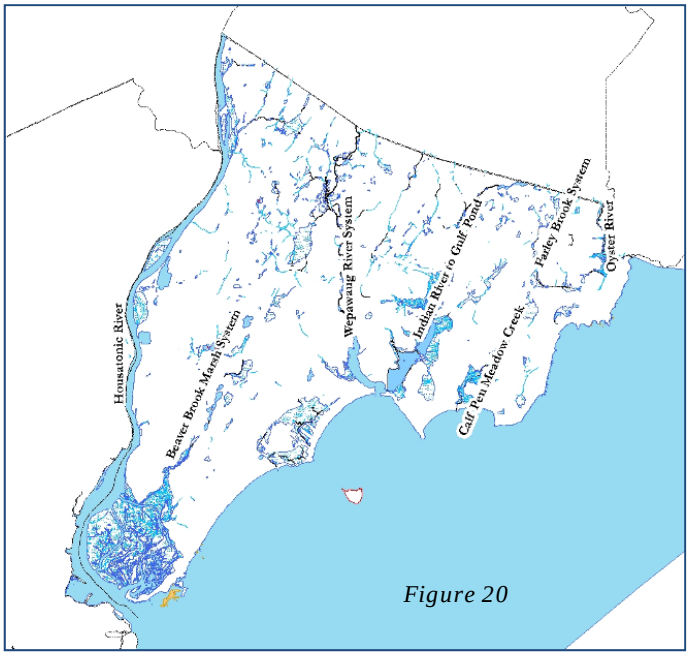


Figure 20

Milford is a coastal community surrounded and intersected by water bodies. It is bordered on the south and south east by Long Island Sound (LIS) and on the west by the mouth of the Housatonic River. It is centrally bisected north to south by the Wepawaug River; easterly bisected by the Calf Pen Creek and Farley Brook/Oyster River systems; and westerly bisected by the Beaver Brook system.

As a result of its geography and topography, the City has strong potential for flooding, as identified on FEMA Risk Maps. GIS analysis calculates the flood zones as encompassing 7.6 square miles or more than 1/3 of the city. Hurricanes and coastal storms can and have caused severe coastal flooding as well as flooding along the Wepawaug River. Milford's shoreline juts into Long Island Sound making it more vulnerable.

Many of the homes along the coastal areas of Milford are converted summer cottages, which are smaller and built on smaller plots of land. This results in Milford's most highly dense residential neighborhoods being the most vulnerable.

Floods are either classified as "slow-rising" or "flash floods". Slow rising floods may be preceded by a warning period of hours or days. Evacuation and sand bagging for slow-rising

floods sometimes help to lessen flood-related damage. On the other hand, flash floods are the most difficult to prepare for, due to minimal advance warning time.

Flooding is the most common type of disaster that occurs in Milford. One type of flood producing storm is the extra-tropical cyclone, moving up the eastern side of the Appalachian Mountains and commonly referred to as a Nor'easter; the other is a tropical low (hurricane) moving up the coast from the South.

Every spring, the chance of floods is increased due to snowmelt or complicated by ice jams. Connecticut, in general, has no distinct flood season. There is no time during the year when a major flood cannot occur. However, there are two yearly periods of higher flood frequency, late summer and early fall, when hurricanes are most likely to occur, and early spring, when snow and ice are melting. Monthly full moon high tides cause minor flooding in Laurel Beach by Milford Point Rd, along Field Court, areas along Calf Pen Meadow Creek – particularly Melba St and Beachland Ave and the finger streets off of East Broadway closest to the tide gate have issues during extreme high tides. The likelihood of floods occurring in these areas can have a return period as short as a month.

Damages from flooding have increased in the last decade. This is mainly due to increased population living in flood plain areas and the removal of forest cover. There are several river basins subject to slow-rising River flooding including the Housatonic River, Wepawaug River and the Indian River.

The impact of flooding on the area would depend on the size of the area affected and the severity of damage. Major flooding can damage infrastructure and cause devastating property damage. Flooding causes significant displacement as populations have to be evacuated, before, during, and likely after the disaster. Mitigation measures are required not only during 100-year storm events, but can be necessary seasonally or during lunar high tide, including regular relocation of vehicles to prevent property damage. Roads are impassable when water-covered and may be damaged. Bridges may be closed or destroyed and utilities may be shut off in flooded areas. Standing water for an extended period of time can also cause structural damage. River floodwater is fast moving and can carry objects; these affects combine to produce damage to bridges and other structures in the water path.

In June of 1982, a low pressure weather system stalled over Connecticut resulting in 12 inches of rainfall within a 4 day period. The Wepawaug River which flows through the center of downtown Milford overflowed its banks literally dividing the City in two. City Hall which is adjacent to the river was flooded and City records were floating in the streets. Access to

Interstate 95 was limited due to extensive flooding of local streets. Emergency response and plans were revised at that time and are revised annually. Emergency response guidelines were established for swift water rescue. Plans were made to have duplicate assets and special rescue teams created for the West and East side of town. The most recent update to the City Emergency Operation Plan was submitted to DEHMS Region 2 in February 2012. Paper records are now mainly electronic with offsite back up storage. CT Department of Energy and Environmental Protection (DEEP) installed a water level gauge upstream of downtown Milford.

RESIDENTIAL FLOODING

Revision statement: Subsection has been revised to reflect changes in the FEMA flood hazard areas. Data from the National Flood Insurance Program on repetitive claims has been updated. New to this section is a fiscal risk assessment on residential structures. Information from the Health Department has been included to describe their mitigation strategies and efforts. Neighborhood descriptions have been updated.

Residential flooding presents the most wide spread natural hazard in the City of Milford. Residential structures that are subject to flooding during significant flood events are primarily in the southern section of the City and are impacted by coastal flooding. There is a mix of the types of homes in the hazard areas, but those at risk are primarily single-family dwellings.

Most of Milford's velocity zones are located along the immediate shoreline. The beachfront properties in the velocity zone are susceptible to damage. Over the years, many seasonal cottages have been converted to year round dwellings, and the character of the Milford shoreline has become more of a year-round community, intensifying risks to life and property for those who live in the coastal area. Beachfront properties are very susceptible to damage, not only as a result of flooding but also because the dynamic nature of the beach system results in shoreline erosion in some locations.

The Hazard Mitigation Committee has identified a project that would review all of the existing available data regarding flood hazards and prepare a comprehensive inventory and assessment of neighborhoods at risk in the coastal flood hazard areas. Some of this analysis has been already been completed, but will continue to be refined through additional plan updates in the coming years. The following table indicates the potential financial risk broken down by flood zone as identified on FEMA's DFIRMs for Milford.

The table focuses specifically on replacement values for properties as determined by the City's Tax Assessor's office and provides a benchmark for fiscal risk impacts to the City. As indicated, the potential fiscal risks for Milford's property owners are high with the majority of properties located in the AE flood zone. However, it should be noted that the average value of structures is higher in the VE flood zone which represents direct waterfront properties with direct views as well as beach and water access. A-zone properties with un-identified Base Flood Elevations are limited within the City's boundaries and are usually subject to riverine flood risks.

Such an inventory program can also be part of a Flood Audit program which would provide early flood warning, guidance and technical information regarding flood risks to coastal property owners, as well as prioritizing future property protection projects. A sample and description of this program is shown in Appendix H. Given the number of Milford's residential structures on parcels completely within the floodplain (approximately 4,000+) this project would be extremely time and labor intensive and has not yet been funded locally or with benefit of a grant. While the vast majority of the repeat flood insurance claims are in coastal areas, other areas in the City are subject to flooding including properties that have experienced repeated flooding in the vicinity of the Wepawaug River and other streams and watercourses.

The City of Milford's Health Department (MHD) works in conjunction with the City's Emergency Operations Center and Emergency Management team to minimize the impact of natural hazards on our vulnerable populations. The business practice of the MHD is to refer to the City's All Hazard Plan[28], ESF 8 section on Environmental Health. Their plan outlines the steps needed to open shelters, protect food safety and sanitation within Milford.

The 2010-2011 annual report[29] from the health department states "The MHD received funding to continue serving as the regional lead for public health emergency preparedness. The grant is a 3-year contract through the CT Department of Public Health and the Centers for Disease Control and Prevention."

The Milford Health Department also coordinates the Coalition for Community Preparedness. The Coalition organizes our community's response to any type of emergency through education and training. The Coalition is a combination of local police, fire, and health department officials, in addition to a growing number of medical and non-medical volunteers. The Milford Community Emergency Response Team (CERT) and the Milford Medical Reserve Corps are included in the Coalition.

Flood Zone Parcel	
This data was derived by using the updated flood hazard areas (RISK Map Update July 8th 2013) provided to the City of Milford by FEMA, February 2013. Analysis was done at the parcel level to determine a percent coverage for each flood hazard area (.02 percent annual risk, A, AE and VE zones). Assessor records for residential ownership were then tied to the parcel boundary on which the owner's structure sits, creating a many-to-one relationship for multiple owners within the same parcel boundary, i.e. condominiums. Refer to Appendix I for further technical explanation of data development methodology.	
Sq feet of flood hazard risk areas	209,108,717
Sq miles of flood hazard risk areas	7.5 miles
Parcels that intersect any flood hazard risk areas	4,316
Residential structures on parcels within any flood hazard risk areas	6,944
Replacement cost, all structures	$ 1,659,689,532
Average replacement cost	$ 239,010
Parcels completely within all flood hazard risk areas*	2,245
Residential structures on parcels completely within a flood hazard area	2556
Replacement cost for all residences	$ 559,005,635
Average replacement cost	$ 218,703
VE	
Number of residences on parcels with 10% or more coverage	1059
Replacement cost for all residences	$ 338,192,897
Average replacement cost	$ 319,351
AE	
Number of residences on parcels with 10% or more coverage	5169
Replacement cost for all residences	$ 1,196,543,124
Average replacement cost	$ 231,484
A	38
Number of residences on parcels with 10% or more coverage	$ 7,729,264
Replacement cost for all residences	$ 203,401
Average replacement cost	
0.2 PCT ANNUAL CHANCE FLOOD HAZARD	
Number of residences on parcels with 10% or more coverage	382
Replacement cost for all residences	$ 48,401,997
Average replacement cost	$ 126,706
*this refers to parcels that are 100% covered by one or more flood zone	

***Figure 21**– Table of potential fiscal risk for flood zone properties*

The MHD is the lead in providing housing during natural disasters[30]. Part of their capability is to manage elderly populations through the *Collaborative for Residential Integrity for the Disabled and Elderly (C.R.I.D.E.)*. C-RIDE serves as an integral part of the social service network and as a model program for other communities. The Community Housing Inspector, Case Manager, and Health Department staff work as a team to conduct in-home assessments, develop remediation plans, provide support, and make referrals to effectively address the needs of elderly and disabled persons in troubled housing.

The Health Department has identified vulnerable populations in their All Hazards Plan which is updated annually. For more information on the demographics of Milford's disabled and elderly populations, please refer to American Community Survey 2011 3 year data release located in Appendix I. They perform Emergency Support Functions where they are the Agency responsible for assisting in securing health related facilities and reviewing prior to opening after a disaster strikes.

MILFORD BEACH AREAS SUBJECT TO COASTAL FLOODING

Cedar Beach - Milford Point to the intersection of Milford Point Road and Seaview Avenue

Figure 22

The Cedar Beach area consists of Seaview Avenue and numerous dead end residential streets that extend to the north terminating at the vast tidal wetland area near the mouth of the Housatonic River. All of the streets in the area are at elevation below the 100-year base flood elevation. As a result, the Cedar Beach area is subject to flooding both from Long Island Sound on the beachside and from overflow of the tidal marsh from the north and is in a high-velocity flood hazard area subject to wave action in addition to flooding. The hazards in the Cedar Beach area are further compounded by the fact that access to the area is then limited to Seaview Ave. Several residential structures in this area, particularly along the beachfront, have been raised to comply with the requirements of the National Flood Insurance Program and the Milford flood plain management regulations, but some of the older cottages remain below the base flood elevation (BFE) and subject to repeated flooding. This neighborhood consists of approximately 127 structures within the flood hazard zones.

Laurel Beach - Milford Point Road / Seaview Avenue to Wildermere Avenue.

The residential development in the Laurel Beach area is at significantly higher elevations than the Cedar Beach and Wildermere Beach areas which flank it. Laurel Beach has a protected shorefront with many well-elevated, substantial residences on larger lots along the shoreline. The land slopes up away from the beach area to the north. In the past, many of the structures in

Figure 23

this neighborhood were not understood to be at high risk of flooding, however, the FEMA coastal flood studies competed as part of the DFIRM update, now place many structures in the Special Flood Hazard area. Access to Laurel Beach is also much better than many of Milford's other beach areas. There are a series of streets available as options to gain access to locations along the shoreline so this area has less of a threat of isolation during a significant flood event. There are approximately 146 structures within this neighborhood in the flood hazard zone.

Wildermere Beach - Wildermere Avenue to Stowe Avenue

The Wildermere Beach area includes a series of dead end streets which run from Broadway, which is the main thoroughfare running parallel to the shoreline, to the beachfront. A very dense mixture of residential development is present throughout the area with many older structures built at low elevations. Several newly renovated residences are elevated on piles or columns with floor elevations above the base flood elevation but a great number of residential structures with lowest floor elevations several feet below the base flood elevation remain in the Wildermere Beach area. There are 297 structures in this neighborhood that are in the flood zone.

Figure 24

Walnut Beach - Stowe Avenue to Nettleton Avenue extended

Figure 25

This section of shoreline is developed primarily with multi-family residential buildings. The development of this area, which includes the largest municipal beach in the city, appears to have been undertaken in a manner consistent with the standards of the National Flood Insurance Program. Beach erosion continues to be a problem along some of the beachfront but the potential for widespread flood damage is more limited. There are 183 residential units in this area in the flood zone with a more significant number of multiple condominium units in singular structures.

Silver Beach - Silver Sands Parkway to Surf Avenue

This beach area includes a densely developed shoreline with numerous low-lying residential streets which extend to the north from East Broadway into the Great Creek wetland area that is part of Silver Sands State Park. Great Creek has a relatively small watershed and creek flooding is primarily related to tidal flooding events.

Figure 26

Limited hydraulic capacity of culvert outlets from the wetland area to the north of East Broadway can result in backup and flooding of low lying backshore residences. Structures along East Broadway directly facing Long Island Sound have primarily been redeveloped; however not all these structures meet the flood compliant standards of the new DFIRMs. Few structures on the streets that extend into the tidal marshland have been redeveloped or elevated so flood risk to these structures is particularly high. Ambient grades on some of these streets are as low as elevation 3 or 4 where the base flood elevation (BFE) is estimated at elevation 11. Streets in this area can also be subject to flooding seasonally and at significant lunar high tide events in addition to larger events like the 100-year flood. This area consists of 337 structures and is one of the City's most vulnerable for flood hazard zones, SLOSH, and future sea level rise impacts.

Fort Trumbull Beach - Surf Avenue to Rogers Avenue

This section of shoreline is generally at a higher elevation than Silver Beach. There is limited potential for flooding from the north because the Great Creek wetland area does not extend beyond Surf Avenue, which is the western limit of this beach area. However, unlike Silver beach, this area has defined lawns and landscape areas protected by low-lying retaining

and landscape walls that have recently been subject to wave action flooding that has also impacted residential structures.

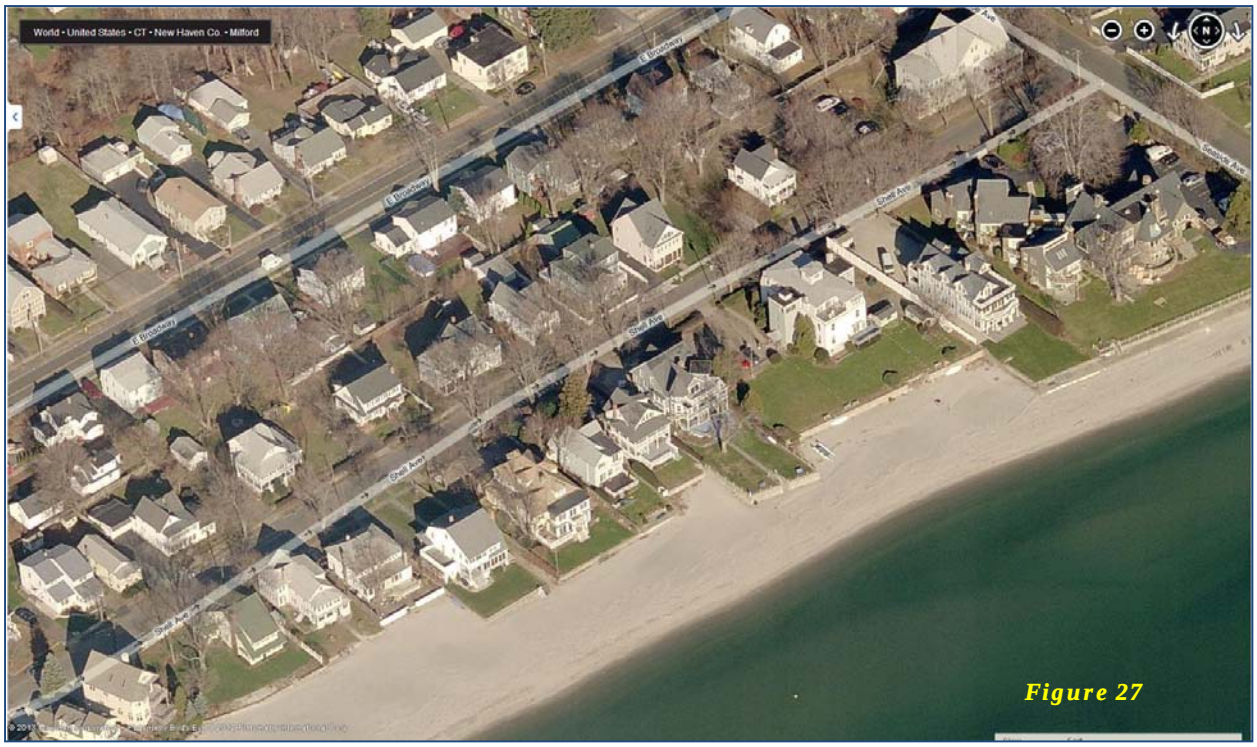


Figure 27

There is strong desire for more armament to protect these "lawns" facing Long Island Sound. This area has 72 structures within the flood zone.

Gulf Beach - Milford Harbor to Point Lookout

Gulf Beach is oriented with a shoreline with limited exposure to long wave fetches and direct attack by coastal storms. The Gulf Beach area has limited development and includes a long section of public beach adjacent to the outlet of Gulf Pond to the west. The residential development in the area consists of large residences located at high elevations at the eastern end of the beach on the north side of Gulf Street. Overland flooding is limited to the roadways closes to the Point Lookout Association Beach area.

Figure 28

This is an area of more water dependent uses in relation to the harbor (boating businesses or private docks and piers) with only 5 residential structures at lower elevation within the flood zone. For the residential structures in this area, lot sizes are generous with proportionally larger homes. It should be noted that the bluffs located on the westerly side of Point Lookout have experienced significant erosion with Storms Irene and Sandy.

Bayview Beach - Point Lookout to Calf Pen Meadow Creek

This beach area is a densely developed single family residential area with many older homes built at elevations significantly below the base flood elevation. A total of 23 repetitive flood insurance claims have been filed in the Bayview Beach area, making it the area of the highest concentration of reoccurring flood losses in the City of Milford.

Figure 29

The majority of the repeat claims are clustered along the shoreline on the south side of Field Court, which runs parallel to the shoreline. The Flood Insurance Rate Map for the City of Milford indicates that the 100-year flood area of inundation extends north of Field Court to the north side of Bayshore Drive. The extent of the area of inundation of such a highly developed area indicates that the level of flood hazard in the Bayview Beach area is high. There are 192 structures within the flood zone in this area. Continued erosion in this area has left many structures extremely vulnerable to wave action and surge damage.

Pond Point Beach - Calf Pen Meadow Creek to Buckingham Avenue

Pond Point Beach is an area with a significant number of low-lying beachfront residences. Melba Street runs parallel to the shoreline. Development is located along the south, shoreline side of the road as well as the north, Calf Pen Meadow wetland side of the road. The majority of the repeat flood insurance claims in this area are clustered along the eastern section of the beachfront. Some properties in this area have been redeveloped, although movement away from the high velocity wave action/surge area is highly recommended to reduce impacts to homes in directly contact with Long Island Sound. There are 158 structures within the flood zone in this area.

Figure 30

Point Beach - Buckingham Avenue to Hilldale Court

Point Beach has historically been flooded repeatedly by storm surges. Properties along Morehouse Street, Richard Street and Point Beach Drive have suffered repeat damages. Point Beach was the location of an Army Corps of Engineers (ACOE) and FEMA flood mitigation project (known as Project Impact) that included raising 42 low lying residences in the area.

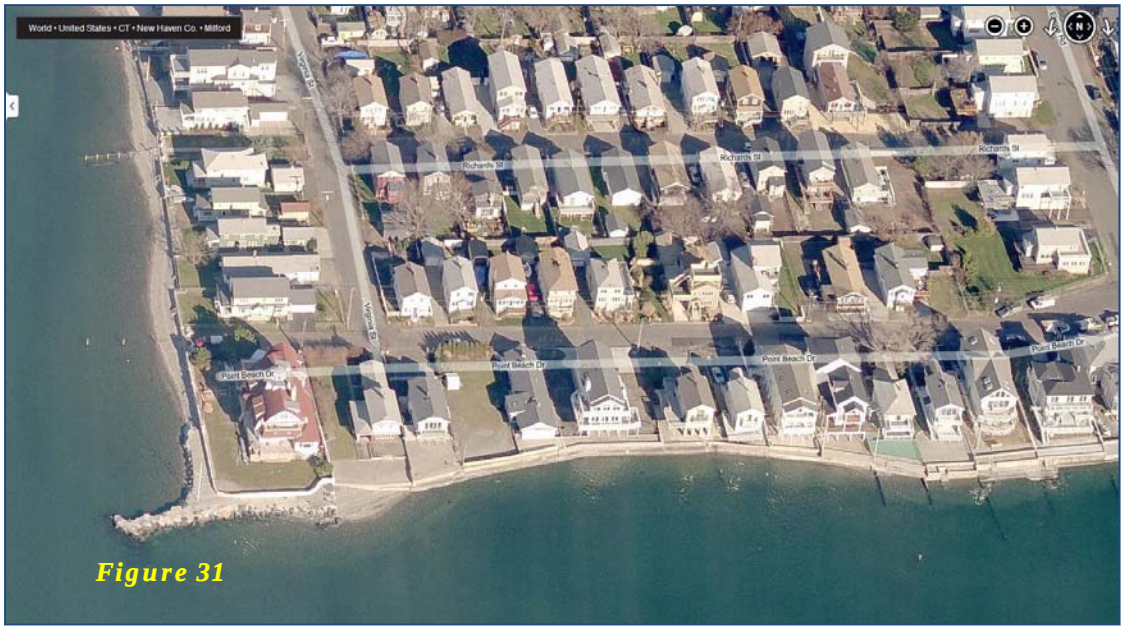


Figure 31

Completion of this project significantly reduced the potential of flood damage in the area. Some residences remain at low elevation however, and roadway and property damage also remains a concern. There are approximately 204 structures in this neighborhood within the flood hazard zone.

Morningside Beach - Hilldale Court to South Street

The development in the area of Morningside Beach is located on a high promontory overlooking Long Island Sound. As a result of its' elevation this beach area has been subject to coastal erosion in the past but has not been the location of wide spread coastal flooding. The shoreline is protected by a major revetment structure that requires periodic maintenance and inspections. The residential structures in this neighborhood are located on a bluff above the flood hazard area. To the west of the revetment, the bluff area has eroded over the last 20 years.

Figure 32

Figure 33 Stucture at risk/Morningside Bluff

Figure 34 Erosion at Morningside Bluff

Hillside Area - South Street to Seabreeze / Merwin Avenue, Benjamin Street

This area has a significant level of development along Hillside Avenue. A total of 25 repeat flood insurance claims have been filed in this area. The locations of the claims are on the shoreline side of Hillside Avenue indicating that the risk in this area is from coastal storm surge and wave action along the beachfront.

Figure 35

Anchor Beach - Benjamin Street to Beach Avenue

This area is subject to coastal flooding in the immediate area of the beachfront. No records of repeat flood damage are available in the Anchor Beach area. This may be as a result of its elevation which is somewhat higher than the adjacent beach areas to the west.

Woodmont - Beach Avenue to West Haven Line

Woodmont is an area of a high promontory overlooking Long Island Sound. The location of Beach Avenue along the immediate shoreline provides protection to the residences located landward of the roadway throughout this easternmost beach area in Milford. This area has not had significant damage due to the recent Irene and Sandy storms, but the DFIRM update does place greater proportions of structures and properties within the flood hazard zone. Formerly very few structures were within the flood hazard zone, the new mapping adds 30 structures to the flood hazard zone.

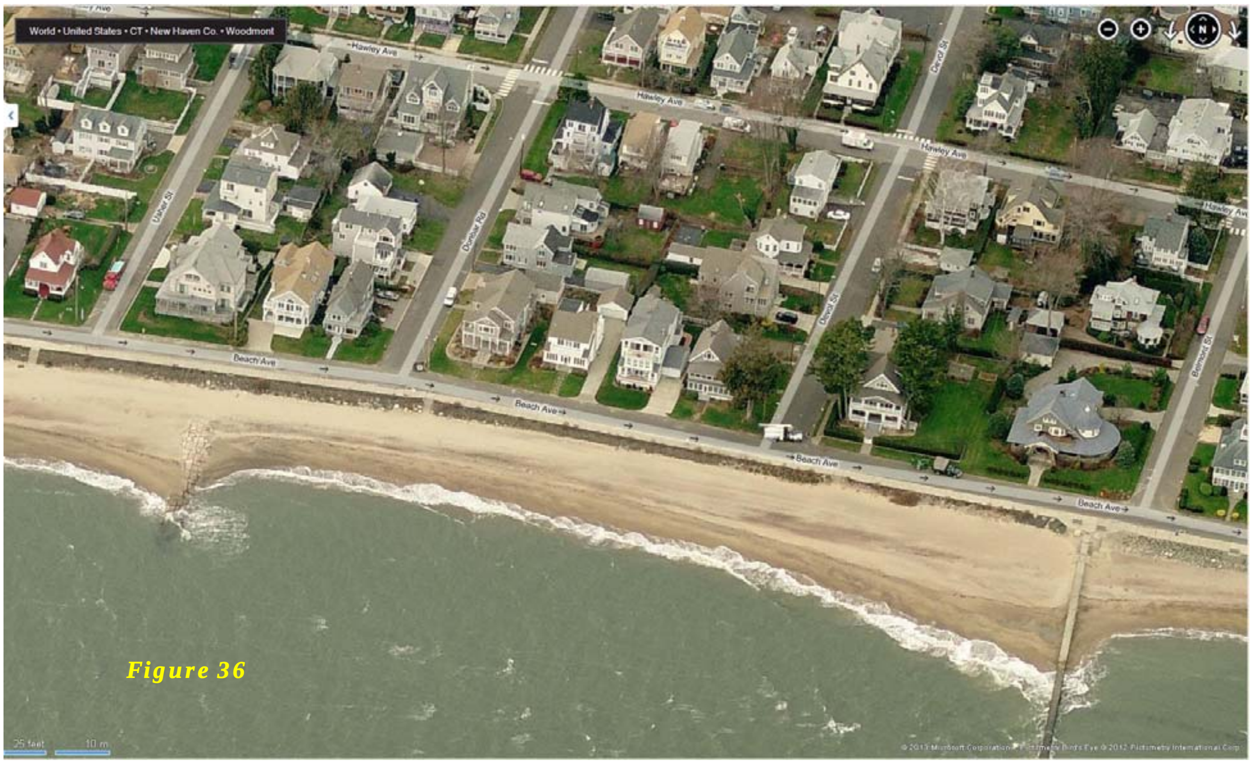


Figure 36

COMMERCIAL FLOODING

Revision statement: Four areas of commercial properties at risk of flooding have been added to the plan and a map has been provided.

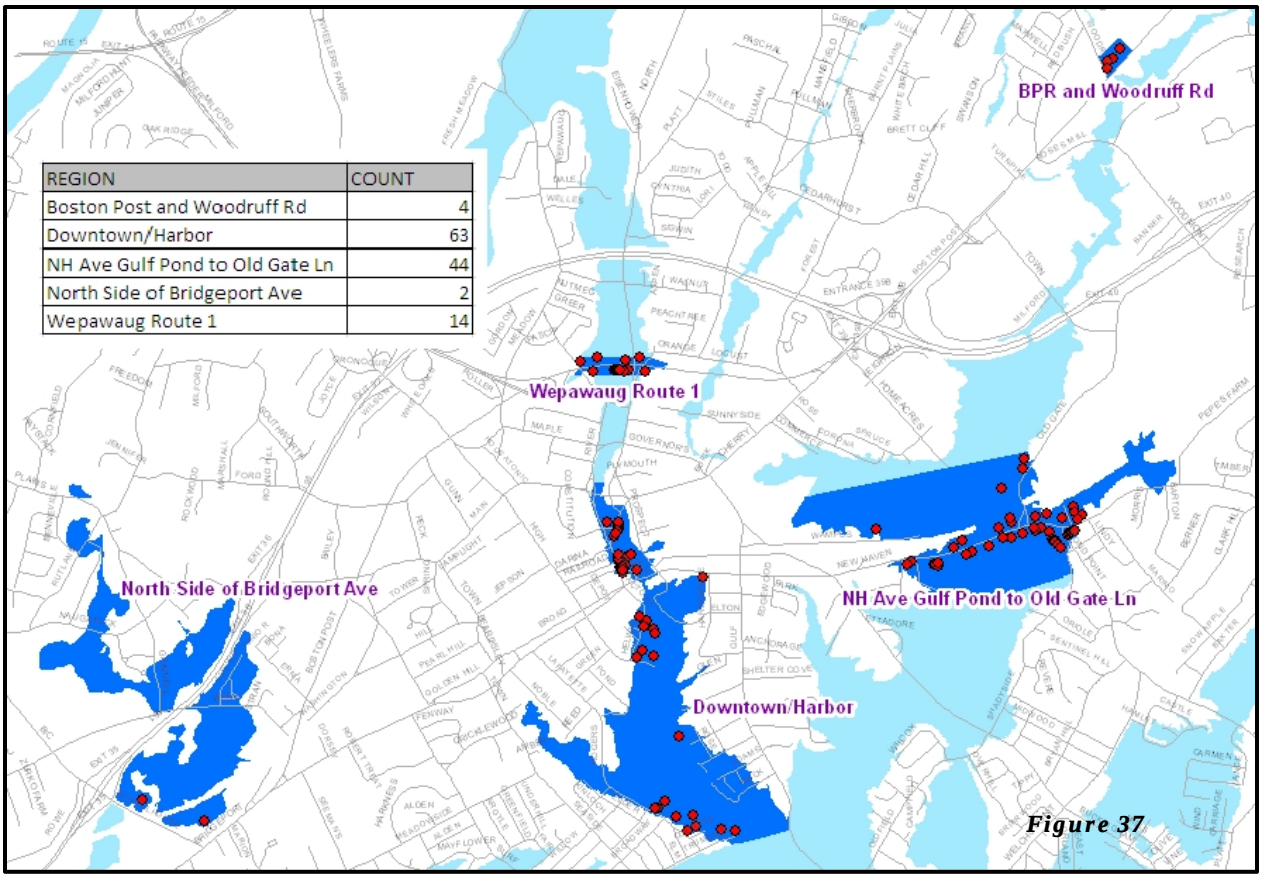
Although residential neighborhoods are the City's primary vulnerable areas, there are also areas of vulnerable commercial properties that have been identified as being located within the flood plain and are considered to be susceptible to damage impacts. The sections below summarize the commercial areas vulnerable to flooding impacts.

1. *Downtown/Milford Harbor Area* - This area includes many restaurant and retail businesses along the Wepawaug River floodplain in the downtown and the low-lying roadways adjacent to the train station underpass. The Milford Harbor includes several private docks, marinas, and some boating businesses.
2. *Wepawaug River (North of I-95 south to Route 1)* **-** This area along the Wepawaug River Floodway has a long history of flooding. There are also commercial properties in the vicinity of the Route 1 crossing of the river that are within the flood hazard area.
3. *North side of Bridgeport Ave (between School House Road & Silver Sands Parkway) -*

Water from the large amount of impervious areas and the state drainage has difficulty getting under the railroad tracks causing a back-up of water on the properties in this area.

4. *New Haven Avenue businesses adjacent to Gulf Pond outlet/Old Gate Lane.* These areas are at particularly low elevation, adjacent to the tidal marsh, and susceptible to flooding.
5. *750 & 772 Bridgeport Avenue* Water from the large amount of impervious areas and the State Drainage has difficulty getting under the railroad tracks causing a back-up of water on the properties at 750 (car dealership) & 772 (UI Substation).
6. *Intersection of Boston Post Road and Woodruff Road* Tumble Brook runs into a 30" pipe which leads to a catch basin near the Boston Post Road in the DOT right of way which bottlenecks into a 15" RCP pipe. The runoff then goes into a 36" pipe underneath the Post Road, finally discharging into the Indian River. In significant rain events there is too much runoff for the 15" RCP pipe or the pipe becomes blocked with debris and water runs through the parking area at #1650 Boston Post Road into the parking lots at 1590, 1602 and 1620, eventually flooding the intersection making it impassable.

Flooding of commercial property is also caused by the overflow of the drainage system in the vicinity of Old Gate Lane as well as in Devon Center. A drainage project for Bridgeport Ave and Naugatuck Ave is in the design phase pending final funding. Based on initial reconnaissance it appears that the majority of the flooding in these areas results in flooded roadways and driveways causing transportation disruption, but limited structural damage to commercial buildings.



REGION	COUNT
Boston Post and Woodruff Rd	4
Downtown/Harbor	63
NH Ave Gulf Pond to Old Gate Ln	44
North Side of Bridgeport Ave	2
Wepawaug Route 1	14

Figure 37

INDUSTRIAL FLOODING

Revision statement: Subsection not revised as impact has not changed.

A major concern with flooding in the industrial sector of Milford is the possible release of hazardous materials into the water or air. The majority of the City's industry is not located in the flood plain, which reduces the hazard potential.

INSTITUTIONAL (MUNICIPAL) AND RECREATIONAL FLOODING

Revision statement: Subsection has been revised to include details on specific institutions.

Some institutional and recreational uses such as Fire Headquarters, City Hall, beaches, parks, and other public properties are also located within the flood plain and may be vulnerable to some damage due to flooding. These facilities include:

- The Tri-Beach Recreation Center on Hillside Avenue (flooded during Sandy)
- The West Shore Recreation Center near Walnut Beach (flooded during Sandy)

- The Animal Control Facility, located within the Silver Sands State Park area has not experienced flood damage to the office area, but the outdoor kennels require evacuation during significant flood events. Relocation of this facility is targeted as a mitigation project in order to allow Animal Control to operate more effectively as a shelter for pets during natural disasters. Since the last Plan, Animal Control has become a regional serving facility which also provides services to the Town of Orange, making mitigation more critical.
- Fishing piers at Walnut Beach and Gulf Beach.
- Lisman's Landing (the City's Marina) in Milford Harbor (flooded during Sandy)

The majority of the City's critical public facilities are not located in flood hazard areas and therefore are not vulnerable to flooding impacts. The City of Milford is in possession of 196 structures with an approximate insured value of over $489 million, including their contents.

Of these, 37 structures are in a flood zone. Nine are pump stations, 7 are recreation facilities, 11 structures that comprise the Beaverbrook Wastewater Treatment Plant. The City Animal Shelter, Lisman Landing Marina and the buildings that comprise the former Gulf Pond Treatment Plant are also located in flood zones. The insured value of these facilities totals $54 million.

The West Mayflower Place, Rock St. and Morningside Dr. pump stations are in areas where flooding makes access difficult. Also, a number of pump stations are outfitted with original generators from the 1960's such as the Sailor's Ln., Milford Point Rd., Viscount Dr., Rock St. and Morningside Dr. The age of these generators make it impossible to obtain replacement parts should there be a mechanical failure.

The City's Beaverbrook Wastewater Treatment (Beaverbrook) facility is a secondary treatment facility that augments the main Housatonic Wastewater Treatment facility. Beaverbook serves approximately 15,000 of Milford's 52,000 residents. This facility is at risk for flooding around the south western edge of the property, shown at elevation 4 below:

Figure 38 *Beaver* Brook Waste Water Treatment Facilities

It is recommended that this be a priority study area in the event of a flood audit along with 796 sanitary manholes located within a flood zone.

FLOODING MITIGATION MEASURES

Revision statement: A list of detailed mitigation measures replaced the generalized description of mitigation measures that was previously identified as FLOOD HAZARD MITIGATION MEASURES (III). Chapter III contained many elements that were felt to be general in nature and were more useful in a distinct chapter on mitigation measures.

Mitigation measures for flooding hazards include:

- Elevate new structures above the 100-year flood level in compliance with the NFIP program.
- Continue to assess Substantial Damage and Substantial Improvement thresholds for structures for increased flood-compliance of existing structures.
- Continue maintenance program to clear debris from storm water drainage areas.
- Provide information to contractors and homeowners on the risks of building in hazard prone areas.
- Develop a list of techniques for homeowner self-inspection and implementation of pre-storm mitigation activities.
- Install backflow valves in storm sewer systems.
- Continue to require sediment control measures through Inland Wetland and Coastal Site Plan approvals.
- Develop sediment control to prevent clogged drainage systems such as street sweeping, curb and gutter cleaning, paving dirt roads, and planting vegetation on bare ground.
- Investigate the use of flood-prone areas as open space.

4. Wind Storms

Revision statement: Plan has been updated to move Wind Storms from IV. OTHER MITIGATION MEASURES into this chapter on Profiling Hazards. Location of hazard has been identified as well as likelihood of occurrence.

This section of the Plan focuses on mitigation of wind hazards associated with hurricanes, tornadoes, severe thunderstorms and winter storms. Due to Milford's location on Long Island Sound, it is susceptible to damaging winds. As noted in Chapter B section 1, the entire Milford community is at risk from the wind danger. Based on the Applied Technology Council Wind Speed finder tool[31] Milford has a 10 year Mean Recurrence Interval wind speed of 77 mph, exceeding the 75 mph designation for hurricane force winds. Using the data from Figure 7 shows that a wind hazard (high winds, blizzard, tropical storm etc.) occurs, on average, ever 4.8 months making it a common occurrence. Experience indicates that winds in excess of 50 miles per hour cause significant tree damage. Tree damage and damage to buildings and cable utilities due to downed trees has historically been the biggest problem associated with

windstorms.

Milford currently has a tree-trimming program to mitigate against wind damage. Efforts are spent on response and clean-up following wind events. Tree trimming on municipal property is conducted on an as-needed basis. United Illuminating (UI) also has a tree trimming maintenance program in place[32]. Contractors are hired to trim limbs and small trees along UI lines in portions of the City on a revolving basis. The City and UI are in direct contact with coordinating these efforts for work to City-owned trees. The UI program is a self-maintenance program that deals only with potential threats to their lines. It does not address other property.

The Milford coast is home to private and municipal marinas that are vulnerable to the effects of both wind and flooding. Harbor management plans should include provisions for hazard mitigation[33]. Much information on Best Management Practices for marinas and yacht clubs is available from both state and federal agencies.

Damage to trees and resulting power outages and damage to buildings are the most problematic issue facing Milford during storms with high winds. Wind damage is also the most frequently occurring natural disaster in the City. Because loss of tree limbs and brush during these events are inevitable, the town must continue to maintain its current programs to clean up and dispose of such debris. The Public Works Department indicates that removal cost for trees during the Storm Sandy event was $616,157 although no exact tonnage figure is known. Milford's commercial business interruption as regional shopping and dining corridor as related to power loss is extensive and is estimated at tens of millions of dollars per day.

Power outages throughout the City are of great concern to the emergency response community in Milford. The loss of power to the City's many traffic signals causes expenditures of a great deal of manpower to control and post the intersections for the duration of the power outages. Improved emergency communication between the City's emergency response agencies and the emergency response coordinators at the electric utility is critical to enhance hazard mitigation efforts in the City.

United Illuminating supplies confidential data on locations of people dependent upon electricity for life support upon request or during major storm events. This vulnerable population is constantly changing. In addition, power outages have widespread effects on the City's business community due to loss of revenue and inventory when companies and businesses cannot operate due to loss of power. No figures are available as to what the lengthy power outage's losses were in business dollars at this time. Businesses remain vulnerable

during these events and potential impacts should be further researched and identified so that mitigation measures can be developed for the next plan update.

