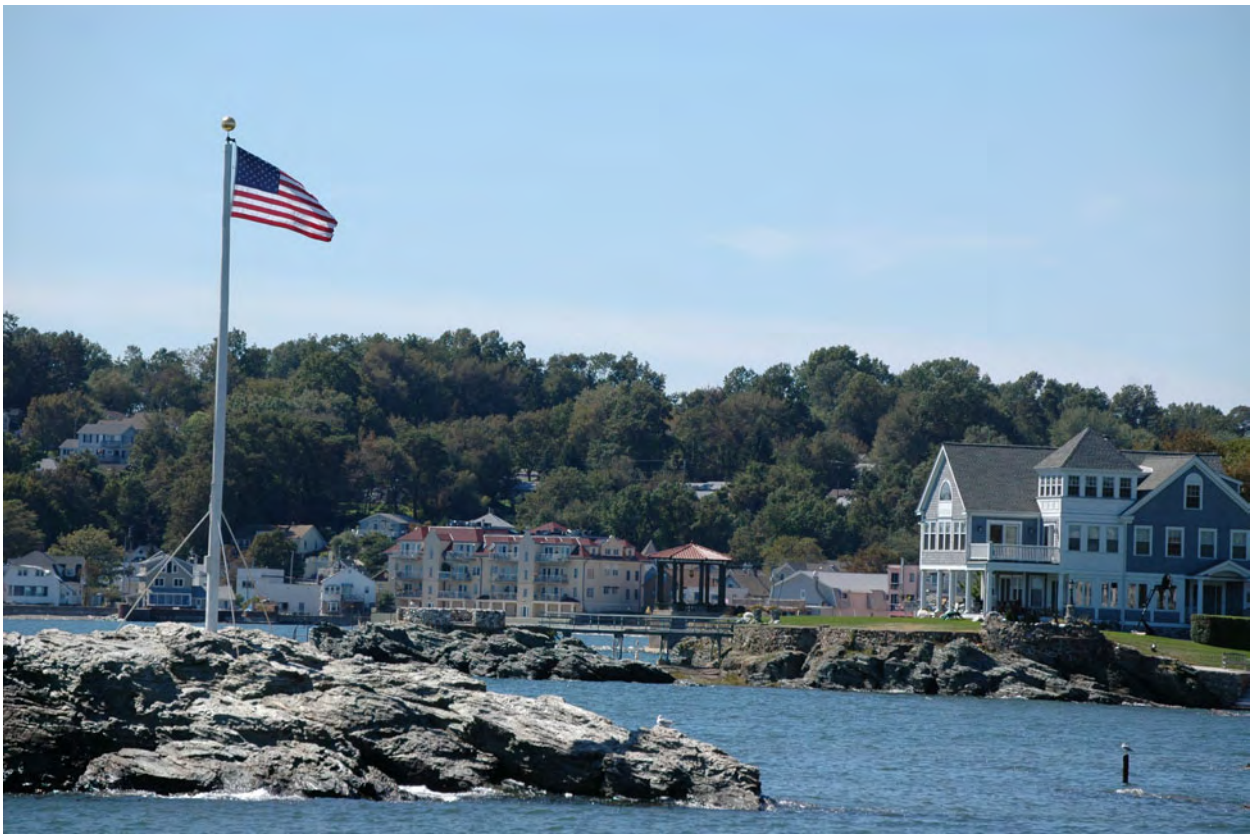
NATURAL HAZARD MITIGATION PLAN

City of Milford, Connecticut



REVISED: April 12, 2007

ACKNOWLEDGMENTS

HAZARD MITIGATION PLANNING COMMITTEE

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Public Works Director	Bruce Kolwicz
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Fire Department	Bill Richards
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I. INTRODUCTION

A. Setting

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. The City is bordered by the Long Island Sound to the south, the Housatonic River to the west, the Town of Orange to the north, and the City of West Haven to the east. 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. Milford has approximately 10 miles of shoreline along Long Island Sound, and several additional miles of shoreline along its' many tidal estuaries. As a result of the presence of both coastal and riverine floodplains, Milford is faced with serious flood hazards.

The most significant natural hazard in Milford is flooding, but other natural hazards such as earthquakes 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 also 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 flood waters.

B. Purposes of Plan

The primary purpose of this 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.

There is a significant difference between Hazard Mitigation Planning and Emergency Operations Planning. Hazard Mitigation is any action 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.

Public safety and property loss reduction are the driving forces behind this plan. 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 may require an applicant to have a mitigation plan.

C. Plan Development Process

The Milford Hazard Mitigation Committee through a series of meetings, interviews and workshops has developed this Hazard Mitigation Plan. The chairman of the committee is Mr. Robert Gregory, Milford Director of Community Development. The members of the committee were appointed by the mayor to represent the major administrative departments in the City. A list of the committee members is included in the acknowledgements page at the beginning of this plan.

The majority of the committee's business was conducted during monthly meetings held during the development of the plan. The first committee meeting was held on May 24, 2001. The final committee meeting was held on October 25, 2001. Additional monthly meetings of the committee were held for the revision of the plan. The revision meetings were held from November 2005 through May 2007.

The members of the committee also contributed to the process by providing input during individual interviews that were conducted by DELTA Environmental Services, Inc. (DELTA). Other agencies and organizations that were not official members of the Hazard Mitigation Committee also provided valuable input, participated and assisted in the development of the plan.

These agencies and organizations included the American Red Cross - Milford Chapter, the United Illuminating Company, the Regional Water Authority and the Milford Harbor Master. Adjacent communities were also contacted and requested to provide input.

City agencies provided DELTA with copies of local regulatory regulations, plans, and reports for review and incorporation into the Hazard Mitigation Plan as appropriate. The American Red Cross - Milford Chapter provided the Hazard Analysis portion of their operating plan; the Fire Department provided information from the City's emergency response plan and records of flood emergency responses.

Subsequent to the completion of a preliminary plan, a public information meeting was held on February 21, 2001. At that meeting the planning process and the contents of the plan were reviewed with the public and public input and comments were received.

After reviewing the public input appropriate revisions were completed and the City finalized the plan for official adoption. A copy of the City's official plan adoption is included in the appendix to this plan.

D. Goals, Policies and Objectives

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

GOALS

1. To minimize the risks to life and property from natural hazards in Milford.

2. To prevent losses from natural hazards to the extent practical.

POLICIES

1. To encourage planning of City services and decision-making so that the risks of natural hazards are considered.

2. To guide the expenditure of public funds on a priority basis relative to natural hazard mitigation.

3. To give high priority to human safety in the programming of hazard mitigation projects.

OBJECTIVES

1. To develop an inventory of the existing natural hazards in the City.

Responsible Department: Hazard Mitigation Planning Committee

Resources: Community Development, City Planner, MIS Department, Public Works Dept, and Fire Dept

Timetable: One year.

2. **To develop a list of potential natural hazard mitigation projects based on priorities of the plan.**

Responsible Department: Hazard Mitigation Planning Committee

Resources: Public Works Dept, Fire Dept, Community Development Dept, and City Planner

Timetable: One year.

3. **To apply for federal and state funds as they become available to supplement City funds for mitigation purposes.**

Responsible Departments: Community Development, Grant Writer, and Fire Department

Resources: FEMA and DEP

Time frame: As grants become available. At least on a yearly basis

4. **To conduct meetings of the Hazard Mitigation Committee on an annual or an as-needed basis to review progress on the plan and determine current priorities and projects**.

Responsible Department: Community Development

Resources: Local

Timetable: Yearly or as needed.

5. **To review City ordinances and regulations to determine methods for improving consistency with the goals of the plan.**

Responsible Department: Hazard Mitigation Committee

Resources: City Attorney, Fire Chief, Public Works Director, City Engineer, and Building Inspector

Timetable: As needed.

6. **To identify, notify and provide information to property owners within the 100-year flood plain regarding risks, responsibilities and responses**.

Responsible Department: Community Development, Red Cross, and Fire Dept

Resources: City website, brochure, newspaper articles, realtors

Timetable: Periodically during the year

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.**

Responsible Department: Public Works

Resources: Consultant, internal controls

Timetable: One year

8. **To develop an implementation plan for the objective of the Milford Hazard Mitigation Plan.**

Responsible Department: Hazard Mitigation Planning Committee

Resources: All departments involved

Timetable: On going

II. **HAZARD RISK ASSESSMENT**

Based on the results of the Hazard Mitigation Committee meetings and additional risk assessment research conducted by the consultant team, 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.

Of unanimous concern was the City's historic and routine exposure to flooding hazards from hurricanes, 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. The hazard of flooding impacts the entire Milford shoreline and the riverine floodplains described previously. The City is extremely vulnerable to widespread damages that would be caused by a hurricane or other coastal storm.

HURRICANES

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, continued high intensity wave action, and extremely high winds. 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.

Connecticut Hurricane Historical Record

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

Date	Name of Hurricane	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.

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.

Wind can cause damage starting at 50mph. 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.

WINTER STORM – NOR'EASTER

Winter storms are a common natural disaster, which can affect Milford. 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.

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 wave coastal 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.

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, by design, 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 a storm surge, which can exceed 4 feet. Extreme cold weather, ice and snow can damage utilities and structures and prevent travel.

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	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

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

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.

FLOODS

Milford is a coastal community, bordered on the south by Long Island Sound, on the west by the Housatonic River, and is bisected north to south by the Wepawaug River. As a result the City has a

strong potential for flooding. Hurricanes and Coastal Storms can and have caused severe coastal flooding as well as flooding along the Wepawaug River. Many of the homes along the coastal areas of Milford are converted summer cottages, which are smaller and built on smaller plots of land. There is a large concentration of people in these homes, some of which are also in the flood plain area.

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.

In the 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.

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. During periods of high water, the population is displaced. 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 will 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.

A. Residential

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.

Repetitive flood insurance claims have been filed for over one hundred and twenty properties in Milford as of the 2002 report from FEMA. These repeat claims demonstrate the serious nature of the flood hazards throughout Milford. 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. Many of the repeat flood insurance claim properties have 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 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) Army Corps of Engineers, 2) FEMA *Project Impact* in the Point Beach area and through (FMA) *Flood Mitigation Assistance*. There are, however, almost 4000 structures that remain susceptible to serious damage as a result of coastal flooding. 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. Such information would be valuable in directing hazard mitigation efforts to locations with the greatest risk.

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 structures at risk in the coastal flood hazard areas. Such an inventory program would be the first step in a Coastal 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. 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.

Milford Beach Areas Subject to Coastal Flooding

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

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.

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 many others remain below the base flood elevation (BFE) and subject to repeated flooding.

2) 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 along the shoreline. The land slopes up away from the beach area to the north. As a result, few structures in the Laurel Beach area are located in the flood hazard area.

Access to Laurel Beach is also much better than to many of Milfords other beach areas. There are a series of streets available as options to gain access to locations along the shoreline.

3) 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.

4) Walnut Beach - Stowe Avenue to Nettleton Avenue extended

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 limited.

5) Silver Beach - Silver Sands Parkway to Surf Avenue

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

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.

6) 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.

7) 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. Flooding is limited to the roadways in the area.

8) 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.

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.

9) Pond Point Beach - Calf Pen Meadow Creek to Buckingham Avenue

Pond Point Beach is an area with a significant number of low-lying beach front 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.

10) 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 a Corps of Engineers and FEMA flood mitigation project that included raising 42 low lying residences in the area. 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.

11) Morningside Beach - Hilldale Avenue 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 inspections.

12) 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.

13) Anchor Beach - Benjamin Street to Beach Avenue

This area is subject to coastal flooding in the immediate area of the beach front. 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.

14) 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.

B. Commercial

There are two significant areas of commercial properties that have been identified as being located within the flood plain and are considered to be susceptible to damage.