Connecticut installed a new type of warning system after a series of deadly tornadoes struck Litchfield and New Haven counties in 1989, killing two persons and causing millions of dollars in damage. This system is managed by the Fire Department and is described in more detail in Chapter J. on Emergency Services.

The National Oceanic and Atmospheric Administration (NOAA) Weather Radio Specific Area Message Encoder (WRSAME) system allows forecasters at three National Weather Service offices to send watches and warnings to the specifically affected areas of Connecticut. Warnings can be sent within a few minutes of a Doppler radar indication that a tornado may be forming within a severe thunderstorm. In addition to information on tornadoes, the weather radios receive information on any severe weather occurrences in the area, including hurricanes and severe thunderstorms.

Vulnerable populations for wind storm events may be those residences and facilities that do not have public water and/or sewer supply. By working with the Regional Water Authority (RWA) the City has identified which parcels are not serviced by RWA and then cross referenced that data with sewer use payments. Results from that analysis indicate an estimated 600 homes are serviced by well water and approximately 300 of those homes are not connected to the sewer network, presumably on septic service.

Data supplied by Kim Kell, City Risk Manager, shows that wind damages to city infrastructure typically affects roof-top HVAC equipment, doors, roofs and the effects of flying debris to city automobiles which averaged to approximately $35,000 for Sandy and Irene. During Tropical Storm Irene the emergency radio tower located at Eel's Hill was damaged by wind. Bringing in a temporary tower and the replacement of the tower cost the city approximately $40,000 which is the highest wind-related cost we have available at this time. Other towers may be at risk and will be assessed in a future plan update.

Future wind storm impacts are anticipated to be similar in major wind events like hurricanes requiring at least $500,000 worth of debris removal and $35,000-$75,000 of cumulative minor damages. Smaller storm s can cause damages in the $500-$35,000 range.

WIND STORM MITIGATION MEASURES

Mitigation measures for wind storms include:

- Make information available on wind resistant construction techniques available to all

building permit applicants. Milford's Building Codes indicate that the entire City is located within a high wind hazard zone where new windows are required to withstand 110 mile an hour winds. (See Building code info in Appendix J)

- Provide literature on wind-resistant construction techniques and make them available in the City library.
- Provide ongoing City maintenance to remove dead or rotting trees and branches.
- Provide outreach to inform homeowners of the dangers of upright, dead and rotting trees.
- Provide public information via the Health Department and Emergency Management, press releases, and other public agencies on emergency preparedness on when to turn off gas, electricity, and water, how to develop an emergency communication plan, and actions to take during a wind storm or severe thunderstorm such as avoiding bathtubs, water faucets, and sinks.
- Secure outdoor objects that could become projectiles
- Install lighting rods.
- Incorporation of Hazard Mitigation Planning into the Milford Harbor Management Plan

5. Sea Level Rise

Revision statement: Plan has been updated to profile Sea Level as an identified hazard.

Although erosion and shoreline change have long been recognized as coastal hazards nationwide, it is only recently that the chronic problem of sea level rise has been projected to be closely connected to the acute threats of erosion and shoreline change. Indeed, continued increases in the rate of sea level rise will increase the incidence, severity, and adverse effects of erosion and shoreline change as well as flooding. Connecticut is seeing rising sea levels beyond global means. The CT DEEP Climate Change[34] primer states that:

> ***"During the last 72 glaciations, the weight of the ice sheet caused the Earth's crust to warp and Connecticut to be slightly uplifted. Now that the ice sheet has melted, the Earth's crust is evening out, and Connecticut is slowly sinking at approximately 0.03-0.035 inches per year [0.76-0.89 mm/yr]"[35]***

This poses an additional risk for the Connecticut shoreline as our anticipated sea level rise will be compounded by the land mass sinking. The Climate Change primer reports that sea level gauges installed in New London show a yearly increase of 2.25 mm across a 69-year period and a gauge in Bridgeport has shown a yearly increase of 2.56 mm a year over a 43 year period. These levels exceed mean global levels that show a .5-1.5 mm annual rise. The sea is rising faster here.

In reviewing the State's Climate Change data at the CT Environmental Conditions Online (CT ECO) website – a joint effort with the DEEP and University of Connecticut (UCONN)- Milford's Silver Sands finger streets neighborhood that extend into the tidal marshland is the most vulnerable to the threat of sea level rise. This is due to the history of this area as a tidal marsh and its existing extremely low elevations. The planning horizon for this data does not begin until 2020, therefore Sea Level Rise is not perceived to be an identified hazard in terms of this plan update but it is recognized that sea level rise can exacerbate flooding and should be considered when developing mitigation strategies.

The United States Geological Survey (USGS) also recently released information[36] showing that sea levels are currently rising along the Atlantic Coast. Many believe that this is a result of climate change, which may be attributable to greenhouse gases or may be at least partly related to natural warming and cooling cycles that the Earth experiences. Regardless, a continued increase in the rate of rising sea levels will inundate low areas, increase erosion of beaches and tidal marshes, increase the incidence of flooding from storm surges, and enable saltwater to advance upstream and intrude further into estuaries and aquifers.

Rising sea level affects both the natural and the human-made environments. Future sea level rise could result in the disappearance of a large percentage of Milford's tidal wetlands, unless they can advance as quickly as the rising level. Saltwater advancing upstream along estuaries can alter the point at which flocculation leads to sedimentation and the creation of shoals.

As sea level rises, storm surges from hurricanes and nor'easters will reach further inland as they are starting from a higher base level. It has been projected that by the end of the 21st century, it is possible that a Category 1 hurricane storm surge will be similar to what is now mapped as a Category 3 hurricane storm surge.

Similarly, FEMA coastal base flood elevations (BFEs) could progressively rise along with sea level currently at unaffected elevations. Sea level rise exacerbates the problem of coastal and near-coastal inland flooding within Milford. As sea level rises, drainage systems become

less effective. Rainstorms will have the potential to cause greater flooding. Milford reportedly experiences increased problems with inadequate storm drainage in the Devon area and several coastal areas. As sea levels rise, these areas will likely experience decreased drainage capacity and increased flooding.

As also indicated in the City's Plan of Conservation and Development (December 2012), Milford should begin examining its entire shoreline with sea level rise impacts in mind and start planning for climate change and sea level rise. The National Oceanic and Atmospheric Administration (NOAA) [37] suggest the following:

1) Understand the SLR risk for your community
2) Assess the properties at risk
3) Research what other communities are doing
4) Consider potential impacts including flood frequency and duration, marsh migration, habitat loss, social and economic impacts, saltwater intrusion, bank and bluff failure, and coastal erosion.
5) Develop adaptive scenarios for measured and predicated outcomes
6) Communicate the impacts

Milford should analyze the benefits and costs of a retreat policy as recommended by many in the scientific and environmental community in addition to identifying areas that should be designated as a priority for protection. Priority areas such as the City's waste water treatment facility or public utilities may warrant infrastructure investment to deter the effects of sea level rise, however it should be noted that these efforts will have significant cost both financially and potentially ecologically. Milford may begin to focus some of its Hazard Mitigation Grant applications for property acquisitions where ambient grades show properties may be inundated in the near future planning horizon.

6. EARTHQUAKES

Revision Statement: Earthquakes have been moved from IV. OTHER MITIGATION MEASURES into this chapter on Profiling Hazards. Technical data from USGS has been updated. Current data from USGS has been added. A technical description of earthquake magnitude has been added as well as probability of occurrence.

Since damage-causing earthquakes are infrequent events in Connecticut and especially within municipalities such as Milford, this section focuses on the history of earthquakes and vulnerability in a statewide framework. The portions of this section that deal with existing

capabilities, goals and objectives and planned mitigation strategies are specific to Milford.

Connecticut has the oldest record of earthquakes in the United States. In 1958, the earliest settlers in Moodus learned of seismic activity from the Native Americans. Connecticut has experienced 137-recorded earthquakes for the period between 1568 and 1989. Of those, 61 were in the Moodus/East Haddam area in south-central Connecticut.

According to the USGS, Connecticut is considered to be in a moderate seismic risk zone. However, moderate relates to the fact that earthquakes in the state have a relatively infrequent reoccurrence interval and not that the earthquake magnitudes or impact on the population will necessarily be moderate. Earthquake magnitude is a measure of the strength of an earthquake, or the strain energy released by it.

Using the USGS 2009 Earthquake Probability Tool[38] the probability of the following 3 different earthquake magnitudes occurring in the next 300 years, within 100 mi (160 km) of Milford CT are as follows:

<5.0 - 10% probability
<6.0 – 2%
<7 – 0%

The Richter scale defines the magnitude of an earthquake. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of earthquake waves recorded on instruments that have a common calibration. The magnitude of an earthquake is thus represented by a single, instrumentally determined value recorded by a seismograph, which records the varying amplitude of ground oscillations.

The magnitude of an earthquake is determined from the logarithm of the amplitude of recorded waves. Being logarithmic, each whole number increase in magnitude represents a tenfold increase in measured strength. Earthquakes with a magnitude of about 2.0 or less are usually called microearthquakes and are generally only recorded locally. Earthquakes with magnitudes of 4.5 or greater are strong enough to be recorded by seismographs all over the world.

Using the USGS Earthquake Finder program[39] only 1 earthquake has been reported in the area since 1973. A 1.8 magnitude earthquake was reported April 4, 2013. Using the USGS 2009 Earthquake Probability Mapping tool[40] shows that Milford has 0% probability of experiencing an earthquake greater that 7.0 magnitude within 50 km over the next 50o years. Based on analysis derived from HAZUS the city is not at risk for earthquake damage for anything less than a magnitude 7.

Mrs. McGaffin, Milford's GIS Analyst, met with Pramod Pandey Senior Transportation Planner/ GIS Analyst for the Capital Region Council of Governments (CRCOG) to get a brief tutorial on how to use HAZUS software as provided by FEMA. No one on the Hazard Mitigation Plan Update Committee has been able to receive formal HAZUS training. Before the next plan update training will be pursued by the city's GIS staff. A HAZUS analysis summary report has been included in Appendix K of this plan.

A HAZUS analysis was ran that identified the entire city of Milford as an area of risk. The HAZUS analysis report states that the replacement cost for Milford's transportation infrastructure is valued at $933.9 million. The replacement cost for all utility systems is valued at $221.5 million, though only one wastewater treatment facility is listed and it gives the city a value of zero for number of wastewater pipelines. Milford's GIS representation of the wastewater network contains over 3,000 pipe features. Building and business interruption loss is indicated as approximately $4.5 million (see Appendix K, page 15).

The earthquake analysis used a probabilistic scenario for a 7.0 magnitude. In this scenario expected building damage by occupancy is expected to be slight for 249 structures, moderate for 42 and extensive for 3 with 167 wood buildings comprising the highest proportion by type of of building. The scenario returned no damages to our essential facilities, transportation network or utility infrastructure.

Connecticut is located near the middle of the North American Tectonic Plate and is subject to intra-plate earthquakes. Connecticut is not near a tectonic plate boundary, but there are many fault lines in the state that formed hundreds of millions of years ago when the area was at a plate boundary. The activity observed today appears to be a result of stresses applied to the sides and base of moving plates which are transmitted to the plate interiors reactivating the old faults.

Connecticut has a population density that is 3.5 times greater than California's and has bedrock that transmits seismic energy 4 to 40 times more efficiently. These facts place more people at greater risk since the built environment in this region is predominately old, un-reinforced masonry and is not seismically designed.

The majority of structures are extremely strong for normal vertical load for which they were designed. Masonry structures do not fare well against the horizontal forces of an earthquake if they are not reinforced or braced.

Certain geological features are more susceptible to earthquake effects than others. Facilities located on filled or sandy soil can sustain heavy damage in a serious tremor.

Consideration of the location of critical facilities (i.e. hospitals, schools, nursing homes, fire stations, etc) and critical infrastructure (roads, bridges, water lines, etc) is important in assessing their vulnerability.

Due to the unpredictable and infrequent nature of earthquakes, mitigation of the hazard at the local level is difficult. Aside from emergency preparedness, and recovery functions, there are no local programs in place which can effectively address earthquake mitigation in Milford.

The Connecticut Earthquake Program is particularly concerned with the safety of the school population. The program includes: active participation in risk evaluation and assessment, public awareness and education programs, information transfer to public school faculty, and assisting in the planning process by emergency response personnel and agencies.

Recent earthquake mitigation in Connecticut has been limited to enforcement of the Connecticut State Building Code[41]. The code addresses earthquakes in a limited manner and for construction of commercial buildings only. The FEMA publication entitled "The Home Builders Guide for Earthquake Design"[42] can be made available to all design professionals, builders and others who are issued permits for new construction. "Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide" [43] can also be made available. All commercial, industrial and institutional property owners should have an opportunity to obtain a copy of the FEMA publication entitled "Emergency Management Guide for Business and Industry"[44]. All publications should also be made available at the Milford Library.

In order to be able to effectively mitigate against earthquake damage at the municipal level, it is crucial to have a better understanding of what is at danger in the event of an earthquake. In addition to public facility mitigation, it is appropriate for Milford officials to be able to provide technical advice to residents and business owners in order to protect private property.

All municipally owned buildings in Milford should be surveyed for their ability to withstand earthquake and wind loading. Appropriate retrofitting should give the buildings to be used as emergency shelters the highest priority. The three primary shelters for Milford are: Jonathan Law and Foran High Schools and the Senior Citizen Center located on Jepson Drive, with Platt Technical High School serving as an alternate shelter.

The State Hazard Mitigation Plan indicates that the probability of an earthquake is a low to moderate risk in our area. Due to the unpredictability and limitations on data for earthquake hazards, risk, and impacts, vulnerable facilities such as schools, child care facilities, Milford

Hospital, senior and assisted living facilities, and rehab facilities should be recommended for additional Building Code updates where appropriate and funding can be obtained.

MITIGATION MEASURES FOR SEISMIC HAZARDS AND EARTHQUAKES

- Apply Building Code requirements where applicable
- Implement rodent control
- Implement mosquito control
- Provide regular maintenance of cooling and plumbing systems
- Provide water purification information
- Ensure and provide adequate sanitary control measures

7. Other Hazards Considered

Revision statement: Plan has been updated to include this section on Other Hazards Considered and all subsequent profiled hazards are new additions to the plan, the most extensive of those related to Dam Failure. The hazards in this section are considered to be relatively low risk and the areas affected by the hazards have been identified.

AVALANCHE

Because the highest point in Milford is 200ft above sea level and there are no undeveloped areas of significant height or mountains, avalanches are not considered a hazard to any location within the City nor is there a probability of occurrence.

DAM FAILURE (See graphic below)

Dam failures can be triggered suddenly with little or no warning, and often in connection with natural disasters such as floods and earthquakes. Dam failures can occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. While flooding from a dam failure generally has a limited geographic extent, the effects are potentially catastrophic depending on the downstream population. The City of Milford has 19 Registered Dams with State classifications from A to BB.

The Connecticut DEEP administers the Dam Safety Section and designates a classification to each state-registered dam based on its potential hazard.

- Class AA dams are negligible hazard potential dams that upon failure would result in no measurable damage to roadways and structures and negligible economic loss.
- Class A dams are low hazard potential dams that upon failure would result in damage to agricultural land unimproved roadways, with minimal economic loss.
- Class BB dams are moderate hazard potential dams that upon failure would result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate economic loss.
- Class B dams are significant hazard potential dams that upon failure would result in damage to any of the following: possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, and schools; damage to interruption of the use of service of utilities; damage to primary roadways and railroads; and a significant economic loss.
- Class C dams are high potential hazard dams that upon failure would result in loss of life ad major damage to habitable structures, residences hospitals, convalescent homes, schools, and main highways, with great economic loss.

According to the "Connecticut Dams" data file that was published in 1996, there were twenty-three DEEP-registered dams within Milford, of which twelve were Class A, nine were Class BB, no Class B, no Class C and two unclassified. Dams in Milford are listed in Table 10-1 and dam locations are illustrated in Figure 10-1. As the published data on dam conditions are almost 20 years old it is not possible to calculate the probability of when a dam failure would occur.

Figure 39: Dams Registered With the DEEP in the City of Milford

Number	Name	Owner	Class
8401	Clark Pond Dam	P	BB
8402	West Pond Dam (830 W River St)	P	BB
8403	Milford Reservoir Dam	P	BB
8404	City Hall Pond Dam	L	BB
8405	Rose Mill Pond Dam	P	BB
8406	Quirks Pond Dam	P	BB
8407	Indian Lake Dam	P	BB
8408	Mondo Pond Dam #2	P	BB
8409	Wepawaug Pond Dam	P	A
8410	Beaver Pond Dam	L	A
8411	Wepawaug River Dam	L	A

8412	Turkey Pond Dam	P	A
8413	New Pond Dam	P	A
8414	Herbert Pond Dam	L	A
8415	Lower Dam	P	A
8416	Mondo Pond Dam #4	P	A
8417	Mondo Pond Dam #3 (Walker Pond)	P	A
8418	Mondo Pond Dam #1	P	A
8419	unnamed	P	
8420	Difranco Dam		A
8421	Equitable Dam (Lily Pond)	P	A
8422	Eisenhower Park Pond Dam	P	BB
8423	Unnamed	P	

This HMP section primarily discusses the possible effects of failure of moderate hazard potential (Class BB) dams that upon failure would result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate economic loss. It is not know if a dam failure analysis has been performed on Milford's dams. As grant funding becomes available the City would like to develop a risk assessment in more detail as the dam classification study by the State is almost 20 years old.

DAM FAILURE MITIGATION MEASURES

The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which govern the registration, classification, and inspection of dams. Dams must be registered by the owner with the DEEP according to Connecticut Public Act 83-38.

Dam Inspection Regulations require that nearly 700 dams in Connecticut be inspected annually. The DEEP currently prioritizes inspections of those dams that pose the greatest potential threat to downstream persons and properties.

Dams found to be unsafe under the inspection program must be repaired by the owner. Depending on the severity of the identified deficiency, an owner is allowed reasonable time to make the required repairs or remove the dam. If a dam owner fails to make necessary repairs to the subject structure, the DEEP may issue an administrative order requiring the owner to restore the structure to a safe condition and may refer noncompliance with such an order to the Attorney General's Office for enforcement. As a means of last resort, the DEEP Commissioner is empowered by statute to remove or correct, at the expense of the owner, any

unsafe structures that present a clear and present danger to public safety.

The Dam Safety section of the DEEP Inland Water Resources Division is charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. The existing statutes require the permits be obtained to construct, repair, or alter dams and that existing dams be registered and periodically inspected to assure that their continued operation does not constitute a hazard to life, health, or property.

The Connecticut DEEP also administers the Flood and Erosion Control Board program, which can provide noncompetitive state funding for repair of municipality-owned dams. Funding is limited by the State Bond Commission. State statute Section 25-84 allows municipalities to form Flood and Erosion Control Boards, but municipalities must take action to create the board within the context of the local government, such as by revising the municipal charter. The City of Milford has a Flood and Erosion Control Board per its City Code.

The City should work with private property owners and the Connecticut DEEP to stay up to date on the evolution of any EOPs and DFAs for the Class BB Dams in Milford, should any be produced. The City's Building and Engineering Departments should have copies of all existing EOPs and DFAs for dams in Milford in its possession. Whenever possible, copies of these documents (or portions of them that do not provide specific dam vulnerabilities) should be made available at the City Hall for reference and public viewing.

The City should maximize its emergency preparedness for a potential dam failure. The City should also consider coordinating occasional inspections of lower-hazard and unranked dams with the assistance of private property owners and inform dam owners of resources available to them through various governmental agencies.

Milford should consider including potential dam failure areas in the Everbridge emergency notification system. This technology could be used to warn residents downstream of a dam of any impending dam failure and facilitate evacuation. In the absence of DFA mapping, the 500-year floodplains could be used to delineate potential dam failure areas.

VULNERABILITIES AND RISK ASSESSMENT

As previously discussed, failure of a Class BB dam has the potential to result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate economic loss. It is noted that the failure of any of the dams in the City could have impacts on human life and property within Milford. Below is a description of three of the Class BB dams.

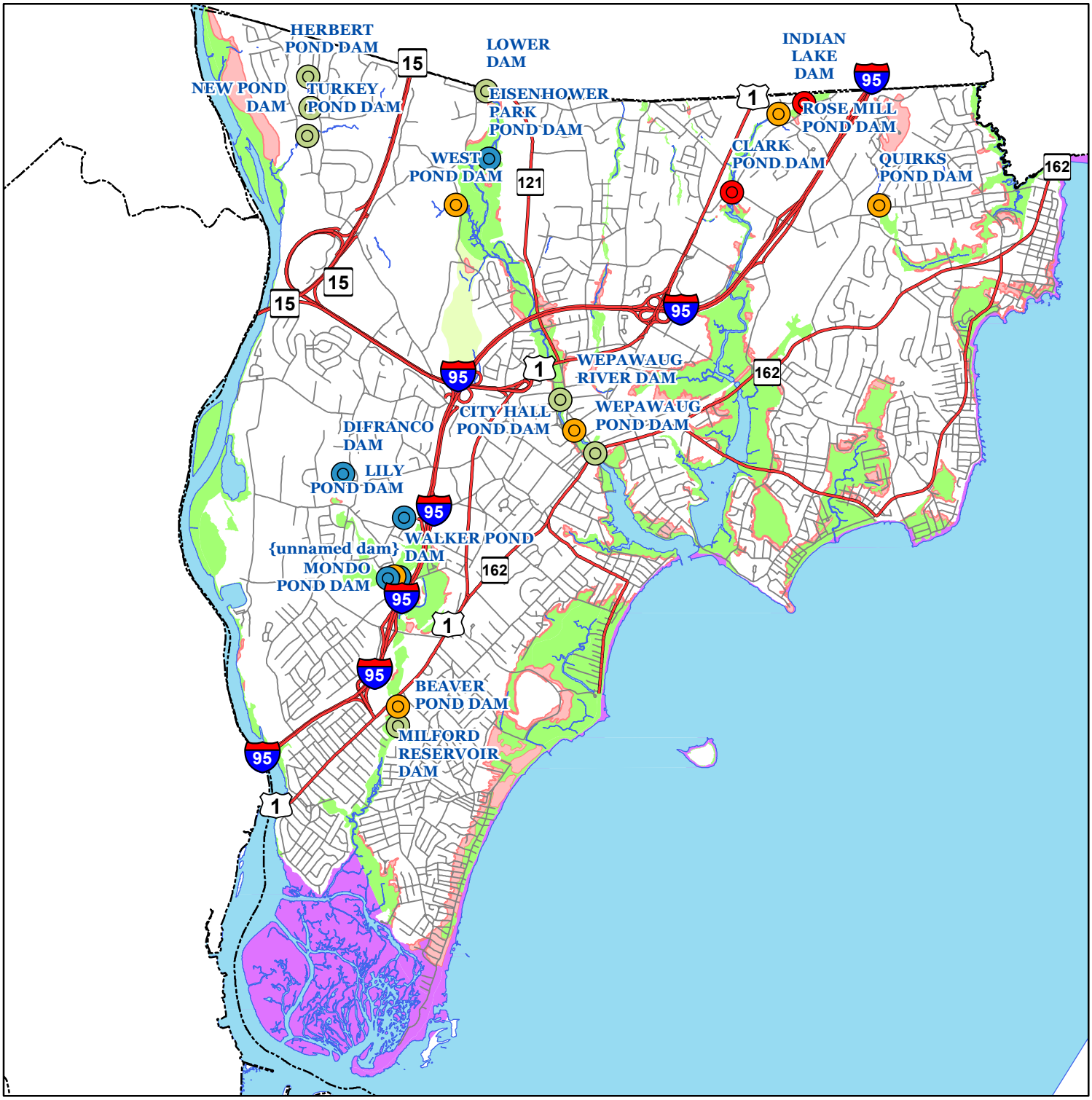
The descriptions below are based on information available at the Connecticut DEEP Dam Safety Section. It is noted that the failure of any of the other dams in Town could also have impacts on human life and property within Milford although these are not discussed because the highest hazard dams are emphasized. To understand the potential loss impacts of this hazard it is recommended that the City perform a dam failure study that would focus on direct and indirect economic losses, public health and public safety. This would require updated dam inspection data, dam failure scenario studies and inundation data, dam failure modeling software and other resources that may or may not be available to the City before the next plan update.

Indian Lake Dam (8407) Indian Lake Dam is a Class B dam located on the Indian River near the Northeast municipal corporate boundary of Milford and Orange. This is a recreational impoundment and is privately owned by the Indian Lake Association. Failure of the dam would likely result in downstream flooding and potential failure of the Roses Mill Pond and the Clark Pond Dams.

Clark Pond Dam (8401) Clark Pond Dam is a Class B dam located on the Indian River downstream of the Indian Lake and Roses Mill Pond Dams. A fish ladder maintained by CT-DEEP is located at this site adjacent to Woodmont Road. Failure of this dam would likely result in minor downstream flooding as below this point there are significant wetland areas leading to Gulf Pond and Long Island Sound.

City Hall Pond Dam (8404) City Hall Pond Dam is a class BB dam located on the Wepawaug River in the center of the City, just North of the downtown area. This dam is the second in a series of four Dams in Milford on the Wepawaug River. Failure of this dam would likely result in flooding along the River behind a number of commercial buildings and homes before hitting the Wepawaug Pond Dam and entering Milford Harbor. The sudden release of water and silt could negatively impact the parking areas and first floor businesses along River and Daniels Street as well as boats moored at the Town Dock and two adjoining private marinas.

The Housatonic River is approximately 140 miles long from its source at Muddy Pond in Pittsfield MA. The Housatonic River basin is roughly 1,950 square miles and discharges an average of 4,700 cf/s with minimum and maximum discharge rates between 54 cf/s and 48,600 cf/s. Within CT, 10 dams are constructed on the Housatonic River. Milford's parcels that border the Housatonic are relatively protected by high elevations. The closest dam for the Housatonic is located approximately 5 miles north in Derby, CT.



CT DEEP DAM HAZARD RISK

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

N

Legend

- Unclassified
- A - Low Potential Hazard
- BB - Moderate Hazard Potential
- B - High Potential Hazard

FEMA Floodzones

- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
- A
- AE
- VE

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 1/29/2013
Path: \\Mgis\gis\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_Dams.mxd

The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property. Residential properties are most vulnerable to dam failure and potential flooding impacts south of the infrastructure location; however, determining the dollar value losses for those properties impacted is difficult without full hydrology and hydraulics study for each dam watershed area which is presently outside of the scope of this plan.

DROUGHT

Quote from the State Department of Energy and Environmental Protection: "Without set asides for the environment, streams, rivers, lakes, and other water bodies may suffer impairment and degradation during sustained periods of low flow. There may not be enough water to support fisheries and the aquatic life on which they depend, wildlife, and all of the other aspects of the natural environment which are water-dependent, as well as the recreational resources and natural beauty that make Connecticut so attractive to its residents and visitors. With careful planning, however, Connecticut can meet the needs of its citizens without sacrificing the quality of its natural environment." [45]

Connecticut is beginning to see more frequent drought impacts, as shallower wells along some lakes dried up in the summer of 2007 and river flows sometimes fall below levels that protect habitat and the resource. Climate change is projected to increase periodic droughts. New England is overdue for a severe and prolonged drought. Conservation measures and reuse of wastewater effluent for cooling, irrigation and industrial purposes, are an essential part of Connecticut's adaptation strategy. Existing drought management measures will be continually re-evaluated to assure applicability to variability of extreme dryness.

The City of Milford will comply with all State directives on the conservation of water during drought emergencies. As noted in the State of Connecticut Drought Preparedness and Response Plan 2003 [46] "The ability to accurately assess the severity of current conditions and to predict the future status of a drought depends upon extensive, long-term monitoring and data collection." At this time data to predict future probability of a drought is not available to the City of Milford, however due to the small size of our community in relation to the state the entire town could be at risk for a drought.

VULNERABILITIES

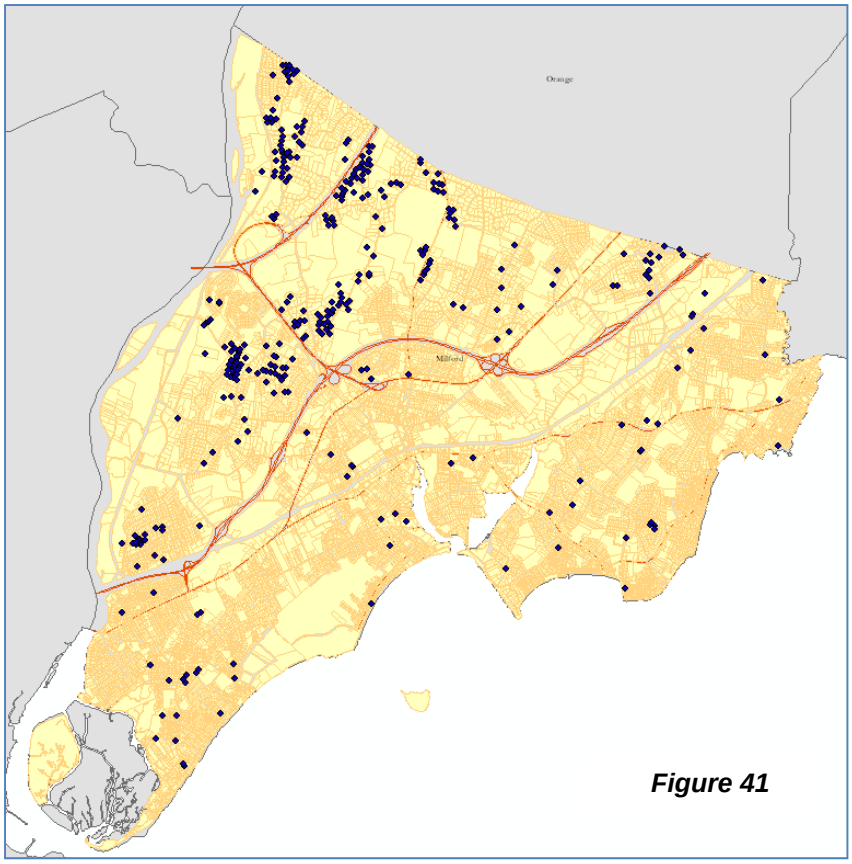


Figure 41

Using data supplied by the Regional Water Authority RWA) the City examined all parcels where the RWA indicated there is water service. By cross referencing that data set with the assessor's information on residential structures with bathrooms it is possible to estimate which parcels are served by well water. This analysis shows 637 homes on well water, our vulnerable population in times of drought. These homes are more concentrated in the north end of town. The figure below shows the point locations of parcels that have bathrooms but are not serviced by the RWA. Costs incurred by the city related to homes on well water would be nominal and relate to public outreach and welfare checks by the Fire department.

Farms typically incur the greatest economic impact during times of drought due to their dependency on weather. The immediate effects of drought often translate to higher prices for consumers. However in Milford our farming community is small and we are able to rely on food from outside sources, therefore potential economic losses from a drought are negligible on the City itself.

LEVEE FAILURE

There are no levees in Milford; therefore our potential impacts are non-existent.

LANDSLIDE

There is little danger for landslides in Milford. Given the gentle rolling hills and highly developed landscape, the only landslide potential would be from earthmoving during development. Local building codes call for preventive measures to protect from that

occurrence and potential losses would be dependent upon the cost of the development.

TSUNAMI

Although flooding from storm damage is severe, the likelihood of a tsunami striking Milford is remote due to the buffer of Long Island to the south. Therefore we consider our potential impacts to be the same as those identified for flooding or hurricane storm surge.

VOLCANO

There is no volcanic activity in Milford; therefore our potential impacts are non-existent.

WILDFIRE

Wildfire danger is limited due to the lack of heavily forested areas. However, there has been wildfire activity in the City's marshes and that can threaten residential areas. Tidal wetlands (as shown on Land Cover in Section D) minus the Charles Wheeler Wildlife area at the City's southwest corner at Milford Point, are typically filled with an invasive species of phragmite that grows upwards of 10-12 feet tall, that dries over the winter and in the summer heat, and becomes combustible and highly flammable in continued dry conditions.

Commonly small brush fires spring up in the area along the MetroNorth rail road tracks before the spring rains and at the end of summer as conditions dry out. A notable 2-day fire occurred in April of 2012 which destroyed a boardwalk running through the Beaver Brook nature preserve and caused minor damage to nearby condominiums. The property loss for this boardwalk is valued at $500,000. Amtrak and MetroNorth train service was suspended in the area. This fire was fueled in part by discarded railroad ties. Railroad ties are soaked in creosote which can burn for an extended period of time.

Available data in the City's Fire Records Management System show s the following records for wildfire history:

Year	Incident Type	#	Incident Type	#	TOTAL
2013	Brush/Grass Fire	8	Forest/Woodland Fire	0	8
2012	Brush/Grass Fire	16	Forest/Woodland Fire	5	21
2011	Brush/Grass Fire	14	Forest/Woodland Fire	0	14
2010	Brush/Grass Fire	34	Forest/Woodland Fire	2	36
2009	Brush/Grass Fire	9	Forest/Woodland Fire	1	10
2008	Brush/Grass Fire	34	Forest/Woodland Fire	3	37

Figure 42

5 Year average 2008-2012 Brush/Grass Fires _21.4_

5 Year average 2008-2012 Forest/ Woodland Fires_2.2_

5 Year Average 2008-2012 Total_25.2

The State Commission on Fire Prevention and Control as well as the State Department of Energy and Environmental Protection send alerts to the Fire Department when conditions are in place for a wildfire hazard. Historically, a wildfire occurred over a 20 acre area in the tidal marshlands of Silver Sands State Park in late April 2008 and in April 2012 a wildfire occurred in an open space area adjacent to the Beaver Brook tidal wetlands area. Although no homes were harmed, a popular Beaver Brook recreational walking trail has been closed due to the damage to the wetlands crossing bridge.

WILDFIRE MITIGATION: The State of Connecticut has actively been attempting to decrease the amount of flammable (non-native) phragmites species with herbicide removal programs. In addition, homeowners, particularly close to marshland areas are recommended to remove a 30-ft swath adjacent to their properties to eliminate the spread of fire to their structures should a wildfire begin.

VULNERABILITIES: As much of the wildfire risk area is located in non-populated areas, vulnerability to life and property is determined to be minimal. The Beaverbrook boardwalk and 2 bird viewing platforms are the only city-owned infrastructure at risk. Bird viewing platforms are valued at $5,000 each, replacement costs for the Beaverbrook Boardwalk is $500,000. The Great River Walk Boardwalk is owned by the privately held Great River Country Club. The Walnut Beach Boardwalk is located on the sand at Walnut Beach, away from the phragmite.

Repetitive Loss Properties

Revision statement: Prior plan identified that 120 properties had filed repetitive flood insurance claims as of 2002. Current plan has been revised with new numbers. Also Plan has been updated to highlight Repetitive Loss Properties in its own section. Further information has been supplied on the type of property (residential/commercial/other) that has incurred repetitive damage.

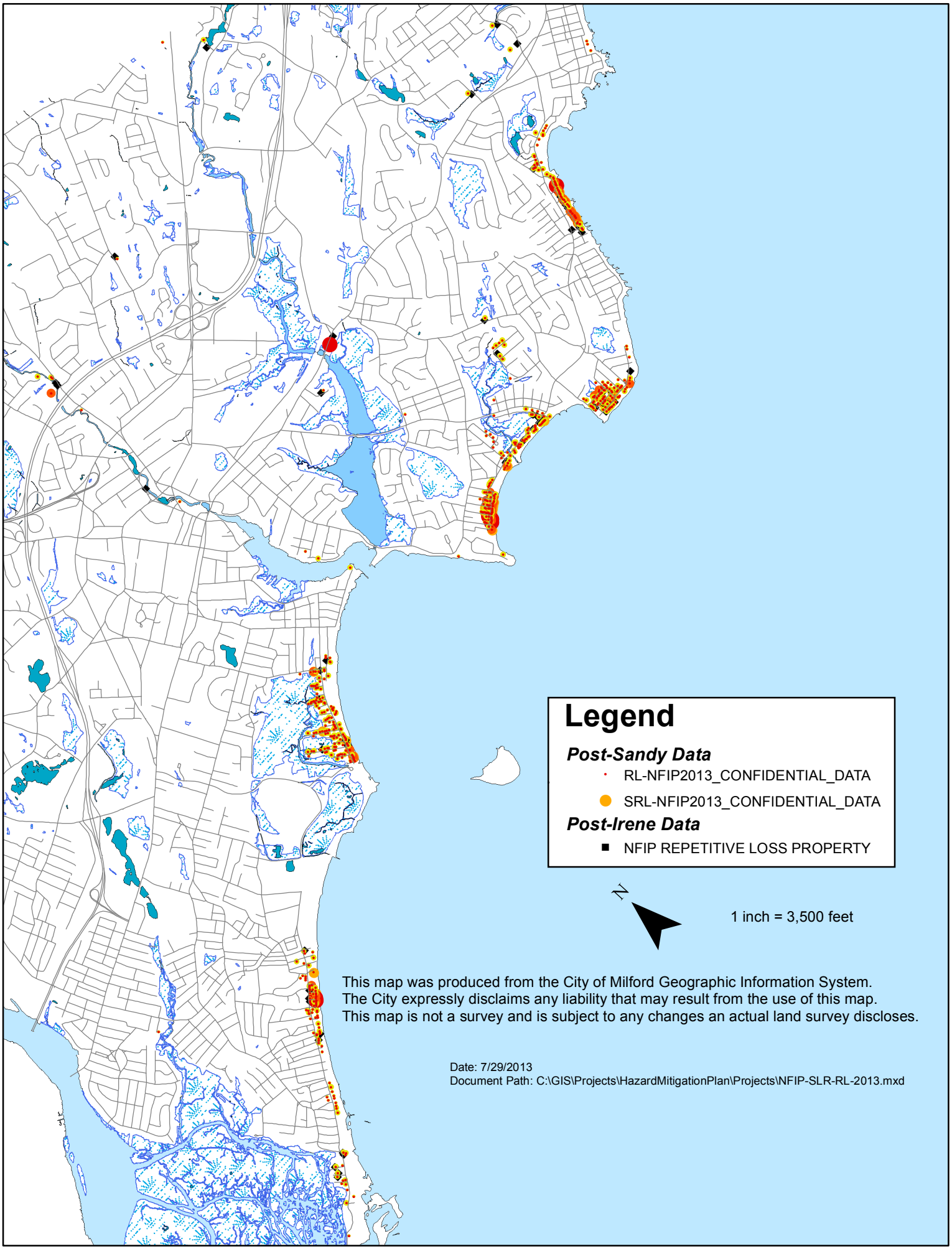
Post Irene, the City had 31 severe repetitive loss (SRL) properties located predominantly in the Field Court, Point Beach, and Hillside neighborhoods. Severe Repetitive Loss properties are defined by FEMA as residential properties that are covered under an NFIP flood insurance policy and:

(a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or

(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

Post Sandy, the number of SRL properties increased to 46. Structures that have received two or more claim payments of more than $1,000 from the National Flood Insurance Program within any rolling 10-year period for residential or commercial properties are considered a Repetitive Loss (RL) structure. Following Storm Irene, the number of repetitive loss properties was one hundred and sixty four (164) comprised exclusively of residential properties per a post-Irene report from the State's NFIP Coordinator. These 164 properties are located in some of the same neighborhoods as well as in the Melba Street, Broadway, and East Broadway neighborhoods. (See SDE map.) These repeat claims demonstrate the serious nature of flood hazards throughout Milford. Following Storm Sandy, the number of repetitive loss properties increased dramatically to 519 predominantly residential structures (see map next page). However, six properties are commercial properties, with three subject to riverine flooding along the Wepawaug River and three other coastal properties that suffered damage due to Irene and Sandy. The businesses include an industrial warehouse, three restaurants, a fitness facility, and a personal service use (tailoring & upholstery).

Until recently, repetitive claims would not automatically mark the homeowner for a required home elevation. A home is not required to be elevated until damage and improvements affect 50% of the value of the structure. Particularly through the Storm Sandy substantial damage assessment process, the City has a better understanding of the hardest hit neighborhoods and has begun to map properties with damage and properties with substantial damage. In addition, in 2010 the City's Zoning Regulations were revised to track all substantial improvements/damages cumulatively over a 10 year period. Although, there is no formalized program currently in place to identify the location or the number of structures that remain susceptible to flooding along the Milford shoreline, post-storm, the substantial damage determination process assists in understanding the City's most vulnerable areas. As a result of Storm Sandy and Irene, approximately 200 structures have been determined to have substantial damage and will need to be made flood compliant. Although homeowners support the need to elevate their homes, elevation costs are expensive and procuring funding for elevating these modest structures has been particularly difficult.


Legend
Post-Sandy Data
RL-NFIP2013_CONFIDENTIAL_DATA
SRL-NFIP2013_CONFIDENTIAL_DATA
Post-Irene Data
NFIP REPETITIVE LOSS PROPERTY
N
1 inch = 3,500 feet
This map was produced from the City of Milford Geographic Information System.
The City expressly disclaims any liability that may result from the use of this map.
This map is not a survey and is subject to any changes an actual land survey discloses.
Date: 7/29/2013
Document Path: C:\GIS\Projects\HazardMitigationPlan\Projects\NFIP-SLR-RL-2013.mxd

The history of coastal flooding in Milford has led to a series of flood prevention and property protection projects to be completed along the City's coastline. Projects have included revetments, groins, jetties and beach nourishment projects. Some of the issues related to repeat flood insurance claim properties have also been addressed by elevating the flood prone structures. Elevation of as many as 130 structures has occurred at locations along the Milford coastline as a result of proactive homeowners, strict enforcement of the requirements of the City's flood plain management regulations and over 42 have been elevated as part of formalized projects such as: 1) US Army Corps of Engineers (USACOE), 2) FEMA *Project Impact* in the Point Beach area and through *Flood Mitigation Assistance (FMA)* and through the *FEMA Hazard Mitigation Grant Program (HMGP)*. Of the almost 4000 structures that remain susceptible to serious damage as a result of coastal flooding, it is not clear the total number that have been elevated or the total number that still remain at serious risk.

C. Setting

Plan revision statement: The chapter on setting has been expanded upon in great detail to demonstrate Milford's awareness of the physical and demographic characteristics that factor into hazard mitigation planning. The section on transportation was taken out of the prior plan's Hazard Risk Assessment section on Flooding. This section has been updated to include information on development patterns, economic development, critical facilities, inland wetlands, geology and public utility infrastructure.

DEVELOPMENT

Out of the 169 towns in Connecticut, Milford is the 17th most populated with approximately 54,000 residents living in a density of 2,344 residents per square mile. There was very little population growth in Milford since the last plan in 2007. There are 23,900 household units within Milford with 71% detached single family residential. Milford is the 5th most populated municipality of the 15 that comprise our regional planning agency, the South Central Regional Council of Governments. Milford is a regional center serving the commercial needs of many surrounding towns. Interstate 95 and Route 15 intersect in Milford and Route 1 bisects the City. When aggregated, the CT Department of Transportation Average Daily Traffic (ADT) Counts show over 260,000 vehicles getting on and off highways here every day. See Appendix L for additional demographic data and traffic data. A land use map is provided for reference on page 109.

Milford is heavily developed with very little residentially-zoned vacant land, less than 150 acres total. Of the approximately 5,500 acres of residentially zoned land, only 2.6% is available for development. To the north of Route 1 housing lots are typically larger than the traditionally small lots from our older housing stock. The City's few small farms intersperse the landscape to the north of Route 1, heaviest concentrations are in the northwest corner. Milford's existing development is shaped by its colonial heritage and history as a coastal community with high density residential south of the Boston Post Road and larger lot residential development in the former farmland area of the north where most lots still rely on private well and septic systems north of the Wilbur Cross Parkway. Milford's primary commercial corridor is the historic Boston Post Road which varies from a local commercial road with locally serving businesses to a regional serving commercial corridor just east of the I-95 cloverleaf at exits 39A & 39B.

Milford has an active open space acquisition program. Much of the land acquired is environmentally sensitive, usually wetlands or close to rivers and streams. If the City did not purchase these properties there is a high likelihood they would be developed with structures, parking and other impervious surfaces. By putting this land into protective status it will not be developed and generally assists in creating water-absorbing property that lesson the potential for flooding downstream.

The Milford Inland Wetland Agency (MIWA) regulates[47] development activity in Inland Wetlands and watercourses and has an upland review area of 100'-150' around inland wetlands and watercourses. The MIWA may also reach beyond the upland review area if there is a potential for the proposed development to impact an inland wetland or watercourse. The MIWA has begun to see Low Impact Design (LID) implemented in applications. LID is a planning and engineering design approach to manage storm water runoff. LID emphasizes conservation and using natural features to protect water quality and reduce runoff by infiltrating, filtering, storing and detaining runoff close to its source. Planning and Zoning further regulates growth by imposing height limits and dividing the existing development into various zones.

ECONOMIC DEVELOPMENT

Milford has a diverse mix of businesses. This has led to a stable business environment. Although Milford has not been immune to the recent economic woes of the country, it has been able to withstand the closures of some businesses by reason of its greater diversity. In

many cases new businesses have come into the market to replace those that left.

Retail makes up a large and important segment of the Milford business mix. Led by the Westfield Connecticut Post Mall, an almost solid band of retail business stretches along the Boston Post Road from Orange to Stratford. Two new developments, Milford Marketplace and Milford Crossing, add strength to the retail mix. Other areas primarily devoted to retail include historic downtown Milford, Devon Center and Naugatuck Avenue leading to Walnut Beach and Cherry Street. Bridgeport and New Haven Avenues, as the secondary main route east-west through the City, have a large retail component. The automobile business has a major presence along the Boston Post Road with a significant number of dealership representing many of the leading manufacturers. Old Gate Lane is shifting from its former industrial self to a more mixed economy including hotels, retail (especially with Lowe's at the former Jai Alai site) office, and assorted other business uses.

Consumer product manufacturer Schick leads a strong manufacturing base of approximately 150 companies. Fabricated metals make up a large segment of the manufacturing group. In the smaller companies there is a great variety of products or components of products made here.

Employment in the manufacturing sector has dropped in the last 5 years in Milford as it has throughout Connecticut. Lower numbers in that segment have come from relocations and reductions in work force by individual companies.

Milford has been a strong player in the defense industry since World War II. Many Milford companies serve as subcontractors to various defense related companies. Most have had to diversify into other markets to survive.

The service business has a significant presence. Serving the general public and the business community, Milford's location offers companies easy access to larger markets. Companies like and ADP and IKON maintain facilities here. Financial services include the Milford Bank, a local bank, and many other regional and national institutions. Insurance and financial/investment companies are well represented.

The legal profession is well represented in the City anchored by the location of the Ansonia-Milford Judicial branch of the State Superior Court. Attorneys and their offices occupy many sites especially in the downtown area.

The construction business is well represented with local firms and the international headquarters of Turner Construction. The recession has hit these businesses particularly hard.

The medical profession is a strong piece of the City's economic pie. Centered on the

presence of Milford Hospital, a local facility concentrating on one-day surgical procedures, a popular birthing center, and emergency operations, many professional offices are located here. The hospital's expansion of their walk-in operation on the Boston Post Road is indicative of the strength of that segment of the economy. Commerce Park is almost completed dedicated to medical offices and lab services. Doctors and dentists are present in significant numbers to serve the population. Many regional practices have offices local offices. There are three nursing homes and two assisted living facilities located in Milford.

Corporate headquarters and Class "A" office space represent another important part of the business mix. Subway International, Neopost Hasler, Perimeter Internetworking, EDR and Dataviz, among others, have located their headquarters in Milford. Smaller office complex are spread throughout the city. A number of older homes have been converted to professional office space. As noted above, Milford is part of the technological revolution. The Internet has brought a whole new world of businesses into the economy. From the larger firms to smaller endeavors, the creative thinking of the new economy is alive and well and growing.

In respect to hazard mitigation planning, a power outage is the primary impact of natural hazards affecting Milford's commercial sector. The severity of power interruptions on the commercial sector due to storms varies depending on the type of business. Critical facilities like Milford Hospital have backup generators. The major shopping center the Connecticut Post Mall has backup power but many of the other businesses do not.

Interruptions of power for as long as a week have significant impacts on the economy. Some losses are never made up. In the restaurant business for instance, people do not go out extra times to make up for the times they were unable to dine out. That revenue is lost forever.

If an outage occurs before a shopping holiday, that revenue is never made up. And even if the business has power, the customers may not be able to get out to shop. They are more concerned about day-today issues...getting to work, getting their home put back together, or caring for family. Shopping becomes a low priority.

Some businesses do prosper in time of emergencies. The sale of generator, batteries, candles, and other similar items peak if there is enough warning of a significant event. In the aftermath of a significant event the sale of building supplies peaks. Repair and remodeling companies prosper.

Employees are impacted when they can't get to their jobs or the business they work at is not open. Hourly employees are most affected because those hours lost most often will not

be made up.

Preparing for major storms is part of the private sector responsibility. While government and public utilities are responsible for maintaining the roads and restoring power, businesses can be better prepared. Recent storms like Irene and Sandy have brought home the need to have emergency power. Losses are not always covered by insurance. The City can be a force in education about natural disasters and provide that to the business community as well as the residential sector.

TRANSPORTATION

Milford is bisected by two major transportation infrastructure, Interstate 95 and the Northeast Corridor Rail Line. A series of railroad and the highway crossings have been constructed to allow passage of roadways under and over the highway and railroad.

The dikes formed by the transportation embankments are also penetrated by numerous drainage structures which generally allow passage of watercourses and storm drainage from the north side of the embankments to the south side to discharge to Long Island Sound.

The potential for serious emergency response disruption exists as few of these crossings are flood free during all flood events. Most vulnerable to flooding are the following roadways:

- New Haven Avenue (Route 162) near Old Gate Lane,
- Boston Post Road (US1) at West River Street intersection (Wepawaug River)
- Southside of Bridgeport Avenue (US1) adjacent to Lansdale Avenue (near Beaver Brook Reservoir)
- Naugatuck Avenue at the Bridgeport Avenue intersection traveling south.
- River Street adjacent to City Hall (Wepawaug River)
- Field Court/Bayshore Drive (seasonal & Lunar high tide)

Close evaluation of the flooding impacts on the transportation system is important. Such an evaluation would focus on critical transportation corridors in terms of providing safe evacuation of low lying areas and those emergency response routes that are critical for use by emergency response personnel.

Route US 1- Boston Post Road is another major east-west transportation route, which would become even more critical in the event of closure of I-95. Route 1 has a series of traffic signals; a significant hazard exists in the event of a major power failure that disrupts the supply of electricity to the signalized intersections.

In addition, the Route 1 crossing of the Wepawaug River, Tumble Brook, Stubby Brook, and Karl's Brook have been identified as areas of repeated flooding. The flooding of this major transportation route can cause serious disruption in the flow of traffic across the City.

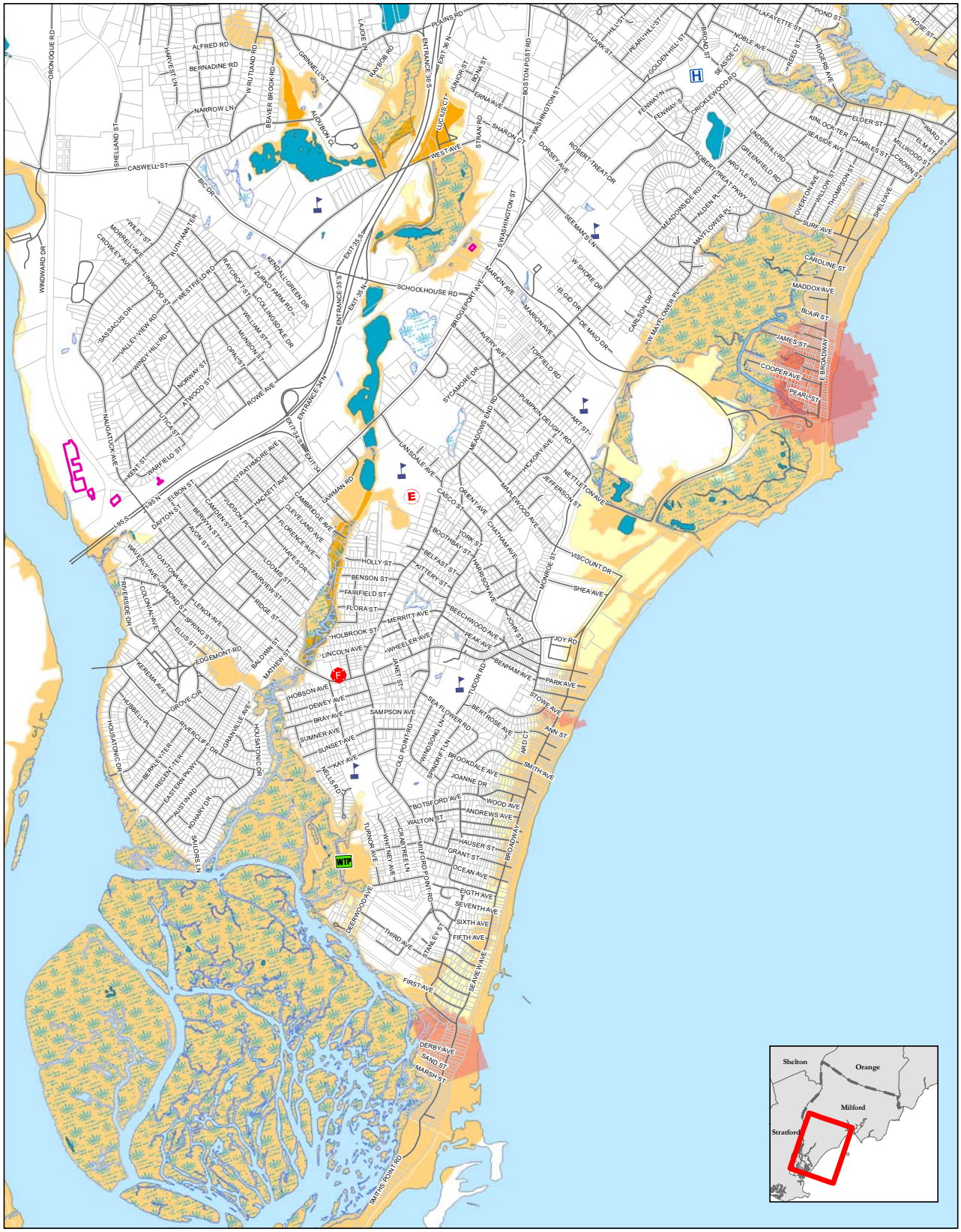
PUBLIC UTILITY INFRASTRUCTURE

Approximately 90% of the Milford's housing units and commercial properties are on public sewer with the exception of residential areas north of the Wilbur Cross Parkway adjacent to the Town of Orange. Northern area sewer expansion was proposed as part of the Avalon development. However, that development has been stalled first by lawsuit and secondly by the housing market.

The City has two Wastewater Treatment facilities that area located on the Housatonic River and discharge into that water body. Both plants were upgraded in 2006-2008 to update their processing systems and to increase capacity. However, the Beaver Brook facility located at lower elevation in the southerly area of the City, in particular, could be vulnerable to SLOSH during a significant storm or hurricane event. The City has 40 pump stations located throughout the City with 260 miles of sewer lines that feed into the Housatonic and Beaver Brook Treatment facilities. The Housatonic Plant has capacity for 8.3 million gallons per day (mgd) and the smaller Beaver Brook Plant can process 3.1 mgd. The Beaver Brook Plant operates at capacity and Housatonic Plant currently processes approximately 7 million mgd. The need for some additional permanent and portable generators has been identified to protect some of the lower lying pump stations in the City.

CRITICAL FACILITIES

Milford considers its critical facilities the Fire Stations and Fire Headquarters (which is the Emergency Operations Center), Police Station, City Hall, Parsons Government Center, Public Works Building, Nursing Homes, Assisted Living Facilities, Senior Living Facilities, Milford Hospital, Milford Health Department and the City's emergency shelters: Milford Senior Center and Jonathan Law High School. A series of Critical Facilities maps reflect Milford's critical infrastructure in relation to identified hazards. The maps are comprised of three tiles, covering the southwestern, northwestern and central-eastern sections of the City respectively.



Critical Facilities

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

N

0 750 1,500 3,000 4,500 Feet

1 inch = 1,500 feet

Legend

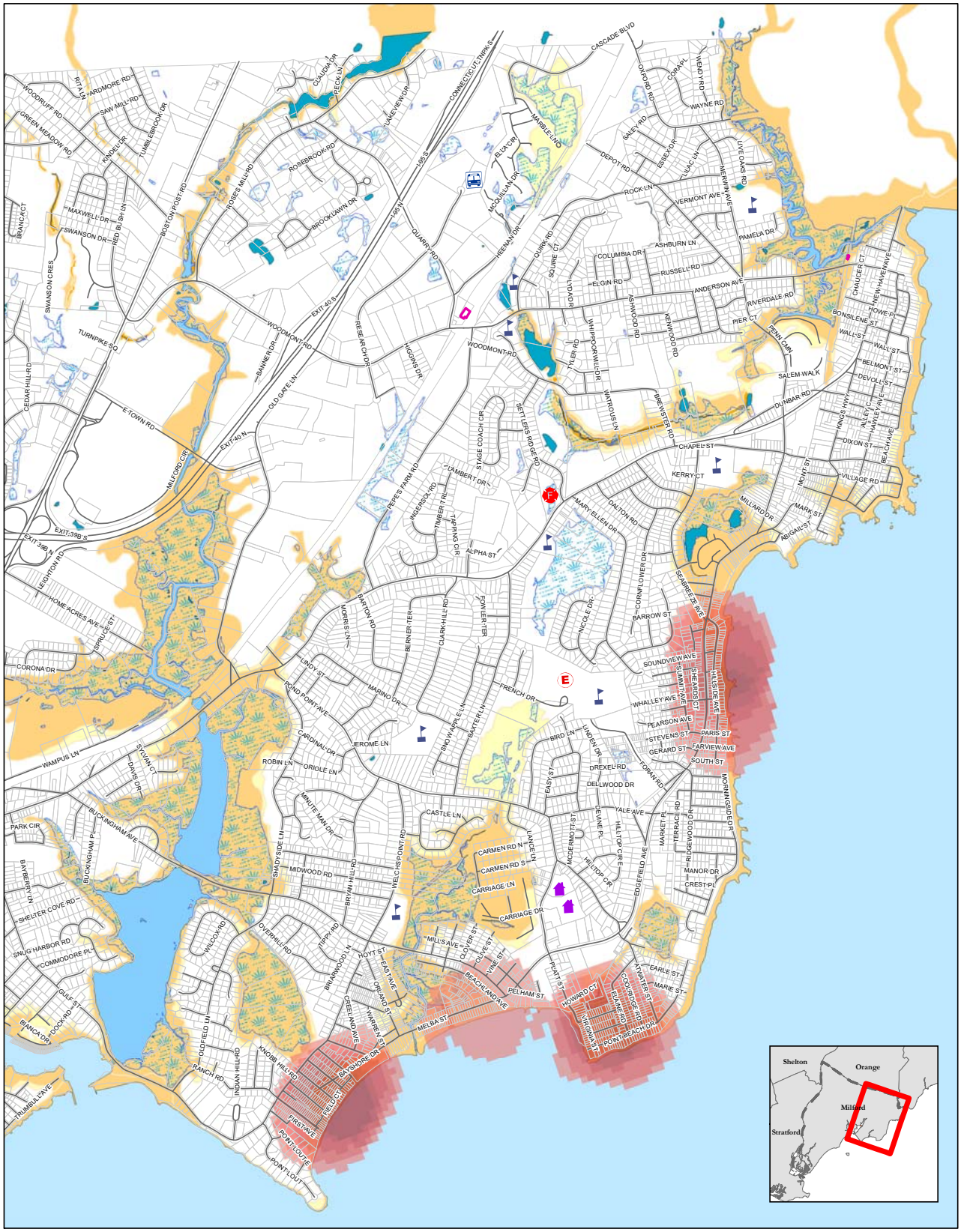
- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- Lake/Pond
- River
- Sound
- Swamp
- NFIP Repetitive Loss

CRITICAL FACILITIES

- Fire Department
- Police Department
- Health Department
- Municipal Office
- Hospitals
- Schools (public and private)
- Emergency Shelter
- Metro North Railroad Station
- Milford Transit District - Bus Depot
- Milford DPW Garage/Offices
- Senior Care Centers
- Sewage Treatment Plant
- Substations

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/14/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_Critical Facilities.mxd



Critical Facilities

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 750 1,500 3,000 4,500 Feet

1 inch = 1,500 feet

Legend

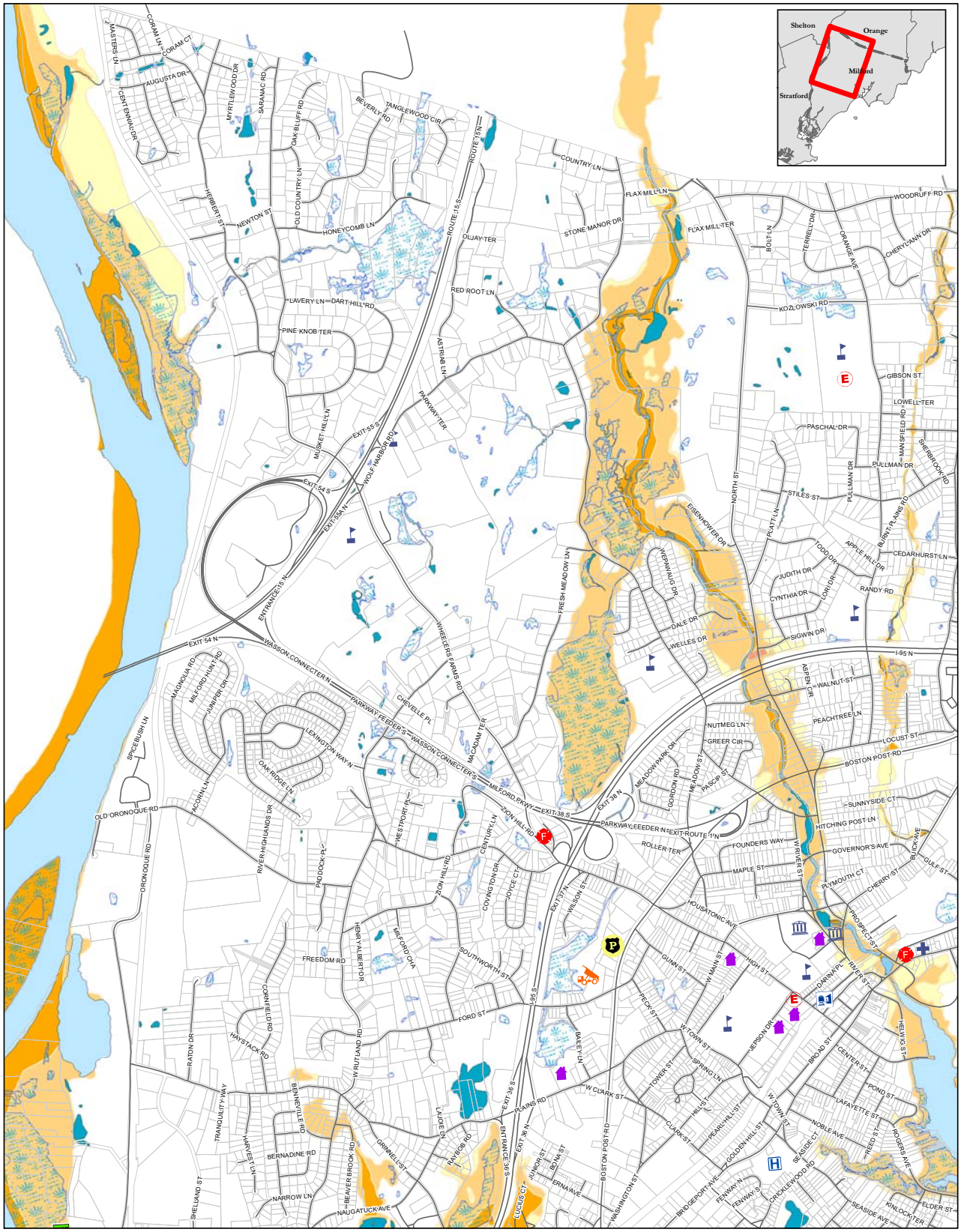
- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- Lake/Pond
- River
- Sound
- Swamp
- NFIP Repetitive Loss

CRITICAL FACILITIES

- Fire Department
- Police Department
- Health Department
- Municipal Office
- Hospitals
- Schools (public and private)
- Emergency Shelter
- Metro North Railroad Station
- Milford Transit District - Bus Depot
- Milford DPW Garage/Offices
- Senior Care Centers
- Sewage Treatment Plant
- Substations

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/14/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_Critical Facilities.mxd



Critical Facilities

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

N

0 750 1,500 3,000 4,500 Feet

1 inch = 1,500 feet

Legend

- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- Lake/Pond
- River
- Sound
- Swamp
- NFIP Repetitive Loss

CRITICAL FACILITIES

- Fire Department
- Police Department
- Health Department
- Municipal Office
- Hospitals
- Schools (public and private)
- Emergency Shelter
- Metro North Railroad Station
- Milford Transit District - Bus Depot
- Milford DPW Garage/Offices
- Senior Care Centers
- Sewage Treatment Plant
- Substations

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/14/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_Critical Facilities.mxd

VULNERABLE POPULATIONS

As stated in the Milford Health Department's 2009-2010 Annual Report to the Mayor "The CT Department of Public Health appointed the Milford Health Department to lead Region 2 in the Vulnerable Populations Identification and Outreach Initiative for Emergency Planning and Response. The Oasis database was developed which identifies vulnerable populations in cities and towns throughout Connecticut. In March 2010, a workshop was coordinated to review the database and provide guidance documents to assist locals in refining emergency response plans."

While the health department tracks vulnerable populations and maintains a standard of privacy for those individuals, it is relevant to the purposes of the Plan to outline an understanding of where Milford's vulnerable populations are located. While the Milford Hospital, Beth-El Shelter, and elderly housing facilities are located on the City's critical infrastructure lists and maps, it is felt important to analyze available Census and American Community Survey data to enumerate the populations of persons with disabilities.

The 2009-2011 ACS 3-year survey results provide insight onto persons with disabilities in Milford. Based on the total population, 4.5% of Milford's population has some type of disability status. For children less than 5 years of age 51 -or 1.6% of that age bracket- has a hearing difficulty, the only disability characteristic recorded. For children aged 5 to 17 years the statistics become more detailed.

Unfortunately the US Census no longer tracks disability statistics in their decennial census. The American Community Survey (ACS) is the next available option, however in 2008 the ACS made significant changes to the disability portion of the questionnaire and that tract-level data won't be available until later in 2013. Until then, city-wide statistics will have to suffice. The full ACS report for the table provided is located in Appendix I.

Figure 45 – Table of Vulnerable Populations

Subject	Milford town, New Haven County, Connecticut					
	Total		With a disability		Percent with a disability	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total civilian noninstitutionalized population	52,373	+/-128	5,346	+/-633	10.2%	+/-1.2
Population 5 to 17 years	7,954	+/-539	300	+/-190	3.8%	+/-2.4
With a hearing difficulty	(X)	(X)	66	+/-82	0.8%	+/-1.0
With a vision difficulty	(X)	(X)	82	+/-87	1.0%	+/-1.1
With a cognitive difficulty	(X)	(X)	212	+/-128	2.7%	+/-1.6
With an ambulatory difficulty	(X)	(X)	38	+/-43	0.5%	+/-0.5
With a self-care difficulty	(X)	(X)	50	+/-48	0.6%	+/-0.6
Population 18 to 64 years	33,456	+/-563	2,463	+/-449	7.4%	+/-1.3
With a hearing difficulty	(X)	(X)	447	+/-177	1.3%	+/-0.5
With a vision difficulty	(X)	(X)	345	+/-149	1.0%	+/-0.4
With a cognitive difficulty	(X)	(X)	875	+/-268	2.6%	+/-0.8
With an ambulatory difficulty	(X)	(X)	1,553	+/-389	4.6%	+/-1.2
With a self-care difficulty	(X)	(X)	489	+/-230	1.5%	+/-0.7
With an independent living difficulty	(X)	(X)	802	+/-273	2.4%	+/-0.8
Population 65 years and over	7,810	+/-430	2,532	+/-414	32.4%	+/-4.8
With a hearing difficulty	(X)	(X)	1,146	+/-294	14.7%	+/-3.6
With a vision difficulty	(X)	(X)	324	+/-119	4.1%	+/-1.5
With a cognitive difficulty	(X)	(X)	628	+/-214	8.0%	+/-2.7
With an ambulatory difficulty	(X)	(X)	1,361	+/-289	17.4%	+/-3.5
With a self-care difficulty	(X)	(X)	545	+/-183	7.0%	+/-2.3
With an independent living difficulty	(X)	(X)	1,284	+/-338	16.4%	+/-4.1

When the next release of the ACS data becomes available later in 2013 the Plan will be updated with tract-level data, giving readers of this Plan a greater ability assess the location and distribution of vulnerable populations without encroaching upon the privacy of these individuals.

HAZARDOUS MATERIALS

Hazardous material incidents are one of the most common technological threats to public health and are commonly used, transported, and produced in the city of Milford. The transportation infrastructure of Milford consists of Interstate 95 (Connecticut Turnpike), Route 15 (Merritt Parkway), and U.S. Route 1 (Boston Post Road). There are 17 interstate motor freight terminals and 2 truck stops. A commuter bus service is available to New Haven, while Metro North and Amtrak provide rail service. Due to this infrastructure, and particularly due to heavy traffic and large volumes of hazardous materials transported via Interstate 95 and railroad tracks, a "vulnerability band" 2,000-feet wide was established on each side of these travel areas to address a worst-case scenario involving large volumes of extremely hazardous vapors. The following facilities contain chemical hazards on site and are therefore locations where incidents/accidents can occur:

- Beaverbrook Wastewater Treatment Facility, 75 Deerwood Road
- BIC Consumer Products Manufacturing Co., Inc., 500 Bic Road
- CAAP Co., Inc., 152 Pepe's Farm Road
- Flow Polymers, Inc., 950 Bridgeport Avenue
- Housatonic Wastewater Treatment Facility, 1255 Oronoque Road
- Jefferson Smurfit Corporation, 75 Cascade Boulevard
- Northeast Electronic Corporation, 455 Bic Drive
- NRG Devon Station, 700 Naugatuck Avenue
- Olympic Steel, 1 Easter Steel Road
- Schick Wilkinson Sword, 10 Leighton Road
- Southern CT Gas Company, 775 Oronoque Road
- Tech Air, 35 Eastern Steel Road

The following table describes ranks the likelihood of different hazardous materials events occurring and is taken from the DEMHS Region 2 Emergency Support Function (ESF)#10 Plan/Hazardous Materials Mutual Aid Plan (July 2012)

Figure 46: Summary of Hazardous Material Risks

Hazard	Likelihood	Potential Population Impact	Potential Economic Impact
Highway Collisions	High	Medium	High
Rail Transport Mishaps	Medium	High	High
Terrorism	Possible	High	High
Residential Incidents	Medium	Low	Low
Industrial Releases	Medium	Medium	Medium
Air transportation	Low	Low	Medium
Water transport	Low	Low	High
Pipelines	Medium	High	High
Hybrid Energy	Medium	Low	Low
Laboratory Incidents	Medium	Low	Low
Clandestine Labs	Low	Low	Low

Milford Fire Department has hazardous materials technician resources with qualified hazmat technicians. Other Region 2 towns also support the City to provide additional emergency personnel and or equipment to fulfill response obligations as listed in the ESF Plan.

BEDROCK GEOLOGY *(see maps on following pages)*

The beginning of Connecticut bedrock or "ledge" geology is linked to a period of tremendous mountain building that occurred between 500 million and 250 million years ago. This mountain building resulted in a world landscape unlike today's, because a single super-continent called Pangea was formed. This mountain-building activity is apparent in the eastern and western thirds of the state of Connecticut. This super-continent existed for approximately 50 million years, following which it was forced apart during a process called rifting. During rifting, the Atlantic Ocean, as we know it, began to form, splitting North America from Africa and the rest of the present-day continents. Evidence of this rifting is seen in the central third of the state, with its trap rock ridges and red beds. The rifting left the Appalachian Mountains as the western edge of the ever-expanding Atlantic Ocean.

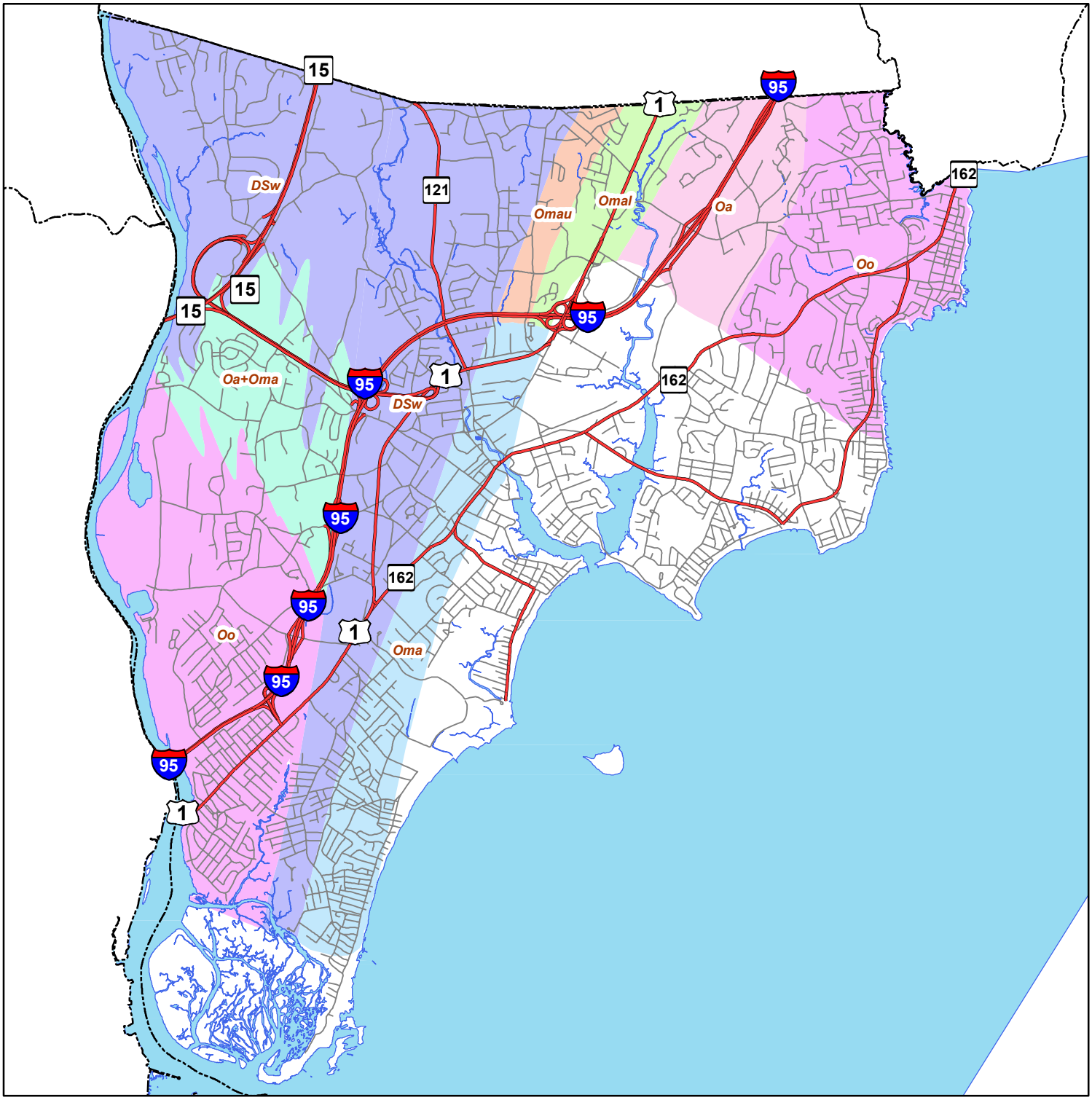
During the last 200 million years, erosion has reduced these once great mountains into the form they exhibit today. The eroded sediments from the Appalachian Mountains were

deposited along the edge of the expanding Atlantic Ocean, forming a seaward thickening wedge of sediment. The landward portion is known as the coastal plain, and the submerged offshore component forms the continental shelf. Most of the City of Milford lies in what is called the Orange-Milford Belt, which is a triangularly-shaped area extending from Milford northeast to about Bethany, due south to West Haven, and then back west to Milford. This belt is comprised of metamorphic gray-green to green phylites, schist, and greenstones formed between 500 and 400 million years ago.

SURFICIAL GEOLOGY

The advance and retreat of glaciers resulting from shifts in world climate is a continuous process throughout the history of the Earth. As the Earth enters a period of cooling, large quantities of water, mostly from the oceans, are frozen into ice. The advancing glacier scrapes the loose material off of ridges and out of valleys, pushing it southward like an overloaded plow. As the climate becomes warmer and the ice melts, streams of water gush from the glacier, depositing boulders, rocks, gravel, sand, and silt.

During the last three million years, major North American glaciation began. Several glacial advances reached Connecticut; these glacial events removed significant amounts of material from the New England landscape. The last, or Wisconsinan, ice advance started in Canada about 85,000 years ago and reached Connecticut about 26,000 years ago. This glacial advance reached its maximum extent about 21,000 years ago, approaching what is now central Long Island and leaving a pile of glacial debris called a terminal moraine. When this Wisconsinan glacier was at its maximum size, sea level was about 300 feet lower than it is today, which resulted in a shoreline 50-70 miles south of Long Island along the continental shelf. By about 10,000 years ago, the ice had completely melted, and the land surface in Milford was much as it is today.



BEDROCK GEOLOGY

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

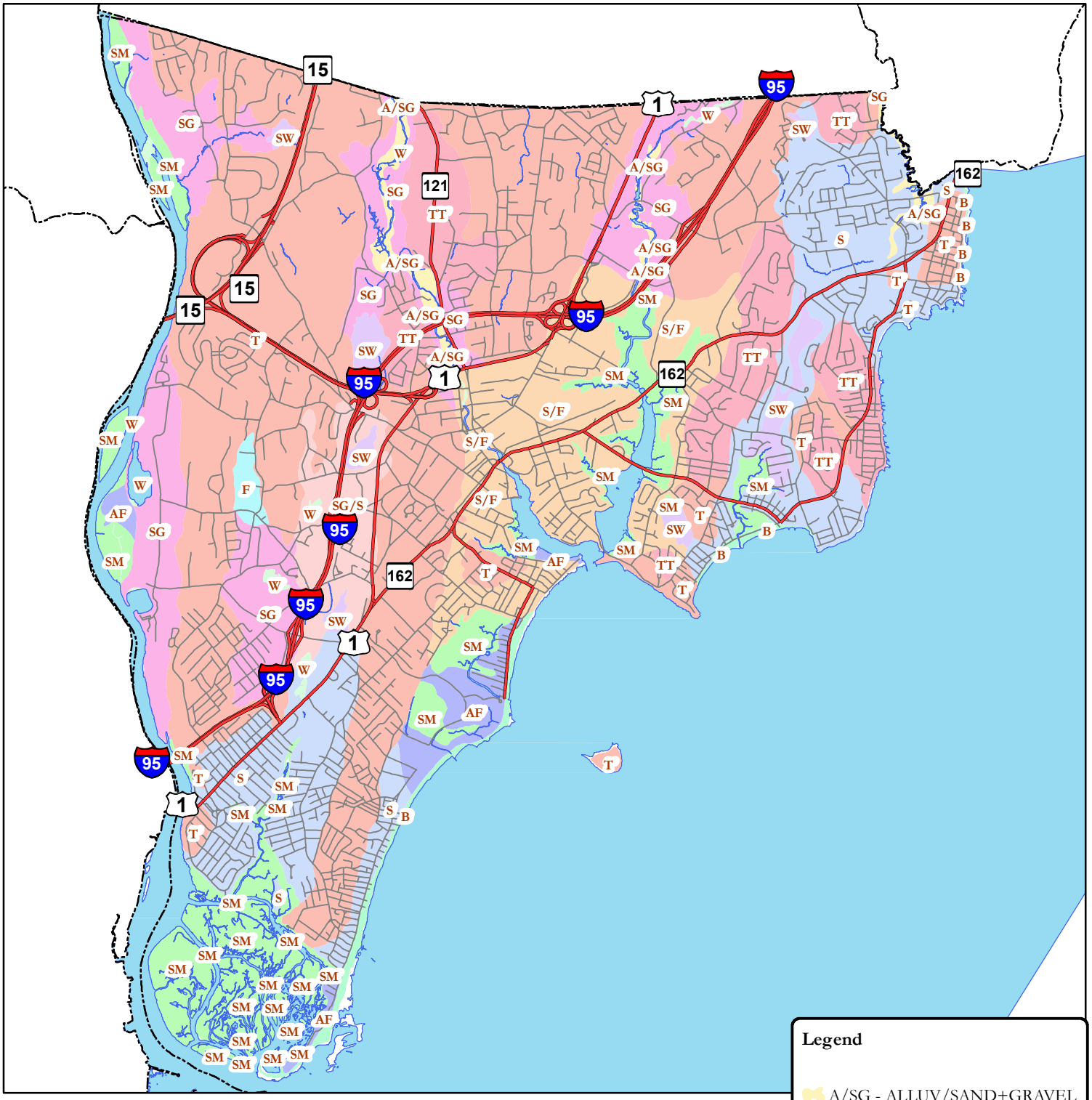
Legend

- DSw - Wepawaug Schist
- Oa - Allingtown Metavolcanics
- Oa+Oma - Allingtown Metavolcanics and Maltby Lakes Metavolcanics undivided
- Oma - Maltby Lakes Metavolcanics
- Omal - Lower part of Maltby Lakes Metavolcanics
- Omau - Upper part of Maltby Lakes Metavolcanics
- Oo - Oronoque Schist

This map was produced from the City of Milford Geographic Information System.
The City expressly disclaims any liability that may result from the use of this map.
This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/14/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_BedrockGeology.mxd

N



SURFICIAL GEOLOGY

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/13/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_SurficialGeology.mxd

Legend

- A/SG - ALLUV/SAND+GRAVEL
- AF - ARTIFICIAL FILL
- B - BEACH
- F - FINES
- S - SAND
- S/F - SAND/FINES
- SG - SAND+GRAVEL
- SG/S - SAND+GRAVEL/SAND
- SM - SALT MARSH
- SW - SWAMP
- T - TILL
- TT - THICK TILL
- W - WATER

The clearest evidence of a glacier's cumbersome trail consists of the grooves and striations that it etches into exposed bedrock as it flows along. These lines are created by rocks embedded in the ice, under the enormous weight of the glacier, which may be hundreds of feet thick. The etched lines tell the direction the glacier was moving. The bedrock outcrops in Milford are riddled with striations trending about S 350 W. The eastern half of the Milford area shows glacial grooves with a southeasterly orientation, suggesting that there were two distinct movements of ice in this area.