1. Downtown -- Milford Harbor Area -- This area includes many businesses and several marinas.

2. Wepawaug River – The area at 354 North Street has a long history of flooding. A

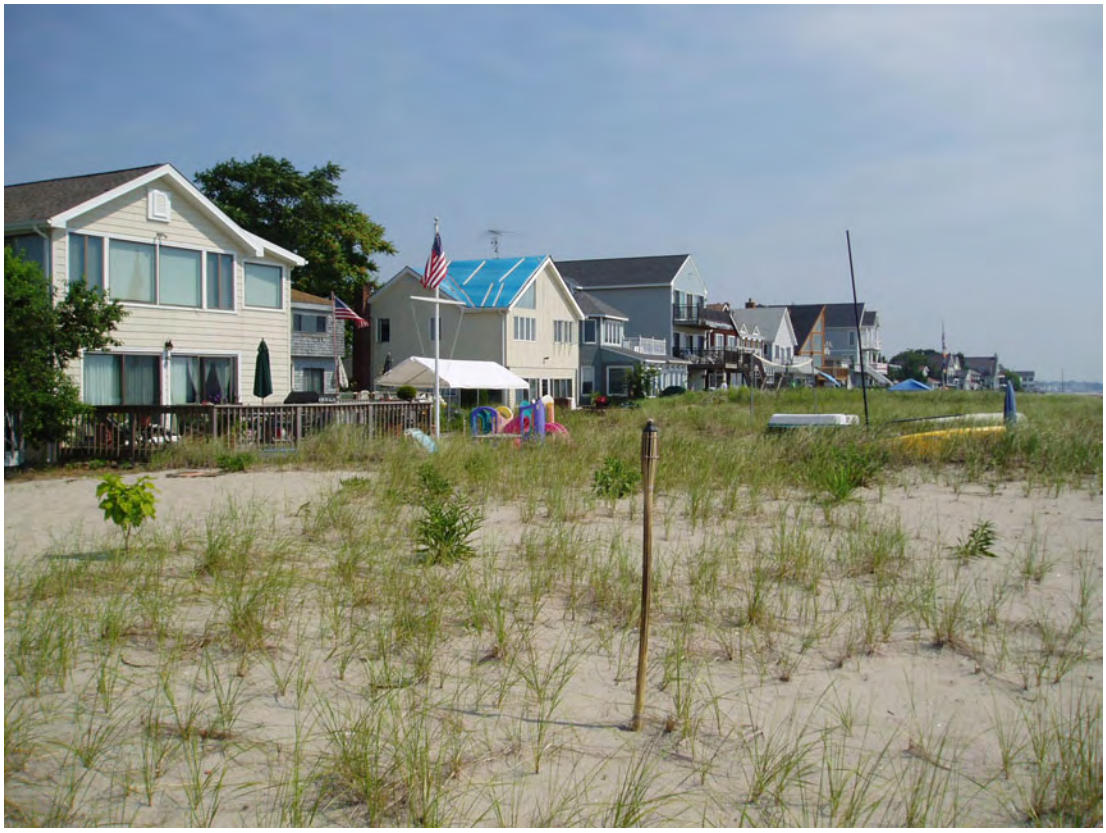

PHOTO #1 - View of Cedar Beach with Structures

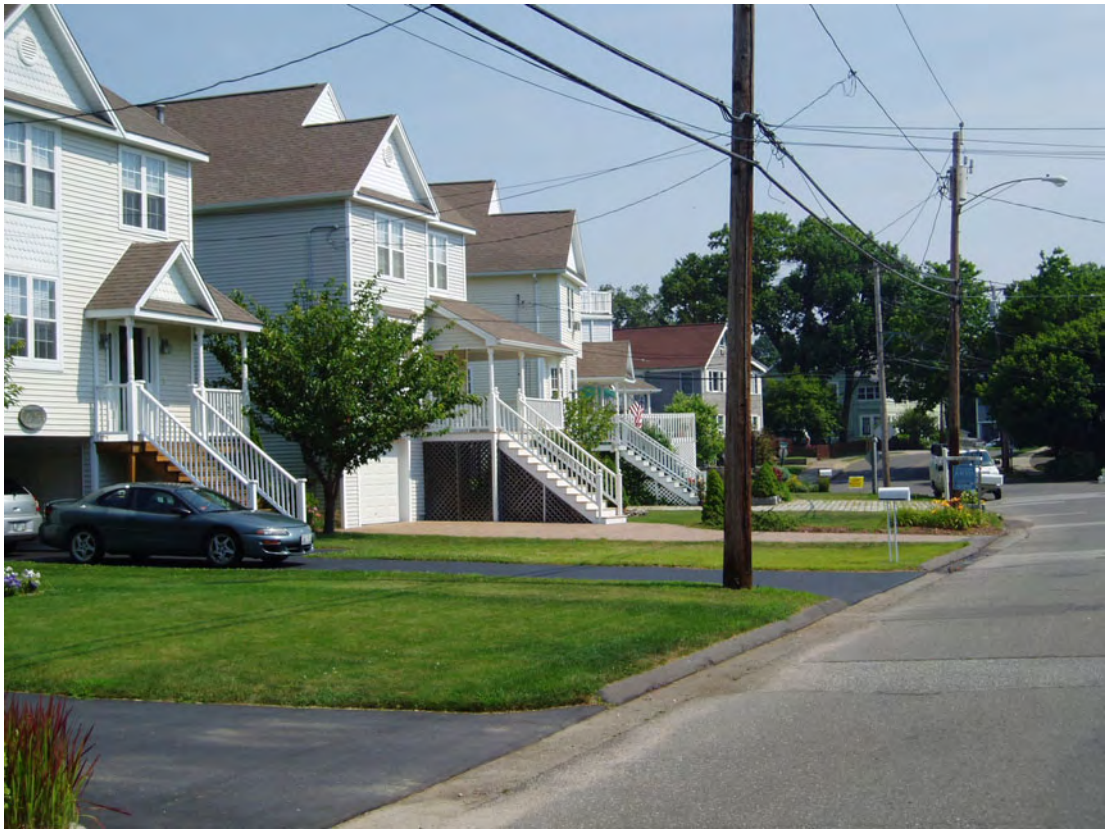

PHOTO #2 – Raised Structures in the Cedar Beach Area

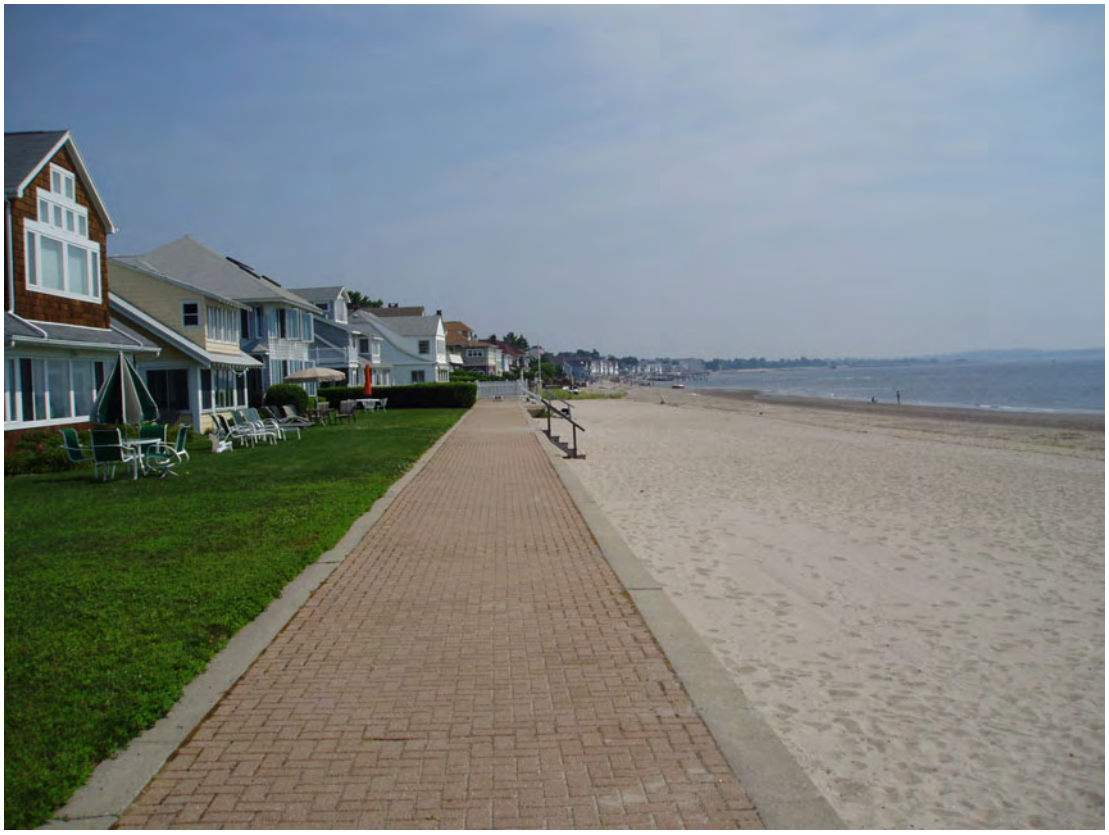

PHOTO #3 – Laurel Beach

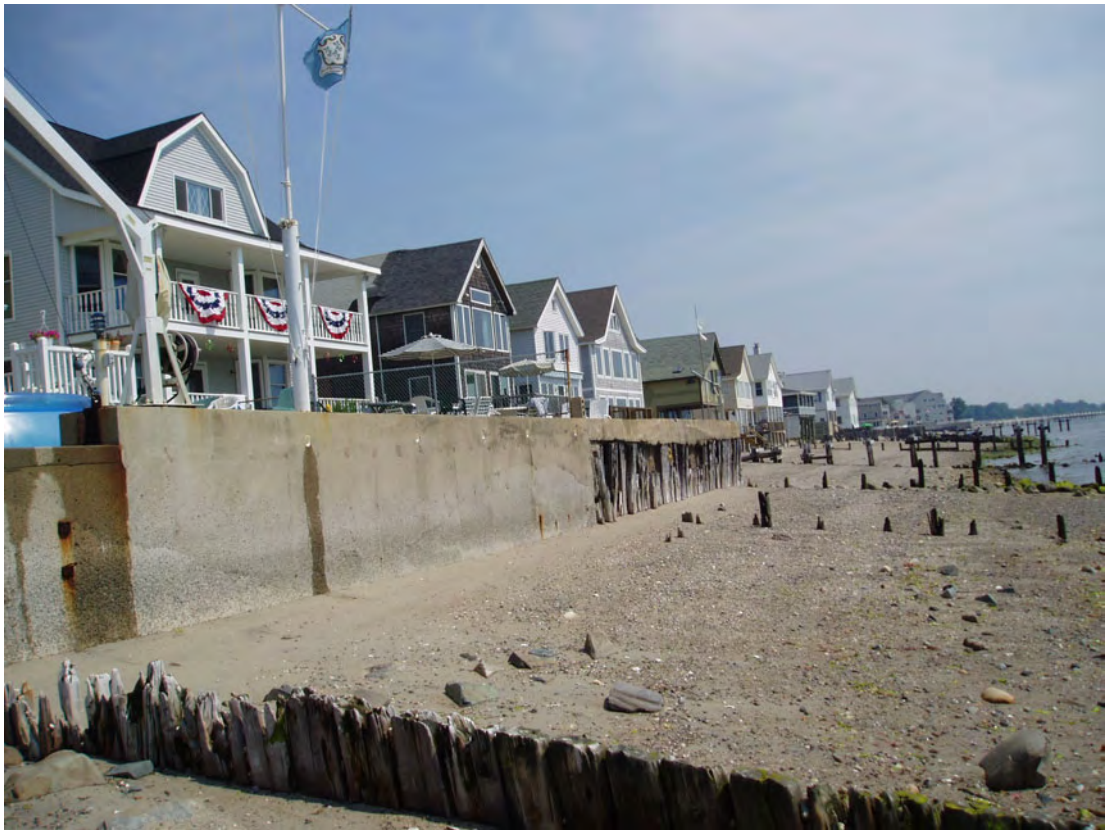

PHOTO #4 – Erosion on Wildermere Beach

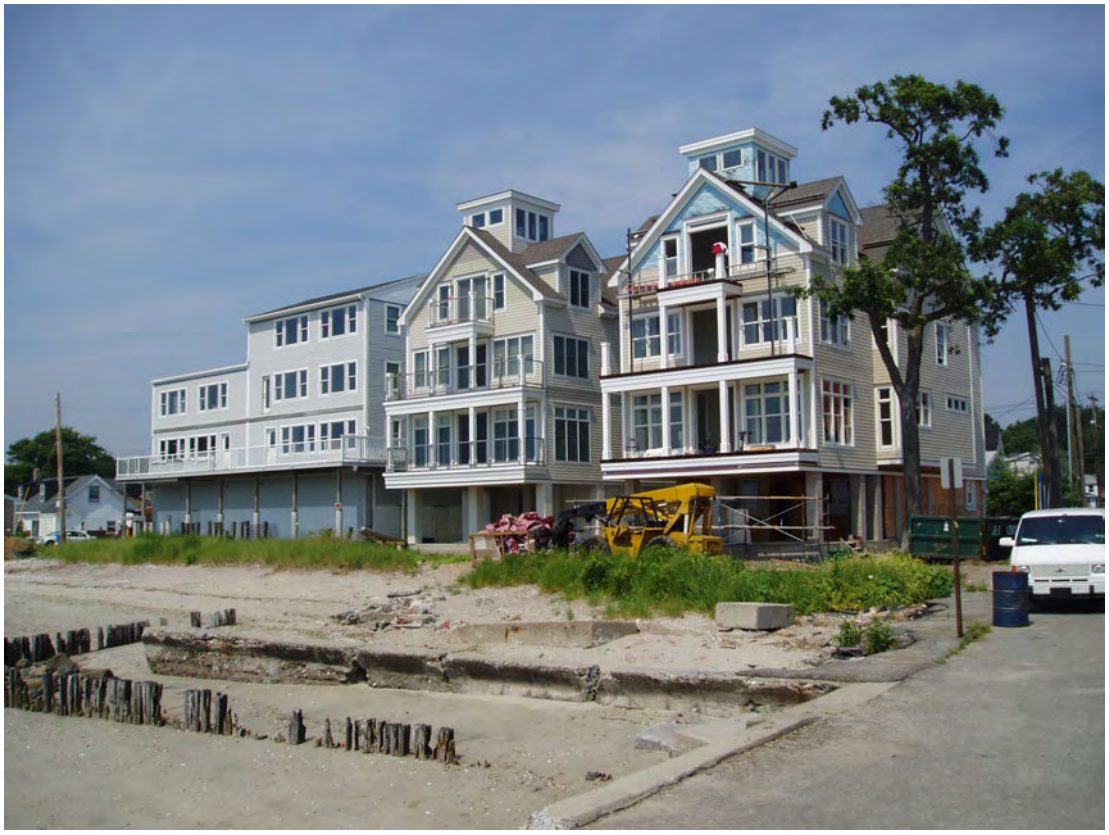

PHOTO #5 - New Development along the shore front

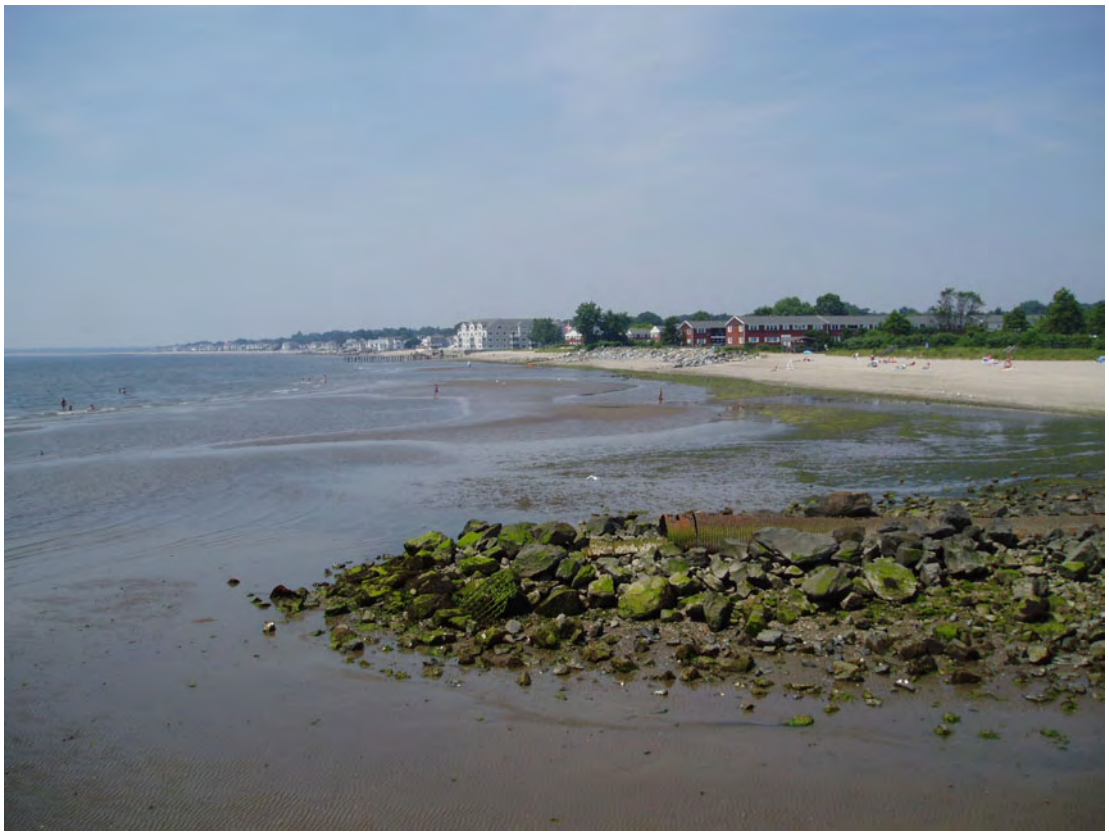

PHOTO #6 - Walnut Beach

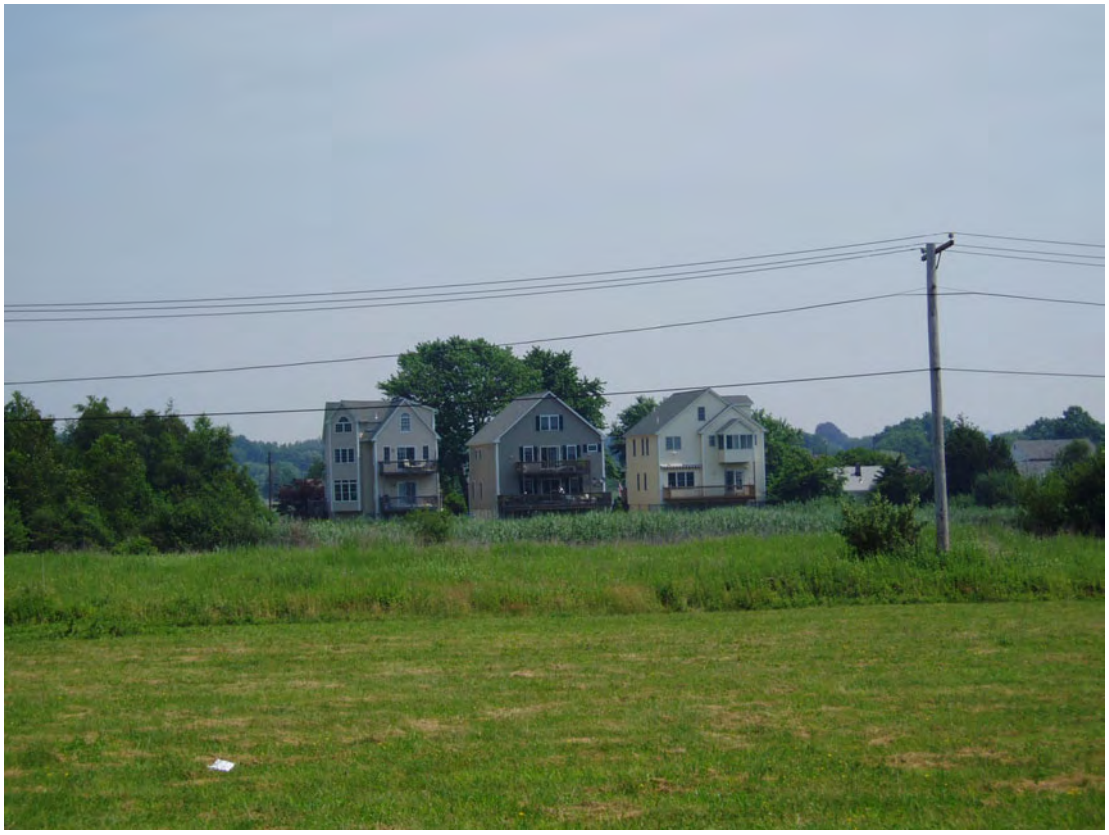

PHOTO #7 - Development in the Silver Sands area

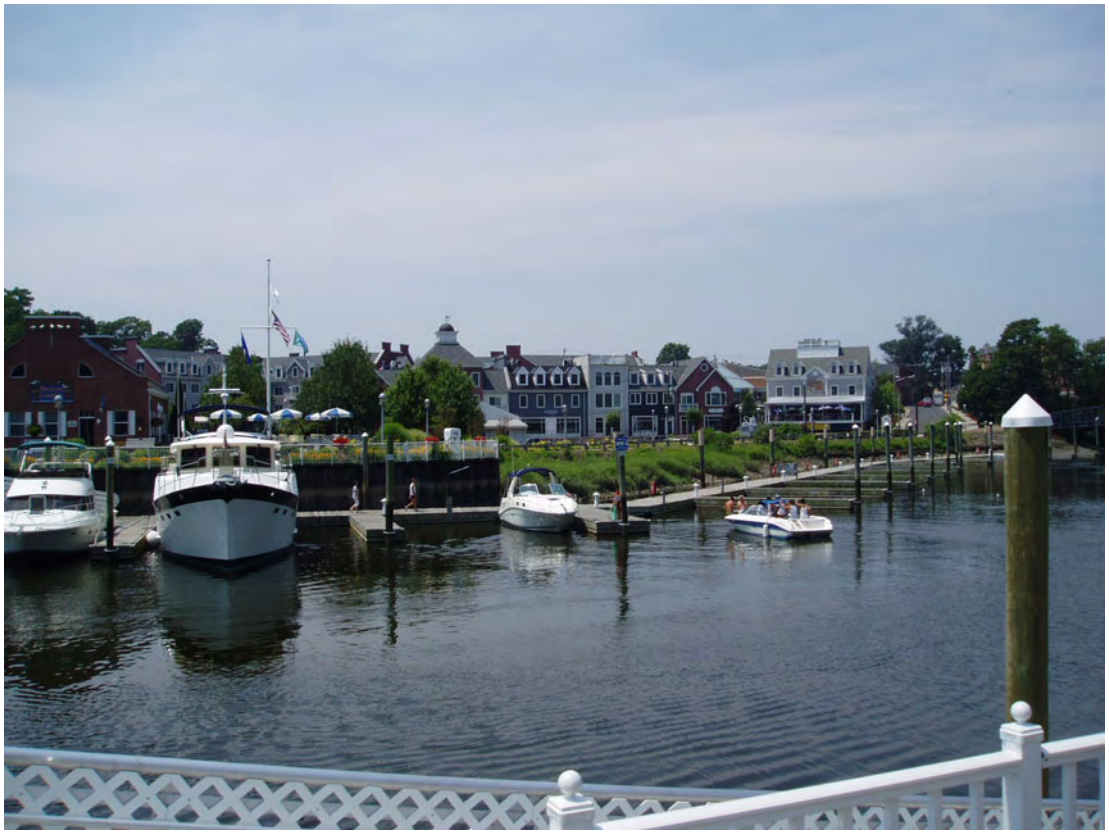

PHOTO #8 - Development along Milford Harbor

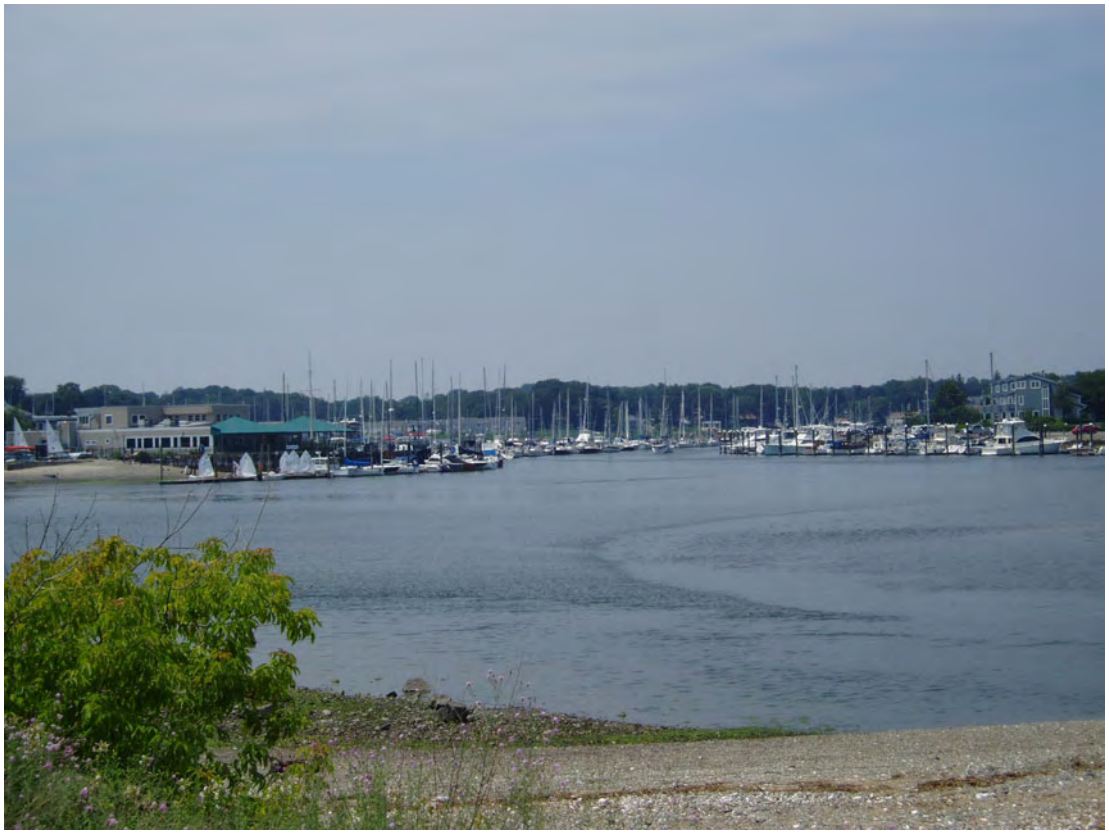

PHOTO #9 – Milford Harbor

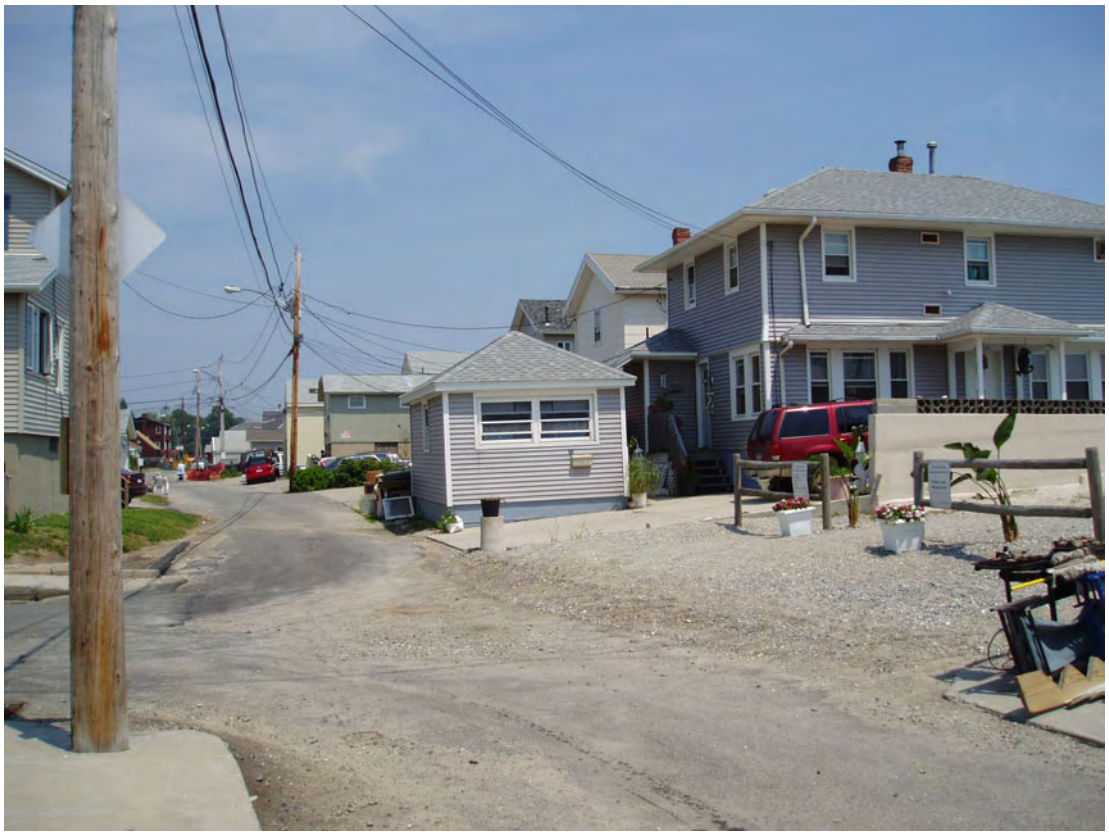

PHOTO #10 – Bayview Beach Area

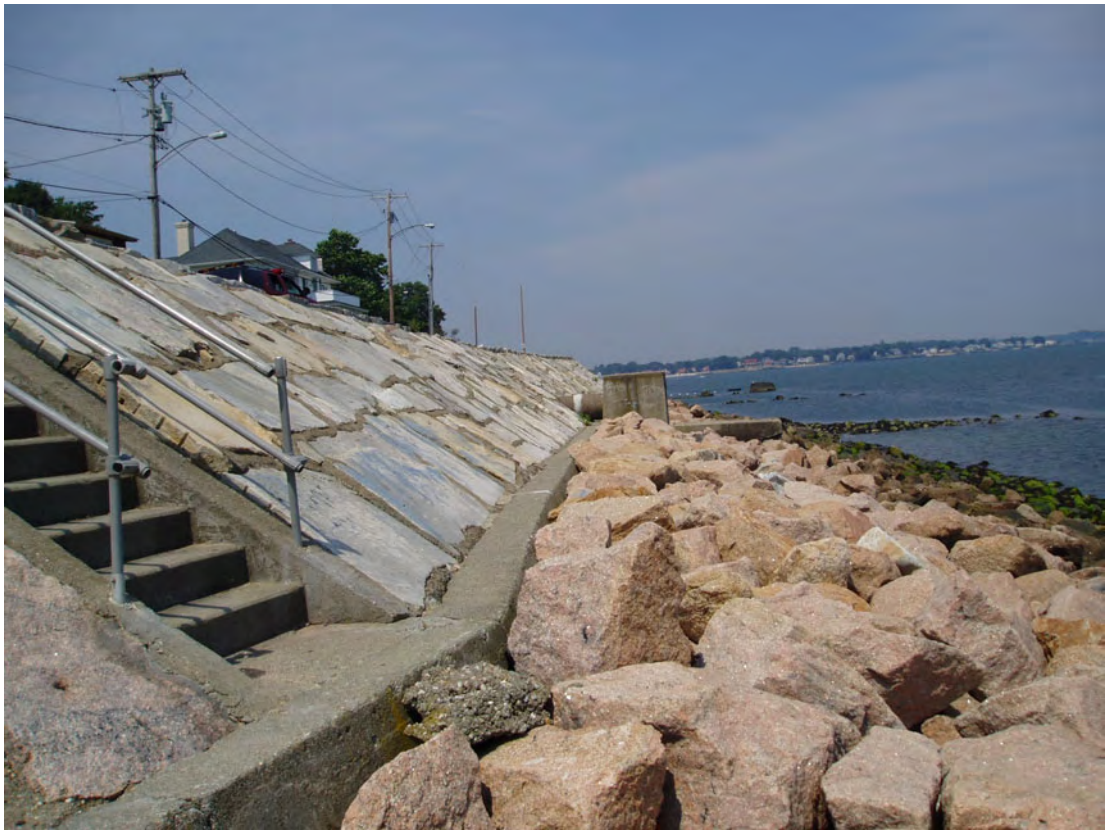

PHOTO #11 – Morningside Wall

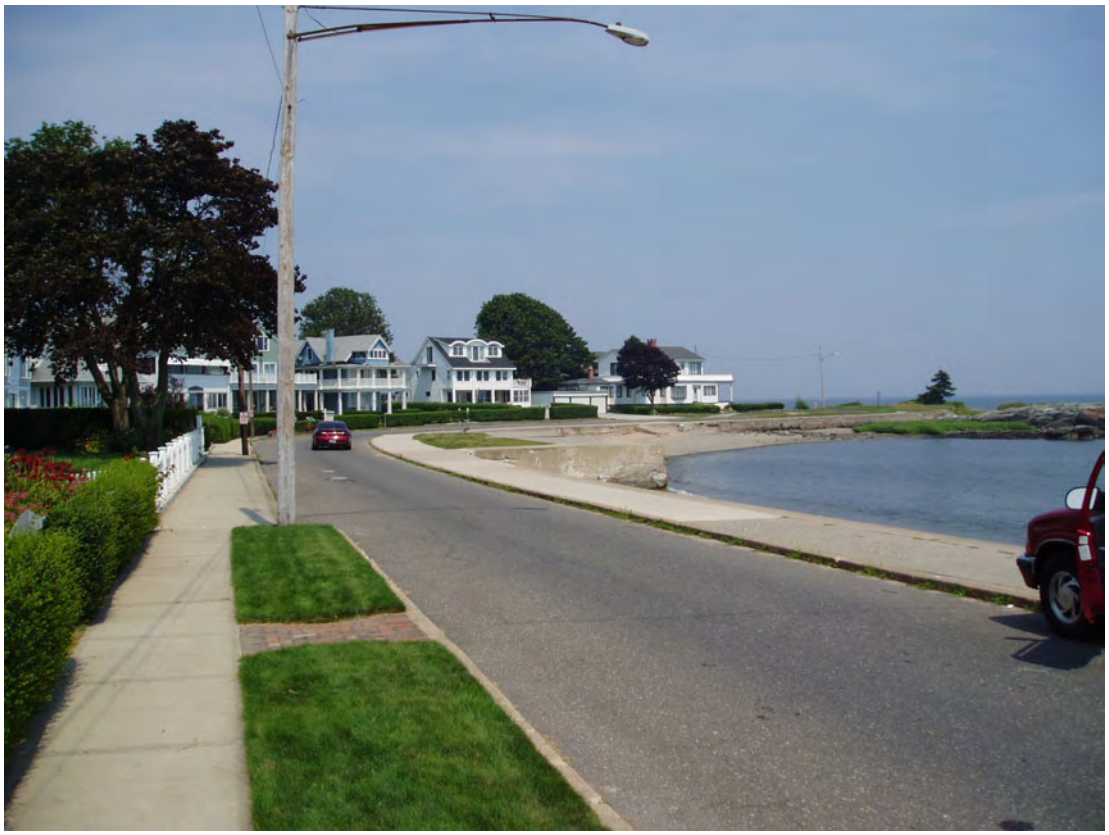

PHOTO #12 – Structures along Woodmont

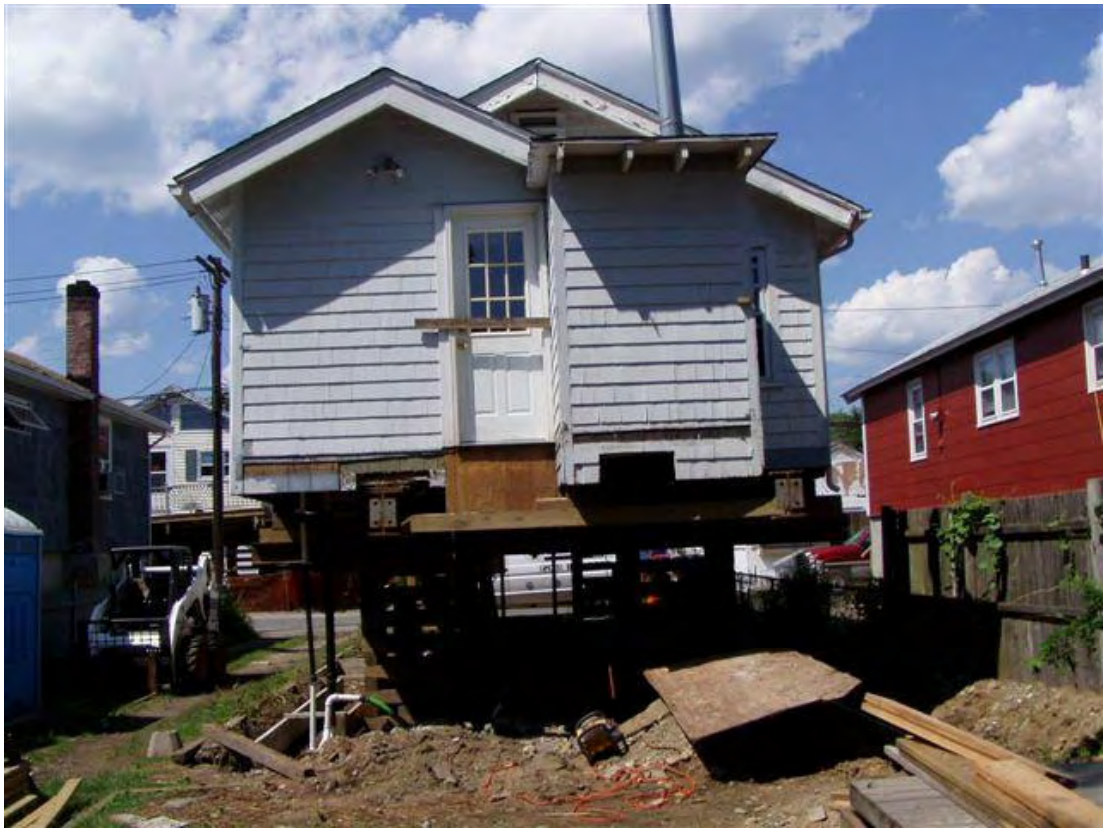