A glacier does not just move passively over existing ridges and valleys; it is also capable of reshaping the surface of the land. As the ice moves, it accumulates loose rock and soil and then re-deposits it in different ways. Higher parts of the land are covered by till, an unsorted, disorganized blanket of rock fragments that is plastered to the ground by the base of the glacier as it churns forward. This till is composed of boulders, pebbles, and sand particles that originated from nearby bedrock. The grayish and olive granites, gneisses, and schists from which the till was produced create mildly to strongly acid soils.

Some interesting landforms are created from till, of which one is called a drumlin. Drumlins are streamlined in shape, similar to half a football, that have their long axis defined by the direction the glacier moved. There are several drumlins located in the areas of Foran High School and Eisenhower Park. Notably, Clark Hill Road and North Street traverse the long axis of two of these drumlins.

The glacier acts as a bulldozer; it pushes a vast amount of material at the front of the glacier. When the glacier stops progressing, it begins to melt and retreat, leaving a pile of debris. These piles are called end moraine deposits. Charles Island is a remnant of the Hammonasset-Ledyard-Queens River Moraine Deposit and is comprised of sandy till, sand and gravel, with some areas of dense surface boulders.

The Wepawaug River in Milford was diverted as a consequence of a glacial event. As the glacier on the higher ground to the north and east melted, the Old Wepawaug Valley remained blocked by a persistent chunk of ice. Meltwaters from the north gushing downstream were slowed by this ice body, so that they dropped great quantities of sand and gravel to form a natural dam, diverting the river to its present southerly course. The subsequent melting of the ice in the old Wepawaug channel further added to the deposits of sand and gravel, which reached a total thickness of 50-100 feet. Today, this ancestral valley is marked by a chain of swamps, where depressions or kettles left behind by the melting ice have become filled in by organic deposits. Beginning with Baldwin Swamp near the point of the original diversion, the chain continues southwest with Black Swamp and Bilberry Swamp, and

then with the wetlands along the eastern edge of the Beaver Brook land—Dismal Swamp, Beaver Brook Marsh, and the marsh east of the Beaver Brook Reservoir.

D. Development Trends

Revision statement: The plan was revised to include a section on Development Trends. The City relied on the 2012 Plan of Conservation and Development for this section. Sources for sea level rise data have been added.

The following section is extracted from our current Plan of Conservation and Development:

CURRENT DISTRIBUTION AND LOCATION

The City maintains a diverse industrial and manufacturing sector, which has historically been located within close proximity to the interstate highway system, rail lines, Route 1, and the Housatonic River. Historically, the retail, medical, and civic land uses have been located in Downtown Milford, but have spread and intensified along the Boston Post Road (Route 1) corridor. Smaller and boutique manufacturing industrial areas are also located along Woodmont Road and Old Gate Lane.

To the west, along the Housatonic River, utility generation and distribution facilities serving the region can be found. To the east, a mixture of retail, industrial, and manufacturing can be found in the areas between the Boston Post Road and vicinity of I-95. The majority of the southern portion of the City is made up of older housing stock on smaller parcels within close proximity to Long Island Sound with more urban-like densities, while the northern portion of the City is comprised of more recent housing stock on larger parcels, lower in density with a more suburban feel.

While the population has remained relatively stable over the last 40 years, the expansion and construction of new and more diverse housing stock has continued, providing new housing choices as family sizes have decreased. Opportunities for recreation can be found in our extensive network of parks and open spaces, as well as City and State beaches.

The continued development and intensification of new retail and service sector business along the Boston Post Road and in the center of Milford indicates that the City continues to expand its role as a regional destination for consumer goods and services.

FUTURE LAND USE TRENDS

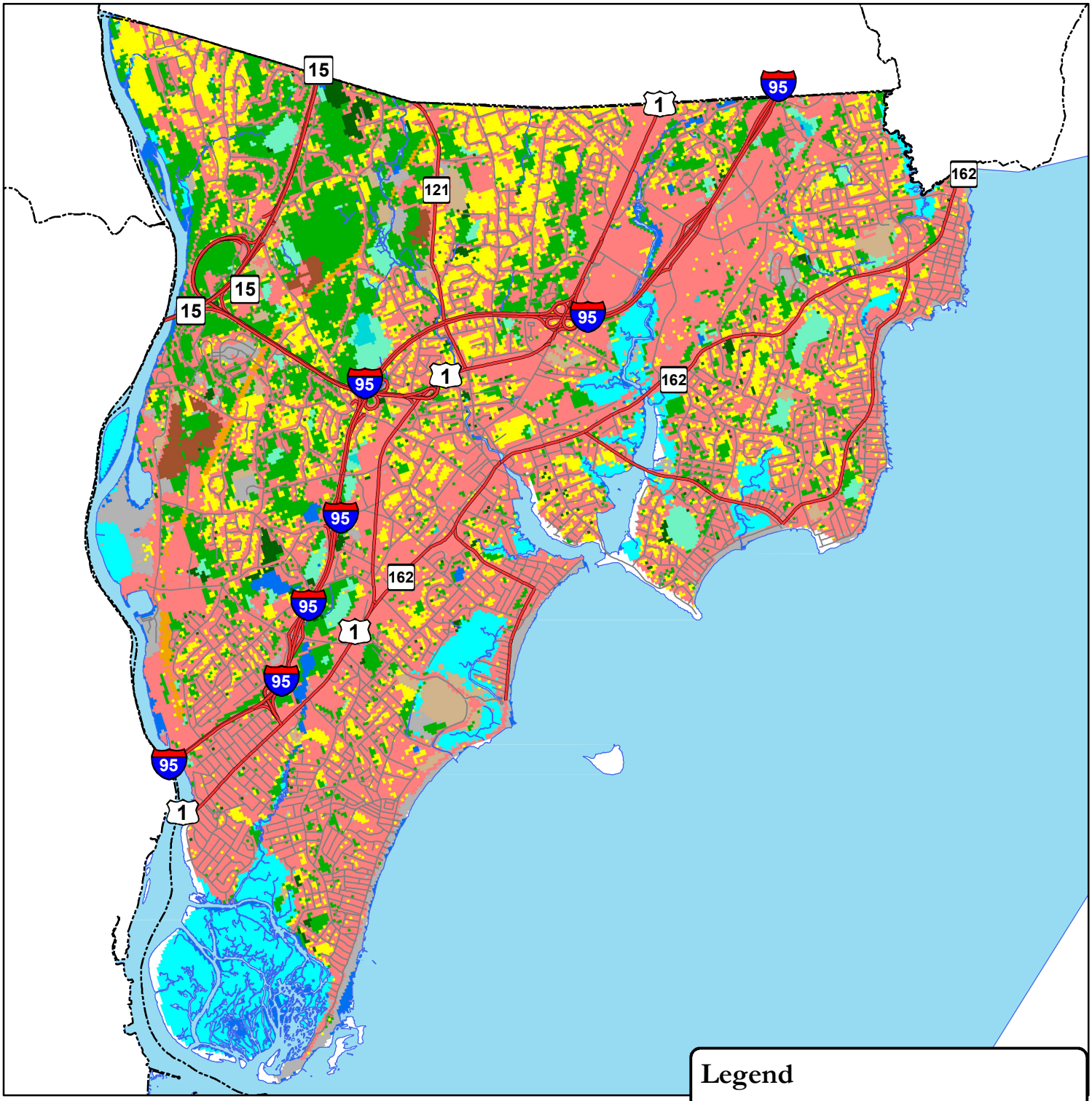
With vacant residentially zoned land availability at a minimum, there will be increased pressure for in-fill development and more intensive development on developed properties with less development constraints. With limited land left for traditional single family home development, the only available areas for expansion (without changing zoning) will be in the Corridor Zones that allow for residential development under specific conditions, and within Milford Center.

The development and redevelopment of commercial properties along the Route 1 corridor will continue, as older less marketable buildings and sites will be replaced with newer more desirable spaces. Continued greening of these sites should occur through conformity to new site plan and environmental standards, which promote improvements in buffering and landscaping. Industrial areas will continue to feel pressure from abutting less intensive land uses such as commercial and residential, but these industrial areas should be preserved since they often house uses that are otherwise impossible to locate elsewhere, are vital to the functioning of the City, and generally provide good municipal tax revenue, while needing minimal city services.

Climate change and a documented historical sea level rise, per sources such as the US Environmental Protection Agency[48], National Oceanic and Atmospheric Administration[49] and the State Department of Energy and Environmental Protection, will have an adverse impact on the future development and viability of the shoreline as a place to locate non-water dependant structures. Recent storm experiences along the Gulf Coast and the Atlantic coastline have federal policy makers, as well as state policy makers, looking at ways to discourage or prohibit future shoreline development while continuing to support water dependant uses.

As has occurred in the past, Mother Nature will, in time, redevelop Milford's shoreline. This redevelopment is occurring through the actual loss of land into Long Island Sound, as well as the destruction of man-made structures. The rate of this redevelopment will increase as sea levels continue to rise, flood zones expand, and more extensive damage occurs from smaller weather events that previously did not damage property. Since the last Hazard Mitigation Plan Update in 2007 patterns in development have remained fairly static, if not slowed due to the sluggish economy. Therefore mitigation strategies remain consistent.

(*See Land Use Map on following page)*



Land Cover (2006 Landsat Data)

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

N

Legend

- Developed
- Turf & Grass
- Other Grasses
- Agriculture
- Deciduous Forest
- Coniferous Forest
- Water
- Non-forested Wetland
- Forested Wetland
- Tidal Wetland
- Barren Land
- Utility ROWs

This map was produced from the City of Milford Geographic Information System. The City expressly disclaims any liability that may result from the use of this map. This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/14/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_LandCover.mxd

IV. MITIGATION STRATEGIES

The following sections provide a brief description of the types of hazard mitigation measures and programs that are currently in place in Milford and those that are potentially available to address the natural hazards that exist in the City.

A. Goals & Policies

Revision statement: The goals and policies of the plan has remained the same and the wording has not been changed. The objective of the plan, to protect life and property, is stated in the Introduction of the plan. The objectives of the prior plan have been addressed in Identification & Analysis of Mitigation Strategies.

The following section provides a brief outline of the goals that have guided the Milford Hazard Mitigation Committee in the development of this plan.

GOALS

- To minimize the risks to life and property from natural hazards in Milford.
- To prevent losses from natural hazards to the extent practical.

POLICIES

- To encourage planning of City services and decision-making so that the risks of natural hazards are considered.
- To guide the expenditure of public funds on a priority basis relative to natural hazard mitigation.
- To give high priority to human safety in the programming of hazard mitigation projects.

B. Identification & Analysis of Mitigation Strategies

Revision statement: In the prior plan, objectives were listed. Below is a table reflecting which of the original eight objectives were completed and which are ongoing, such as applying for grants as they become available. Further objectives, also known as mitigation strategies, have been added to the table.

The objectives indicated in the table below are intended to be ongoing efforts primarily for the Hazard Mitigation Plan Update Committee in continuing its ongoing analysis of mitigation measures necessary, but also for members of the committee relative to their perspective areas of expertise. Most of these are related to on-going studies and analysis necessary to get to the next step of developing appropriate mitigation projects. Ongoing indicates that the objective is implemented on a regular basis and that it will be continued to reviewed for future Plan updates.

Objective	Responsible Department*	Resources*	Timetable
1. To develop an inventory of the existing natural hazards in the City.	HMPC	CDD, CP, GIS, PW, and FD	Completed
2. To develop a list of potential natural hazard mitigation projects based on priorities of the Plan.	HMPC	PW, CE, FD, CDD, and CP	Completed
3. To apply for federal and state funds as they become available to supplement City funds for mitigation purposes.	CDD, Grant Writer, and FD	FEMA and DEEP	As available. Annually.
4. To conduct meetings of the Hazard Mitigation Committee every January and June to review progress on the Plan and determine current priorities and projects	EMD	Local	Annual or as needed.
5. Review City ordinances and regulations to determine methods for improving consistency with HMP goals.	HMPC	P&Z, CAO, FC, PW Director, CE, and CBI	As needed.
6. To identify, notify and provide information to property owners within the 100-year flood plain regarding risks, responsibilities and responses	CDD, P&Z, and FD	City website, brochure, newspaper articles, realtors	As needed during the year

Objective	Responsible Department*	Resources*	Timetable
7. To evaluate the potential for establishing an expanded stream and coastal flood protection structure maintenance program and adopting a maintenance policy to encourage better maintenance of water courses and protection of shoreline structures throughout the City. For further information refer to the City of Milford's Storm Water Management Plan Annual Report	PW, IWA	Consultant, internal controls	One year
8. To develop an implementation plan for the objective of the Milford Hazard Mitigation Plan Update 2013	HMPC	All departments involved	On going
9. To participate and improve the classification in the NFIP/Community Rating System	EMD	FD, FPM, P&Z	Class 9 CRS rating received 9-29-2011. Revisions ongoing.
10. Examine sea level rise scenario data for future mitigation projects and plan updates	FPM	CE, GIS, P&Z	One year
11. Conduct a study to examine the cost, funding opportunities and feasibility of supplying generator back-up power to primary municipal structures, vulnerable pump stations, and vulnerable critical facilities.	MIS, PW, Grant writer	To Be Determined	Within 5 years

Figure 49

List of Acronyms:

CBI: Chief Building Inspector
CE: City Engineer
CDD: Community Development Department
DEEP: State Department of Energy and Environment Protection
DOT: State Department of Transportation
EMD: Emergency Management Director
FEMA: Federal Emergency Management Agency
FC: Fire Chief
FD: Fire Department
FPM: Floodplain Manager
GIS: Geographic Information System Staff
HMPC: Hazard Mitigation Planning Committee
HD: Health Department
IWA: Inland Wetlands Agency
MIS: Management Information Systems
P&Z: Planning & Zoning Division
PD: Police Department
PW: Public Works Department

C. Hazard Mitigation Projects

Revision statement: The projects listed in the previous plan have been updated as shown in the table below with new projects added where identified by the Committee. In the previous plan Appendix B listed the project ranking criteria; in this update those criteria have been integrated into this section. A description of the STAPLEE method and a general description of benefit cost analysis have also been added. Section has been revised to clarify projects from the 2008 plan which have been accomplished and a new table of projects has been added to reflect the Plan Update priorities going forward.

Based on the hazard risk assessment analysis, the Hazard Mitigation Committee has developed a list of several potential hazard mitigation projects recommended to reduce Milford's vulnerability to natural hazards. The point person for public infrastructure project identification has been the City Engineer who can add these projects to the Capital Improvement Plan and prioritize them in consultation with the Public Works Director accordingly. Some of the projects that are indicated as on-going include those that are continuing efforts that occur through the every day interaction with constituents, such as education and continued re-construction and elevation projects. The ongoing projects occur on a continual basis, but will be reviewed and evaluated over the next five years.

The risk assessment matrix below is the foundation for the recommended mitigation projects. The locations identified in the matrix have been prioritized based on the following criteria:

- Historical damage
- Safety of the population
- New development in high risk areas
- Value of property at risk
- Consistency with City goals and objectives

The Hazard Mitigation Planning Committee considers all projects that focus on mitigating losses created by natural or man-made disasters. Priorities are given to projects that demonstrate the use of mitigating techniques in developing or retrofitting areas or structures in order to minimize effects from a catastrophic occurrence. The list below illustrates hazard-mitigation projects that will be maintained as a part of the Local Mitigation Strategy. The list will be scheduled for twice yearly review at a minimum basis during the June and January HMPC meetings.

The following rankings system was developed locally to rank the Hazard Mitigation Projects in this plan. It is based on FEMA's guidance for Hazard Mitigation Planning. Issues that were considered include health risk, structural damage, and access/egress for evacuation, structures that house people with special needs and structures that house a large portion of Milford's population through the following prioritization questions asked.

1. Is the project consistent with the overall Plan of Conservation and Development, Coastal Plan, and Zoning Regulations of the City?
2. Does the project address severe impacts? Projects should reduce loss of life, loss of essential services, damage to critical facilities, or severe economic hardship?
3. Does the project have the greatest potential to reduce future losses in the project area after examining the alternatives available?
4. Is the project cost effective?
5. Is the project in an area with a history of repetitive damage?
6. Does the project provide measures designed to accomplish multi-objectives, including damage reduction, environmental enhancement, and economic recovery?
7. Does the project protect primary residences versus secondary homes and businesses?
8. Are the environmental impacts minimized?
9. Reductions in losses must be natural versus man-made disasters.
10. Does the project have a distinct beginning and end?
11. What is the number of people that are directly benefited by the project?
12. What is the value of the property to be protected by the project?

Using these combined analyses, specific hazard mitigation projects identified by the City of Milford were updated from the 2008 plan. The List of Acronyms is provided in the prior section. Costs are considered low when below $50,000, intermediate between $50,000-$100,000 and high when over $100,000, project priority is based on need and benefit to the community.

Below is the original project list from the 2008 Hazard Mitigation Plan (revised in 2009). For the purposes of this plan update project identification codes have been assigned and status of the project has been updated to reflect current actions. The revision process of this Plan Update has highlighted the need to clarify and update this project table organization.

This project list is followed by a more comprehensive project table that includes projects new to the 2013 Plan Update and shows the status of prior plan projects. Also included in are projects related to hazard mitigation that have been completed by the City under our 2008 and 2013 Capital Improvement Project Plans. From this Plan Update and onward, the new format of the project table will be the matrix going forward. The prior project table will be removed from consideration as any active or current project will have been integrated into the new matrix.

The City of Milford Hazard Mitigation Projects 2008							
Project ID	*Hazard*	*Vulnerable Location/Severity*	*Mitigation Project*	*Priority*	*Responsible Agency*	*Current Status*	*Resource*
F1	Flooding	City Beach Areas/ Very Significant	Identify flood prone properties and develop flood mitigation projects including structural elevation, property acquisition and roadway/storm drain reconstruction	High	CDD, P&Z, PW	Flood prone properties identified, 2013 Project list contains more specific actions. Elevations, acquisitions and reconstruction occurring as needed	Grants, Bonding, City budget
F2	Flooding	Point Beach/ Significant	Upsize culverts Drainage Work Flapper Valve on Point Beach Drive	High	PW	Done	City budget
F3	Flooding	Wepawaug River – Eisenhower Park / Very Significant	The pond will be dredged so it will be smaller and deeper. The dam will be repaired. A berm will be removed and a flood plain area of 4-5 acres will be restored.	Med.	PW and the Park, Beach and Recreation Commission	Project is deisgnedm construction awaiting funding.	Grants, City budget
F4	Flooding	Local Roads and Highways/ Very Significant	Evaluate structural projects	High	PW	Considered standard business practice, specific actions outlined in 2013 plan list	City budget
F5	Flooding	Wepawaug River at Boston Post Road (Route 1)/ Very Significant	Improve hydraulics of bridge to alleviate flooding	Low	PW, DOT	**In the design phase as a state project**	State budget
F6	Flooding	Wepawaug River – North Street	Channel improvement project	High	Private Property project	Project cancelled*	Private funding

F8	Flooding	Silver Sands to Laurel Beach/ Significant	Improve storm drain outfalls.	Med.	PW	Ann St. completed, other areas pending funding	City budget
A1	All Hazards	Town-wide/ Significant	Evaluate the hazard resistant nature of all critical facilities	High	Engineering, BD	Flood, wind and hurricane risks assessed. Schools being updated with roofs and windows.	City budget
A2	All Hazards	Town-wide/ Significant	Maintain emergency personnel training as well as maintaining and updating emergency equipment and response protocols	Med.	FE, PD	This is a preparedness activity and is removed as a mitigation action.	City budget
A3	All Hazards	Town-wide/ Very Significant	Evaluate emergency shelters, update supplies and check communication equipment	Low	Emergency Management Director	This is a preparedness activity and is removed as a mitigation action.	City budget
A4	All Hazards	Town-wide/ Moderate	Distribute or post public information regarding hazards in the city	Low	FD, PD	City website updated as needed, outreach at annual public events, notices posted in Parsons	City budget

Figure 50

*The proposed private development included a large (200+ unit) residential affordable housing project that was approved, but never constructed. The construction of a new Wepawaug River crossing with a larger culvert was a condition of approval for the project. As the project does not appear likely to be developed, this culvert improvement project, located on private property and funded with private dollars, is cancelled.

Going forward, the following table will be used to track the progress of hazard mitigation projects. Please not the following column and field descriptions:

ID: Hazard Mitigation project ID number to be used in subsequent plan updates

Project Name: Identifies project location and/or scope

Project Description: Provides summary detail on project

2008 Index: Ties 2013 Plan Update Projects to 2008 Plan, indicates which projects are new to this plan

Hazard: Identifies which type of hazard project mitigates for

Status:

- Inactive: Project not viable at this time due to lack of resources
- Preliminary – project is in planning stage, depending on available resources
- Pending funding: preliminary stage is complete, funding required to transfer project to active status
- Active/Preliminary: Portions of the project are funded and active, other portions are awaiting a change in status to active.
- Active/Ongoing: Portions of the project are underway , other elements of the project may need to be part of continued maintenance or study
- Active: Project is approved and, under study or in construction phase. Funding has been acquired.
- Complete: project complete, will be removed in next plan update

Time Frame: Anticipated time to bring project to active or completed status

Vulnerable Location/Severity: Identified area of hazard risk and the impact of this hazard to the surrounding community as low, moderate or significant. Complete or Inactive projects not assessed for severity.

- Low: minimal impact on quality of life or risk of damage to personal safety/property. Possible long term effects greater than short term results.
- Moderate: Risk probability is deemed to be higher, impact of project competition likely to alleviate damage to property/safety
- Significant: Risk identified as likely, project determined to protect life and property

Budget/Cost Rating: Estimated cost of the project and a review of the benefit as related to the cost. Low = >$100,00, Moderate = < $100,000 and >$200,000 and High = <$200,000.

TBD refers to costs not being available at this time.

Responsible Agency: Identifies which agency/agencies (as listed under separate table of acronyms) will be responsible for the project

Priority – assessment determined on combination of a project's status, severity of risk, cost and cost benefit review

Resource: funding resources anticipated or acquired for project. TBD indicated funding source has not yet been identified

Comments: additional details as needed

Figure 51

City of Milford Hazard Mitigation Projects

Date: July 25, 2013

ID #1	Project Name			Project Description					
300 KW Fuel Cell-Housatonic WWTP				Provide normal and emergency power supply to sewage treatment plant					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	All Hazards	Inactive	3 years: Dec 2016	Housatonic Flood Zone - Significant	$2,000,000 High	Sewer Comm	Low	Bonds Grant	Project postpned due to size and capacity of required fuel cell does not meet minimum currently available. Subject to future allocation of funds

ID #2	Project Name			Project Description					
Wastewater Facilities Upgrade				Design and construction for upgrades of Housatonic and Beaver Brook Wastewater Treatment Plants andsanitary sewer collection systems. The project has already been financed by an appropriation of the Board of Aldermen					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	All Hazards	Complete	Complete	Housatonic Flood Zone	$64,500,000 High	Sewer Comm	High	Bonds Grant	Construction completed

ID #3	Project Name			Project Description					
Naugatuck/Bridgeport Avenues Drainage				Alleviate flooding along Bridgeport Avenue and Naugatuck Avenue in the Devon Center Area. This will be achieved through a joint city and state project to increase the number of catch basins and t increase the size (capacity) of the drain pipes. Flooding has occured for may years in the Devon center area as far as Church Street.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F1	Flooding	Active	2-3 years: Nov 2015 thru Nov 2016	Naugatuck/ Bridgeport Aves. Devon - Moderate	$4 million High	DPW	High	Bonds Grant	Plans currently under review by the State

ID #4	Project Name			Project Description					
Egan Center Gymnasium Roof				To install a trussed roof with ventilation over the gymnasium portion of the building.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
A1	All Hazards	Inactive	5 years: Sept 2018	Housatonic - Moderate	$160,000 Intermediate	DPW	Low	City Budget	Project postponed due to lack of funding

ID #5	Project Name			Project Description					
Beach Erosion, Drainpipe Replacement, Sand Replenishment				Study and investigate erosion control, repair/replacement of shoreline storm drains and sand replenishment. This amount will be used to fund the study only.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F1	Flooding	Active/On-going	Annual	Shoreline - Moderate	$500,000 High	DPW	High	Bonds	Currently development of design studies are on-going

ID #6	Project Name			Project Description					
Town Dock (High St.} Repair and Renovate				Repair, shore-up and renovate the existing town dock which sits at the end of High Street at the Harbor.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F1	Flooding	Complete	Complete	High St Harbor	$100,000 Intermediate	DPW	High	Bonds	Construction completed

ID #7	Project Name			Project Description					
Eisenhower Park Environmental/Existing Renovations				Environmental reclamation, natural resource improvement, flood plain and water quality improvement, park maintenance and park security. No new facilities or amenities are contemplated					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F3	Flooding	Inactive	5 years: Sept 2108	Eisenhower Park	$380,000 High	Recreation	Low	City Budget	On hold pending funding

ID #8	Project Name			Project Description					
East Shore Middle School				Construction of addition and renovations to East Shore Middle School. Project will include removal of existing windows and replacement with full size insulated windows, roof replacements and various other renovations including intercom and clock systems upgrades.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
A1	All Hazards	Active	2 years: Sept 2014	East Shore MS - Significant	$20,000,000 High	Bd of Ed	High	Bonds Grants	Currently under constructio, completetion anticapated for 2014 school year. Schools are used as primary and secondary emergency shelters.

ID #9	Project Name			Project Description					
Harborside & West Shore Middle Schools Window Replacement				Removal of existing foam panels/windows and replace with full size insulated windows at both schools. This is an ongoing program of replacement of windows at all schools, which is nearing completion.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
A1	All Hazards	Preliminary	3-5 years: Sept 2016 thru Sept 2018	Schools - Moderate	$2,200,000 High	Bd of Ed	High	Bonds Grants	Currently under construction. These schools are used as secondary emergency shelters.

ID #10	Project Name			Project Description					
Live Oaks/Mathewson/JFK/Calf Pen/Harborside/ West Shore Roof Replacement				Roof replacement at various schools					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
A1	All Hazards	Preliminary	3-5 years: Sept 2016 thru Sept 2018	Schools - Moderate	$8,600,000 High	Bd of Ed	High	Bonds Grants	Completed or currently under construction. These schools are secondary emergency shelters.

ID #11	Project Name			Project Description					
West Shore Middle School Addition, Renovation and Upgrades				Construction of addition and renovations to West Shore Middle School. Project includes general alterations and correction of code violations.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
A1	All Hazards	Preliminary	3-5 years: Sept 2016 thru Sept 2018	Schools - Moderate	$8,000,000 High	Bd of Ed	High	Bonds Grants	Construction Completed. This school is used as a secondary emergency shelter.

ID #12	Project Name			Project Description					
Flax Mill Lane Bridge Repair				Rehabilitation and repairs to the deck, piers and abutments to the Flax Mill Lane Bridge over the Wepawaug River.The bridge was constructed in 1935 and has been identified as requiring work to maintain its structural integrity and aesthetic charm.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	5 years: Dec 2018	Flax Mill Ln Wepawaug River - Low	$500,000 High	DPW	Medium	Bonds	Design drawings submitted to State for review and approval

ID #13	Project Name			Project Description					
Tumble Brook Flood Control Study				Commission study to control flooding along Tumble Brook which flows approximately 3,000 lf. from the Orange town line to Route 1 (Boston Post Road). Watershed encompasses over 500 acres of densely developed and populated area. Flooding occurs in heavy rains affecting many homes and flooding on Route 1.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Inactive	5+ years: Dec 2018	Route 1 Orange town line - Moderate	$35,000 Low	DPW	Medium	City Budget	Project on hold due to lack of funding

ID #14	Project Name			Project Description					
Wepawaug River Pond Dredging/Dam and shore Rehabilitation				Dredge Wepawaug River Ponds (Eisenhower Park, North St. (upper) Duck Pond, City Hall (lower) Duck Pond, and Prospect Street Pond). Repair dams and shore walls. The ponds have been filled with silt and debris which threatens wildlife and habitats. Dredging, dam and shore repair has not been done in several decades.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F6	High	Active	1 year: Aug 2014	Wepawaug River - Moderate	$1,100,000 High	DPW	High	City Budget	Study complete and committee has been formed subject to funding, project will proceed

ID #15	Project Name			Project Description					
Study-Shoreline Beach Erosion, Drainpipe Replacement Sand Replenishment				Milford has approximately 17 miles of coastline. Many low lying shoreline neighborhoods are prone to flooding and shoreline erosion. Many drainpipes are decades old and should be repaired or replaced and possibly fitted with "fishmouth or "flapper" valves.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active/On-going	1-3 years: Aug 2014 thru Aug 2016	Shoreline - Significant	$500,000 High	DPW	High	Bonds Grants	Study has been authorized and received, Phased construction is under separately entered project(s)

ID #16	Project Name			Project Description					
Silver Beach area				Sand Replenishment					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active/On-going	3-5 years: Sept 2016 thru Sept 2108	Silver Beach & Silver Sands Significant	TBD	DPW/Army Corps	High	Federal funding	New project resulting from Sandy and Irene storm damage. Work being done in cooperation with the Army Corps of Engineers.

ID #17	Project Name			Project Description					
Silver Sands State Park				rebuilding training walls and flood gate to alter erosion patterns					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F7	Flooding	Active	4-5 years: Nov 2107 thru Nov 2018	Silver Sands Significant	TBD	DEEP	Medium	State funds	Project is approved by State for funding, and is submitted to bonding for funding - design pending

ID #18	Project Name			Project Description					
Gulf Beach				Gulf Beach-sand replenishment.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	Seasonal, annual	Gulf Beach Significant	$20,000 Low	DPW	High	City budget	Gulf Beach sand replenishment

ID #19	Project Name			Project Description					
Milford Harbor				(Federal Channel) dredging project					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Pending funding	5 years: Nov 2018	Harbor - Significant	$200,000 Medium	DPW	Low	City budget State and Federal funds	

ID #20	Project Name			Project Description					
Melba Street and Calf Pen Meadow Creek				Melba Street area was impacted by rain and wave action from Long Island Sound, but also by the Calf Pen Meadow Creek overflowing. Mitigation efforts would include cleaning the silt and debris out of the creek, allowing the water to flow into Long Island Sound.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	1 year: Aug 2014	Melba Street and LIS - Significant	$200,000 Medium	DPW	High	NRCS	Being designed by the Natural Resource Conservation Service

ID #21	Project Name			Project Description					
South Street/Hillside Avenue				The revetment at South Street/Hillside Avenue was damaged during the storm and a FEMA rebuilding project has been proposed for funding.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	2 years: Aug 2015	South St & Hillside Ave - Significant	$150,000 Medium	DPW	High	City Budget Federal Grant	Identified elligible for 75% funding by FEMA and 25% City - New project resulting from Sandy and Irene storm damage

ID #22	Project Name			Project Description					
Wildemere Beach				Sand Replenishment					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active Preliminary	3-5 years: Nov 2016 thru Nov 2018	Shoreline - Moderate	TBD	DPW/Army Corps	High	Federal funds	New project resulting from Sandy and Irene. Storm damage work in cooperation with the Army Corps of Engineers.

ID #23	Project Name			Project Description					
Gulf Street bluff				The natural earth bluff was eroded by the storm. If it continues to erode, it will expose the underground utilities and endanger the asphalt road.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Nov 2016 thru Nov 2018	Shoreline - Significant	$3,000,000 High	DPW	High	City Budget Grant Funding	Pending approval of funding

ID #24	Project Name			Project Description					
Lisman Landing				Post Sandy reconstruction and repair of Lisman Landing, elevation of utilities.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Complete	Complete	Lisman Landing	$90,521 Intermediate	DPW	High	City Budget	Construction completed

ID #25	Project Name			Project Description					
Helwig St. Sewer Damage				Replacement of the Helwig St. manhole pump outside of the Flotilla Bldg.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	1 year: Sept 2014	Helwig St - Moderate	$20,000 Low	DPW	Low	City Budget and Federal funds	Identified as eligible for 75% FEMA funding, 25% City funding. Awaiting FEMA disbursement

ID #26	Project Name			Project Description					
Develop a flood audit program (appendix A)				Develop a flood audit program townwide. Assessor currently evaluating neighborhoods for flood risk.					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Oct 2016 thru Oct 2108	Townwide - Moderate	TBD	CDD	Medium	Grant	With changes in NFIP flood risk, a flood program needs to be re-evaluated

ID #27	Project Name			Project Description					
Bayview Beach drainage design				Engineering design project to improve storm drainage system and outfalls to alleviate flooding					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Oct 2016 thru Oct 2018	Bayview Beach - Significant	$500,000 High	DPW	Medium	City Budget Grants	

ID #28	Project Name			Project Description					
Creeland Avenue drainage design				Engineering design project to improve storm drainage system to alleviate flooding from city street onto private property					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Nov 2016 thru Nov 2018	Creeland Avenue - Low	$100,000 Intermediate	DPW	Low	City Budget Grants	

ID #29	Project Name			Project Description					
Beachland Avenue elevate road				Elevate roadways at Beachland Ave to alleviate flooding					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Nov 2016 thru Nov 2108	Beachland Avenue - Medium	$1,000,000 High	DPW	Medium	City Budget Grants	Elevation of some private property area may be required

ID #30	Project Name			Project Description					
Townwide Flood zone warning system upgrade				Flood gauge and flood warning system upgrades townwide					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	3-5 years: Nov 2016 thru Nov 2018	Flood Zones Townwide - Significant	TBD	Fire	Medium	Grant funding	Project dependant on receiving grant funding

ID #31	Project Name			Project Description					
City Beach/Shoreline Mitigation Projects				Identify flood prone properties and develop flood mitigation projects including structural elevation, property acquisition and roadway/storm drain reconstruction					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F1	Flooding	Active/On-going	3-4 years: Dec 2016 thru Dec 2017	City Beach Areas - Significant	TBD	CDD/DPW	High	Grant/ DPW	Includes construction which is under separately entered project(s). Some grants may require private funding match.

ID #32	Project Name			Project Description					
Great Creek				sediment removal in Great Creek					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
F7	Flooding	Complete	Complete	Great Creek near Silver Sands - Moderate	State Funding	DEEP	Medium	State Funds	
ID #33	**Project Name**			**Project Description**					
Morrningside Dr Pump Station				Repair of Morningside Dr pump station and flood mitigation improvements					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	Flooding	Active	1 year: Sept 2014	Morningside Dr - Moderate	$20,000 Low	DPW	Medium	City Budget and Federal Funds	Identified as eligible for 75% FEMA funding, 25% City funding. Awaiting FEMA disbursement
ID #34	**Project Name**			**Project Description**					
Generator Feasibility Study				City needs to investigate the viability of incorporating generator power to City facilties					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	All Hazrds	Preliminary	5 years: Aug 2018	Citywide - Moderate	TBD	CDD	Medium	TDB	
ID #35	**Project Name**			**Project Description**					
IT Infrastructure				Where appropriate and when available the City needs to upgrade IT, mapping and communications infrastructure and capabilities to mitigate and assess hazard risks and perform public outreach					
2008 Index	**Hazard**	**Status**	**Time Frame**	**Vulnerable Location and Severity**	**Budget Cost Rating**	**Responsible Agency**	**Priority**	**Resource**	**Comments**
New	All Hazrds	Active	5 years: Aug 2018	Citywide - Moderate	TBD	TBD	Medium	TDB	

STAPLEE METHOD

To prioritize the recommended public infrastructure mitigation projects, Milford's City Engineer, Director of Community Development, and Floodplain Manager reviewed the proposed projects to determine how effective each measure will be in reducing or preventing damage. A set of criteria commonly used by public administration officials and planners was applied to each proposed strategy. The method, called STAPLEE, is outlined in FEMA planning documents such as Developing the Mitigation Plan (FEMA 386-3) and Using Benefit- Cost Review in Mitigation Planning (FEMA 386-5). STAPLEE stands for the "Social, Technical, Administrative, Political, Legal, Economic, and Environmental" criteria for making planning decisions as shown by the categories below. The STAPLEE method was not used in the previous HMP but was selected as a tool to add as part of the update process for the public infrastructure projects only.

Benefit-cost review was emphasized in the prioritization process. Criteria were divided into potential benefits (pros) and potential costs (cons) for each mitigation strategy. The following questions were asked about the proposed mitigation strategies:

Social:

- Benefits: Is the proposed strategy socially acceptable to Milford?
- Costs: Are there any equity issues involved that would mean that one segment of Milford could be treated unfairly? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower-income people? Is the action compatible with present and future community values?

Technical:

- Benefits: Will the proposed strategy work? Will it reduce losses in the long term with minimal secondary impacts?
- Costs: Is the action technically feasible? Will it create more problems than it will solve? Does it solve the problem or only a symptom?

Administrative:

- Benefits: Does the project make it easier for the community to administer future mitigation or emergency response actions?
- Costs: Does Milford have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained? Can the City perform the necessary maintenance? Can the project be accomplished in a timely manner?

Political:

- Benefits: Is the strategy politically beneficial? Is there public support both to implement and maintain the project? Is there a local champion willing to see the project to completion? Can the mitigation objectives be accomplished at the lowest cost to the community (grants, etc.)?
- Costs: Have political leaders participated in the planning process? Do project stakeholders support the project enough to ensure success? Have the stakeholders been offered the opportunity to participate in the planning process?

Legal:

- Benefits: Is there a technical, scientific, or legal basis for the mitigation action? Are the proper laws, ordinances, and resolutions in place to implement the action?
- Costs: Does Milford have the authority to implement the proposed action? Are there any potential legal consequences? Will the community be liable for the actions or support of actions, or for lack of action? Is the action likely to be challenged by stakeholders who may be negatively affected?

Economic:

- Benefits: Are there currently sources of funds that can be used to implement the action? What benefits will the action provide? Does the action contribute to community goals, such as capital improvements or economic development?
- Costs: Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? What proposed actions should be considered but be tabled for implementation until outside sources of funding are available?

Environmental:

- Benefits: Will this action beneficially affect the environment (land, water, endangered species)?
- Costs: Will this action comply with local, state, and federal environmental laws and regulations? Is the action consistent with community environmental goals?