PHOTO #13 – Structures being raised

residential project has been approved for the site with changes approved that will mitigate flooding on site and downstream. There are also commercial properties in the vicinity of the Route 1 crossing of the river that are within the flood hazard area.

Flooding of commercial property is also caused by the overflow of the drainage system in the vicinity of Old Gate Lane and in Devon Center. 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.

C. Industrial

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.

D. Institutional and Recreational

Some institutional and recreational uses such as Fire Headquarters, City Hall, beaches, parks, and other public properties are also located within the flood plain. The vast majority of the City's critical public facilities are, however, not located in flood hazard areas.

E. Transportation Corridors

Milford is bisected by two major transportation facilities, Interstate 95 and the Northeast Corridor Rail Line. A series of crossings of the railroad and the highway 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 exist as few of these crossings are flood free during all flood events. Close evaluation of this 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.

In addition, Route 1 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.

F. Future Land Use Trends

Milford is a "mature" community that has shaped its destiny over 368 years. Most of the good buildable land in Milford has already been developed. All of the development that occurs now is "redevelopment" or new development in more sensitive areas.

Milford's Plan of Conservation and Development states, "Building, grading, road construction and other activities proposed within a flood zone must be carefully reviewed by the City in order to promote the health, public safety and general welfare of the community and control and minimize the extent of floods and reduce the impact and occurrence of flooding and runoff and minimize downstream flood impacts".

The City has an active open space acquisition program. Much of the land we have 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. By putting this land into protective status it will not be developed and generally assists in creating water-absorbing property that lessons flooding downstream.

Milford's Inland Wetlands Agency regulates development activity in and around wetlands from 100'-150' and sometimes even more if there is a significant watercourse involved. Planning and Zoning further regulates growth by imposing height limits and dividing the existing development into various zones.

In areas subject to flooding, new construction is required to have the first floor above the flood plain elevation. If a present building incurs more than 50% damage it must be elevated. The same is true for reconstruction.

Future land use is guided by regulations that take existing development and place commercial development in areas already commercial, and residential development in areas already residential. Within those zones there is consistency in the types of commercial and residential. For instance, downtown looks very different from the commercial corridor that is the Boston Post Road.

Development in the future will look very much like development does today. Quoting from Milford's Plan of Conservation and Development again…"The Land Use Plan is based largely upon

existing land use and development patterns, environmental and natural features, current zoning, planning analysis and desires and vision of citizens and community stakeholders as expressed at public forums held throughout the plan development process."

III. FLOOD HAZARD MITIGATION MEASURES

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. Prevention

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 department's enforcement of the International Building Code 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 development include strengthening existing programs in the following areas:

1. Planning and Zoning
2. Open Space Preservation
3. Floodplain Development Regulations
4. Stormwater Management

B. Property Protection

Property protection measures can address hazards at 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 protection as a hazard mitigation tool in the Point Beach area where several flood prone residential structures are being elevated.

The following list identifies common property protection measures:

1. Relocation
2. Acquisition
3. Building Elevation
4. Utility Protection
5. Flood Proofing
6. Floodgates

Additional descriptions of property protection measures are provided in Appendix D.

C. Natural Resource Protection

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.

1. Wetlands Protection
2. Erosion and Sediment Control Regulation

D. Emergency Services

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 central communications hub is the dispatch office at the Milford Fire Department Headquarters. The Fire Department houses the Milford Flood Warning System base station and manages and implements the City's flood warning notification program. Information on the Milford Flood Warning System is provided in the Appendix D.

In the event of an emergency the Mayor's Office generally establishes an emergency command post and mobilizes the major response agencies in the City. This procedure has assured effective communication between response agencies and efficient utilization of resources in emergency response.

The major utilities that provide service to the City follow similar procedures. The United Illuminating Company and the Regional Water Authority have emergency operations centers that become operational in the event of any emergency that could impact the utilities.

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. Information on the Milford Flood Warning System is provided in Appendix D. Aspects of emergency services hazard mitigation include the following:

1. Emergency Communication
2. Flood Warning
3. Flood Response
4. Critical Facilities Protection

E. Structural Projects

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:

1. Levees/Floodwalls
2. Diversions
3. Channel Modifications
4. Storm Sewer Improvements
5. Structural Project Maintenance and Repair

Additional information on some types of structural projects is provided in Appendix A.

F. Public Information

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 could include providing educational information to the homeowners and business owners in the flood hazard areas. The American Red Cross stressed their interest in providing assistance in expanded hazard mitigation and emergency response public information programs in the City. A public education and information component should be included in all hazard mitigation projects undertaken by the City of Milford.

The following list includes some types of Public Information measures:

1. Map Information
2. Flood Audits
3. Real Estate Disclosure
4. Library
5. Technical Assistance
6. Environmental Education

IV. OTHER MITIGATION MEASURES

A. Earthquake

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 actions are specific to Milford.
Connecticut has the oldest record of earthquakes in the United States. The earliest settlers learned of seismic activity, dating back to 1568 in Moodus 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.

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.

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.

Recent earthquake mitigation in Connecticut has been limited to enforcement of the Connecticut State Building Code. The code addresses earthquakes in a limited manner and for construction of commercial buildings only.

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 the planning by emergency response personnel and agencies.

The FEMA publication entitled "The Home Builders Guide for Earthquake Design" 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" (FEMA-74, 1994) 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" (FEMA- 141, 10/93). 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 mitigation, it is appropriate for Milford officials to be able to provide technical advice to residents and business owners.

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.

B. Wind Storm

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. 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. Contractors are hired to trim limbs and small trees along UI lines in portions of the City on a revolving basis. 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. 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 is 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 is inevitable, the town must continue to maintain its' current programs to clean up and dispose of such debris.

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 improved hazard mitigation efforts in the City.

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.

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 specific 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.

The City of Milford can make information on wind resistant construction techniques available to all building permit applicants, obtain literature on wind-resistant construction techniques and incorporate that information into the natural hazards reduction reference information available in the City library.

V. CITY OF MILFORD HAZARD MITIGATION PROJECT RANKING AND LOCATIONS

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 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

For a detailed explanation of the prioritization process, see Appendix A. 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.

The Hazard Mitigation Committee identified several community wide hazard mitigation projects that are appropriate to be included as high priority projects for consideration. These projects include:

- Updating the existing flood audits along the Wepawaug River.
- Developing a detailed citywide risk assessment and inventory of flood prone structures.
- Developing a flood audit program for identified flood prone structures.
- Developing a formalized maintenance program for the coastal flood control and beach and shore erosion projects and for stream maintenance throughout the City.

The following is a chart of the specific hazard mitigation projects identified by the City of Milford.

The City of Milford Hazard Mitigation Projects March 2007						
Hazard	***Vulnerable Location/Severity***	***Mitigation Project***	***Priority***	***Responsible Agency***	***Time Frame***	***Resources***
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	Community Dev Planning & Zoning Public Works	Ongoing	Grants Bonding City Budget
Flooding	Point Beach/ Significant	Upsize Culverts	High	Public Works	3+ Years	City Budget
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.	Medium	Public Works and the Park, Beach and Recreation Commission	1-3 Years	Grants City Budget
Flooding	Local Roads and Highways/ Very Significant	Evaluate Structural Projects	High	Public Works	Ongoing	City Budget
Flooding	Wepawaug River at Route 1/ Very Significant	Improve Hydraulics of Bridge to Alleviate Flooding	Low	Public Works DOT	3+ Years	State Budget
Flooding	Wepawaug River – North Street	Channel Improvement Project	High	Private Developer	Within Year	Private Funding
Flooding	Town Wide/ Moderate	Develop a Flood Audit Program	Medium	Community Dev	3+ Years	Grant

Hazard	***Vulnerable Location/Severity***	***Mitigation Project***	***Priority***	***Responsible Agency***	***Time Frame***	***Resources***
Flooding	Silver Sands to Laurel Beach/ Significant	Improve Storm Drain Outfalls to alleviate Flooding	Medium	Public Works	Ongoing	City Budget
All Hazards	Town Wide/ Significant	Evaluate the Hazard Resistant Nature of All Critical Facilities	High	Engineering & Building Departments	Ongoing	City Budget
All Hazards	Town Wide/ Significant	Maintain Emergency Personnel Training as well as Maintaining and Updating Emergency Equipment and Response Protocols	Medium	Fire Dept Police Dept	Ongoing	City Budget
All Hazards	Town Wide/ Very Significant	Evaluate Emergency Shelters, Update Supplies and Check Communication Equipment	Low	Emergency Management Director	Ongoing	City Budget
All Hazards	Town Wide/ Moderate	Distribute or Post Public Information Regarding Hazards in the City	Low	Fire Dept Police Dept	Ongoing	City Budget

VI. MONITORING AND 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. Therefore, following adoption of this Plan, it is the intent of the Hazard Mitigation Committee to meet on an 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.

Public participation involved in creating this plan consisted of public informational meetings. 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 into the plan a system of monitoring its' progress and making necessary adjustments. The Director of Economic and Community Development is coordinator of the Hazard Mitigation Committee that was responsible for preparing the plan. On the anniversary of the adoption of the plan the committee will meet to review the implementation progress as well as the goals, objectives, and actions outlined in the plan. The committee coordinator will prepare a report annually on the status of plan implementation. The report will include the following: a review or 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 or 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 web site will be provided along with the information on the Hazard Mitigation Plan. Public participation meetings will also be conducted to review the revisions to the currently approved plan.

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.

City of Milford, Connecticut
NATURAL HAZARD MITIGATION MAPS

0 750 1,500 3,000 4,500 6,000

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.

City of Milford, CT - MIS Department
Thursday, July 20, 2006
File: H:\CommDev\Projects\Natural Hazard Mitigation Plan.mxd

Legend

- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- Lake/Pond
- River
- Sound
- Swamp
- Major Highway/Road
- NFIP REPETITIVE LOSS PROPERTY

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

City of Milford, Connecticut
NATURAL HAZARD MITIGATION MAPS

0 750 1,500 3,000 4,500 6,000

Feet

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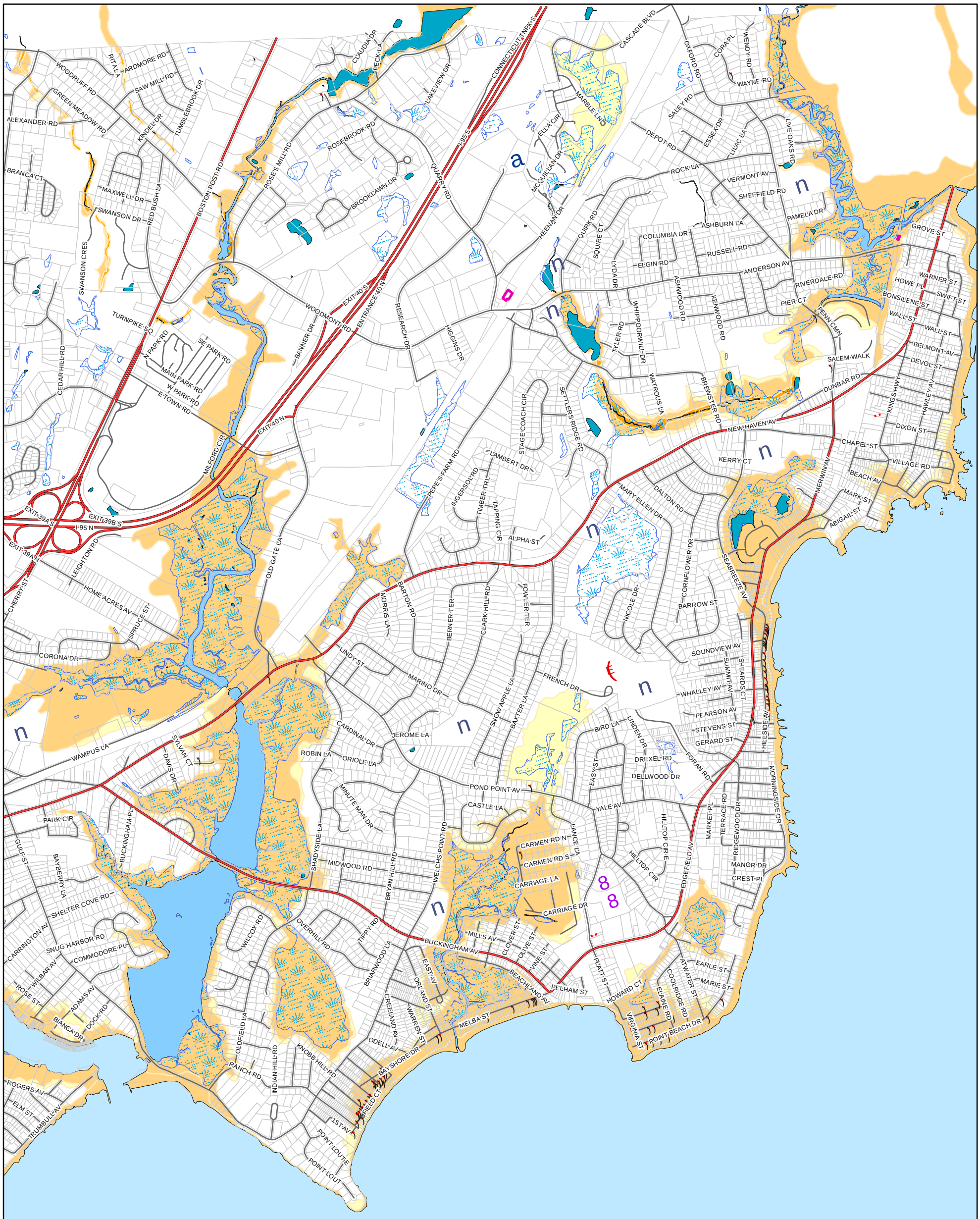

City of Milford, Connecticut
NATURAL HAZARD MITIGATION MAPS

0 750 1,500 3,000 4,500 6,000

Feet

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City of Milford, CT - MIS Department
Thursday, July 20, 2006
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Legend

- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- Lake/Pond
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- Sound
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- Schools (public and private)
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- Metro North Railroad Station
- Milford Transit District - Bus Depot
- Milford DPW Garage/Offices
- Senior Care Centers
- Sewage Treatment Plant
- Substations

City of Milford, Connecticut
FEMA 100-Year and 500-Year Flood Zones

0 2,000 4,000 8,000 12,000 16,000 Feet

1 inch equals 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.

N

September 2005

Legend

floodzone

- 100 Year Flood Zone
- 500 Year Flood Zone
- Floodway in Zone AE
- LAKE
- SHORE
- WATER
- PRIMARY HIGHWAY

Trumbull
Shelton
New Haven
Bridgeport
Stratford
Milford
West Haven

APPENDIX A
HAZARD MITIGATION MEASURES

MITIGATION MEASURES

Natural Hazards

Hurricane

- 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 mitigation activities.