Each proposed mitigation strategy presented in this plan was evaluated and quantitatively assigned a "benefit" score and a "cost" score for each of the seven STAPLEE criteria, as outlined below:

- For potential benefits, a score of "1" was assigned if the project will have a beneficial effect for that particular criterion or a "0" if the project would have a negligible effect or if the questions were not applicable to the strategy.
- For potential costs, a score of "-1" was assigned if the project would have an unfavorable impact for that particular criterion or a "0" if the project would have a negligible impact or if the questions were not applicable to the strategy.

- Technical and economic criteria were double weighted (x2) in the final sum of scores.
- The total benefit score and cost score for each mitigation strategy were summed to determine each strategy's final STAPLEE score.

The worksheets for the STAPLEE analysis can be found in Appendix M. The following table shows a selection of mitigation projects. Not all current projects in this Plan Update have been evaluated. Analysis shall be conducted for the full range of projects in the next plan update.

***Figure 52*: STAPLEE Evaluation of Municipal Mitigation Projects**

Municipal Mitigation Project	STAPLEE Score	Project Priority Ranking
Naugatuck Avenue	7	High
Bayview Beach	5	High
Flood Gauges	5	High
Tumblebrook	4	Medium
Animal Shelter	4	Medium
Silver Sands	3	Medium
Generators	2	Medium
Beachland/Melba	1	Low
Creeland	-2	Low

The highest scoring is determined to be of more importance economically, socially, environmentally, and politically and, hence, prioritized over those with lower scoring. In addition, structural projects were also evaluated qualitatively. The STAPLEE scores should be evaluated on a regular basis as social and political ranking may change over time.

BENEFIT-COST RATIO

Although a community may implement recommendations as prioritized by the STAPLEE method, an additional consideration is important for those recommendations that may be funded under the FEMA mitigation grant programs. To receive federal funding, the mitigation action must have a benefit-cost ratio (BCR) that exceeds one. Calculation of the BCR is conducted using FEMA's Benefit Cost Analysis (BCA) toolkit. The calculation may be complex, varying with the mitigation action of interest, and is dependent on detailed information such as property value appraisals, design and construction costs for structural projects, and tabulations of previous damages or NFIP claims.

It is beyond the scope of this plan to develop precise BCRs for each recommendation, however, the likelihood of receiving funding for each mitigation projects such as elevations are understood to be high, particularly where damage is repetitive and existing grades are significantly below the Base Flood Elevation (BFE) as discussed in the Repetitive Loss Properties and National Flood Insurance Program section of this plan. When pursuing grants for selected projects, this information can be used to help select the projects that have the greatest chance of successfully navigating through the application review process.

The Hazard Mitigation Planning Committee understands that any project that would qualify for FEMA's Hazard Mitigation Grant Program that the cost effectiveness of projects establishes the priority of the project. Therefore it is important to identify projects that are the most cost effective. Over the economic life of the project, the total benefits must exceed the cost of the project. For Milford's Repetitive Loss properties and Severe Repetitive Loss properties in particular, the benefit of mitigation projects generally demonstrate that the costs are warranted given the repeated and high cost of damage to these structures should they remain at high risk.

D. Property Protection

Revision statement: In the previous plan, Property Protection was identified as a Flood Hazard Mitigation Measure (Chapter III section B). Property protection is necessary for all hazards and as such has been identified as mitigation strategy of its own. The section in its entirety has been moved below.

Property protection measures can address hazards for a single structure or can include multiple structures. Such projects as flood-proofing, building elevation, property acquisition and utility modification all fall under the broad category of property protection. Milford is currently utilizing property elevation as a hazard mitigation tool in a number of coastal areas that are subject to repetitive flooding.

The following list identifies common property protection measures:

- Relocation
- Acquisition
- Building Elevation
- Utility Protection
- Flood Proofing
- Floodgates

E. Structural Projects

Revision statement: In the previous plan, Structural Projects were identified as a Flood Hazard Mitigation Measure (Chapter III section E). That section in its entirety has been moved below.

Structural projects include utilization of the flood control strategies that have been and continue to be applied in Milford. Successful projects in the coastal flood hazard areas have included construction of revetments and beach nourishment projects. Many potential structural projects have not been pursued to date, however, because it is questionable whether or not an acceptable cost-benefit ratio exists for the projects. The potential environmental impact of structural projects is often also a concern. The Hazard Mitigation Committee identified the need for a more formalized maintenance and repair program for existing flood control structures.

Structural Projects that can be included in a hazard mitigation plan include the following:

- Levees/Floodwalls
- Flood Gates and Flood Gauges
- Diversions
- Channel Modifications
- Storm Sewer Improvements
- Structural Project Maintenance and Repair

F. Natural Resource Protection

Revision statement: In the previous plan, Natural Resource Protection was identified as a Flood Hazard Mitigation strategy (Chapter III section C). Natural Resource Protection is necessary for all hazards and as such has been identified as mitigation strategy of its own. This section has been updated to include further details on a newly created Open Space and Natural Resource Agent office in the City, wetlands protection, and erosion and sediment control regulation.

Natural resource protection is a category which is actively being applied in Milford. This category includes many programs similar to those included in the prevention section. New to the City of Milford is an Open Space and Natural Resources Agent position as of 2013. Future

plan updates will include representation from this agency.

WETLANDS PROTECTION

The Milford Inland Wetland Agency (MIWA) review for permit all work proposed in wetlands and watercourses and any work within 100' of a wetland or watercourse in the Housatonic River, Indian River and South Central Shoreline Watersheds (see map page 105) and all work proposed within 150' of wetlands and watercourses in the Wepawaug and upper Beaver Brook Watersheds. The Inland Wetland Compliance Officer inspects active construction projects as well as complaints, issuing enforcement notices to uphold the local IWA Regulations and State Statutes.

EROSION AND SEDIMENT CONTROL REGULATION

The Milford Inland Wetland Agency requires erosion controls on all IWA approved projects. Applicants are required to show erosion controls in conformance with the Connecticut Department of Energy and Environmental Protection (DEEP) manual entitled "2002 CT Erosion & Sedimentation Control Guidelines"[50] on their site plans. The Agency requires erosion and sedimentation control inspections and reporting for active construction projects weekly and within 48 hours of a significant precipitation event. The MIWA does not review or inspect erosion and sedimentation controls on projects that do not require an Inland Wetland Permit.

Natural Resource protection project can include things such as:

- Beach nourishment
- Dune development
- Inland Wetlands Restoration
- Riverine Silt Removal/Dredging
- Tidal Wetlands Restoration

G. Prevention

Revision statement: In the previous plan, Prevention was identified as a Flood Hazard Mitigation strategy (Chapter III Section A). Prevention is necessary for all hazards and as such has been identified as mitigation strategy of its own. Section has been revised to include updates tot eh Connecticut State Building Code. Detail on the National Flood Insurance Program has been added to this section. References have been added for the

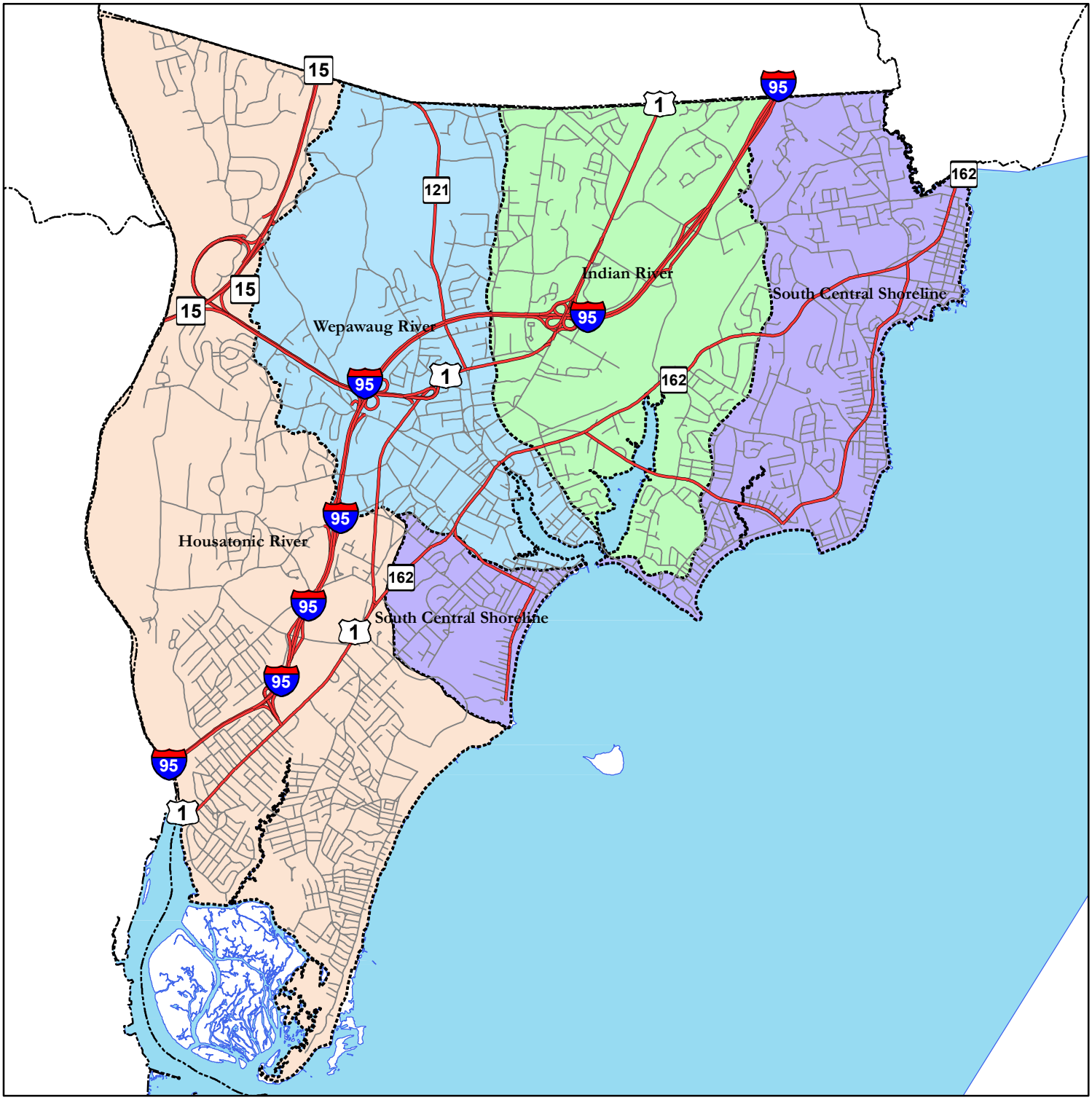
City of Milford Planning and Zoning Board's adoption of the new DFRIM maps for construction purposes.

Hazard prevention includes identification of risks and the use of land-use regulatory and other available management tools to prevent future damage. The City of Milford has comprehensive planning and zoning tools in place that incorporate floodplain management. The City's planning and zoning regulations, inland wetlands and watercourses regulations, harbor management regulations and the Building Inspection Division's enforcement of the Connecticut State Building Code (Adopted 2005 with 2009 & 2011 Amendments) are all important existing regulatory mechanisms that address hazard prevention.

Other mechanisms that could be utilized and should be considered in coordination with other planning programs such as the revision of the comprehensive Plan of Conservation and Development and include strengthening existing programs in the following areas:

- Planning and Zoning
- Open Space Preservation
- Floodplain Management Regulations
- Storm water Management

Hazard prevention includes identification of risks, impacts, and the use of land-use regulations and other available management tools to prevent future damage. These tools are utilized on an on-going basis within the City for new development and redevelopment to strengthen Hazard Mitigation.



Subregional Watersheds

MILFORD NATURAL HAZARD MITIGATION PLAN

MILFORD, CONNECTICUT

0 2,500 5,000 10,000 15,000 Feet

1 inch = 5,000 feet

Legend

SUBREGION

- Housatonic River
- Indian River
- South Central Shoreline
- Wepawaug River

This map was produced from the City of Milford Geographic Information System.
The City expressly disclaims any liability that may result from the use of this map.
This map is not a survey and is subject to any changes an actual land survey discloses.

City of Milford, CT - MIS Department
Date: 8/13/2012
Path: \\Mgis\GIS\Projects\HazardMitigationPlan\Projects\Natural Hazard Mitigation Plan_SubregionalWatershe.mxd

NATIONAL FLOOD INSURANCE PROGRAM

The City of Milford participates in the National Flood Insurance Program (NFIP). As part of the program, the City has adopted Flood Hazard and Flood Damage Prevention regulations within its Zoning Regulations to both recommend better site planning and require construction that can withstand flood conditions.

The City of Milford joined the NFIP in 1978. There are 2,758 properties insured in Milford with nearly $577,869,900.00 worth of property covered. More than $30,287,112.00 in losses has been paid by the NFIP for 1,740 claims since 1978. (This does not fully incorporate damages due to Storm Irene in 2011 and Sandy in 2012 which is estimated to be approximately $36 million combined based on Substantial Damage Estimates completed.) Milford's first flood map was adopted in 1978 with the last map updates adopted in December 2010 with the Map Modernization Project.

FEMA has released new draft Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Studies (FIS) for all of coastal Connecticut, including Milford, to reflect the increased risk of flooding to these areas based on increased development in inland watersheds and changes to coastal topography. This DFIRM update includes the following impacts for coastal Milford:

- No parcels mapped out of high-risk area
- 790+/- parcels mapped into high risk area
- 2,600+/- parcels remain in high-risk area – most with an elevation increase
- Only 13 parcels in the Coastal Study remain in moderate- to low-risk areas

Milford's Planning & Zoning Board adopted the new flood maps which went into effect for permitting and construction purposes at the end of March 2013[51]. The new flood maps are anticipated to go into effect for insurance purposes on July 8, 2013. The updated maps help Milford educate its residents how to better mitigate and prepare for flooding events.

H. Mapping Risk Scenarios

Revision Statement: The use and prevalence of GIS in the City of Milford has been greatly expanded upon since the prior plan. This section has been added to the plan to describe the GIS capabilities of Milford's staff and to provide insight on how GIS was used in this plan for mitigation planning, risk, and hazard impact analysis.

Mapping Milford's risks is one of the critical tools necessary to mitigate, prepare, and respond to natural hazards. Geographic Information Systems (GIS) technology aids in all level of disaster and emergency management but has a vital role in mitigation.

The City of Milford has hundreds of thousands of mapped features available. We have over 20,000 parcels, 284 miles of roads, approximately 27,000 structures and 236 miles of sewer pipes cataloged, inventoried and mapped. The City has acquired numerous state and federal data sources including elevation data, Census/American Community Survey demographics, FEMA flood zone boundaries, storm surge scenarios and aerial photography to augment our data development activities.

Our GIS system was used to identify and notify our residents of impending FEMA map changes. Parcel-level maps were created to illustrate to each resident the changes in flood zone status specific to their property. The GIS also contains the critical infrastructure inventory, hydrology, geology, dam information, watershed and other data sets used to develop hazard mitigation steps outlined in this plan. Our data is also used to create our remediation projects. With this data available, decision makers can assess current and impending natural hazards and tailor response to the unique topographic or demographic characteristics for site-specific or city-wide events.

The City's GIS professionals have identified that they could do more risk analysis with some additional mapping software. The Network Analyst extension would allow the City of Milford to further leverage our data. We have many data networks in place that we are limited in our capability to analyze. With Network Analyst we could model sewer disruptions, determine safe walking routes to schools, fire hydrant service, routing of vehicles and re-routing based on obstacles. Purchasing this software extension is a long-term goal requiring funding that is not currently available.

I. Public Information

Revision statement: In the previous plan, Public Information was identified as a Flood Hazard Mitigation strategy (Chapter III section F). Public Information is necessary for all hazards and as such has been identified as mitigation strategy of its own. This section has been updated to include information on updated NFIP flood hazard determinations.

Public Information is another type of hazard mitigation measure which, like prevention and resource protection, can be most effectively implemented in conjunction with other hazard mitigation projects.

The Hazard Mitigation Committee has identified the need for a continued and expanded program of public information. Such a program includes providing educational information to the homeowners and business owners in the flood hazard areas. A public education and information component should be included in all hazard mitigation projects undertaken by the City of Milford.

Milford's Planning and Zoning (P&Z) Office has been most proactive with the proposed NFIP flood hazard determinations. The P&Z Office has answered hundreds of questions regarding the new maps and held two public information sessions in April 25th and 26th 2012. On a day-to-day basis this office offers information to homeowners in flood plain areas regarding flood risks, flood mapping, insurance information. Most recently this includes new information about the Biggert-Waters Flood Insurance Reform to the NFIP and the insurance implications related to that. The P&Z office relies heavily on FEMA produced talking points and brochures to provide this information to the general public.

Referrals are made to FEMA's website (www.floodsmart.gov) for additional information as well as to obtain flood maps from FEMA's Map Service Center. In addition, the City has provided links to these web pages through its own local website.

The following list includes some types of Public Information measures in order to educate Milford's residents about hazards, risks, impacts, and mitigation measures:

- NFIP Flood Map Information
- Real Estate Disclosure
- Library
- Technical Assistance
- Insurance Information
- Environmental Education
- Milford Public Access Television Outreach

J. Emergency Services

Revision statement: In the previous plan, Emergency Services was identified as a Flood Hazard Mitigation strategy (Chapter III section D). Emergency Services are necessary for all hazards and as such has been identified as mitigation strategy of its own. This section has been expanded upon to include descriptions of various alerting systems and programs, references to the local electricity utility, emergency communications and updated weather services used by the City's first responders.

Emergency Services hazard mitigation measures can potentially be combined with other types of measures to form successful projects, or remain as stand-alone projects. Emergency communications is a critical aspect of the hazard response programs currently in place in Milford. The Public Safety Answering Point (PSAP-911) is the central dispatch office for the Milford Fire Department and Milford Police Department located at Police Headquarters. The Police Department also houses the Milford Flood Warning System base station and manages and implements the City's flood warning notification program.

In the event of an emergency the Mayor generally establishes an Emergency Operations Center (EOC) and mobilizes the major response agencies in the City. This procedure ensures effective communication between response agencies and the efficient utilization of resources in emergency response.

In the event of a power failure in the City there are procedures in place to transport the City's most critical IT systems (financial/payroll) to the police department where generator power is available. It is recommended by the Committee that a study be conducted to determine the cost, funding opportunities and feasibility of supplying back-up generator capabilities to all or part of the Parson's Government Complex. In the event of a long-term power outage a generator would allow the City to maintain the functions of government and communication capabilities of non-emergency personnel.

The major utilities that provide service to the City follow similar procedures. The United Illuminating Company (UI) and the Regional Water Authority have emergency operations centers that become operational in the event of any emergency that could impact the utilities. In preparation of this plan, the UI participated in one of the HMPC meetings to provide input on the plan.

The interagency communications between the City and these independent utilities requires continued coordination to assure the critical communications link between the City operations and the utilities is effectively maintained. The need for this coordination was identified by the

Hazard Mitigation Committee. Aspects of emergency services hazard mitigation include the following:

EMERGENCY COMMUNICATION

Everbridge Notification

Everbridge is a company that provides internet-accessible mass notification services. Everbridge subscriptions can be designed for almost any organization or application.

CT Alerts

In 2010, the State of Connecticut began using Everbridge. It is referred to as CT ALERTS[52]. It utilizes the state 911 database. Cities and towns within the state may access CT ALERTS to send emergency notifications within their communities. Its mapping capabilities provide for multijurisdictional use. For example; this system can be used to notify people living/working within the evacuation radius of an incident, regardless of the city or town in which they are located. The state 911 database is protected by state statute and access to it is reserved for emergencies only. Emergency messages can also be posted on the State website.

Milford Alerts

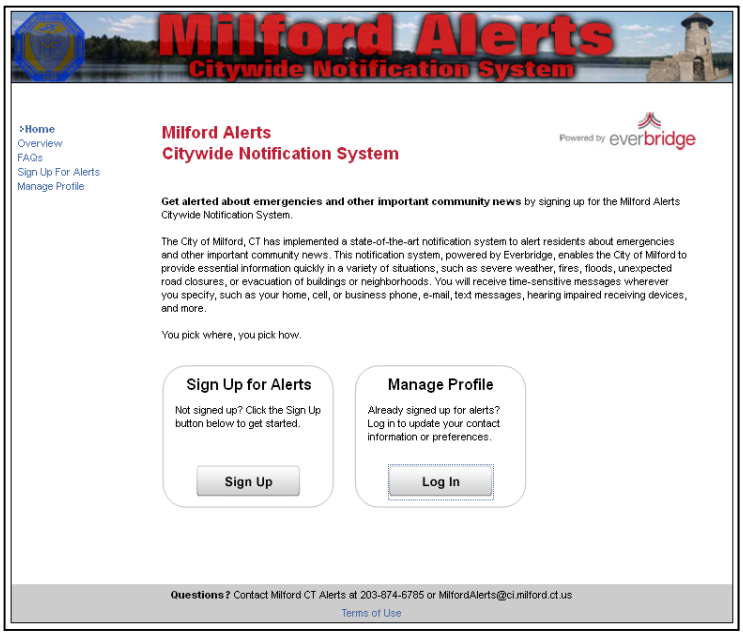


Figure 54 *Milford Alerts Sign up page*

The City of Milford has purchased its own Everbridge subscription. It is called "Milford Alerts", and replaced an older system we knew as "Code Red". This is where the versatility of the Everbridge system is most demonstrated. In addition to emergency messages, residents can be notified of severe weather alerts, road closures, localized coastal flood warnings, crime advisories and community events.

The database used for Milford Alerts is built from a combination of the telephone directory "white pages" and voluntary enrollment in the system. Enrollment is done with paper forms and can also be

done on the City website. All residents who sign up will receive emergency notifications. They can also choose to be notified about other events simply by using check boxes. Residents can add their cell phone numbers and e-mail addresses to the database. When a message is sent, Everbridge will continue sending that message to all listed communication pathways until the resident verifies receipt. The system can identify residents who have special needs such as hearing, vision, or speech impairment, people with in-home medical devices that will not operate during power outages, and people who are mobility impaired. This information can be used to establish priority lists for power restoration and emergency response tactics.

The City's website is another source of emergency information. An "ALERT" banner appears on the main page of the website that will notify residents of severe weather events or other emergencies. Efforts to increase enrollment for Everbridge notifications are being made in the form of mass mailings, public education and enrollment at community events. This system is also used to notify employees of city departments when extra personnel are needed for emergencies. During such a time, when on-duty personnel may become overwhelmed, the system will make hundreds of phone calls notifying off-duty personnel to respond. Recipients can be further broken down into groups by department, specially trained teams, medical personnel etc.

Early Warning System

Along the shoreline of Milford there are six pole-mounted early-warning sirens equipped with large multi-directional loudspeakers. These are also controlled from the PSAP at Police Headquarters. Milford's shoreline communities, particularly on the East and West ends of the City, are susceptible to even minor flooding.

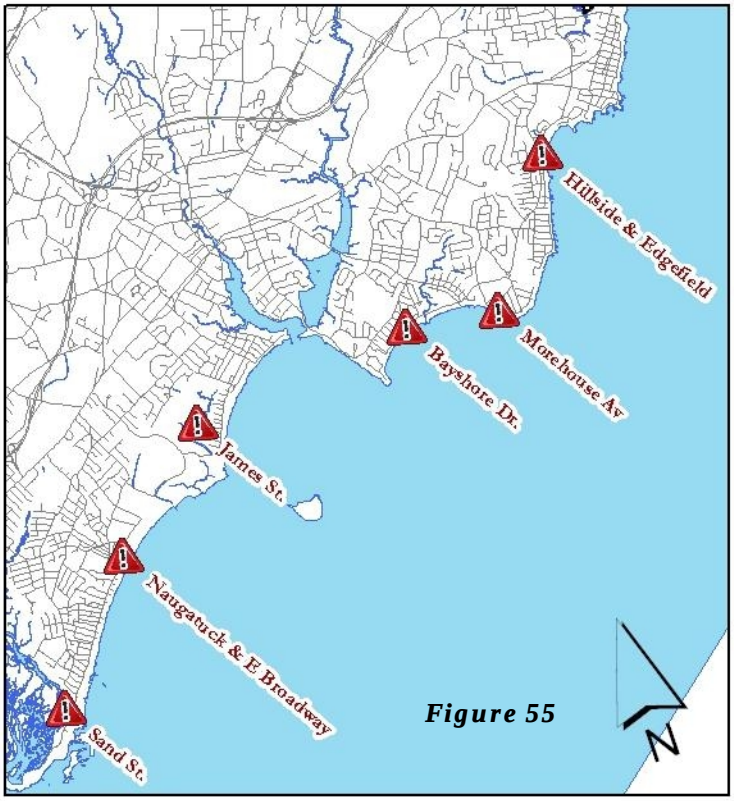


Figure 55

The Early Warning System is used to warn shoreline residents of impending street flooding or an approaching coastal storm. They can be activated together or selectively.

As more residences are being raised above their flood level, street flooding is becoming less of a hazard for structures but mobile property remains at risk of damage. The Early Warning System is used to direct residents to relocate cars and other portable assets to higher ground. When necessary, this system is used for evacuation instructions.

Weather Sentry

A satellite based weather-monitoring system is in place in the PSAP. This provides real-time monitoring of weather conditions nationwide. The State is displayed on-screen and approaching weather is shown in the form of radar images. The Sentry System is capable of showing rainfall rates, hail, wind speed and direction, lightning and tornadoes. It can calculate arrival of severe weather to the minute. This is a stand-alone system which is used to supplement NOAA and NWS alerts and warnings. It provides the EOC with a "close-up" look at what is happening and what can be expected in the community.

Areas of the city are constantly monitored by cars and apparatus manned by on-duty personnel of the Emergency Services Division. Pertinent information and observations are passed to the EOC.

V . REVIEW, EVALUATION & IMPLEMENTATION

Revision statement: in the prior plan there was no subsection on implementation of the plan, it has been added below. A Mitigation Plan Update Timeline has also been included. The Monitoring & Evaluation section has been updated to include a description of the City's new multi-office permitting software.

A. Implementation

Implementation of this plan will be integrated on a per-project basis by the departments that oversee these activities. Specific departments such as Emergency Management, Engineering, Public Works, Police and Fire are tasked with integrating the recommendations of this plan in future capital improvement projects and the updated list of specific Hazard Mitigation projects listed in this document through incorporating them to the City's Capital Improvement Plan and requested budgets. The Planning and Zoning Department contains the Floodplain Manager jurisdiction and all relevant flood mitigation

strategies are applied through that office as mitigation projects such as elevation and new flood compliant construction have been integrated into the requirements of the Zoning Regulations. Planning mechanisms such as changes in Zoning Regulations and the Plan of Conservation and Development will continue to integrate the policies, goals and objectives of this document. The City's Plan of Conservation and Development, completed in 2012, included a section on planning for sea level rise hazards.

B. Monitoring & Evaluation

It is recognized by the Milford Hazard Mitigation Committee that the goals and objectives outlined in the Hazard Mitigation Plan will need to be modified over time in order to meet the demands of a changing community. Accomplished activities will be eliminated, and new ones added. A table showing a general outline of anticipated activities is shown below.

Figure 56: Mitigation Plan Update Timeline

Date	Action/Task	Responsible Party
Summer 2013	FEMA approves Plan (5 year expiration)	FEMA
On-Going/As-Needed per disaster occurrence	Post-Disaster Review of Mitigation Measures and Strategies	HMPC and other agencies
Fall 2013	Bi-Annual Meeting to review and update Mitigation Measures and Strategies	HMPC
January 2014	Bi-Annual Meeting to review and update Mitigation Measures and Strategies	HMPC
June 2014	Bi-Annual Meeting to review and update Mitigation Measures and Strategies	HMPC
Fall 2104	Apply to State for Planning Grant Application	HMPC Chair
January 2015	Bi-Annual Meeting to review and update Mitigation Measures and Strategies	HMPC
June 2015	Bi-Annual Meeting to review and update Mitigation Measures and Strategies	HMPC
Fall 2015	If grant is received – initiate RFP process to select plan update consultant.	HMPC Chair/RFP Selection Committee
January 2016 – January 2018	Begin monthly plan update meetings including outreach to utilities, regional and state agencies.	HMPC
June 2016	Host public outreach meeting(s) for input on Plan	HMPC

Fall 2017	Submit Plan for State Review	HMPC
Winter 2018	Revisions/Review	HMPC
Late Winter 2018	FEMA review and comments	FEMA
Spring - May 2018	Plan revisions made and Plan Update Adopted	HMPC/Board of Alderman

Therefore, following adoption of this Plan, it is the intent of the Hazard Mitigation Committee to meet on a semi-annual basis in order to review each of the goals and objectives listed in this document in order to determine whether or not changes need to be made. In addition, the committee will consider whether new activities should be added to the Plan. The Emergency Management Director is coordinator of the Hazard Mitigation Committee that is responsible for preparing the Plan. The Plan was prepared with the understanding that potential funding sources may not be available within the time frame necessary to complete the actions on a specific schedule. It is necessary to incorporate a system of monitoring its progress and making necessary adjustments. On the anniversary of the adoption of the Plan the committee will meet to review the implementation progress derived from semi-annual meetings (January and June and as-need on an emergency basis), public input received as well as the goals, objectives, and actions outlined. The committee coordinator will prepare an annual report on the status of plan implementation. The report will include the following: a review of the goals and objectives of the original plan, a review of any disasters or hazards that occurred during the year, a review of each element or objective of the original plan - including what was accomplished the previous year- and recommendations for new projects or revised objectives.

Public participation will be an important component of the Plan review and revision process. All committee meetings will be open to the public and notice on the City website will be provided along with the Hazard Mitigation Plan. Public participation meetings will also be conducted to review the revisions to the currently approved plan. In addition, members of the committee are available for one-on-meetings with residents. This is especially true for the Floodplain Administrator and the Director of Community Development as they are continually interfacing with residents affected by previous storms. There is also a free flow of information disseminated by electronic communication.

The City's new building permitting system, ViewPermit, flags construction projects within flood zones, wetlands and upland review areas. Therefore all departments involved in the

construction side of the permitting process (Building, Engineering, Inland Wetlands, Planning and Zoning) and their staffs are cognizant of the restrictions and hazards imposed in these areas. Staff members have been trained to divert the public to correct departments for assistance to mitigate their risks when building in risk-prone areas

The City is currently pursuing many of the recommendations contained in the Plan. There needs to be continued careful coordination between the City's efforts in emergency response planning and hazard mitigation planning.

ENDNOTES

[1] Disaster Mitigation Act http://www.fema.gov/library/viewRecord.do?id=1935

[2] City of Milford Hazard Mitigation Plan 2007
http://www.ci.milford.ct.us/public_documents/MilfordCT_Planning/Documents/Milford%20Hazard%20Mitigation%20Plan%20Web.pdf

[3] FEMA publication Undergoing a Map Change
http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/map_change.jsp

[4] Flood Protection, City of Milford 2004 Subdivision regulations, Section 3.16

[5] City of Milford Zoning Regulations section 5.8 Flood Hazard and Flood Damage Prevention Regulations Adopted 1930, Re-Adopted 1973, Amended 2011

[6] Increased Cost of Compliance , FEMA March 2007
http://www.floodsmart.gov/toolkits/flood/downloads/OutreachToolkit2007TPsICCL.pdf

[7] April 1, 2002 Board of Alderman meeting item 8h, copy in Appendix H of 2007 plan

[8] June 4, 2007 Board of Alderman meeting item 8e, copy in Appendix H of 2007 plan

[9] FEMA Map Modernization Project, http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization

[10] Milford Ct Plan of Conservation and Development, December 2012
http://www.ci.milford.ct.us/public_documents/MilfordCT_Permitting/2012%20POCD/FinalPOCDDec2012.pdf

[11] City of Milford Emergency Operations Plan, updated March 2013

[12] City of Milford Stormwater Management Plan Annual Report, 2011,
http://www.ci.milford.ct.us/Public_Documents/MilfordCT_DPW/MilfordCT_engin/2011%20Annual%20Report.pdf

[13] Connecticut Coastal Management Act 2008 Connecticut General Statutes CHAPTER 444*

[14] FEMA Flood Insurance Study Volumes 1-6. New Haven County, CT Revised July 8, 2013 (Flood Insurance Study Number 09009CV001B)

[15] Southeastern Connecticut Regional Council of Government Multi-Jurisdiction Plan Update 2012

[16] http://www.ct.gov/deep/lib/deep/water_inland/hazard_mitigation/2010_nhmp.pdf

[17] Town of East Haven Hazard Mitigation Plan Update 2012

[18] State of CT Two Storm Panel Final Report January 2012

[19] State of Connecticut Natural Hazards Disaster Plan, 2009

[20] State of Connecticut Geospatial Information System Council, Storm Response and Recovery Assessment Group Report, March 2012

[21] CT Housing Permits by Year http://www.ct.gov/ecd/cwp/view.asp?a=1106&q=250640

[22] Storm Events Online http://www.ncdc.noaa.gov/stormevents

[23] CT Eco Coastal Hazards Map http://ctecoapp1.uconn.edu/ctcoastalhazards/

[24] https://www.atcouncil.org/windspeed/

[25] http://csc.noaa.gov/hurricanes/#app=1834&3e3d-selectedIndex=0

[26] FEMA P-804 Wind Retrofit Guide for Residential Buildings

[27] Building Planner Chapter 3, Part III – Building Planning and Construction of Appendix G of the 2005 International Residential Code Portion of the 2005 State Building Code

[28] City of Milford All Hazard Plan 2012

[29] City of Milford Health Department Annual Report to the Mayor 2010-2011

http://www.ci.milford.ct.us/public_documents/milfordct_health/HlthReport/

[30] City of Milford CT Health Department After Action Report on Irene 02/25/11

[31] https://www.atcouncil.org/windspeed/

[32] State of Connecticut OLR Research Report, Tree Trimming Laws and Programs, September 2011

[33] City of Milford Harbor Management Plan, 2008 http://www.ci.milford.ct.us/Public_Documents/MilfordCT_Harbor/Harbor%20Plan

[34] DEEP Climate Change Primer 2012, http://www.ct.gov/deep/cwp/view.asp?A=2705&Q=475764

[35] Gornitz, V., S. Hale, K. Larsen, N. Nevine, C. Rosenweig, and L. Sacks. 2004. Bracing for Climate Change in the Constitution State: What Connecticut Could Face. Environmental Defense.

[36] Sea Level Rise Accelerating in U.S. Atlantic Coast 2012 http://www.usgs.gov/newsroom/article.asp?ID=3256&from=rss_home

[37] Incorporating Sea Level Change Scenarios at the Local Level, 2012

[38] https://geohazards.usgs.gov/eqprob/2009/

[39] USGS Earthquake Finder http://earthquake.usgs.gov/earthquakes/eqarchives/epic/results.php

[40] https://geohazards.usgs.gov/eqprob/2009/index.php

[41] State of Connecticut Department of Construction Services 2005 State Building codes section 1615

[42] FEMA 232 - Homebuilders' Guide to Earthquake-Resistant Design and Construction http://www.fema.gov/library/viewRecord.do?id=2103

[43] FEMA-74, 1994Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Third Edition

http://www.fema.gov/library/viewRecord.do?id=3843

[44] FEMA- 141 Emergency Management Guide for Business and Industry 1993

http://www.fema.gov/library/viewRecord.do?id=1689

[45] *Report to the General Assembly on State Water Allocation Policies Pursuant to Public Act 98-224,* January 2000.

[46] http://www.drought.state.ct.us/drtwkpln.pdf

[47] Inland Wetlands And Watercourses Regulations Of The City Of Milford, Connecticut, Amended 2001, http://www.ci.milford.ct.us/Public_Documents/MilfordCT_InlandWetlands/MIWARegs/S000CAA2A

[48] Global Average Absolute Sea Level Change 1880-2011 http://www.epa.gov/climatechange/science/indicators/oceans/sea-level.html

[49] Sea Levels Online, NOAA http://tidesandcurrents.noaa.gov/sltrends/

[50] 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, http://www.ct.gov/deep/cwp/view.asp?a=2720&q=325660&deepNav_GID=1654

[51] Meeting Minutes of the March 5 2013 Milford Planning and Zoning Board, http://www.ci.milford.ct.us/Public_Documents/MilfordCT_BComm/planningdocuments/2013planningdocuments/Minutes%20P%20%20Z%20Board%20Meeting%203%205%202013.pdf

[52] CT Alerts http://www.ct.gov/ctalert/site/default.asp

AT THE REGULAR MEETING OF THE BOARD OF ALDERMEN HELD ON SEPTEMBER 9, 2013 THE FOLLOWING RESOLUTION WAS APPROVED.

A RESOLUTION ADOPTING THE CITY OF MILFORD'S HAZARD MITIGATION PLAN UPDATE 2013

WHEREAS, the City of Milford has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the City of Milford, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2013 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between December 2011 and July 2013 regarding the development and review of the Hazard Mitigation Plan Update 2013; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the City of Milford; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the City of Milford, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the City of Milford eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Aldermen:

1. The Plan is hereby adopted as an official plan of the City of Milford;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution;
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Aldermen by The Hazard Mitigation Plan Committee.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the City of Milford this 10TH day of September, 2013.

DATED AT MILFORD, CT THIS 10TH DAY OF SEPTEMBER 2013.
ATTEST: LINDA STOCK, CITY CLERK, CCTC

APPENDIX B

HAZARD MITIGATION PLAN COMMITTEE

AGENDA

DECEMBER 13, 2011

I. INTRODUCTION AND BACKGROUND

II. DISTRIBUTION OF MINUTES, PLANNING GUIDANCE AND CROSSWALK

MAY 30

III. DISCUSSION OF PROCESS/DEADLINES

PUBLIC MTG
INCORPORATE & UPDATE
TO FLOOD MAPS

III. SCHEDULE

Emmeline Harrigan
John Hangen
Jocelyn Mathiasen
Gary Wassmer
Dan Delveccia
Bill Richards
David Sulkis
Bob Gregory

HOT SPOTS FOR
REPETIVE CLAIMS

CRS

9

1/10 10 AM

Hazard Mitigation Plan Committee
Minutes
12/13/11

Present: Delveccia, Gregory, Harrigan, Hangen, Richards, Sulkis, Wassmer

Mr. Gregory convened the meeting at 10:05 a.m.

I. Introduction and Background

Mr. Gregory noted that the first plan was done in 2002 and the current plan in 2007. The current plan end date is August 2012. No FEMA grants will be issued to communities that do not have an approved plan. Mr. Gregory, Mr. Richards, and Mr. Hangen were involved in the previous plan.

One of the major concerns was lack of an annual meeting of the committee to keep track of progress.

II. Minutes, Planning Guidance and Crosswalk

Mr. Gregory distributed the above-mentioned documents. He asked committee members to review them and be prepared to accept assignments at the next meeting.

Discussion was held regarding Storm Irene and the amount of damage in Milford. 542 homes were damaged. Problems with insurance claims were discussed.

Mr. Hangen has examined some other maps. He is prepared to produce the maps necessary. Ms. Harrigan said we should map our most vulnerable areas and include issues that Jimmy Chin from the NFILP recommends.

Mr. Gregory said that the Hazard Mitigation Plan must be infused into the Plan of Conservation and Development. Mr. Sulkis said that the Haz Mit Plan would be done before the POCD.

The difference between this plan and the emergency action plan is that mitigation is what you do before an event while the action plan is what you do when the event is happening.

Public meetings are required. Ms. Harrigan suggested combining the meetings with new flood map information.

A high priority is to match hazards with mitigation measures according to FEMA reps Gregory said. We must show how we prioritize actions to mitigate dangers.

The dredging of the Wepawaug River was discussed as a project.

Mr. Richards said we should review the proposed projects from the 2007 plan and assess what was done and what was not done. We should make the plan realistic.

III. Schedule

Because of DEEP and FEMA reviews, Mr. Gregory set a deadline of May 2012 to finish and submit the updated plan. Mr. Richards said we should be able to do it in 90 days.

The next meeting was set for January 10, 2012, at 10 a.m. in Conference Room A.

Hazard Mitigation Plan Committee
Minutes
1/10/12

Present: DelVecchio, Gregory, Harrigan, Hangen, McGaffin, Mathiasen, Richards, Sulkis, Wassmer

I. Mr. Gregory convened the meeting at 10:05 a.m.

II. General Discussion

Mr. Richards said we needed to review projects and provide a more realistic list. Mr. Wassmer was asked to review the projects and add any new projects.

It was decided to combine the Hazard Mitigation Plan with the Flood map public hearings.

Discussion was held regarding a regional approach to the plan. Mr. Gregory said that we sent a copy of our plan to Stratford, West Haven and to SCROG. Orange should be included because of the Wepawaug.