- Implement dune restoration and other coastal protection projects consistent with the CT Coastal Area Management Program.

- Acquire shorefront land for open space.

- Develop a comprehensive sheltering system.

- 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

- Encourage the purchase of flood insurance

- Retrofit:

    1) Wet flood proofing (allowing water to enter uninhabited areas of the house)

    2) Dry flood proofing (sealing the structure to prevent floodwaters from entering)

    3) Install backflow valves on sewer systems

    4) Venting on roofs

    5) Garage doors with stiffer horizontal members, glider tracks and track support

    6) Hurricane straps and hurricane clips

- Retrofit, Cont:

    7) Reinforcement of concrete block wall; concrete tie-columns at all corners

    8) Bracing with struts or columns in walls perpendicular to freestanding walls

    9) Elevation of structures on piers, posts, columns, and pilings

    10) Add shutters for glazed openings

    11) Re-nail sheathing

    12) Create a secondary water barrier

    13) Provide support for sliding glass doors and double doors opening to the outside

    14) Improve anchorage of windows to openings

    15) Add ridge ventilators to reduce uplift of wood sheathing

    16) Anchor adjacent structures, including privacy fences, pool enclosures, and patio roofs

    17) Improve connections of porch roofs and overhangs

    18) Reinforce entry doors

Floods

- Elevate new structures above the 100-year flood level
- 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 mitigation activities

- Install backflow valves in sewer systems

- Incorporate a “hazard disclosure” requirement for deed transfers, leases, or other contracts for sale or exchange of property in flood hazard areas

- 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

- Retrofit:

    1) Elevate the lowest floor above the 100-year flood level

    2) Wet flood proofing (allowing water to enter uninhabited areas of the structure)

    3) Dry flood proofing (sealing the structure to prevent flood waters from entering)

    4) Levees and floodwalls (constructing a barrier around the structure to keep out flood waters)

    5) Demolition (tearing down the structure and rebuilding with appropriate flood proof techniques or relocating the structure)

    6) Elevate the main breaker or fuse box

Severe Thunderstorms and Lightening

- Clear dead or rotting trees and branches
- Public information on when to turn off gas, electricity, and water; how to develop an emergency communication plan; and actions to take during a severe thunderstorm such as avoiding bathtubs, water faucets, and sinks
- Secure outdoor objects that could become projectiles
- Install lightening rods

Tornadoes

- Telephone warning system
- Community warning sirens
- NOAA weather radio tone alerts
- Retrofit structures to include reinforced safe room

Soil / Beach Erosion

- Sand management
- Relocation of threatened facilities
- Threatened real estate may be set aside as open space
- Vegetation replenishment program

Seismic Hazards

- Rodent control
- Mosquito control
- Regular maintenance of cooling and plumbing systems

- Water purification maintenance
- Adequate sanitation control measures

Technological Hazards

Power Failure

- Voluntary conservation public information (bill inserts)
- Electrical Emergency Contingency Plan

Transportation System Accident

- Develop accident contingency plans

All Hazards

- Map vulnerable areas and distribute information about the hazard mitigation strategy and projects
- 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 mitigation activities
- Organize and conduct training opportunities regarding natural hazards and hazard mitigation
- Distribute NOAA weather radios (school superintendents, etc.)
- Sound land use planning based on known hazards
- Enforcing building codes and local ordinances
- Increasing public awareness of community hazards
- Consider conservation of open space by acquisition of repetitive loss structures
- Maintain a hazard mitigation committee

PROPERTY PROTECTION PROJECTS

Specific measures which are considered property protection include:

- Installation of temporary or permanent closures for openings in structures
- Raising existing structures in-place
- Constructing structures on fill or columns
- Constructing small walls or levees around structures
- Relocating or protecting damageable property within an existing structure
- Relocating exiting structures and/or contents out of a flood hazard area
- Use of water resistant materials in new or existing structures
- Acquisition of title or easement to flood plain land

Flood Insurance
Installation of flood forecast and warning systems with an appropriate evacuation plan

Structures whose exterior is generally impermeable to water can be retrofitted to keep floodwater out by installing watertight closures in openings such as doorways and windows. While some seepage will still potentially occur, it can be reduced by applying a sealant to walls and floors. Closures can be temporary or permanent. Temporary closures are installed only after a flood forecast and therefore need warning time for installation. Specific measures which may be taken are described below.

Doorway Closures: Exterior doors do not normally seal tight enough to prevent seepage around the doorjamb. Installation of a rubber type gasket and the means to press the door against the gasket to create a tight seal can be adequate for low flooding depths (0-1 feet). A more effective means is the use of flood shields. Shields are normally of aluminum, steel, wood or plastic and are made to the height and width desired. In commercial/industrial structures they are permanently installed at the doorway on hinges or rollers for swinging or sliding into place. More often however, they may be stored nearby for installation on brackets or anchor bolts at the time of a flood. The shield seals against the doorjamb with a rubber type gasket.

Window Closures: Normal window glass can resist very little hydrostatic pressure and is vulnerable to breakage by floating debris. Flood shields are commonly used to protect

windows and prevent water from entering. As with doorway shields, window shields can be permanently installed on hinges or rollers or stored and installed temporarily during floods.

Another alternative is to install heavy duty Plexiglas, as a substitute to window glass, which can resist hydrostatic pressures of several feet. Large display windows in commercial structures are sometimes protected by installing weep holes at the base of the window. This allows water on the inside to equalize the hydrostatic pressure on the window, but it is prevented from entering the remainder of the structure by parapet walls. Windows not needed can be permanently closed with bricks, blocks, or other impermeable material. The condition of the structure, and the number, location and size of openings influence the feasibility of utilizing closures. Structures with large and/or numerous openings lack advantages associated with structures with fewer openings. The most favorable situation is a structure constructed of relatively impermeable materials, in good condition, with few openings.

Seals: Waterproofing sealants can be applied to generally impermeable walls and floors to limit seepage. Sealants are particularly effective on brick veneer, cement block, reinforced concrete and similar masonry type surfaces, as well as rigid aluminum and vinyl siding. Cracks in masonry can be filled by caulking. Structures with exterior walls constructed of brick, brick veneer, concrete and cement block are relatively impermeable and can be made more so by sealing exterior surfaces.

Structural Adequacy: When water is prevented from entering a structure, the walls become subject to lateral hydrostatic forces which may cause failure by bending or shear, and the floors to uplift forces which may cause buckling or flotation. It is somewhat more difficult to analyze the capability of existing structures to resist these forces because of the general lack of knowledge about workmanship and materials used during construction and about the present condition of these materials.

Building Elevation: This alternative involves raising the building in place so that the first floor elevation is above the flood level. Raising buildings is generally used in areas of low to moderate water depth and velocity. After the building is jacked up, existing foundation walls are extended vertically. Although raising foundations walls is often viewed as the easiest flood proofing, there are several important considerations. The most important concern is that the original foundation and footing must be able to withstand the extra loading from the vertical dead load of the new wall.

Flood Proofing Utilities: Elevation is the most effective way to prevent flood damage to exterior utilities. All incoming electrical power lines, transformers, and panels should be located at least one foot above the 100-year flood elevation. Because sewer lines in most areas are highly susceptible to infiltration, they often become saturated during flooding events. In such cases floodwater may enter a building through the sewer system and create internal flooding that is near or equal to exterior flood levels. To prevent this, backflow prevention valves should be installed on the building's sewer lines.

There are several alternatives for locating backflow devices. A main valve may be located where the sewer is strong enough to resist the flood-induced pressures and where all possible reverse flows can be stopped. Whenever flooding occurs above the lowest floor level, floodwater may enter the sewer system and back up into the building.

Water distribution lines are not usually contaminated when flooding occurs unless the water source itself is inundated by floodwater.

Heating or air conditioning units, or similar facilities located outside the structure, must also be flood proofed. Elevating the equipment is preferred, but if this is not feasible, a watertight closure system should be provided.

To complete the utility system flood proofing process, all openings below the base flood elevation where pipes, conduits, vents or other fixtures pass through a floor or exterior wall must be sealed to prevent leakage. Penetrations can be pressure sealed in several ways: gel-like expansive sealants, electrometric seals, molded sleeves, and neoprene seals.

STRUCTURAL PROJECTS

Flood walls and Levees: Floodwalls and levees are freestanding structures located away from the building that prevent inundation of the building. They may completely encompass the perimeter of the building or provide protection just to the low-lying areas. Generally, levees are constructed of compacted soils. Levees have the advantage of being compatible with the surrounding landscape since they are easy to shape.

An important factor in considering the feasibility of a levee involves the availability of suitable fill material for the levee, and the adequacy of the underlying supporting soil. Most types of soils are suitable for levee construction, with the exception of extremely fine-grained or highly organic soils. In addition, levees require a substantial area to construct and may not be feasible on small lots.

Construction of floodwalls is another option. Floodwalls are similar to levees however they are not constructed of earthen materials. They are generally thinner and take up less area than levees. Floodwalls can be constructed using a variety of designs and materials. The most common material for floodwall construction is concrete

APPENDIX B
PROJECT RANKING CRITERIA

PROJECT RANKING CRITERIA

The following ranking system was developed to rank the Hazard Mitigation Projects in this plan. It is based on FEMA's guidance for Hazard Mitigation Planning.

1. Is the project consistent with the overall plan of 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. Reduction in losses must be from 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?

What is the value of the property to be protected by the project?

APPENDIX C
COST EFFECTIVENESS OF HAZARD MITIGATION PROJECTS

COST EFFECTIVENESS OF HAZARD MITIGATION PROJECTS

It is important to identify mitigation projects that are the most cost effective. A cost effective plan is one where the total cost of installation operation and maintenance is less than the amount of physical damage, lost earnings, and other economic impacts that are likely to occur if the project is not completed.

In order to qualify for federal assistance under the Hazard Mitigation Grant Program, a hazard mitigation project must have a positive benefit to cost ratio. Over the economic life of the project, the total benefits must exceed the cost of the project.

Damages are generally calculated on an average annual damage basis over the economic life of the structure. These average annual damages that would be incurred without mitigation are considered as the average annual benefits associated with the proposed project. Other benefits, such as reductions in insurance premiums, and reduction in lost production time are also included in the calculation of annual benefits.

The total cost of implementing a mitigation plan must also be calculated. All factors must be considered, including the cost of installation, operation, maintenance and financing. Once these variables have been identified, it is possible to amortize the total project over the economic life of the structure to identify an average annual cost. The average annual cost can then be directly compared with the average annual benefits (damages prevented) to determine the relative cost effectiveness of proposed projects.

Benefits

Direct benefits include:

- Building damages;
- loss of, or damage to, personal property or building contents;
- Infrastructure damages;
- Displacement costs after a disaster event;
- Casualties;
- Loss of function: Critical public facilities;
- Transportation routes;
- Electrical power;
- Businesses; and emergency protective measures.

Indirect Benefits

Some benefits may not be considered when determining the benefits of a mitigation project. Damages and losses are not included in the analysis when there is no clear cause and effect relationship between the event and the damages or loss. Some examples of indirect benefits include:

- Lost wages;
- Looting;
- Gross or region-wide economic effects; and
- Recreation opportunities lost or gained.

APPENDIX D
STATE OF CONNECTICUT AND CITY OF MILFORD FLOOD WARNING SYSTEMS

THE CONNECTICUT FLOOD WARNING SYSTEM

The Automated Local/Statewide Evaluation in Real Time (ALERT) system is an automated early flood warning and response system. ALERT was installed in Connecticut by the Natural Resources Conservation Service (NRCS) in cooperation with the Department of Environmental Protection (DEP) in 1985 as a direct result of the June flooding of 1982. Rainfall, river, tidal, and weather data collected by the flood warning system is radioed into the DEP Alert Center and the three offices of the National Weather Service and used to issue faster severe weather watches, and warnings. The Alert System has aided communities in responding more rapidly to flash flooding and other weather related emergencies in Connecticut.

The automated rainfall, river, tidal and weather gauges that make up the ALERT flood warning system measure weather conditions statewide, and transmit their data via VHF radio signals to computer base stations located throughout Connecticut.

Two of the computer base stations are located at the State DEP/Inland Water Resources Division (IWRD) Flood Alert Center in Hartford and the Hartford Public Works Department.

Once received at each base station, the precipitation, river, tidal and weather data are stored in the database. Special software is used to analyze the data and alert IWRD staff of potential flooding conditions before they occur. The data is also uploaded to the Northeast River Forecast Center (NERFC) in Taunton, Massachusetts, and the Weather Service Offices at Albany, New York, and Brookhaven, Long Island. NERFC personnel analyze the rainfall and river data, and prepare river flood forecasts. The ALERT system also provides valuable rainfall data to the Department of Forestry's fire monitoring program, and roughly 30 other public and private agencies.

In addition to the Statewide Flood Warning System there are nine local Automated Flood Warning Systems encompassing 13 towns and cities. These nine communities suffer from repeated flooding and have installed ALERT Systems to increase their flood warning and response time. Each town has its own computer base station that can monitor local conditions as well as communicate via phone modem with the central base stations in Hartford. With the aid of a modem line to the Hartford base stations, towns can view heavy rainfall moving in their direction before it arrives.

FLOOD WARNING SYSTEM DESIGN

The Committee on Automated Flood Warning was formed from a study group in 1985 to design and install an Automated Local/Statewide Evaluation in Real Time (ALERT) Flood Warning System for Connecticut.

Prior to the installation of the statewide system in 1985, ALERT systems were already operational in the cities of Stamford and Hartford. The first phase of installation of the statewide system involved the placing of 14 automated precipitation gauges evenly spaced across the state. The gauges were designed to collect and transmit rainfall data automatically. To receive and store the rainfall data, a pair of computer operated base stations were installed at the DEP in Hartford and the National Weather Service Northeast River Forecast Center (NERFC) in Bloomfield (now located in Taunton, MA). Five radio repeaters were installed to relay data transmissions from the gauges to the base stations.

The second phase of the installation called for two local ALERT systems to be installed in the communities of Southington and Norwich. Each of these ALERT systems consists of four precipitation gauges, one river gauge, a computer base station and a radio repeater. Rainfall and river data from the gauges are received at the local base stations, and relayed via radio repeater to the two state ALERT base stations in Hartford.

Since 1990, the statewide system has been further expanded to include the Hartford, Milford, and Wallingford Alert Systems. New systems are currently planned to be installed in, the Norwalk River basin, Danbury and East Haven.

These communities receive warnings of heavy rainfall and potential flooding several hours in advance of damage, and they use this additional time to implement special community Emergency Operations Plans (EOPs). Individual homeowners and businesses are notified so that they can implement their flood audit action plans to reduce flooding damages before flooding occurs.

In 1992, six fully automated weather stations were also installed to replace six aging weather stations that were installed as part of the second phase in 1986. Devices on these weather stations collect and transmit rainfall, temperature, soil moisture, wind speed/direction, and relative humidity data to the base stations via radio repeaters. The University of Connecticut and the Division of Forestry use the data for climatologically research and to forecast forest fire burn potential.

The system was expanded again in 1997 to include ten additional river gauges on the states seven largest rivers and two tide elevation gauges in Old Saybrook and Groton. Because these new gauges are located in areas that do not suffer flash flooding, but are prone to normal river flooding which takes 12-36 hours to occur, these expansion used gauges operate via telephone and cellular links.

NOAA/EAS WEATHER WARNING RADIO NETWORK

During 1993-1994, with assistance from the Federal Emergency Management Agency (FEMA), Connecticut installed the NOAA Weather Warning Radio WRSAME system. The acronym WRSAME stands for Weather Radio Specific Area Message Encoder. This new system allows the NWS to issue warnings to specific areas of Connecticut without alarming the entire state.

Connecticut, and 300 NOAA Weather Radios (with built-in decoders) were placed in schools,

state parks, police and fire departments statewide. These newer radios can store messages and alert users when watches and warnings are issued. The radios also scan the frequency for static or weak signals and alert users if problems are detected.

The NOAA/WRSAME system operates on the Federal Hydrologic frequencies. In Connecticut, four transmitters; Hamden (162.400 MHz), Soapstone (162.475 MHz) Montville (162.550 MHz), Central Park (162.550 MHz) and Mohawk Mountain (162.500 MHz); are used by the NWS to transmit forecasts, watches, and warnings.

During 1997-98 the NOAA/WRSAME system was upgraded to work with the newer Emergency Alerting System (EAS). The new EAS system includes civil preparedness messages along with the existing weather watches and warnings.

COASTAL FLOOD WARNING SYSTEM

During 1997, Connecticut installed a Coastal Flood Warning system. The system consists of two automated tide gauges which transmit data via telephone links to the DEP and NWS. These gauges measure still water elevation, rainfall, and barometric pressure. As part of the Coastal Flood Warning System, about 300 hurricane evacuation signs have been installed in 13 towns along the coast. These signs serve two purposes: 1) they direct evacuating vehicles along routes away from the coast; 2) each sign has an 8 foot staff gauge beneath it that shows the ground surface elevation at that location. Using these signs, towns can evacuate persons in phases based on their elevation above sea level.

FORECAST & WARNING PROCEDURES IN CONNECTICUT

NATIONAL WEATHER SERVICE

The National Weather Service (NWS) is responsible for preparing the daily weather forecasts, severe weather watches and warnings, and flash flood watches and warnings are broadcast over radio and television in Connecticut. Weather forecasting for Connecticut is divided between three different NWS offices. Each office covers part of the state.

The NWS office in Taunton, Massachusetts is responsible for the counties of Hartford, Tolland and Windham. Litchfield County is covered by the Albany NWS office, and the four southern counties of Fairfield, New Haven, Middlesex and New London are covered by the NWS office at Brookhaven, Long Island. These offices also provide the daily forecasts seen on the weather channel.

Also located in the same office as the NWS Forecast office in Taunton, Massachusetts, is the NWS Northeast River Forecast Center (NERFC). The NERFC is responsible for preparing river stage forecasts, headwater guidance, and flash flood guidance for a large portion of southern New England. The NERFC also issues flood warnings and river statements for all rivers in Connecticut. Among the rivers forecasted in Connecticut by the NERFC are the Connecticut, Farmington, Quinnipiac, and Park river basins

Coordination between the three NWS offices is handled by their AFOS (Automation of Field Operations and Services) computer network. The latest weather maps, ALERT rainfall data, and computer products from the National Meteorological Center in Washington D.C. are sent through the AFOS computer network to the NWS offices and River Forecast Centers all across the country.

Most precipitation and river readings as well as all weather watches, warnings, statements and forecasts are transmitted by AFOS from one NWS Office. ALERT rainfall and river data from Connecticut's flood warning system are automatically relayed to the NERFC via a micro-wave link. Once received by the NERFC the AFOS computer relays the data to all NWS facilities in southern New England.

When printed forecasts, watches and warnings need to be broadcast in Connecticut, the forecast or warning message is read off the AFOS network by personnel at the State Office of Emergency Management (OEM) and typed onto the Connecticut On-Line Law Enforcement Teletype (COLLECT) system. Within 15 minutes, the COLLECT system relays the message to all 169 towns within the state.

All forecasts, watches and warnings are also transmitted over the National Oceanic and Atmospheric Administration (NOAA) Weather Radio Network. This network uses the Weather Radio Specific Area Message Encoding System (WRSAME) and the Emergency Alerting System (EAS) to warn areas that are in the path of severe weather.

Routine Operations

During routine operations, ALERT rainfall and river data are automatically transmitted to the NERFC and stored in their ALERT computer. Shortly after the top of each hour, these data are transmitted through AFOS to the rest the NWS facilities in southern New England.

As mentioned earlier, each NWS office issues different messages to the general public. Each message, whether a flood statement or warning for specific gauges, issued by the NERFC, or a flash flood warning for generally ungauged streams issued by the WSOs is sent into AFOS. These forecasts, watches, and warnings are then relayed to the Office of Emergency Management in Hartford, and then they are sent to the towns via the COLLECT system.

This cycle takes from less than one hour to several hours depending on the type of watch, warning, or forecast that the National Weather Service is issuing and the time it takes to generate or update the forecast.

Emergency Operations

In heavy rainfall situations, whether forecasted or not, the NERFC and WSFO will take the lead. Since flood watches are issued for the most part by the WSFO, coordination between offices must take place. In the most rapid of situations, NERFC will issue forecasts and warnings for ALERT river basins and coordinate with the DEP and OEM. In many of these situations, the DEP will contact ALERT base stations and Emergency Operations Centers (EOCs) directly, and relay the latest warnings using its high speed faxing service. This cuts the response time considerably. Personnel at the local EOCs have the ability to phone persons living in the floodplains and inform them of the latest river stage forecast. Individuals then begin moving their stock and contents listed in their Flood Audit Emergency Operations Plans out of basements and flood prone areas. Towns with ALERT base station computers also have the capability to monitor rainfall and river levels in their own area. The computer base stations are equipped with antenna that receive the rainfall and river data at the same time it is transmitted to the NWS. This gives the local authorities the ability to respond quickly to the sudden rise of a local river, or locally heavy rains.

NERFC will issue specific stage forecasts and warnings where necessary. These river forecasts will frequently contain forecasted rainfall for the next few hours. This provides users of the forecasts with a scenario. If for example an additional inch of rain falls during the next hour, then the user can expect the river to rise to a certain stage. This If/Then scenario adds to the flood warning lead time.

All forecasts or warnings will be sent into AFOS and from AFOS to OEM. Once received by OEM, the warnings are sent into the COLLECT system. Within 15 minutes the towns receive their new forecasts.

High Speed Faxing Service

In 1995 the DEP began using a new technology that allows detailed fax messages and maps to be sent to every town in Connecticut in as little as five minutes during emergencies. Faxes are computer generated and sent simultaneously to 340 locations statewide. Some of the locations re-transmit the faxes to more locations in their local areas. The total number of recipients is estimated at 1,000. Most of the fax locations are 911 Centers, police and fire headquarters, civil preparedness offices, schools and state parks.

The faxes contain maps, and forecasts along with any watches or warnings issued by the NWS. If necessary, radar images and satellite pictures can also be faxed. This service is also used for routine operations to send out weekly tropical weather updates and storm reports.

Milford Flood Gates

- Surf Village Condos on Merwin Ave. (the Condo unit maintains and controls).
- State Property at Silver Sands. Located by Heritage Sound Condos
- Gates at Melba St. for Calf Pen Creek, but were removed when the bridge was rebuilt.

Milford Flood Gauges

- Melba Street Bridge
- Gulf Street Bridge (to be reinstalled upon bridge completion)
- East Broadway & Surf (Silver Sands Area)
- Walnut Street Bridge (Wepawaug River Monitor)

APPENDIX E
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. This program is performed in conjunction with the installation of municipal ALERT flood warning and response systems.

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"[2] 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.

[2] Negative numbers shown as follows (-2") are water elevations below the floor or entry level.

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.

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:
* If you have a generator, then also check its operation and fuel supply for use during electrical service interruption.
** Because subsurface water is causing critical stress on basement floor and foundation, high hazard exists for structural damage as pumping continues.

LOCATION: OUTSIDE
ACTIONS TO TAKE FOR THE FORCASTED 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.**

APPENDIX F
TECHNICAL AND FINANCIAL RESOURCES

TECHNICAL & FINANCIAL RESOURCES

This Section is comprised of a list of resources to be considered for technical assistance and potentially 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.

Federal Resources

Federal Emergency Management Agency
Region I Office
J.W. McCormack POCH, Room 462
Boston, MA 02109-4595
(617)-223-9575

Mitigation Division

Administers all of **FEMA's** hazard mitigation programs, including: National Flood Insurance Program and Community Rating System; prepares and revises flood insurance studies and maps; information on past and current acquisition, relocation, and retrofitting programs; expertise in other natural and technological hazards, including hurricanes, earthquakes and hazardous materials. Financial assistance includes Hazard Mitigation Grant program (post-disaster); Flood Mitigation Assistance Program (pre-and post-flood); training for local officials at Emergency Management Institute in Emmetsburg, Maryland.

Earthquake Hazards Reduction Assistance Program

As part of the National Earthquake Hazards Reduction Program (NEHRP), the purpose of the **FEMA's** State Earthquake Hazards Reduction Program is to provide funds for the development of comprehensive risk reduction programs 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 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.

State Hurricane Program

This program is concerned with reducing the impacts of hurricanes and coastal storms on coastal areas of the United States and its territories as well as reducing the extent of subsequent losses. FEMA provides financial and technical assistance to State and local governments to support their efforts to mitigate the damaging effects of hurricane and coastal storms. State Hurricane Program funds are to be used for mitigation and preparedness activities related to hurricane hazards. Each participating State receives a Local Assistance allocation of $5,000 in addition to the State Assistance Grant.

Hurricane Program Property Protection - Mitigation Grants

This element of the Hurricane Program provides grants to hurricane-prone States to implement mitigation projects. Each FEMA Region with States participating in the Hurricane Program receives funds for this activity.

The Regional offices solicit the States to undertake projects that reduce the risk of loss of life or injury from damaged structures and reduce the overall cost of hurricane disasters due to property damage. This program is administered by the CT OEM.

Multi-State Groups

There are three multi-state (regional) consortia that FEMA funds: the Western States Seismic Policy Council (WSSPC), the New England States Emergency Consortium (NESEC), and the Central United States Earthquake Consortium (CUSEC). The mission of all three consortia is to support the National Earthquake Hazard Reduction Program (NEHRP) funded State earthquake programs. They provide support in areas such as coordination between the States in a region and public awareness and education, and they also reinforce interactions between all levels of government, academia, non-profit associations, and the private sector.