III. Review Crosswalk

The question of adoption by the local legislative body. Last time we send an adopted plan. FEMA suggested we send a copy for review first and then have it adopted.

The process of developing the plan must be outlined. The deadline for our plan is May of 2012. Ms. Harrigan said that we can have the public hearings in March. The location of the meeting was discussed and the auditorium was thought to be the best.

Risk Assessment: It was felt that we did a good job of identifying risk last time was good. More education is needed. The question was raised of having knowledge of flood hazard as part of the real estate transactions.

CRS program requires notification of risk to homeowners. Possible notice in tax mailings was discussed. Newspaper article had been published in previous years. Information could drive people to the website with more information. Information included could be how to flood proof their home, flood warning

system, available grants, evacuation routes etc. Ms. Mathisen could develop website information with maps.

Mapping does not identify specific addresses.

Discussion was held on the estimated potential dollar losses. Dan Thomas was mentioned as a person to estimate loss. The methodology used to prepare the estimate must be included. We can use damage from Storm Irene as a guideline. Other hazards should be included. A risk assessment and vulnerability for every hazard must be included.

Discussion was held on development trends. Building and elevation changes the environment. Ms. Mathiasen asked if the changes to the building code would give us credit. There is a section where that should be included. Ms. Harrigan said that the most improvements have come in the beachfront properties. The difficulty comes in the marsh area properties.

Discussion was held about the possibility of the City doing more to assist in elevation of homes. Possible assistance from FEMA, Homeland Security or HUD was discussed.

The question of identifying Woodmont in the plan was discussed. Woodmont is within Milford and should be noted as such.

Study of the dredging of the Wepawaug was discussed. Coordination with Orange and Woodbridge was desired but Milford receives the brunt of the flooding.

A narrative description of the planning process will be included. Use of the website in the process was discussed. Information could be provided on the city website for the public to provide input to the plan.

We must document how the planning team reviewed and analyzed each section of the plan and what revisions were made as part of the process.

Risk Assessment

We must include all natural hazards and the risk from each. Risk of power outages was discussed. Discussion with UI should include their plans for mitigation. Ms. Harrigan brought up the undergrounding of utilities as a prevention method.

Keeping the commercial section of the community viable for providing services to those without power was discussed. Ms. McGaffin said that there is a plan being developed at the state level to identify important locations on the grid.

We must include the probability of future events for each hazard in the plan.

Discussion was held on the future potential for loss damage with beach cottages being replaced with elevated, more expensive homes. We must describe land uses and development trends.

We should include the isolation of areas when flooding occurs and what our response should be.

We should examine our goals and revise as necessary. We should identify actions and projects for each hazard. We should identify critical existing buildings and effects of hazards on those facilities. The hospital was discussed as a critical facility.

We have to have a schedule of monitoring, evaluating and updating the plan.

Mr. Gregory asked that Mr. Sulkis and Ms. Harrigan review planning aspects, Mr. Hangen, Ms. McGaffin and Ms. Harrigan review, and Mr. Wassmer to review the projects.

Ms. McGaffin said that Sen. Slossberg will be here tomorrow to discuss GIS is used mitigation and emergency management.

The next meeting was set for January 24th, 10 a.m. in Conference Room "A"

The meeting was adjourned.

Hazard Mitigation Plan Committee
Minutes
1/24/12

Present: DelVecchio, Gregory, Harrigan, Hangen, McGaffin, Richards, Wassmer

I. Mr. Gregory convened the meeting at 10:05 a.m.

II. The minutes of January 10, 2012 were accepted as presented.

III. Critical Facilities – Richards (see attached list)

The committee reviewed the list of critical facilities. Discussion was held of facilities with hazardous material. Although not natural hazards, these facilities must be addressed in the plan.

Railroad and highways and vehicles carrying hazardous materials were discussed.

Iroquois's gas pumping station on Oronoque Road was added to the list.

Man-made hazards are subject to the natural storms that hit Milford.

Discussion of the sewer system and generators to keep thing moving during outages. Private systems discussed.

The committee discussed the need to contact UI re their critical facilities. They will asked to contribute to our discussion. They may have a plan to deal with outages. In light of Storm Irene they may be updating their plan.

IV. Proposed Projects – Wassmer (See attached list)

Discussion of the list. The mayor is meeting with state representatives and DEEP to obtain funding for some of the projects.

Better cleaning of catch basins necessary.

Dredging of the Wepawaug. Fuss and O'Neil will have plan by the 1st quarter of this year.

Naugatuck Ave drainage is in design phase.

Bayview Beach project to improve storm drainage system. Pipes are old. Solution is expensive. City could apply for grants.

Flood gauges need replacement. Fire Dept is conducting a study to improve gauge measurement.

Evacuation signs discussed.

Project list should be updated with what we've done, what we want to do and long-range projects.

Ms. McGaffin called the committee's attention to a program called Network Analyst extension that would allow the City of Milford to further leverage our data. She said the city has many systems in place but we are limited in our capability to analyze. With Network Analyst we could model sewer disruptions, determine safe-walking routes to schools, fire hydrant service, routing of vehicles and re-routing based on obstacles. It's a powerful tool and we have the data ready to use. If we were to purchase the extension for ArcServer it would allow analysis to be conducted over our intranet, in mobile applications and over the web.

V. Public Information

The Everbridge warning system discussed. More publicity needed to get people to sign up. Use of cable TV to reach people was discussed. The idea of partnering with UI so that a notice could go out in their mailings was raised. Drive people to website for more information.

Discussion revolved around a map that Mr. Hangen had done for evacuation. Making that available to the public would be a good idea. It was suggested that a laminated 81/2 x 11 to give out to residents. It was suggested to tie in the map image to cell phone, Twitter, Internet, etc.

Discussions with DEEP are doing their own thing with other communities. We must proceed with our public input meetings on our own. Our timeframe should be on a Wednesday/Thursday in April. PZ will produce a postcard. Flood Map changes affect 4,000 properties. Two meetings will be held at Parson's auditorium, one for each side of town.

VI. Other Items

There will a workshop to assist towns in their planning efforts on February 14th. Mr. Gregory and Ms. Harrigan will attend.

The nest meeting will be February 7 at 10 a.m.

Hazard Mitigation Plan Committee
Minutes
1/24/12

Present: DelVecchio, Gregory, Harrigan, Hangen, Mathieson, McGaffin, Sulkis, and Wassmer

I. Mr. Gregory convened the meeting at 10:05 a.m.

The minutes of January 24, 2012 were tabled until additional information was added.

II. Public Information

Mr. Gregory said he included an information sheet in the package that had been in the newspaper in 2008. He felt that this could be used as a guide for some information piece that could be sent out to all residents in flood zones.

Regarding the Flood Audit Program Mr. Gregory said that we could do something in-house that would provide homeowners with good flood information while not as detailed as a true audit.

A meeting was held with homeowners regarding the grants where they expressed opinions about mitigation issues.

III. Other Issues

Mr. Gregory asked all members of the committee to maintain a diary on all activities related to the Hazard Mitigation Plan.

Discussion was held regarding the FEMA grant process.

IV. Critical Facilities

Man-made hazards as well as natural hazards should be included in our plan.

V. Proposed Projects

Priority projects should be listed as well as long-term projects. The chairman asked Mr. Wassmer to expand the list of projects.

VI. Public Input

Ms. Harrigan said that two dates had been scheduled for public information hearings regarding the plan and flood map revision. Those dates are April 25th for the east side of the city and April 26th for the west side from 7-9 p.m. at the Parsons Auditorium. Ms. McGaffin asked if more mapping was needed. Ms. Harrigan said some enlarged area maps would be good. Ms. Mathieson asked if we could do comparison maps side by side. Ms. McGaffin said that it was possible. A press release will be prepared and invitation postcards will be sent to every homeowner affected. That will require approximately 4,000 labels ready by April 4th. Funding will come from the PZ budget. A message will be put on the website, cable, Everbridge, and a press release prepared.

Mr. Gregory will do the plan review first with a 10-minute break between presentations. Presentation details were discussed.

VII. United Illuminating

The need to coordinate our planning with UI was discussed. A representative will be invited to our next meeting. Discussion was held regarding the sharing of information. Coordination of tree trimming efforts by the City and UI would be desirable.

VIII. Community Rating System

Information related to this should be included in our Hazard Mitigation Plan.

IX. Development Issues

Mr. Gregory asked the planners to provide comment for the plan on this issue. Ms. Harrigan said that a review of development and how it affected mitigation should be included.

The meeting was adjourned at 11 a.m. The next meeting will be Feb 21st at 10 a.m. in conference room “B“.

Haz Mit Plan

Present: Gregory, Harrigan, Hangen, McGaffin, Palumbo, Richards, Sulkis

Organization of material
Plan should be on website

Changes should be noted in font or other ways. Plan in present form would not be acceptable. Problem of how to show changes from last time. FEMA has checklist of items they are looking for. Looking for easy to find.

Getting content together and then Chair will figure out how to put it together.

Plan goes to DEEP first. They review and then send back with changes. Then goes to FEMA.

Chair reminds committee to keep a diary so that efforts toward the plan would be documented.

Must have approved plan to be eligible for grants. Timetable should work even if our plan expires in August.

We should have material ready for public meetings. Public will be more interested in projects.

DEEP does not favor projects that call for armor around private homes…things like revetments, seawalls etc. Can use to protect vital facilities like treatment plants.

Riverine Flooding

Indian and Wepawaug Rivers most likely to cause problems. Maryrose Palumbo brought in to discussion.

Risk Assessement – Assigned to Mr. Richards. Copy of Guilford plan. STAPLEE method of prioritizing projects.

Haz Mit Plan Mtg
3-27-12

Gregory, Palumbo, McGaffin, Hangen, Delvecchio, Harrigan, Wassmer

1. Public Meetings – April 25 & 26

No money for postcards. Getting the word out – webpage – Everbridge – press releases – MGAT public TV

Website will address both plan and flood map changes – will link from front page

Mapping – list of addresses where flood change affects residents will be provided

Discussion of Everbridge – targeting calls – first message should to out 4/9 – reminder 4/22 – Mayor should be the voice

Information package to be developed

Press release to mayor's office – Needs to go out next week – Gregory will follow up

Gregory will talk to mayor re funds for plan – last time Fire Dept printed copies – funds for color cartridge - Estimate of $5,000

Email to FEMA meeting attendees

Powerpoint presentation discussed – Gregory will do plan presentation – Focus on projects and getting input

Harrigan will present flood map info

Three tables will be set up in the lobby – one for fire to sign up for Everbridge – Two for flood info

Meeting to start at 6:30 p.m. Plan portion should only take ½ hour

2. Plan

Draft goes to DEEP first – Comes back for revision -

Project is pursuing grants for elevation

Grants to support mitigation efforts

Committee needs to continue to meet quarterly to review progress

Next meeting will be April 10, 2012

April 9, 2012

For Immediate Release

HAZARD MITIGATION PLAN AND FEMA RISK MAP UPDATE

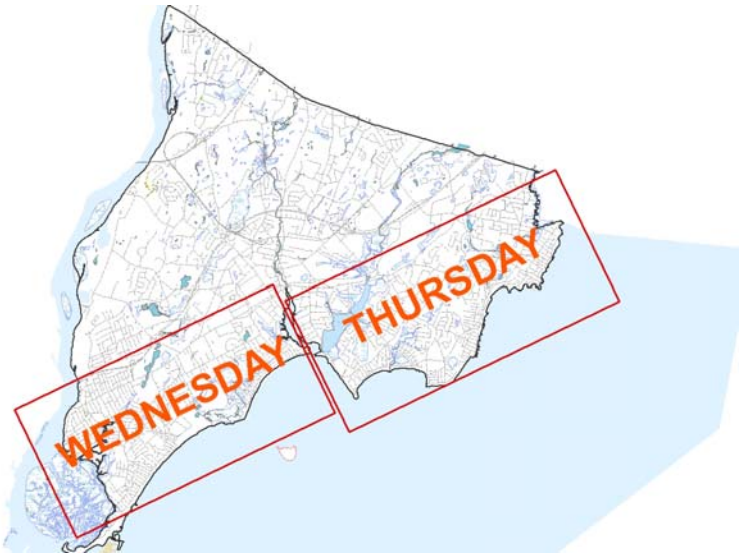
Milford, CT.—Milford residents interested in the city's plans to address natural hazards such as floods and power outages or in finding out how changes to FEMA flood maps may affect their properties and insurance rates can learn more at meetings at the city on April 25 or 26.

The meetings will be from 6:30 – 9:30 pm in the Parsons Government Center Auditorium.

The first part of the meeting is to obtain public input on the City's Hazard Mitigation Plan. The Plan identifies the City's approach to reducing risks from natural hazards such as hurricanes and flooding. The City first adopted a Plan in 2002 with an update in 2007. The City must adopt an updated Plan by August 2012 in order to continue to quality for grant opportunities including those recently applied for as a result of Tropical Storm Irene.

The second part of the meeting provides an overview of FEMA's proposed changes to flood mapping along Milford's coast. The City estimates that the flood zone for approximately 3,800 properties will be revised. Approximately 800 properties will be shifting from a non-mandatory flood zone to mandatory where flood insurance will be required by mortgage companies and lending institutions. The City will also provide an overview of the "grandfathering" clause and potential insurance impacts due to the map changes.

The April 25th meeting will show changes to coastal areas west of Milford Harbor and the April 26th meeting will show changes to the coastal areas in the eastern portion of the City. Residents should plan on attending the meeting that corresponds to the location of their property as shown on the map below.



****

Please contact Community Development Director Bob Gregory at (203)783-3230 for more information about the Hazard Mitigation Plan or Assistant City Planner Emmeline Harrigan in the City's Planning and Zoning Department at (203) 783-3245 for more information about the FEMA Map Updates. Information will also be available on the City's website. Please look for the link in the right hand corner for FLOOD HAZARD MAPS.

APPENDIX C

ATTENDEE LIST - Hazard Mitigation/FEMA Outreach

April 25th 26th 2012

	A	B	C	D	E
1	**Last Name**	**First Name**	**Str #**	**Street Name**	**Apt/Fl/Uni**
2	Anderson	Don	33	Driftwood Ln	
3	Andriolas	Tony	28	Wood Ave	
4	Angelica	Christine	87	Carriage Path S	
5	Antalik	Barbara	75	Riverdale Rd	
6	Bailarob-Whithan	Lisa	28	Davis Dr	
7	Bassett	David/Patricia	8	Kirkside	
8	Bataille	Elaine	16	Turnor Ave	
9	Bonessi	Raquel	83	Beach Ave	
10	Bonessi	Ed	83	Beach Ave	
11	Britton	KS	6	Millwood St	
12	Brown	Fred	189	Seabreeze Ave	
13	Byrnes	Theresa	87	Atwater St	
14	Campbell	Mike	21	Summer Pl	
15	Carlson	Valerie	75	Wilcox	
16	Carveth	Arthur/Judy	19	Thompson St	
17	Casey	Elaine	20	Andrews Ave	
18	Chaffin	Stan	57	Riverdale Rd	
19	Charbonneau	Marybeth	177	Third Ave	
20	Chasse	Leo/Nancy	12	Hauser St	
21	Claude	Alan	115	Bray Ave	
22	Cornelio	Kathryn/Donald	16	Andrews Ave	
23	Corrigan	Dorothy	332	Housatonic Dr	
24	Covaleski	Theresa	3	Lawrence Ct	
25	Covaleski	Janet	43	Deerwood Ave	
26	Crans	Richard/Jeane	63	Seabreeze Ave	
27	Curry	Michele	41	Pamela Dr	
28	Davidson	Richard/Cheryl	143	Point Beach Dr	
29	Dente	Lucille	216	Broadway	
30	Denzler	Richard	77	Bray Ave	
31	Devine	James/Susan	267	Melba St	C-12
32	DiDonato	Dennis	801	East Broadway	
33	Donnelly	Leslie	38	Devonshire St	
34	Dubuque	Margaret	39	Point Lookout	
35	Emerson	Marilyn	45	Riverdale Rd	
36	Foster	CJ	33	Odell Ave	
37	Fuchs	Bob	17	Shell Ave	
38	Galullo	Michael	21	Deerfield Ave	
39	Gargiulo	Judi	70	Point Beach Dr	
40	Gartz	Angela	85	Viscount Dr	
41	Gaynor	Constance	70	Sixth Ave	
42	Goromby	Bill	46	Elaine Dr	
43	Gottsegen	Alison	8	Deerfield Ave	
44	Hallquist	Jeff	189	Hillside Ave	
45	Hanlon	Trish	47	Laurel Ave	
46	Herbert	Stacy	280	First Ave	
47	Hulse	Marilyn	125	Carriage Path S	
48	Ianna	Frank	861	East Broadway	
49	Ianna	Frank	100	Trumbull Ave	
50	Infurchici	Frank/Barbara	42	Eighth Ave	
51	Jeffrey	D'Arcy	17	Grove St	
52	Jerue	Susan/Lawrence	610	Merwin Ave	

APPENDIX C

ATTENDEE LIST - Hazard Mitigation/FEMA Outreach

April 25th 26th 2012

	A	B	C	D	E
1	**Last Name**	**First Name**	**Str #**	**Street Name**	**Apt/Fl/Uni**
53	Johnson	Karen	26	Point Beach Dr	
54	Jolley	Barbara	256	Shadyside Lane	
55	Jones	Ed/Valerie	143	Hillside Ave	
56	Jones	Chris	143	Hillside Ave	
57	Judge	Monica	226	Third Ave	
58	Judson	Helen/Ernie	27	Sylvan Ct	
59	Kaletsky	Donald	6	South Wind Ln	
60	Kemp	Luanne/Darrel	10	Ettadore Park	
61	Kizykwa	Doris	288	Third Ave	
62	Klaus	George	19	Caroline St	
63	Konowitz	Amy	73	Wilbar St	
64	Kosikowski	Eva/Stan	14	Marie St	
65	Krikorian	Maria	157 1/2	Kings Hwy	
66	Kubek	Dora	33	Liberty St	
67	Kubik	Ron/Gail	246	Shadyside Lane	
68	Kulesh	Kim	175	Kings Hwy	
69	Lambert	Barbara	8	Breakneck Ln	
70	Lapine	Susan	87	Trumbull Ave	
71	LaVoie	Alma	39	Mark St	
72	Lawrence	Kathy	44	Morning Mist	
73	Lewis	Tyler/Barbara	11	Earle St	
74	Licklider	Nell	85	Viscount Dr	
75	Linn	James	98	Hillside Ave	
76	Liscinsky, Sr	Joe	993	East Broadway	
77	Luiselle	Jerrry	85	Viscount Dr	7A
78	Malisek	Christine	41	Milford Pt Rd	
79	Martin	Barbara	330	Merwin Ave	
80	Massari	Jerry	111	Corona Dr	
81	Masury	Ronald	31	Morehouse Ave	
82	Mazas	Charles	75	Thompson St	
83	McCarthy	Bill	32	Deerfield Ave	
84	McLenithan	Deeanna	142	Castle Lane	
85	McVinua	William	14	Liberty St	
86	Medvedow	Phyllis	4	Belmont St	
87	Melanson	Frank	4	Edgewood Ave	
88	Miller	Rose	7	Orland St	
89	Mobbs	Anita	17	Maddox Ave	
90	Moe	Mary Louise	119	Fifth Ave	
91	Moroney	Eva/John	18	Warren St	
92	Morra	Marion	1	Platt St	
93	Morrison	Isabelle	69	Point Beach Dr	
94	Murray	LeRoy Dennis	29	Benham Ave	
95	Narcisi	Robert	34	Brookdale Ave	
96	Nemec	Rose/Rich	318	Pond Point Ave	
97	Neville	Kathrine	16	Abigail St	
98	Niedermeier	Donald/Sandra	85	Viscount Dr	
99	O'Bymachow	Mike	248	Milford Pt Rd	
100	Parnoff	Linda	342	Edgefield Ave	
101	Parrella	Patrick	181	Melba St	
102	Paulson	Kathy	53	Park Ave	
103	Pavia	Charlotte/Bob	2	Seventh Ave	

APPENDIX C

ATTENDEE LIST - Hazard Mitigation/FEMA Outreach

April 25th 26th 2012

	A	B	C	D	E
1	**Last Name**	**First Name**	**Str #**	**Street Name**	**Apt/Fl/Uni**
104	Payton	Alcine	143	Fourth St	
105	Pocock	Nancy	60	Shell Ave	
106	Porzenheim	Margaret	16	Wildwood Ave	
107	Puzzo	Joe/Louise	168	Shorefront (Broadway)	
108	Raynor	Robert/Betty	15	Morehouse Ave	
109	Rea	Thomas	18	Pearl St	
110	Renzulli	Glenn	206	Third Ave	
111	Riggi	Anita	162	Shorefront (Broadway)	
112	Rooney	Connie	330	Merwin Ave	
113	Safire	J Wendy	23	Caroline St	
114	Safire	J Wendy	26B	Lafayette St	
115	Schorsch	Hilary	57	Laurel Ave	
116	Shea	Bill/Martha	38	Harborview	
117	Sherman	Ed/Valerie	56	Orland St	
118	Shults	Randy	24	Depot Rd	
119	Sigman	Julia	8	Oyster Landing	
120	Sivkin	Miriam	40	Seabreeze Ave	
121	Southard	Craig	107	Melba St	
122	Spinelli	Frank/Susan	53	Pamela Dr	
123	Steady	Bob	62	Greenwich Way	
124	Stefanacci	Karen	39	Wildmere	
125	Stelluti	Marie Diven	22	Field Ct	
126	Sterback	Jane	117	Castle Lane	
127	Sullivan	Kelley	14	Grant St	
128	Swanson	Stan	228	Shadyside Lane	
129	Sykora	Fred	43	Mark St	
130	Sylvain	Norm	59	Shea Ave	
131	Sylvester	Linda/Kevin	76	Barbara Drive	
132	Szturma	Leonard	183	Third Ave	
133	Tarkhan	Ismail	55	Beach Ave	
134	Taylor-Austin	Lisa	38	Carriage Drive	
135	Teichgraeber	WT	356	Edgefield Ave	
136	Thoma	Paul	52	Sylvan Ct	
137	Tiberio	Joe	18	Noble Ave	
138	Tomao	Doreen	22	Davis Dr	
139	Toole	Pat/Larry	606	Gulf St	
140	Tynan	Mary Jane	102	Deerwood Ave	
141	VanPala	Fred	11	Sperry St	
142	Varholac	Larry	24	Field Ct	
143	Vitelli	Anthony	115	Melba St	
144	Warner	Nancy	18	Seaside Ave	
145	Whitbread	Ray	11	Seaside Ave	
146	Winkleman	James	222	Third Ave	
147	Wolmering	Mark/Suzanne	5	Mayflower Pl	
148	Wulff	Alan/Claudia	7	Abigail St	
149	Yarri	O	195	Kings Hwy	
150	Zieball	Marsha	10	Silver St	

Hazard Mitigation Plan

City of Milford

April 25th and 26th 2012

Storm Irene

Purpose

The primary purpose of a hazard mitigation plan is to identify natural hazards and risks, existing capabilities and activities that can be undertaken by the City of Milford to prevent loss of life and reduce property damages associated with identified natural hazards.

The secondary purpose is to enable Milford to accept grants from FEMA.

As part of the planning process, the City of Milford sets goals for mitigation and tries to lessen the harm caused by natural disasters.

History

Milford's prime natural disasters are hurricanes and nor'easters and the flooding and wind damage caused by them.

Milford's first Hazard Mitigation Plan was approved in 2003. That plan came out of a FEMA program called Project Impact. Milford was chosen as one of the communities to participate because we were 47th in the country in terms of repetitive losses. The City received $300,000 to implement a number of projects and the plan was one of them.

The plan must be updated every five years. We did that in 2008 and now we are preparing another update. Part of that job is to solicit public input and that is what we are doing tonight.

To view the current plan go to the city website:
http://www.ci.milford.ct.us/publicdocuments/MilfordCTPlanning/Documents/Milford%20Hazard%20Mitigation%20Plan%20Web.pdf

Possible Projects

Bayview Beach	Engineering Design Project to Improve Storm Drainage system and outfalls to alleviate flooding
Creeland Avenue	Engineering Design Project to Improve Storm Drainage system to alleviate flooding from City Street onto Private Property
Beachland Avenue	Evaluate ways to alleviate Flooding
Tumblebrook Road behind Milford Marketplace to Costco	Evaluate ways to alleviate Flooding
Naugatuck Avenue	Project is in final design to alleviate Flooding
Flood Zone Areas Townwide	Flood Gauge and Flood warning system upgrades
Silver Sands Flood gates	Project to update flood gates

How to Respond

- Tonight by filling out a card
- By sending an email to: bgregory@ci.milford.ct.us
- By sending snail mail to: Bob Gregory
  - Community Development
  - 70 West River St, Milford, CT 06460

APPENDIX C

City Hall
110 River Street
Milford, CT 06460
Phone 203 783-3201
Fax 203 783-3329
E-mail mayor@ci.milford.ct.us

City of Milford

PressRelease

Mayor Announces FEMA Grant Application Assistance Workshop

Milford, CT, November 4, 2011: The City of Milford will host a workshop for victims of Tropical Storm Irene who want to apply for federal hazard mitigation grants, Mayor James L. Richetelli, Jr. announced today.

The Hazard Mitigation Grant Program (HMGP) application assistance workshop is scheduled for 6 p.m., November 15 in the Harborside Middle School cafeteria, on High Street. The event is free, and is organized by the State Department of Emergency Services and Public Protection (DESPP) in conjunction with the Federal Emergency Management Agency (FEMA).

Tropical Storm Irene was the largest HMGP disaster declaration in Connecticut since the program was created in 1988. The workshop is

designed to help homeowners, businesses and municipalities complete their applications for HMGP funding assistance. The workshop will also provide an opportunity for grant applicants to receive a preliminary Benefit to Cost Analysis (BCA) of their proposed projects. Since the HMGP application process can be time consuming, and the grant selection process very competitive, this preliminary BCA can help applicants assess the relative strength (i.e. competitiveness) of their application to determine if they should continue the process.

The following information is needed from each applicant who attends the assistance workshop in order to calculate a preliminary BCA:

1. Cost estimate for the proposed project (i.e. home elevation, home acquisition, culvert replacement, etc.);
2. Amount of flood damage suffered by the home or business during the past 10 years, including Irene and T.S. Lee, if available;
3. An elevation certificate for the building to be mitigated, or at least the elevation of the first floor as defined in a flood insurance policy;
4. The flood elevations (10-year, 50-year, 100-year, 500-year) for the location of the mitigation project. This is available from municipal officials;

5. Tax assessor's card for the property to be mitigated, which also is available from municipal officials, and;
6. For property acquisition, the property owner should provide a pre-event fair market value.

Using this basic information, staff from DESPP and FEMA will run a BCA on each project and give the results to applicants during the workshop. Applicants then may use the preliminary BCA results to determine if they want to move forward and prepare a full application. Full applications are due at midnight on December 31, 2011. Applications submitted by e-mail must be received by 11:59 p.m. on December 31, followed by an original signed application in the mail by January 6, 2012.

"I encourage all of our affected residents to attend this workshop and take full advantage of the expertise that will be available that evening," Mayor Richetelli said. Any questions prior to the workshop should be directed to Community Development Director Robert Gregory at 203-783-3230 or bobg@ci.milford.ct.us.

APPENDIX D

IRENE OUTREACH ATTENDANCE SHEET

NAME	ADDRESS
Adam Quarker	12 Sperry Street
Katherine Pico	22 Richard Street
Christopher Carveth	26 Cherry Street
John Bennett	712 East Broadway
Nancy Collins	37 Cooper Avenue
John E. Turek	59 Hillside Avenue
Donna Weaver	59 Hillside Avenue
Susan Riordan	26 Field Court
Ray Vitali (Alderman 5th)	48 Founders Way
Mary Ellen Rogers	175 Broadway
Ben Blake (Alderman 5th)	5 Anchorage Drive
Susan DeVaney	16 Silver Street
William "Skip" Ziebell	10 Silver Street
Marjorie Brower	38 Elaine Road
Elizabeth Daniels	29 Elaine Road
Alicia DiGennaro	47 Elaine Road
Lorraine Seaberg	27 Elaine Road
Mary Ann Davidson	36 Elaine Road
Deborah A. Dinan	17 Orland Street
Annette Stofan	12 Naugatuck Avenue
David Sulkis	70 West River Street
Jim Dorney	55 Point Beach Drive
Deborah Rowe	46 Point Beach Drive
Joan Garrett	43 Hillside Avenue
Stacey Fiore	41 Hillside Avenue
Brady Garber	47 Hillside Avenue
Geoffrey Chittick	40 Beachland Avenue
Duarte Cabral	31 Beachland Avenue
Christine Woods	26 Elaine Road
William Gillette	11 Orland Street
Clayton Seelgen	15 Sand Street
Bruce Kaye	152 Shorefront (0 Botsford)
Sandra Haley	685 East Broadway
Patricia Roland	185 Melba Street #102
Joan Kalil	185 Melba Street #213
Patricia Sikeritzky	185 Melba Street #107
Patricia Warren	18 Field Court
Nancy Wolfe	39 Deerfield Avenue
Chuck Wolfe	39 Deerfield Avenue
Wayne Weed	83 Point Beach Drive
Sherry Weed	83 Point Beach Drive
D. Anne Davenport	108 Shorefront (108 Waterbury)
Gregory Davenport	108 Shorefront (108 Waterbury)
Arthur Hiller	63 Point Beach Drive
John L. Grant	11 Ettadore Park
Ryan Frederick	26 Howard Court

APPENDIX D

IRENE OUTREACH ATTENDANCE SHEET

Anthony Capece	12 Cooper Avenue
Renee Capece	12 Cooper Avenue
Michele Bombard	26 Morehouse Avenue
Randy LeGault	48 Point Beach Drive
Rocco Surace	183 Point Beach Drive
Natalina Surace	183 Point Beach Drive
Anita Mobbs	17 Maddox Ave
Tibor Tamas	4 Villa Rosa Terrace (4 Abigail)
Pamela A Nelson	62 Surf Avenue
Rosanne Yagovane	33 Abigail Street
Matthew P Hurzeler	20 Coolridge Road
John Jarvis	26 Richard Street
Mary Jarvis	26 Richard Street
Ryan Frederick	36 Blair Street
Francis Altieri	160 Shorefront
Nanci Altieri	160 Shorefront
Marie Diven-Stelluti	22 Field Court
Lawrence Varholak	24 Field Court

Contact: Benjamin G. Blake
Mayor, City of Milford
City Hall
110 River Street
Milford, CT 06460
Phone 203 783-3201
Fax 203 783-3329
E-mail Mayor@ci.milford.ct.us
Web site www.ci.milford.ct.us

City of Milford

Press Release

Mayor Blake Announces Rebuilding After Sandy Workshops

Milford, CT, November 14, 2012: Mayor Benjamin G. Blake announced today that homeowners seeking to repair and rebuild after Storm Sandy may need to meet new Federal requirements designed to make structures safer in case of future floods. To learn more about getting permits for Storm Sandy repairs, including requirements that substantially damaged structures be elevated or rebuilt to new flood standards, the City will be hosting two *Storm Sandy Rebuilding Workshops*. Staff will also be available to provide information about grants and loans that may be available to help pay for home elevations. **Saturday, November 17, 2012 from noon to 1:30 PM and Tuesday, November 27, 2012 from 6:00 PM to 7:30 PM at City Hall Auditorium.**

Residents impacted by the storm are also encouraged to contact the U.S. Small Business Administration (SBA) as they may be eligible to received low interest loans to recover from physical damage and economic injury to their homes and/or businesses as a result of Storm Sandy. The telephone number for SBA is

800-659-2955. You may also seek information online at www.sba.gov/sandy. Representatives from SBA will be available at Parson's Government Center located at 70 West River Street from 8:00 AM to 8:00 PM.

The FEMA Disaster Recovery Center remains open daily from 8:00 AM to 8:00 PM at the gymnasium of Parson's Government Center. Residents must register with FEMA in order to be considered to receive disaster assistance. You can register by calling 800-621-3362 (TTY 800-462-7585) or online at www.DisasterAssistance.gov. You may also register in person at the Disaster Recovery Center. By registering with FEMA, homeowners and renters of all income levels who suffered losses as a result of Storm Sandy may be eligible to receive assistance such as grants for temporary housing or essential repairs to make their homes safe and secure. Registering for FEMA may also unlock low interest loans, disaster unemployment assistance and other state or federal aid.

####

APPENDIX F

Bob Gregory

From: Bob Gregory
Sent: Friday, July 27, 2012 11:08 AM
To: 'jzeoli@orange-ct.gov'; 'jpicard@westhaven-ct.gov'; 'snocer@townofstratford.com'; 'camento@scrcog.org'
Subject: Milford's Natural Hazard Mitigation Plan

To All;

Milford is in the process of updating our Hazard Mitigation Plan, required every five years by FEMA. Part of the process requires the City to reach out to our neighbors and regional organization to solicit comments. I have included the draft of our plan for your review and comment. I have not included all the appendices as they would not fit in the email space allotted and only serve as backup material. If you desire any of them or have other related questions, please get back to me. Also, please pass this on to anyone else who might have a comment or expertise in this matter.

NATURAL_HAZARD MITIGATION_PLAN.

Thank you for your attention to this matter.

Bob Gregory
Director of Economic & Community Development
City of Milford
70 West River Street - Milford, CT 06460
Telephone 203-783-4857 Fax 203-878-7394
Cell 203-988-2274

CONFIDENTIALITY NOTICE

This electronic message is confidential and may contain legally privileged information intended only for the use of the individual or company named above. If the reader of this message is not the intended recipient, or the employee or agent responsible to deliver it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please immediately notify us by telephone, and return the original message to us at the address below.

City of Milford, Community Development Department, Parsons Government Complex, 70 West River Street, Milford, Connecticut 06460 USA

APPENDIX G

FISCAL RISK ANALYSIS METHODOLOGY

PROPERTY VALUES/REPLACEMENT COST

While the following is not a comprehensive explanation of assessment practices, a highly generalized overview of a portion of the assessment process is being provided to quantify why certain data elements rather than others were chosen to analyze Milford's fiscal risk impact. For each and every element in a home – from the roof to the basement floor – there are dozens upon dozens of individual characteristics that the assessor uses in their evaluation and which they are tested on during the revaluation process. For the purpose of this analysis and the explanation of the methodology used in this plan a very narrow focus was placed on a small number of factors as explained below.

When thinking of property assessment, the primary function of assessment is to determine the most likely price a property owner would get for their real estate on the open market which allows the local government to develop its grand list. To develop that likely price many factors must be measured and then weighted to come up with a value that the city may then use for taxation. Those factors include quantifiable numbers such as the number of bedrooms in a home, the amount of land, depreciation value and utilities available and also quantitative factors that determine desirability such as neighborhood character. To understand the fiscal risk impact in the event that a natural hazard, such as a storm or flood causing residential property damages, it is not applicable to look at the assessor's determination of the price a home would fetch on the open market, there is better data available and that is replacement cost. Part of the assessor's business is to determine how much a residence would cost to replace, taking in various factors such as improvements, outbuildings, construction materials, accessory structures and the like.

The assessor weighs another set of data that is valuable for the purposes of this analysis and that is the effective year built. While the assessor keeps records on the actual year a home is built, intervening measures such as remodels and upgrades change the perception of a building's age. The assessor determines the effective year built based on these upgrades and for the purpose of understanding Milford's fiscal risk exposure it is relevant to look at the effective year built as well as the actual year a residence was constructed.

The assessor also develops a ranking system called construction grade. Grade assignment is the attempt by the assessor to recognize differences in quality of construction. Construction grade is a composite of the types and quality of materials used, the level of workmanship and the

individuality of the design in the home. While improvements may introduce varying construction elements, it is a general practice for builders to use consistent materials to complement existing elements in the home. Adjustments to the replacement cost of all new buildings are made based on the quality of construction and are built into Milford's valuation tables. The quality rating also becomes a means by which the assessor establishes and gauges equity in the assessments, i.e. making sure assessments are equal based on a certain measure or standard, such as grade quality. Grade is also an integral part of the development of cost tables. Cost tables are established by checking local construction costs and analyzing current sales during the time of revaluation. The higher the quality rating is for a structure, the higher the construction grade becomes. To provide a visual aid on construction grade, images of homes in Milford and their construction grades are provided below:

Grade 2

Grade 5

Grade 10

Grade 15

Lastly, there is a fundamental component of analyzing residential structures versus analyzing parcels that must be explained. A parcel is a piece of land. It may be vacant, it may contain a single family home or it may contain 600 condominium units. In many cases there can be multiple owners within one parcel. The assessor's office evaluates structures as well as land and owners are taxed for the whole package or their portion thereof.

HURRICANE STORM SURGE RISK IMPACT ON RESIDENTIAL PROPERTY

The City of Milford maintains a highly comprehensive assessor's database using VISION Appraisal software. The assessor's office conducted its most recent revaluation in 2011. By taking extracts of assessment data and linking it to the City's GIS it is possible to analyze many building elements at once, for example: year built and year remodeled, construction grade and replacement cost.

It was decided by the GIS staff that understanding what was damaged during Irene and Sandy could aid in developing data parameters that would provide a more realistic risk impact analysis. To determine parameters for storm surge risk factors on residential properties in SLOSH zones, 645 existing structures that have received substantial damage estimates (SDE) for homes impacted by Irene and/or Sandy were examined. By using GIS to tie assessor's data to the addresses of the homes with SDE's it was possible to look for common factors among the structures.

By looking at the construction grade of SDE properties it was found that every single home incurring 25% or more damage in either Irene or Sandy had a construction grade of 6 or less and when the SDE totals were combined only 2 residences graded higher than 6 surpassed 25% damage.

Substantial Damage Estimate Sample Analysis Using Assessed Construction Grade

	Irene			Sandy			Combined		
Residential Structures Grade Description	Count	SDE <25%	SDE <50%	Count	SDE <25%	SDE <50%	Count	SDE <25%	SDE <50%
Minimum				1	1	1		1	1
Below Average	14	13	7	89	82	66	90	80	66
Average	9	7	4	75	59	42	77	59	45
Average +10	27	20	2	127	84	19	156	86	32
Average +20	22	13	2	102	60	17	139	63	
Good	6	5	1	31	11	4	52	13	6
Good +10	1	1		6			15	1	
Good +20				2			7		
Very Good	1			4	2		7	2	
Very Good +10				7			8		
Very Good +20				85			93		
Excellent				1			3		
Excellent +10									
Excellent +20									
Luxurious									
Superior									
Superior +10									
Not Available	2	2	1	6	1				
# of structures analyzed:	82	61	17	536	300	149	647	305	150

Using the results from this SDE analysis it was then decided to examine the residential construction grade of structures present in the areas covered by the SLOSH model. The way that GIS data is configured in Milford requires that some caveats be presented before the following analysis:

- Parcel data is representative of the land boundary determining property ownership. The data was originally drafted from assessor's maps and there is error inherent in developing data that way.
- Assessor's data used in the following analysis represents *residential structures*. As in any community there are often more residential structures than parcels. To represent residential structures in this analysis, parcel points were created. A point is much smaller than a building; we are not able to accurately model the amount of a building in a SLOSH zone, only the land the building(s) sit on.
- When looking at the following analysis it must be remembered that we are analyzing the risk of buildings based on the percentage of land that will be inundated, not analyzing the inundation of the footprint of the building.

To begin the analysis, parcels and SLOSH model data were brought into GIS. A data set was created from an intersection of the SLOSH areas and the parcels. Each parcel was chopped into pieces based on its SLOSH coverage and the size of that area was calculated. Using the data about the original size of the parcel, the coverage of the SLOSH area per the total size of the parcel was calculated as a percentage. Then the attribute table of the parcel/SLOSH intersection shapefile was brought into Microsoft Excel and the data was transposed in a Pivot Table to create a table where each GISID was listed just once and the area of the percentage of each SLOSH scenario was calculated. That table was brought back into ArcMap and joined back to the parcels making it possible to determine the parcel's SLOSH coverage for each category.