Technical Assistance Contracts

The Mitigation Directorate has in place several Technical Assistance Contracts (TAC) that support FEMA, States, territories, and local governments with activities to enhance the effectiveness of natural hazard reduction program efforts. The TACs support FEMA_s responsibilities and legislative authorities for implementing the earthquake, hurricane, dam safety, and floodplain management programs. The range of technical assistance services provided through the TACs varies based on the needs of the eligible contract users and the natural hazard programs. Contracts and services include:

The Hazard Mitigation Technical Assistance Program (HMTAP) - Contract-supporting post-disaster program needs in cases of large, unusual, or complex projects; situations where resources are not available; or where outside technical assistance is determined to be needed. Service includes environmental and biological assessments, benefit/cost analyses, historic preservation assessments, hazard identification, community planning, training, and more.

The Wind and Water Technical Assistance Contract (WAWTAC) - supporting wind and flood hazards reduction program needs. Projects include recommending mitigate measures to reduce potential losses to post-FIRM structures, providing mitigation policy and practices expertise to States, incorporating mitigation into local hurricane program outreach materials, developing a Hurricane Mitigation and Recovery Exercise, and assessing the hazard vulnerability of a hospital.

The National Earthquake Technical Assistance Contract (NETAC) - supporting earthquake program needs. Projects include economic impact analyses of various earthquakes, vulnerability analyses of hospitals and schools, identification of and training on non-structural mitigation measures, and evaluating the performance of seismically rehabilitated structures, post-earthquake.

Hazard Mitigation Grant Program (HMGP) - MGP is a post-disaster mitigation program that provides funding for hazard mitigation projects in affected counties following presidential declared disasters. Available funds are based on a percentage of the total damages caused by the particular disaster. Grants from this program are limited to state and local governments and certain non-profit organizations. There is a need to demonstrate a positive cost/benefit analysis and a cost-share requirement of 25% to match the federal funds provided. Grants are competitive within the affected area. This program is administered by the state of Connecticut, Department of Environmental Protection.

Flood Mitigation Assistance Program (FMA) - FMA is a pre-disaster mitigation program created by the National Flood Insurance Reform Act of 1994. This program provides both project and planning grants annually for flood hazard mitigation planning and projects with direct demonstrable benefits to the NFIP insurance fund. Administratively, this program is very similar to the HMGP described above.

Response & Recovery Division Information on dollar amounts of past disaster assistance including Public Assistance, Individual Assistance, and Temporary Housing; information on retrofitting and acquisition/relocation initiatives. Coordinates federal disaster assistance programs, including 75% grants for mitigation projects to protect eligible damaged public and private nonprofit facilities from future damage through the Public Assistance Program, and 100% _minimization_ grants through the Individual and Family Grant Program.

Computer Sciences Corporation
New England Headquarters,
140 Wood Road, Suite 200,
Braintree, MA 02184
(781) 848-1908

A private company contracted by the Federal Insurance Administration as the National Flood Insurance Program Bureau and Statistical Agent, CSC provides information and assistance on flood insurance, including handling policy and claims questions, and providing workshops to lenders, insurance agents, and communities.

Small Business Administration
360 Rainbow Boulevard South, 3rd Floor
Niagara Falls, NY 14303
Disaster Program Director: Win Allred
(716) 282-4612 or 800-659-2955

SBA has the authority to "declare" disaster areas following disasters that affect a significant number of homes and businesses, but that would not need additional assistance through FEMA. (SBA is triggered by a FEMA declaration, however.) SBA can provide additional low-interest funds (up to 20% above what an eligible applicant would normally qualify for) to install mitigation measures. They can also loan the cost of bringing a damaged property up to state or local code requirements. Can be used in combination with the new "mitigation insurance" under the NFIP, or in lieu of that coverage.

Environmental Protection Agency
Region I - JFK Federal Building, Government Center,

Boston, MA 02203
(617) 565-3400

Capitalization Grants for State Revolving Funds
Low interest loans to governments to repair, replace, or relocate wastewater treatment plants damaged in floods. Does not apply to drinking water or other utilities.

Clean Water Act Section 319 Grants
Cost-share grants to state agencies that can be used for funding watershed resource restoration activities, including wetlands and other aquatic habitat (riparian zones). Only those activities that control non-point pollution are eligible. Grants are administered through the CT DEP, Bureau of Water Management, Planning and Standards Division.

U.S. Depart. of Housing and Urban Development
CT Dept. Of Economic and Comm. Development
330 Main Street
Hartford, CT 06106
(860) 566-5310
(860) 240-4515

Community Development Block Grants (CDBG): Communities with populations greater than 50,000 contact HUD directly regarding CDBG. Communities smaller than 50,000 compete for funds allocated to the state Department of Economic Development. One program objective is to improve housing conditions for low and moderate-income families. Projects can include acquiring flood prone homes or protecting them from flood damage. Funding is a 100% grant; can be used as a source of local matching funds for other funding programs, such as FEMA's 404" Hazard Mitigation Grant Program. Funds can also be applied toward blighted conditions, which is often the post-flood condition. A separate set of funds exists for conditions which create an imminent threat. The funds have been used in the past to replace (and redesign) bridges where flood damage eliminated police and fire access to the other side of the waterway.

U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

(978) 318-8505

Provide 100% funding for floodplain management planning and technical assistance under the Floodplain Management Services Program (FPMS). Various flood protection measures such as beach re-nourishment, stream clearance and snagging projects, flood proofing, and flood preparedness funded on a 50/50 matching basis by Section 22 Planning Assistance to States program. They are authorized to relocate homes out of the floodplain if it proves to be more cost effective than a structural flood control measure.

U.S. Department of Commerce
National Weather Service
445 Myles Standish Blvd.
Taunton, MA 02780
(508) 823-2266

Prepares and issues flood, severe weather, and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues and can give technical assistance in preparing flood-warning plans.

U.S. Department of the Interior
National Park Service
Rivers and Trails Conservation Program
Regional Office, 15 State Street
Boston, MA 02109
(617) 223-5203

Technical Assistance with open space preservation planning; can help facilitate meetings and identify non-structural options for floodplain development.

Fish and Wildlife Service
New England Field Office
22 Bridge Street, Unit # 1
Concord, NH 03301

Can provide technical and financial assistance to restore wetlands and riparian habitats through the North American Wetland Conservation Fund and Partners for Wildlife programs.

U.S. Department of Agriculture
Natural Resources Conservation Service (formerly SCS)
344 Merrow Road, Suite A
Tolland, CT 06084
(860) 871-4016

Technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts on land-use and conservation planning, resource development, storm water management, flood prevention, erosion control and sediment reduction, detailed soil surveys, watershed/river basin planning and recreation, fish and wildlife management. Financial assistance is available to reduce flood damage in small watersheds and to improve water quality. Financial assistance is available under the Emergency Watershed Protection Program; the Cooperative River Basin Program; and the Small Watershed Protection Program.

State Resources

Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 06106
(860) 424-3706

Bureau of Water Management, Inland Water Resources Division - This division is generally responsible for flood hazard mitigation in Connecticut, including administration of the National Flood Insurance Program.

National Flood Insurance Program State Coordinator - flood insurance and floodplain management technical assistance, floodplain management ordinance review, substantial damage/improvement requirements, community assistance visits, and other general flood hazard mitigation planning.

State Hazard Mitigation Officer - Hazard mitigation planning and policy; oversight of administration of the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Project Impact initiative.

Flood Warning and Forecasting Services - Prepares and issues flood, severe weather, and coastal storm warnings. Staff engineers and forecaster can work with communities on flood warning issues and can give technical assistance in preparing flood-warning plans.

Flood & Erosion Control Board Program - provides assistance to municipalities to solve flooding, beach erosion and dam repair problems. Certain non-structural measures that mitigate flood damages are also eligible. Funding is provided to communities that apply for assistance through a Flood & Erosion Control Board on a non-competitive basis.

Stream Channel Encroachment Line Program - Similar the NFIP, this state regulatory program places restrictions on the development of floodplains along certain major rivers. This program draws in environmental concerns in addition to public safety issues when permitting projects. Inland Wetlands and Watercourses Management Program - Provides training, technical and planning assistance to local Inland Wetlands Commissions, reviews and approves municipal regulations for local

Dam Safety Program - Charged with the responsibility for administration and enforcement of Connecticut_s dam safety laws. Permits the construction, repair or alteration of dams, dikes or similar structures and maintains a registration database of all known dams statewide. This unit also operates a statewide inspection program.

Bureau of Water Management - Planning and Standards Division - Administers the Clean Water Fund and many other programs directly and indirectly related to hazard mitigation including the Rivers Restoration Grant Program, Section 319 Non-point source pollution reduction grants, and municipal facilities program which deals with mitigating pollution from wastewater treatment plants.

Office of Long Island Sound Programs - Administers the Coastal Area Management Act program and Long Island Sound License Plate Program.

State Military Department
Office of Emergency Management
360 Broad Street
Hartford, CT 06105
(860) 566-3376

OEM is the lead agency responsible for emergency management. Specifically, responsibilities include emergency preparedness, response & recovery, mitigation, and an extensive training program. OEM is the state point of contact for most FEMA grant and assistance programs. OEM administers the Earthquake and Hurricane programs described above under the FEMA resource section. Additionally, OEM operates a mitigation program to coordinate mitigation through out the state with other government agencies.

Connecticut Department of Public Safety
Office of the State Building Inspector
1111 Country Club Road
Middletown, CT 06457
(860)685-8310

Responsible for administering and enforcing the Connecticut State Building Code. Also responsible for the municipal Building Inspector training Program.

Department of Transportation
Berlin Turnpike
Newington, CT
(860) 594-3236

The Department of Transportation administers the federal Intermodal Surface Transportation Efficiency Act (ISTEA) which includes grants for projects which promote alternative or improved methods of transportation. Funding through grants can often be used for projects with mitigation benefits such as preservation of open space in the form of bicycling and walking

trails. CT DOT is also involved in traffic improvements and bridge repairs which could also be mitigation related.

Regional Resources

South Central Regional Council of Governments

Private and Other Resources

The Association of State Floodplain Managers
2809 Fish Hatchery Road, Suite 204
Madison, WI 53711
(608) 274-0123

Professional association that assists communities with the NFIP with a membership of almost 2000. ASFPM has developed a series of technical and topical research papers and a series of Proceeding from their annual conferences. Many mitigation success stories have been documented through these resources, and provide a good starting point for planning.

Natural Hazards Center
(303) 492-6818 (M-F, 11:00AM-6:00PM Eastern)
Includes the Floodplain Management Resource Center, a free library and referral service of the ASFPM for floodplain management publications. The Natural Hazards Center is located at the University of Colorado in Boulder; staff can use keywords to identify useful publications from the more than 900 documents in the library.

New England Flood and Stormwater Managers Association, Inc.
J. W. McCormack
P.O. Box 676
Boston, MA 02102-0676

NEFSMA is a non-profit organization made up of state agency staff, local officials, private consultants and citizens from across New England. NEFSMA sponsors seminars and workshops and publishes the NEFSMA News, three times per year to bring the latest flood and stormwater management information from around the region to its members.

National Center for Earthquake Engineering and Research
(716) 645-3391
A Source for earthquake statistics, research, engineering and planning advice

National Emergency Managers Association
c/o Council of State Governments
3650 Iron Works Pike, P.O. Box 11910
Lexington, Kentucky 40578-1910
606-244-8000

A national association of state Emergency Management Directors and other emergency management officials. The NEMA Mitigation Committee is a voice tin shaping all-hazard mitigation policy in the nation. NEMA is also a source of technical assistance.

New England States Emergency Consortium (NESEC)
(800) 445-6332
Clearinghouse for mitigation and preparedness information. Cooperation amongst all New England states. NESED presents a unique, non-governmental approach to aid. This agency could secure access to private sources of monetary and logistics support.

Institute for Business and Home Safety (IBHS)
1408 Westshore Boulevard, Suite 208
Tampa, FL 33604
(813) 286-3400

A non-profit organization established by the insurance industry to research ways of lessening the impact of natural hazard. IBHS advocates the development and implementation of building codes and standards nationwide and may be a good source of model code language. IBHS is also involved in the promoting of strong land use planning practices which incorporate natural hazards into local development processes.

Volunteer Organizations

Volunteer organizations, such as the American Red Cross, the Salvation Army, and the Mennonite Disaster Service are often available to help after disasters. Service Organizations, such as the Lions, Elks, and VFW are also. The Mennonite Disaster Service provides skilled labor to help rebuild damaged buildings incorporating mitigation or flood proofing concepts. The office of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

Flood Relief Funds

After a disaster, local businesses, residents and out-of-town groups often donate money to local relief funds. They may be managed by the local government, one or more local churches, or an ad hoc committee.

No government disaster declaration is needed. Local officials should recommend that the funds be held until an applicant exhausts all sources of public disaster assistance. That would allow the funds to be used for mitigation and other projects that cannot be funded elsewhere.

APPENDIX G
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REFERENCES

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State of Connecticut, DEP, A Survey of Local Natural Hazards Mitigation Needs in Connecticut, March 1995

Wiss, Hanney, Elstner Associates, Inc, for the Federal Emergency Management Agency, Reducing the Risks of Nonstructural Earthquake Damage, a Practical Guide, September 1994

APPENDIX H
RESOLUTIONS