Figure 1

Figure 1 depicts a home on a parcel that is covered by all 4 hurricane surge scenarios:

In this particular parcel the breakdown of SLOSH model coverage is as follow:

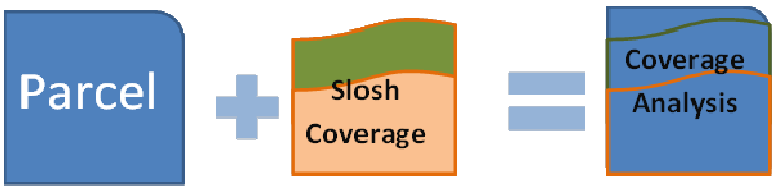
Category 1 22.3%

Category 2 12.3 %

Category 3 14.3%

Category 4 51.1%

See ***figure 2***:



However, this process only calculates the coverage as if it were a strip. If a category 2 hurricane came through this area it is assumed that all areas modeled for a category 1 scenario would also be inundated. Same for category 3, it would be assumed that should a category 3 strike, all areas modeled in a category 1 and 2 would also be included.

Therefore, cumulative data is necessary to get a more accurate risk assessment. New fields were added to the parcel layer and percentages were added together. By combining the coverage we get a better understanding of the risk impact these types of storm could present:

Category 1: 22.3%

Category 1 & 2: 33.6%

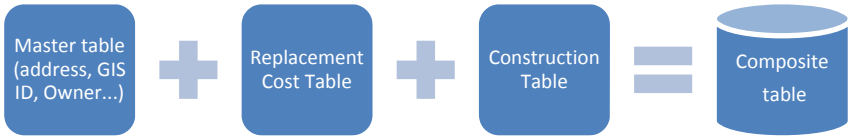
Category 1 thru 3: 47.9%

Category 4: 100%

By conducting this cumulative coverage analysis for the parcels it becomes possible to examine Milford's exposure to risk in a more realistic manner. However, the crucial element to understanding the fiscal impact of these storms is to look at the structures that are at risk. Due to technological and staffing constraints, creating a 1 to 1 link between residential structures in the GIS and the assessor's database has never been established. Milford does have structures represented in the GIS but the data does not represent multi-owner structures nor does the data have the necessary attributes to determine what is a primary residence, a shed or a garage. Therefore some assumptions had to be made about the best available method to proceed.

The next data that was developed took the multitude of assessor data on residential construction and tied that to a mappable entity. In Microsoft Access a number of assessor's tables were joined by their GISID to make a composite table and then brought into the GIS.

See ***figure 3***



The parcel table containing the x,y coordinate of the centers, as well as the SLOSH coverage was joined to the composite table of assessor's data, giving a specific spatial location to the data as well as a many-t0-one relationship as shown in Figure 4. Multiple assessor records now had a way to be mapped within a single parcel. With the x, y data added to the residential construction table the GIS was able to create points. Therefore, where one GISID may be associated with 10 assessor records we now had 10 mapped entities to represent each record of ownership.

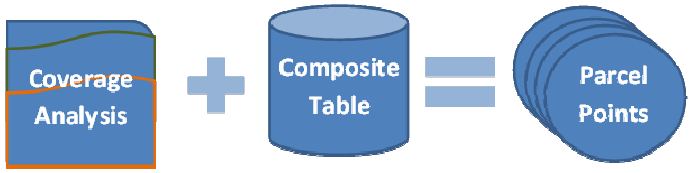


figure 4

Once the coverage analysis was complete and the parcel points were created, all points representing structures with a construction grade of 6 or less were separated for further analysis. Realizing that examining all structures graded 6 or less that resided on parcels that intersect SLOSH zones would present over-inflated results it was determined that a parcel with at least 50% of its area covered by SLOSH model data would create a more realistic analysis. Figure 5 shows an example of parcels that were removed from the risk analysis as modeled inundation in this area is nominal.

figure 5

Referring back to Figure 1, the flood hazard risk for the structure shown falls into a category 4 scenario. Looking at the coverage analysis for this parcel, it still would only be analyzed in a category 4 scenario because the percent coverage does not exceed 50% until a category 4 scenario. Creating a benchmark of 50% coverage removes outliers that could over-inflate the risk analysis findings.

When accounting for all residential structures in SLOSH zones it is found that 5,891 structures graded 6 or lower are on parcels that intersect a SLOSH zone, yet when the analysis is

ran on parcels that are at least 50% covered by SLOSH zones the number of structures at risk drops to 4,660.

When those 4,660 structures are examined it is determined that the replacement cost for all residences in parcels that totals over $1.25 billion dollars.

FEMA FLOOD HAZARD AREA ANALYSIS METHODOLOGY

The methodology used in the FEMA Flood Hazard Area analysis was exactly the same as the surge scenario except that the intersection of the parcel was done using the 2013 FEMA Flood Hazard Risk Areas. The only exception is that flood risk areas were not combined the way hurricane categories were in the SLOSH data.

APPENDIX H

FLOOD AUDIT PROGRAM

THE FLOOD AUDIT PROGRAM The Flood Audit program was developed by the USDA Natural Resource Conservation Service (NRCS) and the Connecticut Department of Environmental Protection to help reduce flood damage to contents and nonstructural building components for buildings within the 100-year floodplain of selected rivers.

The flood audit provides homeowners and small businesses with information on flood warning levels and the relationship of the flood levels to their structures. When a flood warning level is forecast for the area, the individual takes the actions listed in the flood audit for the corresponding level. The audit includes an individual action plan which will help owners react quickly and effectively to flood warning reports broadcast over the radio, television or both. Using this information, the individual can move furniture, appliances, etc., out of basements and other low areas. Flood audit data is also loaded in the local community's flood warning system computer database. The display includes an elevation graph for each structure in the flood-prone area. The structures are listed in order of height. Each bar on the graph represents a building. The bottom of the bar is the basement or lowest floor elevation, and the top of each bar is the elevation of the next floor, usually the first floor.

If the next floor is above 12 feet, the bar extends to the top of the graph, and has no top. The elevation at which water from the river will spill into the building through an opening, such as a door or window, is shown by an arrow pointing to a level on the bar. The names of owners and residents are listed in the same order (by structure height) as in the graph. Under the person's name is a phone number. With the computer display, municipal and state officials can quickly spot the lowest structures in flood-prone areas and notify audited homeowners and small businesses to begin taking actions to reduce flood damages.

Audits generally require one field day per structure and result in a package of information that property owners maintain and review annually.

When a flooding event is imminent, homeowners and businesses take the actions prescribed in the audits, including evacuation when flood heights are at a level that threatens lives and roads are flooded.

UPDATED SAMPLE

Milford Flood Audits

MILFORD FLOOD WARNING SYSTEM AUDIT #22

Flood Audit Form

OWNER **John Doe** TELEPHONE NO. 555-0000 ADDRESS

Milford, CT 06460

OCCUPANT **Same** TELEPHONE NO. **Same** ADDRESS **Same**

I. Floodwaters enter your **basement** at Flood Warning Level **8.9'** feet**.**

II. Relocate vehicles[1], trailers etc., to high and dry ground at Flood Warning Level **8.9'** driving the following route: **Directions**

III. Absolutely Evacuate everyone from building[2] at Flood Warning Level **10.1'** carefully walking the following route: **Directions**

IV. SPECIFIC FLOOD RELATED INFORMATION FOR YOUR LOCATION

Flood Warning Level (in feet)	**8.0'**	**9.6'**	**10.4**
FLOODWATER DEPTH IN FT'INCHES"*			
FOR: Basement[2]	**Dry**	**14"**	**34"**
Low Entry Point at: Garage	**Dry**	**18"**	**38"**
Outside	**Dry**	**12"**	**32"**
First Floor	**Dry**	**Dry**	**Dry**
Other: Road	**Dry**	**6"**	**26"**
Evacuation Route	**Dry**	**6"**	**26"**

[1] Remember that your evacuation route may become flooded before your building. Most cars can be safely driven through six (6) inches of water covering the road; one (1) foot for most light duty trucks. All people and pets should also EVACUATE at this time (except those individuals necessary to implement flood damage reduction actions).

[2] Based on low hazard evacuation conditions by typical adults on foot. *Negative numbers shown as follows (-2") are water elevations below the floor or entry level.

A – 2

Flood Audit (Continued)

V. [X] RECOMMENDATIONS TO CONSIDER TAKING WELL IN ADVANCE OF THE NEXT POTENTIAL FLOOD

[X] Purchase or continue flood insurance coverage.

[X] Obtain special plastic flood bags for all of your appliances, motors, etc., which protect hard-to-relocate items such as washers and stoves.

[X] Obtain and properly install a sump pump with at least 1.5" diameter discharge. Put on/off switch in dry location and obtain float on/off switch.

[X] Obtain a gasoline powered generator capable of operating your sump pump(s) during periods of electrical service interruption. You may also consider adding additional wattage capability for other electrical needs.

[ ] Hire a professional engineer to design for you a relief drainage system consisting of subsurface drains around the perimeter of your foundation and pump(s). Install a relief drainage system

[ ] Design and construct a new utility room at least____inches above your____ floor.

[X] Locate nearby a readily available supply of sandbag materials (bags, sand, and plastic); become familiar with sandbagging procedures.

[X] Obtain correct size rubber check valves for installation in waste and/or drain lines to prevent water back-ups.

[ ] Raise fuse or circuit-breaker box to at least inches above the floor.

[X] Relocate items with electronic devices (computers, security systems, numerical control devices, thermostats, instruments, switches, etc.) to keep such electronic devices at least 36" inches above BASEMENT floor.

[X] Relocate items with motors and transformers to keep motors and transformers at least 36" inches above BASEMENT floor.

[X] Modify items with electronic devices, motors, transformers, and heating system burners to allow quick disconnection and removal.

[X] Properly anchor fuel tank(s) and other buoyant objects which may cause damage by floating into other objects or being pressed up against a ceiling.

[ ] Attach gutter extensions in rear of structure to keep water from settling near openings

[ ] Place merchandise and/or equipment on pallets for easy relocation above floodwaters.

[ ] Attach gutter extensions in rear of structure to keep water from settling near openings.

LOCATION: BASEMENT

ACTIONS TO TAKE FOR THE FORCASTED FLOOD WARNING LEVEL

ITEMS	**FLOOD LEVELS: 8.9'-9.6' FEET**	**9.6'-10.1' FEET**
Low Entry Point: Garage Doors:	**Sandbag to 20" inches on the outside of the doors. Turn on sump pump to control any leakage.**	**Remove sandbags at Flood warning Level 9.6' feet and turn off sump pump and main power breaker.**
Water / Gas:	**Be prepared to close main valves.**	**Close main valves.**
Furnace or Burner:	**Be prepared to shut off and disconnect and bring to first floor.**	**Shut off, disconnect and remove burner and bring to first floor. Bag circulator pump.**
Water Heater:	**Be prepared to shut off if water enters basement.**	**Shut off.**
Fuse Box or Circuit Breaker:	**Be prepared to shut off power.**	**Shut off. Use masking tape to seal electrical outlets.**
Tools / Machinery:	**Be prepared to elevate**	**Move to first floor or either remove or bag motors, etc. and coat moving parts with lubricant.**
Clothing:	**Move up to at least 15" inches off of basement floor or bag and tie, or move to first floor.**	**Move to first floor or bag and tie.**

Garage Contents:	**Relocate to 19” inches off floor or to first floor.**	**Relocate to 19” inches off floor or to first floor.**

****NOTES****

* Because subsurface water is causing critical stress on basement floor and foundation, high hazard exists for structural damage as pumping continues.

* If you have a generator, then also check its operation and fuel supply for use during electrical service interruption.

LOCATION: OUTSIDE

ACTIONS TO TAKE FOR THE FORECASTED FLOOD WARNING LEVEL

ITEMS **FLOOD LEVELS 8.9’-10.1’ FEET**

People and Pets:	**Vehicular evacuation once road is covered with six (6) inches of water (approx. FWL 9.5’). Absolutely evacuate by foot once road is covered with three (3) feet of water (approx. FWL 10.1’).**
Vehicles:	**Relocate to West River Street for Flood Warning Levels above 8.9’ feet.**
Storage Space Under Deck:	**Raise up onto the deck, or move into house on first floor.**

S1810: DISABILITY CHARACTERISTICS
2009-2011 American Community Survey 3-

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Data and Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Subject	Milford town, New Haven County, Connecticut					
	Total		With a disability		Percent with a	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Total civilian noninstitutionalized	52,373	+/-128	5,346	+/-633	10.2%	+/-1.2
Population under 5 years	3,153	+/-389	51	+/-83	1.6%	+/-2.6
With a hearing difficulty	(X)	(X)	51	+/-83	1.6%	+/-2.6
With a vision difficulty	(X)	(X)	0	+/-118	0.0%	+/-1.8
Population 5 to 17 years	7,954	+/-539	300	+/-190	3.8%	+/-2.4
With a hearing difficulty	(X)	(X)	66	+/-82	0.8%	+/-1.0
With a vision difficulty	(X)	(X)	82	+/-87	1.0%	+/-1.1
With a cognitive difficulty	(X)	(X)	212	+/-128	2.7%	+/-1.6
With an ambulatory difficulty	(X)	(X)	38	+/-43	0.5%	+/-0.5
With a self-care difficulty	(X)	(X)	50	+/-48	0.6%	+/-0.6
Population 18 to 64 years	33,456	+/-563	2,463	+/-449	7.4%	+/-1.3
With a hearing difficulty	(X)	(X)	447	+/-177	1.3%	+/-0.5
With a vision difficulty	(X)	(X)	345	+/-149	1.0%	+/-0.4
With a cognitive difficulty	(X)	(X)	875	+/-268	2.6%	+/-0.8
With an ambulatory difficulty	(X)	(X)	1,553	+/-389	4.6%	+/-1.2
With a self-care difficulty	(X)	(X)	489	+/-230	1.5%	+/-0.7
With an independent living difficulty	(X)	(X)	802	+/-273	2.4%	+/-0.8
Population 65 years and over	7,810	+/-430	2,532	+/-414	32.4%	+/-4.8
With a hearing difficulty	(X)	(X)	1,146	+/-294	14.7%	+/-3.6
With a vision difficulty	(X)	(X)	324	+/-119	4.1%	+/-1.5
With a cognitive difficulty	(X)	(X)	628	+/-214	8.0%	+/-2.7
With an ambulatory difficulty	(X)	(X)	1,361	+/-289	17.4%	+/-3.5
With a self-care difficulty	(X)	(X)	545	+/-183	7.0%	+/-2.3
With an independent living difficulty	(X)	(X)	1,284	+/-338	16.4%	+/-4.1
SEX						
Male	25,441	+/-778	2,295	+/-372	9.0%	+/-1.4
Female	26,932	+/-797	3,051	+/-468	11.3%	+/-1.7
RACE AND HISPANIC OR LATINO						
One Race	N	N	N	N	N	N
White alone	45,986	+/-1,000	4,866	+/-631	10.6%	+/-1.4
Black or African American alone	1,528	+/-573	160	+/-111	10.5%	+/-7.9

American Indian and Alaska Native	N	N	N	N	N	N
Asian alone	N	N	N	N	N	N
Native Hawaiian and Other Pacific	N	N	N	N	N	N
Some other race alone	N	N	N	N	N	N
Two or more races	N	N	N	N	N	N
White alone, not Hispanic or Latino	44,253	+/-1,036	4,733	+/-617	10.7%	+/-1.4
Hispanic or Latino (of any race)	2,237	+/-638	172	+/-118	7.7%	+/-5.4
PERCENT IMPUTED						
Disability status	4.5%	(X)	(X)	(X)	(X)	(X)
Hearing difficulty	2.7%	(X)	(X)	(X)	(X)	(X)
Vision difficulty	2.6%	(X)	(X)	(X)	(X)	(X)
Cognitive difficulty	3.1%	(X)	(X)	(X)	(X)	(X)
Ambulatory difficulty	3.1%	(X)	(X)	(X)	(X)	(X)
Self-care difficulty	3.1%	(X)	(X)	(X)	(X)	(X)
Independent living difficulty	3.0%	(X)	(X)	(X)	(X)	(X)

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see Accuracy of the Data). The effect of nonsampling error is not represented in these tables.

The Census Bureau introduced a new set of disability questions in the 2008 ACS questionnaire. Accordingly, comparisons of disability data from 2008 or later with data from prior years are not recommended. For more information on these questions and their evaluation in the 2006 ACS Content Test, see the Evaluation Report Covering Disability.

While the 2009-2011 American

Community Survey (ACS) data generally reflect the December 2009 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural population, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2000 data. Boundaries for urban areas have not been updated since Census 2000. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Source: U.S. Census Bureau, 2009-2011 American Community Survey

Explanation of Symbols:

Part III — Building Planning and Construction

CHAPTER 3

BUILDING PLANNING

SECTION R301
DESIGN CRITERIA

R301.1 Design. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed by this code. The construction of buildings and structures shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation.

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1 the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards the design shall comply with the *International Building Code.*

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual* (WFCM).
2. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-family Dwellings* (COFS/PM).

R301.1.2 Construction systems. The requirements of this code are based on platform and balloon-frame construction for light-frame buildings. The requirements for concrete and masonry buildings are based on a balloon framing system. Other framing systems must have equivalent detailing to ensure force transfer, continuity and compatible deformations.

R301.1.3 Engineered design. When a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise, not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design in accordance with the *International Building Code* is permitted for all buildings and structures, and parts thereof, included in the scope of this code.

[B] R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established by the local jurisdiction and set forth in Table R301.2(1).

R301.2.1 Wind limitations. Buildings and structures or portions thereof shall be designed and constructed in accordance with the wind speed requirements and construction methods of this code. Basic wind speeds shall be determined by Appendix M. Where different construction methods and structural materials are used for various portions of a building or structure, the applicable requirements of this section for each portion shall apply. Where loads for windows, skylights and exterior doors are not otherwise specified, the loads listed in Table R301.2(2) adjusted for height and exposure per Table R301.2(3), shall be used to determine design load performance requirements for windows and doors.

R301.2.1.1 Design criteria. Construction in locations where the basic wind speed as determined by Appendix M equals or exceeds 110 miles per hour shall be designed in accordance with one of the following:

1. American Forest and Paper Association (AF&PA), *Wood Frame Construction Manual for One- and Two-Family Dwellings* (WFCM-01); or
2. *Southern Building Code Congress International Standard for Hurricane Resistant Residential Construction* (SSTD 10-99); or
3. *Minimum Design Loads for Buildings and Other Structures* (ASCE-7-02); or
4. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing – Prescriptive Method for One- and Two-Family Dwellings* (COFS/PM-01).
5. Concrete construction shall be designed in accordance with the provisions of this code.

R301.2.1.2 Internal pressure. Windows in buildings located in windborne debris regions shall have glazed openings protected from windborne debris or the building shall be designed as a partially enclosed building in accordance with the *International Building Code.* Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and of ASTM E 1886 referenced therein.

Exception: Wood structural panels with a minimum thickness of $^{7}/_{16}$ inch (11.1 mm) and a maximum span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings. Panels shall be precut to cover the glazed openings with attachment hardware provided. Attachments shall be provided in accordance with Table R301.2.1.2 or shall be designed to resist the components and cladding loads determined in accordance with the provisions of the *International Building Code*.

APPENDIX M

BASIC WIND SPEED

MUNICIPALITY	BASIC WIND SPEED (3 second gust)	MUNICIPALITY	BASIC WIND SPEED (3 second gust)	MUNICIPALITY	BASIC WIND SPEED (3 second gust)	MUNICIPALITY	BASIC WIND SPEED (3 second gust)
Andover	100	East Haven	110	Morris	90	Southbury	90
Ansonia	100	East Lyme	110/120[1]	Naugatuck	100	Southington	100
Ashford	100	Easton	100	New Britain	90	South Windsor	90
Avon	90	East Windsor	90	New Canaan	100	Sprague	100
Barkhamsted	90	Ellington	90	New Fairfield	90	Stafford	90
Beacon Falls	100	Enfield	90	New Hartford	90	Stamford	100
Berlin	100	Essex	110	New Haven	110	Sterling	100
Bethany	100	Fairfield	100/110[2]	Newington	100	Stonington	110/120[5]
Bethel	90	Farmington	90	New London	120	Stratford	100
Bethlehem	90	Franklin	100	New Milford	90	Suffield	90
Bloomfield	90	Glastonbury	100	Newtown	90	Thomaston	90
Bolton	100	Goshen	90	Norfolk	90	Thompson	100
Bozrah	110	Granby	90	North Branford	110	Tolland	100
Branford	110	Greenwich	100	North Canaan	90	Torrington	90
Bridgeport	110	Griswold	100	North Haven	100/110[2]	Trumbull	100/110[2]
Bridgewater	90	Groton	120	North Stonington	110	Union	90
Bristol	90	Guilford	110	Norwalk	110/110[3]	Vernon	100
Brookfield	90	Haddam	110	Norwich	110	Voluntown	110
Brooklyn	100	Hamden	100/110[2]	Old Lyme	110/120[1]	Wallingford	100
Burlington	90	Hampton	100	Old Saybrook	110	Warren	90
Canaan	90	Hartford	90	Orange	110	Washington	90
Canterbury	100	Hartland	90	Oxford	100	Waterbury	90
Canton	90	Harwinton	90	Plainfield	100	Waterford	110/120[1]
Chaplin	100	Hebron	100	Plainville	90	Watertown	90
Cheshire	100	Kent	90	Plymouth	90	Westbrook	110
Chester	110	Killingly	100	Pomfret	100	West Hartford	90
Clinton	110	Killingworth	110	Portland	100	West Haven	110
Colchester	100	Lebanon	100	Preston	110	Weston	100
Colebrook	90	Ledyard	110	Prospect	100	Westport	100/110[2]
Columbia	100	Lisbon	110	Putnam	100	Wethersfield	100
Cornwall	90	Litchfield	90	Redding	100	Willington	100
Coventry	100	Lyme	110	Ridgefield	90	Wilton	100
Cromwell	100	Madison	110	Rocky Hill	100	Winchester	90
Danbury	90	Manchester	100	Roxbury	90	Windham	100
Darien	100	Mansfield	100	Salem	110	Windsor	90
Deep River	110	Marlborough	100	Salisbury	90	Windsor Locks	90
Derby	100	Meriden	100	Scotland	100	Wolcott	90
Durham	100	Middlebury	90	Seymour	100	Woodbridge	100
Eastford	100	Middlefield	100	Sharon	90	Woodbury	90
East Granby	90	Middletown	100	Shelton	100/110[4]	Woodstock	100
East Haddam	110	Milford	110	Sherman	90		
East Hampton	100	Monroe	100	Simsbury	90		
East Hartford	110	Montville	110	Somers	90		

1. Areas south of I-95 = 120 mph; areas north of I-95 = 110 mph
2. Areas south of Rt. 15 = 110 mph; areas north of Rt. 15 = 100 mph
3. Areas south of I-95 = 110 mph; areas north of I-95 = 100 mph
4. Areas east of Rt. 8 = 110 mph; areas west of Rt. 8 = 100 mph
5. Areas south of Rt. 184 = 120 mph; areas north of Rt. 184 = 110 mph

Hazus-MH: Earthquake Event Report

Region Name: Milford Hazard Mitigation

Earthquake Scenario: Probalistic_500yrMag7

Print Date: July 16, 2013

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

Section	Page #
General Description of the Region	3
Building and Lifeline Inventory	4
Building Inventory	
Critical Facility Inventory	
Transportation and Utility Lifeline Inventory	
Earthquake Scenario Parameters	6
Direct Earthquake Damage	7
Buildings Damage	
Critical Facilities Damage	
Transportation and Utility Lifeline Damage	
Induced Earthquake Damage	11
Fire Following Earthquake	
Debris Generation	
Social Impact	12
Shelter Requirements	
Casualties	
Economic Loss	13
Building Losses	
Transportation and Utility Lifeline Losses	
Long-term Indirect Economic Impacts	

Appendix A: County Listing for the Region

Appendix B: Regional Population and Building Value Data

General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 23.15 square miles and contains 12 census tracts. There are over 20 thousand households in the region which has a total population of 52,305 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 22 thousand buildings in the region with a total building replacement value (excluding contents) of 5,344 (millions of dollars). Approximately 90.00 % of the buildings (and 69.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 933 and 203 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 22 thousand buildings in the region which have an aggregate total replacement value of 5,344 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 83% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 46 beds. There are 26 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 2 dams identified within the region. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 13 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 1,136.00 (millions of dollars). This inventory includes over 42 kilometers of highways, 44 bridges, 913 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	44	556.60
	Segments	25	345.60
	Tunnels	0	0.00
		Subtotal	**902.20**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	6	26.00
	Tunnels	0	0.00
		Subtotal	**26.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	3	3.80
		Subtotal	**3.80**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	1	2.00
		Subtotal	**2.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	**0.00**
		Total	**933.90**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	9.10
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**9.10**
Waste Water	Distribution Lines	NA	5.50
	Facilities	1	76.60
	Pipelines	0	0.00
		Subtotal	**82.10**
Natural Gas	Distribution Lines	NA	3.70
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**3.70**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	1	126.50
		Subtotal	**126.50**
Communication	Facilities	1	0.10
		Subtotal	**0.10**
		Total	**221.50**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Probalistic_500yrMag7
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	7.00
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

Hazus estimates that about 45 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	82	0.38	1	0.51	0	0.73	0	0.95	0	0.59
Commercial	1,329	6.12	22	8.88	6	14.46	1	19.81	0	16.57
Education	44	0.20	1	0.27	0	0.42	0	0.55	0	0.56
Government	16	0.07	0	0.09	0	0.14	0	0.17	0	0.13
Industrial	515	2.37	8	3.25	2	5.26	0	6.61	0	4.45
Other Residential	3,351	15.43	51	20.35	13	29.82	1	34.85	0	38.58
Religion	66	0.31	1	0.46	0	0.77	0	1.13	0	1.33
Single Family	16,311	75.11	164	66.18	20	48.41	1	35.93	0	37.78
Total	**21,715**		**249**		**42**		**3**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	18,010	82.94	167	67.30	16	37.80	0	12.25	0	0.00
Steel	1,038	4.78	14	5.73	4	8.51	0	8.33	0	0.00
Concrete	253	1.16	3	1.17	1	1.36	0	0.60	0	0.00
Precast	62	0.29	1	0.44	1	1.36	0	2.63	0	0.00
RM	444	2.04	6	2.28	2	5.70	0	7.41	0	0.00
URM	1,692	7.79	51	20.48	17	40.17	2	66.66	0	100.00
MH	217	1.00	6	2.60	2	5.09	0	2.12	0	0.00
Total	**21,715**		**249**		**42**		**3**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 46 hospital beds available for use. On the day of the earthquake, the model estimates that only 40 hospital beds (88.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 96.00% of the beds will be back in service. By 30 days, 99.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	1	0	0	1
Schools	26	0	0	26
EOCs	0	0	0	0
PoliceStations	1	0	0	1
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	25	0	0	25	25
	Bridges	44	0	0	44	44
	Tunnels	0	0	0	0	0
Railways	Segments	6	0	0	6	6
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	3	0	0	3	3
Ferry	Facilities	0	0	0	0	0
Port	Facilities	1	0	0	1	1
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	1	0	0	1	1
Communication	1	0	0	1	1

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	457	0	0
Waste Water	274	0	0
Natural Gas	183	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	20,900	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 75.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 40 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 52,305) will seek temporary shelter in public shelters.

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 4.56 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 4.01 (millions of dollars); 25 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 48 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.01	0.21	0.01	0.01	0.23
	Capital-Related	0.00	0.01	0.17	0.01	0.00	0.18
	Rental	0.03	0.06	0.13	0.01	0.00	0.23
	Relocation	0.09	0.04	0.16	0.03	0.02	0.34
	Subtotal	**0.12**	**0.12**	**0.67**	**0.05**	**0.03**	**0.99**
Capital Stock Losses							
	Structural	0.26	0.08	0.23	0.06	0.03	0.66
	Non_Structural	0.87	0.28	0.49	0.14	0.06	1.84
	Content	0.16	0.04	0.18	0.09	0.02	0.49
	Inventory	0.00	0.00	0.01	0.02	0.00	0.02
	Subtotal	**1.30**	**0.41**	**0.90**	**0.31**	**0.11**	**3.02**
	Total	**1.41**	**0.53**	**1.57**	**0.36**	**0.14**	**4.01**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Hazus estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	345.59	$0.00	0.00
	Bridges	556.64	$0.04	0.01
	Tunnels	0.00	$0.00	0.00
	Subtotal	**902.20**	**0.00**	
Railways	Segments	25.95	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**26.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	3.76	$0.07	1.74
	Subtotal	**3.80**	**0.10**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	2.00	$0.03	1.74
	Subtotal	**2.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**933.90**	**0.10**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	9.10	$0.00	0.02
	Subtotal	**9.13**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	76.60	$0.15	0.20
	Distribution Lines	5.50	$0.00	0.02
	Subtotal	**82.07**	**$0.15**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	3.70	$0.00	0.01
	Subtotal	**3.65**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	126.50	$0.25	0.20
	Subtotal	**126.50**	**$0.25**	
Communication	Facilities	0.10	$0.00	0.17
	Subtotal	**0.12**	**$0.00**	
	Total	**221.47**	**$0.41**	

Table 14. Indirect Economic Impact with outside aid

(Employment as # of people and Income in millions of $)

LOSS	Total	%

Appendix A: County Listing for the Region

New Haven,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New Haven	52,305	3,693	1,650	5,344
Total State		**52,305**	**3,693**	**1,650**	**5,344**
Total Region		**52,305**	**3,693**	**1,650**	**5,344**

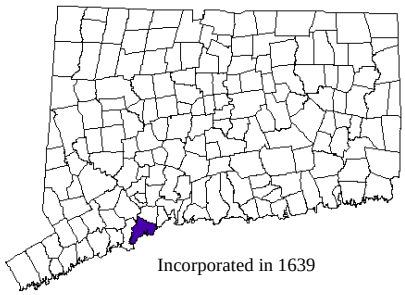
APPENDIX L

Milford, Connecticut

CERC Town Profile 2012

Town Hall
110 River Street
Milford, CT 06460
(203) 783-3201

Belongs to
New Haven County
LMA Bridgeport - Stamford
South Central Economic Dev. Region
South Central Connecticut Planning Area



Incorporated in 1639

Demographics

Population (2011)	*Town*	*County*	*State*
1990	49,938	804,219	3,287,116
2000	52,305	824,008	3,405,565
2011	52,894	871,258	3,610,073
2016	53,968	905,825	3,754,486
'11-'16 Growth / Yr	0.4%	0.8%	0.8%
Land Area (sq. miles)	23	606	5,009
Pop./ Sq. Mile (2011)	2,344	1,438	721
Median Age (2011)	40	39	40
Households (2011)	21,910	340,030	1,391,975
Med HH Inc. (2011)	$78,738	$63,310	$70,705

Race/Ethnicity (2011)	*Town*	*County*	*State*
White	47,107	651,407	2,800,328
Black	1,340	110,922	365,949
Asian Pacific	2,835	30,890	138,364
Native American	73	2,521	11,369
Other/Multi-Race	1,539	75,518	294,063
Hispanic (any race)	2,992	139,381	512,039
Poverty Rate (2010)	3.9%	10.9%	9.2%

Educational Attainment (2011)

Persons Age 25 or Older	*Town*	*%*	*State*	*%*
High School Graduate	10,934	31%	702,670	29%
Some College	9,183	26%	594,209	24%
Bachelors or More	13,373	38%	883,658	36%

Age Distribution (2011)

	0-4		*5-17*		*18-24*		*25-49*		*50-64*		*65+*		*Total*
Male	1,728	3%	4,782	9%	2,599	5%	8,338	16%	4,969	9%	3,326	6%	25,742
Female	1,647	3%	4,337	8%	2,371	4%	8,988	17%	5,211	10%	4,598	9%	27,152
County Total	53,213	6%	145,329	17%	84,217	10%	297,919	34%	166,460	19%	124,120	14%	871,258
State Total	217,641	6%	611,932	17%	343,959	10%	1,213,300	34%	711,463	20%	511,778	14%	3,610,073

Economics

Business Profile (2005) — *% of Total*

Sector	*Establishments*	*Employment*
Agriculture	2.2%	0.7%
Const. and Mining	12.4%	5.8%
Manufacturing	7.7%	16.0%
Trans. and Utilities	3.0%	5.0%
Trade	25.9%	30.0%
Finance, Ins. and Real Estate	6.8%	5.7%
Services	39.3%	34.2%
Government	2.7%	2.8%

Top Five Grand List (2009)	*Amount*	*% of Net*
Connecticut Post Mall	$140,479,800	1.9%
CT Light & Power Co.	$109,848,230	1.5%
Milford Crossing Investors	$73,700,500	1.0%
Smith Craft Real Estate	$59,884,020	0.8%
Devon Power	$57,358,982	0.8%
Net Grand List (2009)	$7,422,164,367	

Top Five Major Employers (2006)

Milford Board of Education
New England Home Care Inc.
Milford Hospital
Bic Corporation
Schick

	Town	*State*
Retail Sales (2007) *All Outlets*	$1,820,643,365	$136,936,194,241

Education

2009-2010 School Year	*Town*	*State*
Total Town School Enrollment	7,304	552,782

Most public school students in Milford attend Milford School District, which has 7,303 students.

Connecticut Mastery Test Percent Above Goal

	Grade 4		*Grade 6*		*Grade 8*	
	Town	*State*	*Town*	*State*	*Town*	*State*
Reading	68	61	79	69	73	69
Math	64	64	78	69	67	65
Writing	72	64	69	62	71	67

For more education data please see: http://www.state.ct.us/sde/

Students per Computer	*Town*	*State*
Elementary:	3.1	4.1
Middle:	2.8	2.8
Secondary:	2.3	2.7

Average Class Size

Grade K	17.4	Grade 2	17.3
Grade 5	20.6	Grade 7	20.4
High School	20.4		

Average SAT Score

	Town	*State*
Reading	498	503
Writing	501	506
Math	499	508

No representation or warranties, expressed or implied, are given regarding the accuracy of this information.

Milford
Connecticut

CERC start here
Connecticut Economic Resource Center, Inc.

Government

Government Form: Mayor-Board of Aldermen

Total Revenue (2010)	$175,643,000
Tax Revenue	$147,150,000
Non-tax Revenue	$28,493,000
Intergovernmental	$22,212,000
Per Capita Tax (2010)	$2,706
As % of State Average	109.2%

Total Expenditures (2010)	$176,451,000
Education	$106,657,000
Other	$69,794,000
Total Indebtness (2010)	$126,455,000
As % of Expenditures	71.7%
Per Capita	$2,326
As % of State Average	104.4%

Annual Debt Service (2010)	$10,048,000
As % of Expenditures	5.7%
Eq. Net Grand List (2008)	$6,972,378,128
Per Capita	$125,808
As % of State Average	76%
Date of Last Revaluation (2009)	2006
Moody's Bond Rating (2009)	Aa2
Actual Mill Rate (2010)	27.50
Equalized Mill Rate (2010)	21.08
% of Grand List Com/Ind (2007)	17.3%

Housing/Real Estate

Housing Stock (2009)	***Town***	***County***	***State***
Existing Units (total)	23,924	352,042	1,452,007
% Single Unit	71.0%	59.5%	64.8%
New Permits Auth. (2009)	86	509	3,786
As % Existing Units	0.36%	0.14%	0.26%
Demolitions (2009)	20	212	1,219
House Sales (2009)	258	3,553	14,696
Median Price	$300,000	$246,000	$265,000
Built Pre 1950 share (2000)	32.4%	33.2%	31.5%

Owner Occupied Dwellings (2009)	15,329	185,400	812,964
As % Total Dwellings	65%	53%	57%
Subsidize Housing (2008)	1,348	41,649	149,355

Distribution of House Sales (2009)	***Town***	***County***	***State***
Number of Sales			
Less than $100,000		80	346
$100,000-$199,999	9	953	3,539
$200,000-$299,999	119	1,347	4,847
$300,000-$399,999	82	645	2,510
$400,000 or More	48	528	3,454

Labor Force

Place of Residence (2011)	***Town***	***County***	***State***
Labor Force	30,934	457,670	1,918,145
Employed	28,414	413,076	1,749,489
Unemployed	2,520	44,594	170,828
Unemployment Rate	8.1%	9.7%	8.9%
Place of Work (2011)			
# of Units	1,928	22,256	103,381
Total Employment	28,175	300,474	1,612,373
2000-'11 Growth AAGR	-0.3%	-1.8%	-0.3%
Mfg Employment	3,631	33,266	166,279

Commuters (2000)

Commuters into Town from:		Town Residents Commuting to:	
Milford	9,225	Milford	9,225
West Haven	3,112	Bridgeport	2,115
Bridgeport	1,976	New Haven	2,014
New Haven	1,834	Stratford	1,832
Stratford	1,428	Shelton	1,146
Shelton	932	Norwalk	1,133
Orange	905	Stamford	1,044
Hamden	811	Fairfield	938
Waterbury	691	Trumbull	852
Ansonia	503	West Haven	836

Other Information

	Town	***State***
Banks (2007)	16	1,029
Crime Rate (2009)		
Per 100,000 Residents	154	298

Library (2010)	***Town***
Total Volumes	138,479
Circulation Per Capita	5.6

Distance to Major Cities	***Miles***
Hartford	42
Boston	130
New York City	61
Providence	94

Residential Utilities

Electric Provider
The United Illuminating Co.
(800) 257-0141

Gas Provider
Southern Connecticut Gas Company
(203) 382-8111

Water Provider
South Central CT Regional Water Auth.
(203) 562-4020

Cable Provider
CABLEVISION SYSTEMS OF SOUTHER
(203) 336-2225

No representation or warranties, expressed or implied, are given regarding the accuracy of this information.

DOT Average Dailty Traffic (ADT) Counts from June-July 2008

I-95

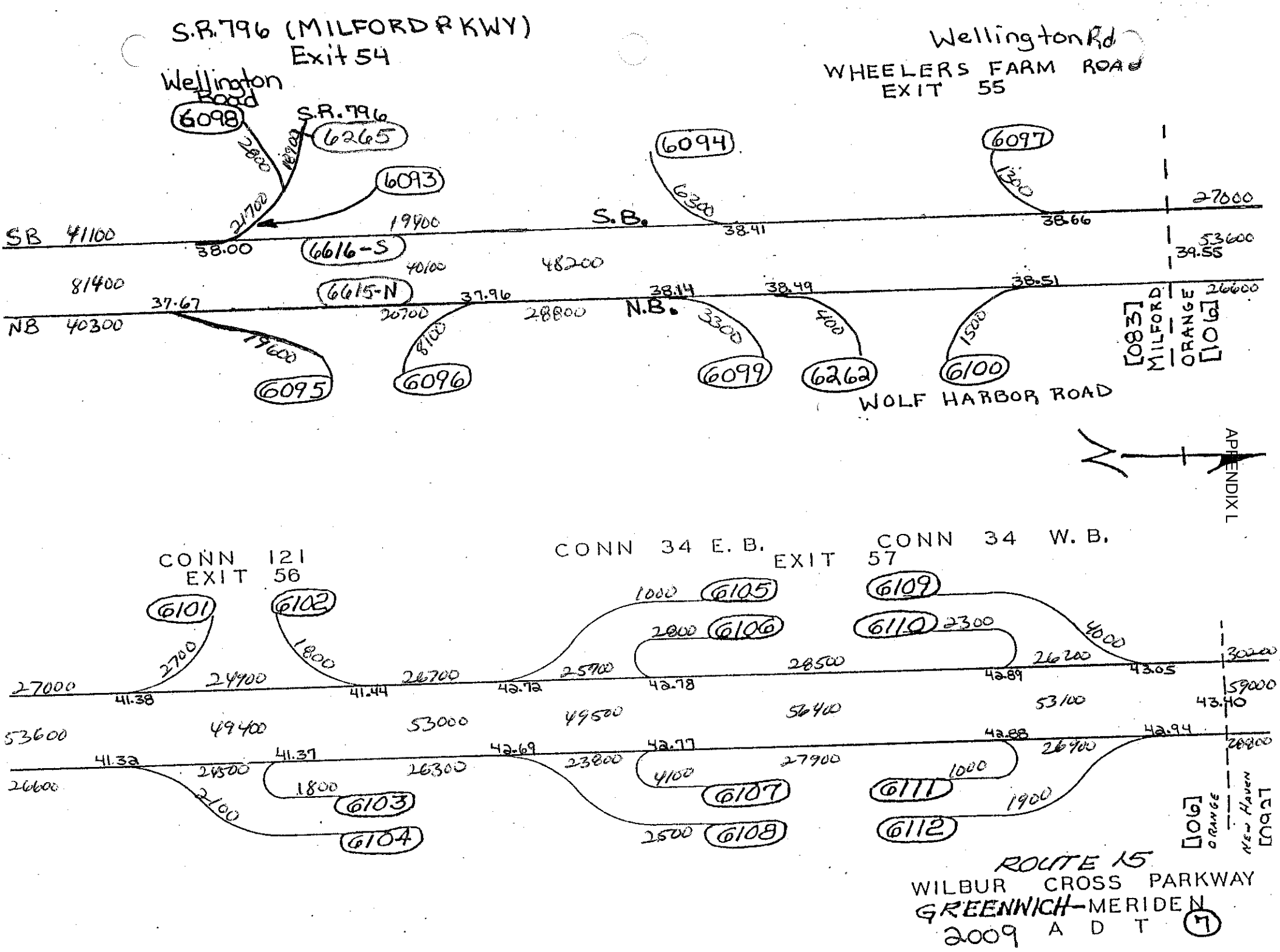
EXIT	On ramp Southbound	Off ramp Southbound	On ramp Northbound	Off ramp Northbound
34	2,000	6,000	5,600	2,400
35	3,500	4,300	5,100	2,700
36	2,300	5,100	4,800	2,600
37				3,000
38	9,800	15,400	14,200	6,800
39A	8,700	4,900	2,600	1,800
39B	1,800	2,800	5,700	6,000
40	7,600	7,100	8,100	9,400
Sum	35,700	45,600	46,100	34,700

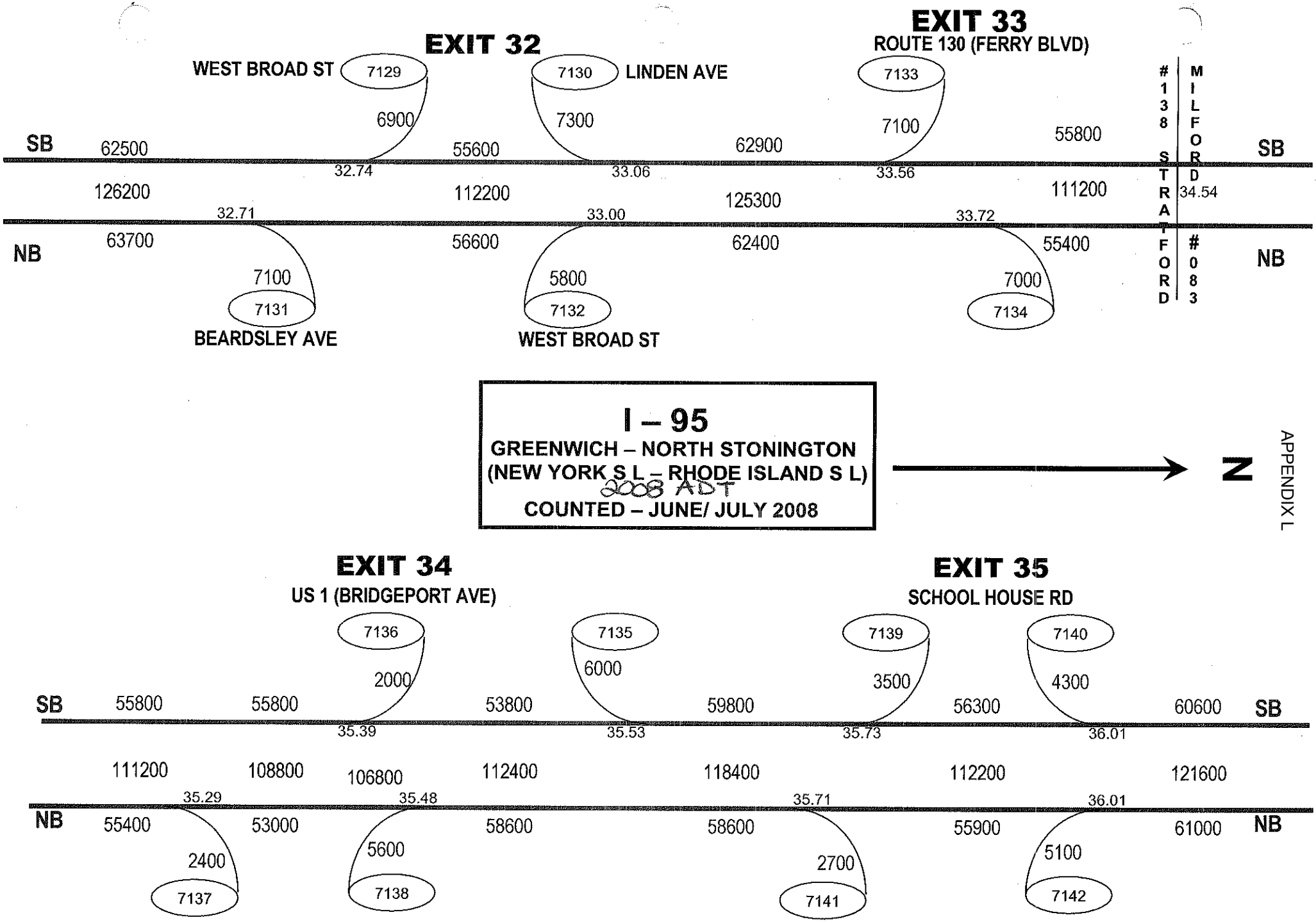
Rte 15

EXIT	On ramp Southbound		Off ramp Southbound		On ramp Northbound		Off ramp Northbound	
54	21,700	6,300	1,300		8,100		19,600	
55			1,300	6,300	1,500	3,300	400	
56	2,700	1,800			1,800		2,100	
57	2,300	1,000	4,000	2,800	4,100	1,900	2,500	1,000
Sum	26,700	9,100	6,600	9,100	15,500	5,200	24,600	1,000

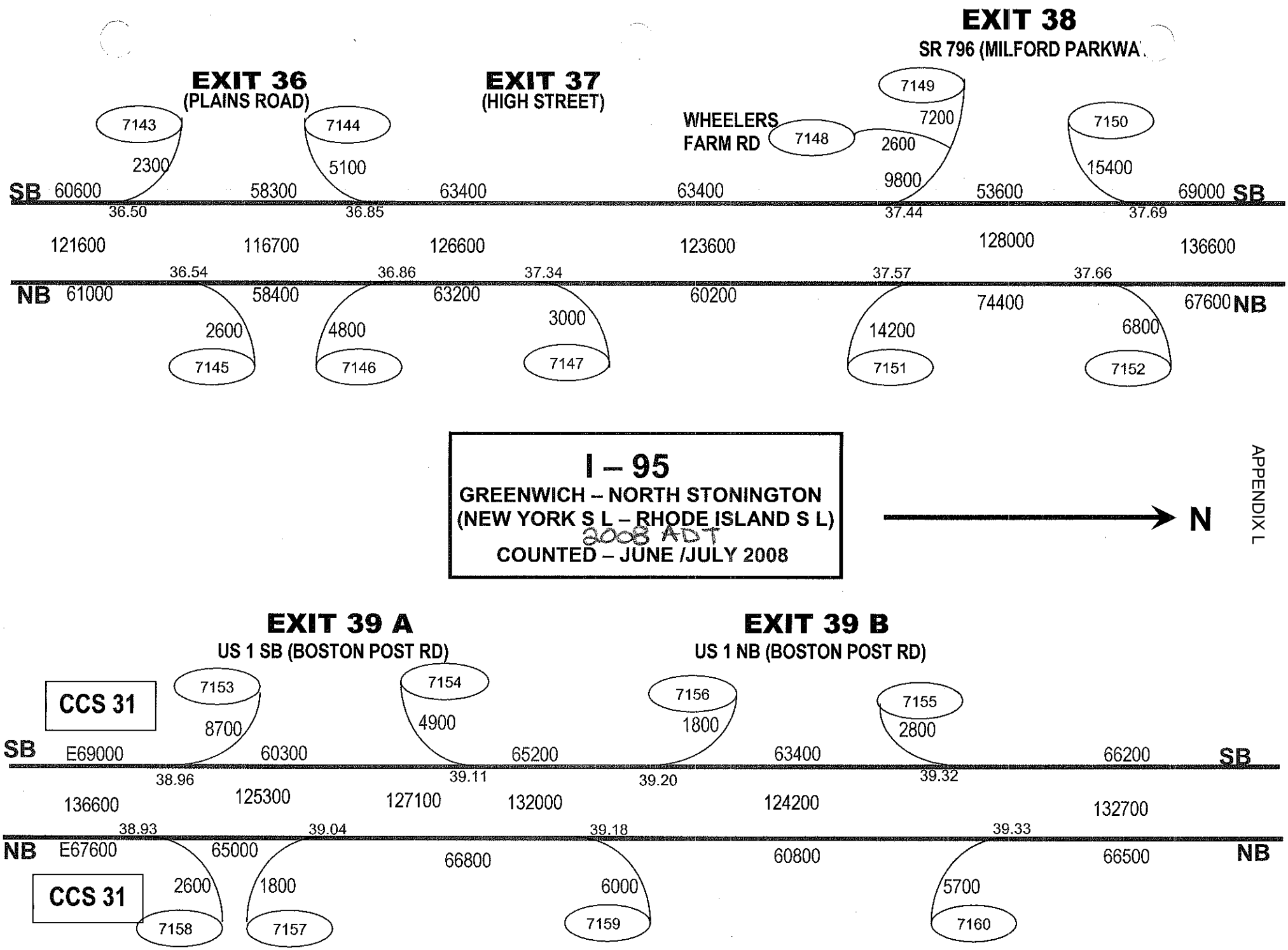
All Highways

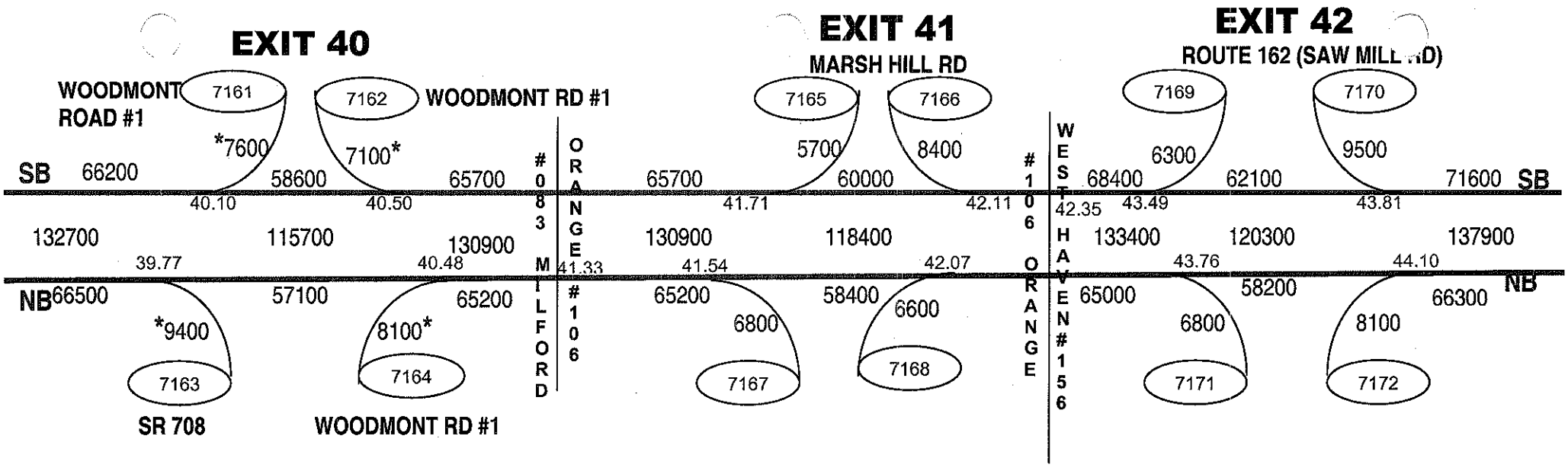
Southbound On Ramps	71,500
Southbound Off Ramps	61,300
Northbound On Ramps	66,800
Northbound Off Ramps	60,300
On ramp total:	138,300
Off ramp total:	121,600
Sum:	259,900


S.R.796 (MILFORD PKWY)
Exit 54
Wellington Road
6098
S.R.796
6265
6093
6094
6097
Wellington Rd
WHEELERS FARM ROAD
EXIT 55
SB 41100
38.00
21700
2800
18700
19900
S.B.
6300
38.41
1300
38.66
27000
53600
39.55
6616-S
40100
48200
81400
6615-N
37.67
37.96
38.14
38.49
38.51
26600
NB 40300
20700
28800
N.B.
3300
400
1500
19600
8100
6095
6096
6099
6262
6100
[083] MILFORD
ORANGE [09]
WOLF HARBOR ROAD
APPENDIX L
CONN 121
EXIT 56
CONN 34 E.B.
EXIT 57
CONN 34 W.B.
6101
6102
6105
6109
6106
6110
1000
2800
2300
4000
2700
1800
27000
24900
26700
25900
28500
26200
30200
41.38
41.44
42.72
42.78
42.89
43.05
59000
43.40
53600
49400
53000
49500
56400
53100
41.32
41.37
42.69
42.77
42.88
42.94
26600
24500
26300
23800
27900
26900
20900
4100
1000
1800
6103
6107
6111
2100
1900
6104
2500
6108
6112
[09] ORANGE
NEW HAVEN [087]
ROUTE 15
WILBUR CROSS PARKWAY
GREENWICH-MERIDEN
2009 A D T
7


EXIT 32
WEST BROAD ST
7129
7130
LINDEN AVE
EXIT 33
ROUTE 130 (FERRY BLVD)
7133
1 3 8 STRATFORD
MILFORD
34.54
0 8 3
SB
62500
6900
55600
7300
62900
7100
55800
SB
32.74
33.06
33.56
126200
112200
125300
111200
32.71
33.00
33.72
NB
63700
56600
62400
55400
NB
7100
7131
BEARDSLEY AVE
5800
7132
WEST BROAD ST
7000
7134
I – 95
GREENWICH – NORTH STONINGTON
(NEW YORK S L – RHODE ISLAND S L)
2008 ADT
COUNTED – JUNE/ JULY 2008
N
EXIT 34
US 1 (BRIDGEPORT AVE)
EXIT 35
SCHOOL HOUSE RD
7136
7135
7139
7140
2000
6000
3500
4300
SB
55800
55800
53800
59800
56300
60600
SB
35.39
35.53
35.73
36.01
111200
108800
106800
112400
118400
112200
121600
35.29
35.48
35.71
36.01
NB
55400
53000
58600
58600
55900
61000
NB
2400
7137
5600
7138
2700
7141
5100
7142

APPENDIX L


EXIT 38
SR 796 (MILFORD PARKWA
EXIT 36
(PLAINS ROAD)
EXIT 37
(HIGH STREET)
WHEELERS
FARM RD
7143
7144
7148
7149
7150
2300
5100
2600
7200
9800
15400
SB 60600
58300
63400
63400
53600
69000 SB
36.50
36.85
37.44
37.69
121600
116700
126600
123600
128000
136600
36.54
36.86
37.34
37.57
37.66
NB 61000
58400
63200
60200
74400
67600 NB
2600
4800
3000
14200
6800
7145
7146
7147
7151
7152
I – 95
GREENWICH – NORTH STONINGTON
(NEW YORK S L – RHODE ISLAND S L)
2008 ADT
COUNTED – JUNE /JULY 2008
N
EXIT 39 A
US 1 SB (BOSTON POST RD)
EXIT 39 B
US 1 NB (BOSTON POST RD)
CCS 31
7153
7154
7156
7155
8700
4900
1800
2800
SB E69000
60300
65200
63400
66200
SB
38.96
39.11
39.20
39.32
136600
125300
127100
132000
124200
132700
38.93
39.04
39.18
39.33
NB E67600
65000
66800
60800
66500
NB
CCS 31
2600
1800
6000
5700
7158
7157
7159
7160



* CLASSIFICATION COUNT

I – 95

GREENWICH – NORTH STONINGTON
(NEW YORK S L – RHODE ISLAND S L)
2008 ADT
COUNTED – JUNE/JULY 2008

N

APPENDIX L

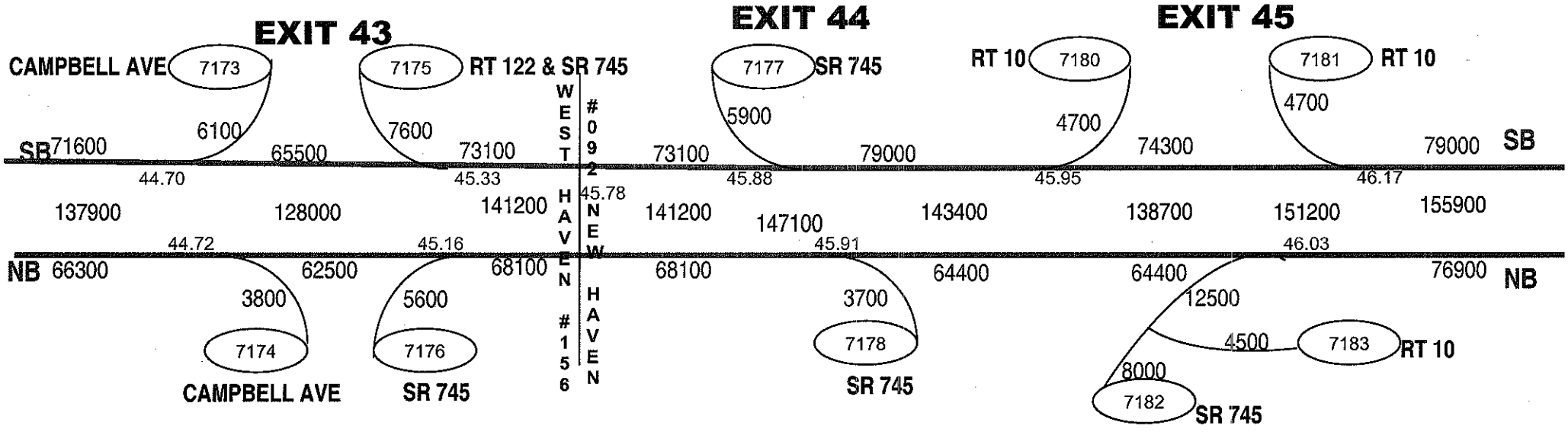


Exhibit 5: Prioritization Using STAPLEE and Qualitative Scores

Actions → / Criteria ↓	Silver Swords		Generators @ Public facilities		Relocation of Animal Shelter out of Flood Zone	
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social	0	1	-1	1	1	1
Technical	-1	0	0	1	0	0
Administrative	-1	1	0	0	0	0
Political	0	1	1	1	1	1
Legal	0	1	0	0	0	0
Economic	0	1	-1	1	-1	-1
Environmental	0	0	-1	0	1	1
Priority	-2	5	-2	4	2	2
	3		+2		4	

Definition of rating scale: _____

Exhibit 6: Prioritization Using STAPLEE and Simple Scores

Actions → / Criteria ↓						
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale: _____

Exhibit 5: Prioritization Using STAPLEE and Qualitative Scores

Actions → / Criteria ↓	Navgatuck Ave		Bayview Beach		Creeland	
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social	0	2	-1	1	-1	1
Technical	-1	1	-1	1	-1	-1
Administrative	-1	0	-1	0	-1	-1
Political	0	+2	0	2	1	1
Legal	0	0	+1	1	1	0
Economic	0	2	+1	1	0	0
Environmental	0	1	0	0	0	0
Priority	-1	8	-1	6	-2	0
		7		5	-2	

Definition of rating scale: Simple

Exhibit 6: Prioritization Using STAPLEE and Simple Scores

Actions → / Criteria ↓						
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale: _____

Exhibit 5: Prioritization Using STAPLEE and Qualitative Scores

Actions → / Criteria ↓	Beachland/Melba		Tumblebrook		Flood gauges	
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social	0	1	0	1	0	1
Technical	-1	0	-1	1	-1	1
Administrative	-1	0	-1	0	-1	0
Political	1	1	1	1	1	1
Legal	0	0	1	0	1	1
Economic	-1	0	-1	1	0	1
Environmental	0	1	0	1	0	0
Priority	-2	3	-1	5	0	5
	(+1)		(4)		✓ (5)	

Definition of rating scale: _____

Exhibit 6: Prioritization Using STAPLEE and Simple Scores

Actions → / Criteria ↓						
	Cost	Benefit	Cost	Benefit	Cost	Benefit
Social						
Technical						
Administrative						
Political						
Legal						
Economic						
Environmental						
Sub-total of cost/benefit						
Total Score						
Priority						

Definition of rating scale: _____

APPENDIX N

TECHNICAL & FINANCIAL RESOURCES

This section is comprised of a list of resources to be considered for technical assistance and potential financial assistance for completion of the actions outlined in this plan. This list is not all-inclusive and is intended to be updated as necessary. Agency summaries have been obtained off their websites.

FEDERAL RESOURCES

Federal Emergency Management Agency (FEMA)
FEMA's mission is to support citizens and first responders as part of a team to work together to build, sustain and improve the nation's capability to prepare for, protect against, respond to, recover from and mitigate all hazards.

Mitigation Division
Administers all of FEMA's Hazard Mitigation Programs, including National Flood Insurance Program (NFIP) and Community Rating System (CRS); prepares and revises flood insurance studies and maps; information on past and current acquisition, relocation, elevation, and retrofit programs; expertise in other natural and technological hazards, including hurricanes, earthquakes and hazardous materials. Financial assistance includes Hazard Mitigation Grant Program (post-disaster); the National Flood Mitigation Fund; and training for local officials at the Emergency Management Institute (EMI) in Emmetsburg, Maryland. The following includes financial resources available through FEMA:

> *Public Assistance (PA) Grant Program*
> Following a Presidentially-Declared Disaster, the PA Grant Program provides supplemental federal disaster grant assistance for emergency and permanent repair, replacement, or restoration of disaster-damaged facilities. Emergency work includes debris removal and disposal and removal and demolition of unsafe structures. Permanent work includes repair, replacement, or restoration of disaster-damaged facilities to pre-disaster design. The program applies to publicly owned water and wastewater utilities or private nonprofit utilities (e.g., cooperatives), but does not cover private, for-profit drinking water or wastewater utilities. The PA Grant requires matching funds from local and state governments. The federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the state) determines how the non-federal share (up to 25%) is split with the subgrantees (eligible applicants such as utilities).As part of the PA Grant Program, FEMA would consider hazard mitigation proposals that would eliminate or reduce future damages similar to those that occurred during the current Presidentially-Declared Disaster. For example, for a Presidentially-Declared Disaster that flooded a culvert and washed out a road, FEMA would consider funding various mitigation measures including upsizing the culvert, increasing pipe capacity, or projects to redirect stormwater flow. Mitigation is a special consideration for permanent work projects in the Public Assistance Grant Program.

Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

National Flood Mitigation Fund

The Biggert-Waters Act of 2012 consolidated NFIP funded mitigation programs (Repetitive Flood Claims, Severe Repetitive Loss Properties, Flood Mitigation Assistance) into a single program. The combined National Flood Mitigation Fund is to be funded at $90 million per year. The new programsimplifies and combines the three previous programs and includes the following:

Three types of FMA grants are available to States and communities:

- *Planning Grants* to prepare Flood Mitigation Plans, which can be part of multi-hazard mitigation grants.States can be awarded up to $50,000 and local communities up to $25,000. Only NFIP-participating communities with approved Hazard Mitigation Plans can apply for Project grants.
- *Project Grants* to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures or utilities. Demolition and rebuild is now also an allowed mitigation activity. Grants can be targeted with a federal share requirement as follows:
    - Up to 100% for severe repetitive loss structures (4+ Claims of over $5000 or 2+ claims exceeding value of structure).
    - Up to 90% for repetitive loss properties (2 or more claims of at least 25% value of structure over 10-year period).
    - Up to 75% for other approved mitigation activities.

Earthquake Hazards Reduction Assistance Program

As part of the National Earthquake Hazards Reduction Program (NEHRP), the purpose of FEMA's State Earthquake Hazards Reduction Program is to provide funds for the development of a comprehensive risk reduction program at the State level and risk reduction measures at the local level to reduce future earthquake damages and losses. The fundamental goal of the program is to reduce future earthquake impacts and the subsequent loss of lives, property damages, and economic losses. To accomplish these goals, technical assistance from State programs to local governments in the areas of structural and non-structural mitigation, building codes, and land-use planning ordinances is necessary.

National Hurricane Program

The National Hurricane Program (NHP) helps protect communities and residents from hurricane hazards through various projects and activities. Established in 1985, the NHP also conducts assessments and

provides tools and technical assistance to State and local agencies in developing hurricane evacuation plans. The program is a multi-agency partnership involving numerous Federal agencies, including:

- Federal Emergency Management Agency (FEMA)
- National Oceanic & Atmospheric Association (NOAA)
- National Weather Service (NWS)
- U.S. Department of Transportation (USDOT)
- U.S. Army Corps of Engineers (USACE)

The NHP receives $5.86 million in annual funding, which consists of $2.91 million for FEMA program activities and $2.95 million for the Emergency Management Performance Grant program. These funds are directed into general State funds for hurricane preparedness and mitigation activities.The NHP also assists States and local emergency managers to better understand potential damage from hurricanes by providing the HAZUS MH loss estimation tool.

National Oceanic and Atmospheric Administration (NOAA)

NOAA protects, preserves, manages, restores and enhances the nation's coastal resources and ecosystems along 95,439 miles of United States' shoreline. Through the Coastal Zone Management Program, NOAA works with state and territory coastal resource managers to share knowledge, promote research and pursue innovative management strategies and techniques. The NOAA Coastal Services Center supports the environmental, social, and economic well being of the coast by linking people, information, and technology with the delivery of NOAA products and programs to coastal managers, non-profits and other federal, state and local agencies.NOAA also maintains a network of marine protected areas including the National Estuarine Research Reserves and National Marine Sanctuaries and a national marine monument that protect habitats and provide venues for research, recreation and education.NOAA's National Sea Grant College Program engages a network of the nation’s top universities in conducting scientific research, education, training, and extension projects designed to foster science-based decisions about the use and conservation of our coastal aquatic resources.It is through these programs and others that NOAA is working to protect, restore and manage the use of coastal resources.

Small Business Administration (SBA)

Following a natural disaster declaration, SBA representatives can be located at a Disaster Recovery Center (DRC). SBA provides low-interest disaster loans to homeowners, renters, businesses of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Environmental Protection Agency (EPA)

The EPA allocates grant funding through two State Revolving Funds (SRFs): the Drinking Water SRF and the Clean Water SRF. The SRFs, administered by the states, have the potential to support mitigation or post-disaster recovery/rebuilding projects; they tend not to fund immediate disaster response. These funds may be available after.an emergency, or in which such decline is considered imminent, to obtain or maintain adequate quantities of water that meets the standards set by the Safe Drinking Water Act. This emergency is considered an occurrence of an incident such as, but not limited to, a drought, earthquake, flood, tornado, hurricane, disease outbreak or chemical spill, leakage or seepage. These EPA grants are as follows:

Drinking Water State Revolving Fund (DWSRF)
EPA provides grants to states to support the Drinking Water State Revolving Fund, which provides low-interest loans to water systems for infrastructure improvements needed to protect public health and ensure compliance with the Safe Drinking Water Act. States may also reserve a portion of their grants (i.e., set-asides) to finance technical assistance to help utilities recover from disasters. Assistance could include assessing damages, identifying restoration needs, and locating/monitoring pollution sources. Funds have been used in flood and drought situations.

Clean Water State Revolving Fund (CWSRF)
EPA also provides grants to the states in support of Clean Water Act requirements through low-interest loans or other assistance to publicly owned wastewater collection and treatment systems, stormwater systems, and nonpoint source pollution control and estuary management projects.

Housing and Urban Development (HUD)
HUD provides flexible grants called Disaster Recovery grantsto help cities, counties, and States recover from Presidentially declared disasters, especially in low-income areas, subject to availability of supplemental Congressional appropriations under the .Community Development Block Grant Program (CDBG). Disaster Recovery grants often supplement, but may not duplicate, grants from the Federal Emergency Management Agency (FEMA), the Small Business Administration (SBA), or the U.S. Army Corps of Engineers (USACE).

Disaster Recovery Grants
CDBG Disaster Recovery grants are noncompetitive and grantees must submit an Action Plan describing the needs, strategies for long-term recovery and projected uses of assistance before receiving funds. Through waivers to the regular CDBG laws and regulations, CDBG Disaster Recovery funds provide grantees greater flexibility in administering funds to help cities, counties, and States recover from disasters, especially in low-income areas. For example, Disaster Recovery grantees are required to spend at least 50 percent of their funds on activities that principally benefit low-and moderate-income persons, as opposed to the regular program's 70 percent requirement. However, all activities must be located in Presidentially-Declared Disaster areas and must relate to an impact caused by the disaster. Among eligible activities used for recovery efforts under CDBG Disaster Recovery funds are several relating to infrastructure.

Examples of these activities include:
Debris removal not covered by FEMA
Acquisition, construction, or rehabilitation of public facilites such as neighborhood centers
Construction/ reconstruction of streets, water/sewer or drainage systems
Construction/reconstruction of water lift stations
Public services
Helping businesses retain or create jobs in disaster impacted areas
Planning and administration costs (limited to no more than 20 percent of the grant)
More information can be found at HUD's CDBG Disaster Recovery Assistance website.

United States Army Corps of Engineers (USACE)
Every year, the USACE, part of the federal government’s unified national response to disasters and emergencies, sends hundreds of people to respond to disasters around the world.

USACE has more than 40 specially trained response teams ready to perform a wide range of public works and engineering-related support missions.USACE uses pre-awarded contracts that can be quickly activated for missions such as debris removal, temporary roofing, water and commodities distribution, and generator installation.When disasters occur, USACE teams and other resources are mobilized from across the country to assist our local districts and offices to deliver our response missions.The USACE Flood Risk Management Program (FRMP) works across the agency to focus the policies, programs and expertise of USACE toward reducing overall flood risk. This includes the appropriate use and resiliency of structures such as levees and floodwalls, as well as promoting alternatives when other approaches (e.g., land acquisition, flood proofing, etc.) reduce the risk of loss of life, reduce long-term economic damages to the public and private sector, and improve the natural environment.

United States Fish & Wildlife Agency (FWS)

As part of the FWS's mission of "protecting fish and wildlife and their habitats for the continuing benefit of people" emergency management plays a vital role. Emergency management provides strategy and support in dealing with planning, preparedness and response to natural or man-made disasters. In addition, grants are available in coastal wetlands areas as follows:

> *National Coastal Wetlands Conservation Grant Program (Coastal Grants Program)*
> The Coastal Grants Program was established by Title III of P.L. 101-646, Coastal Wetlands Planning, Protection and Restoration Act of 1990. Under the Program, the FWS provides matching grants to States for acquisition, restoration, management or enhancement of coastal wetlands. To date, about $183 million in grant monies have been awarded to 25 coastal States and one U.S. Territory and to acquire, protect or restore over 250,000 acres of coastal wetland ecosystems. Typically, between $13 million and $17 million in grants are awarded annually through a nationwide competitive process. Funding for the program comes from excise taxes on fishing equipment and motorboat and small engine fuels.States provide 50 percent of the total costs of a project. If, however, the State has established and maintains a special fund for acquiring coastal wetlands, other natural areas or opens spaces, the Federal share can be increased to 75 percent. Territories and Commonwealths are not required to share the costs of projects except for Puerto Rico. Grants awarded under the Coastal Grants Program cannot exceed $1 million for an individual project.

United States Geological Survey (USGS)

The USGS provides practical, unbiased information about the Nation's rivers and streams that is crucial in mitigating hazards associated with floods. Water is one of six science mission areas of the USGS. Water's mission is to collect and disseminate reliable, impartial, and timely information that is needed to understand the Nation's water resources.The USGS Water Mission Area actively promotes the use of this information by decision makers to:

- Minimize loss of life and property as a result of water-related natural hazards, such as floods, droughts, and land movement.
- Effectively manage groundwater and surface-water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses.
- Protect and enhance water resources for human health, aquatic health, and environmental quality.
- Contribute to the wise physical and economic development of our Nation's resources for the benefit of present and future generations.

CONNECTICUT STATE RESOURCES

Department of Emergency Services and Public Protection (formerly CT DEMHS)
The mission of the Department of Emergency Services and Public Protection is to direct and coordinate all available resources to protect the life and property of the citizens of Connecticut in the event of a disaster or crisis, through a collaborative program of prevention, planning, preparedness, response, recovery, and public education.The Departmentis responsible for coordinating with state and local government personnel, agencies, authorities and the private sector to ensure adequate planning, equipment, training and exercise activities by such personnel, agencies, authorities and the private sector with regard to emergency management and homeland security; coordinating, and as may be necessary, consolidating homeland security communications and communications systems of the state government with state and local government personnel, agencies, authorities, the general public and the private sector; distributing and, as may be appropriate, coordinating the distribution of information and security warnings to state and local government personnel, agencies, authorities and the general public; and establishing standards and security protocols for the use of any intelligence information. The Division also has the responsibility for providing a coordinated, integrated program for state-wide emergency management and homeland security.

Department of Energy and Environmental Protection (DEEP)
DEEP is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making cheaper, cleaner and more reliable energy available for the people and businesses of the state. The agency is also committed to playing a positive role in rebuilding Connecticut's economy and creating jobs – and to fostering a sustainable and prosperous economic future for the state.DEEP was established on July 1, 2011 with the consolidation of the Department of Environmental Protection, the Department of Public Utility Control, and energy policy staff from other areas of state government. The environmental protection agency had been established in 1971 at the dawn of the environmental movement, while the public utilities regulatory authority traces its roots back more than 150 years to the state's Railroad Commission. Within DEEP, the following agencies specifically coordinate in relation to Hazards and mitigation to alleviate risk and impacts related to hazards.

Bureau of Water Protection and Land Reuse
Inland Water Resources Division
Office of Long Island Sound Programs

PRIVATE RESOURCES

Association of State Floodplain Managers (ASFPM)
ASFPM is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery. ASFPM has become a respected voice in floodplain management practice and policy in the United States because it represents the flood hazard specialists of local, state and federal government, the research community, the insurance industry, and the fields of engineering, hydrologic forecasting, emergency response, water resources, and others. The mission of ASFPM is to promote education, policies, and activities that mitigate current and future losses, costs, and human suffering caused by flooding, and to protect the natural and beneficial functions of floodplains - all without causing adverse impacts.

The Nature Conservancy (TNC); http://coastalresilience.org/
TNC has developed a unique tool to view sea level rise, flood risks, and impacts called Coastal Resilience. Coastal Resilience's primary purpose is to engage communities on the risks of coastal hazards and discuss options for adaptation. Moreover, the resources developed for communities including the reports, papers, data, website, and mapping application have helped to effectively engage regional, national and international leaders in the sea level rise and coastal risk impacts discussion. This engagement has established TNC and partners as leaders in the integration of socio-economic and ecological data to reduce vulnerability to coastal hazards.

APPENDIX O

REFERENCES

1. Disaster Mitigation Act http://www.fema.gov/library/viewRecord.do?id=1935
2. City of Milford Hazard Mitigation Plan 2007
3. http://www.ci.milford.ct.us/public_documents/MilfordCT_Planning/Documents/Milford%20Hazard%20Mitigation%20Plan%20Web.pdf
4. FEMA publication Undergoing a Map Change http://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/map_change.jsp
5. Flood Protection, City of Milford 2004 Subdivision regulations, Section 3.16
6. City of Milford Zoning Regulations section 5.8 Flood Hazard and Flood Damage Prevention Regulations Adopted 1930, Re-Adopted 1973, Amended 2011
7. Increased Cost of Compliance , FEMA March 2007 http://www.floodsmart.gov/toolkits/flood/downloads/OutreachToolkit2007TPsICCL.pdf
8. April 1, 2002 Board of Alderman meeting item 8h, copy in Appendix H of 2007 plan
9. June 4, 2007 Board of Alderman meeting item 8e, copy in Appendix H of 2007 plan
10. FEMA Map Modernization Project, http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization
11. Milford Ct Plan of Conservation and Development, December 2012 http://www.ci.milford.ct.us/public_documents/MilfordCT_Permitting/2012%20POCD/FinalPOCDDec2012.pdf
12. City of Milford Emergency Operations Plan, updated March 2013
13. City of Milford Stormwater Management Plan Annual Report, 2011, http://www.ci.milford.ct.us/Public_Documents/MilfordCT_DPW/MilfordCT_engin/2011%20Annual%20Report.pdf
14. Connecticut Coastal Management Act 2008 Connecticut General Statutes CHAPTER 444*
15. FEMA Flood Insurance Study Volumes 1-6. New Haven County, CT Revised July 8, 2013 (Flood Insurance Study Number 09009CV001B)
16. Southeastern Connecticut Regional Council of Government Multi-Jurisdiction Plan Update 2012
17. http://www.ct.gov/deep/lib/deep/water_inland/hazard_mitigation/2010_nhmp.pdf
18. Town of East Haven Hazard Mitigation Plan Update 2012
19. State of CT Two Storm Panel Final Report January 2012
20. State of Connecticut Natural Hazards Disaster Plan, 2009
21. State of Connecticut Geospatial Information System Council, Storm Response and Recovery Assessment Group Report, March 2012
22. CT Housing Permits by Year http://www.ct.gov/ecd/cwp/view.asp?a=1106&q=250640
23. Storm Events Online http://www.ncdc.noaa.gov/stormevents
24. CT Eco Coastal Hazards Map http://ctecoapp1.uconn.edu/ctcoastalhazards/
25. https://www.atcouncil.org/windspeed/
26. http://csc.noaa.gov/hurricanes/#app=1834&3e3d-selectedIndex=0
27. FEMA P-804 Wind Retrofit Guide for Residential Buildings
28. Building Planner Chapter 3, Part III – Building Planning and Construction of Appendix G of the 2005 International Residential Code Portion of the 2005 State Building Code
29. City of Milford All Hazard Plan 2012
30. City of Milford Health Department Annual Report to the Mayor 2010-2011
31. http://www.ci.milford.ct.us/public_documents/milfordct_health/HlthReport/
32. City of Milford CT Health Department After Action Report on Irene 02/25/11

33. https://www.atcouncil.org/windspeed/
34. State of Connecticut OLR Research Report, Tree Trimming Laws and Programs, September 2011
35. City of Milford Harbor Management Plan, 2008 http://www.ci.milford.ct.us/Public_Documents/MilfordCT_Harbor/Harbor%20Plan
36. DEEP Climate Change Primer 2012, http://www.ct.gov/deep/cwp/view.asp?A=2705&Q=475764
37. Gornitz, V., S. Hale, K. Larsen, N. Nevine, C. Rosenweig, and L. Sacks. 2004. Bracing for Climate Change in the Constitution State: What Connecticut Could Face. Environmental Defense.
38. Sea Level Rise Accelerating in U.S. Atlantic Coast 2012 http://www.usgs.gov/newsroom/article.asp?ID=3256&from=rss_home
39. Incorporating Sea Level Change Scenarios at the Local Level, 2012
40. https://geohazards.usgs.gov/eqprob/2009/
41. USGS Earthquake Finder http://earthquake.usgs.gov/earthquakes/eqarchives/epic/results.php
42. https://geohazards.usgs.gov/eqprob/2009/index.php
43. State of Connecticut Department of Construction Services 2005 State Building codes section 1615
44. FEMA 232 - Homebuilders' Guide to Earthquake-Resistant Design and Construction http://www.fema.gov/library/viewRecord.do?id=2103
45. FEMA-74, 1994Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide. Third Edition
46. http://www.fema.gov/library/viewRecord.do?id=3843
47. FEMA- 141 Emergency Management Guide for Business and Industry 1993
48. http://www.fema.gov/library/viewRecord.do?id=1689
49. Report to the General Assembly on State Water Allocation Policies Pursuant to Public Act 98-224, January 2000.
50. http://www.drought.state.ct.us/drtwkpln.pdf
51. Inland Wetlands And Watercourses Regulations Of The City Of Milford, Connecticut, Amended 2001, http://www.ci.milford.ct.us/Public_Documents/MilfordCT_InlandWetlands/MIWARegs/S000CAA2A
52. Global Average Absolute Sea Level Change 1880-2011 http://www.epa.gov/climatechange/science/indicators/oceans/sea-level.html
53. Sea Levels Online, NOAA http://tidesandcurrents.noaa.gov/sltrends/
54. 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, http://www.ct.gov/deep/cwp/view.asp?a=2720&q=325660&deepNav_GID=1654
55. Meeting Minutes of the March 5 2013 Milford Planning and Zoning Board, http://www.ci.milford.ct.us/Public_Documents/MilfordCT_BComm/planningdocuments/2013planningdocuments/Minutes%20P%20%20Z%20Board%20Meeting%203%205%202013.pdf
56. CT Alerts http://www.ct.gov/ctalert/site/default.asp