

BOROUGH OF NAUGATUCK NATURAL HAZARD PRE-DISASTER MITIGATION PLAN

**CENTRAL NAUGATUCK VALLEY
REGIONAL PLANNING AREA**

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Prepared For:



**Council of Governments
Central Naugatuck Valley**

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EXECUTIVE SUMMARY

Borough of Naugatuck Natural Hazard Pre-Disaster Mitigation Plan

1. The primary purpose of this natural hazard pre-disaster mitigation plan (HMP) is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken to prevent loss of life and reduce property damages associated with the identified hazards. The Disaster Mitigation Act of 2000 (DMA) requires local communities to have a Federal Emergency Management Agency (FEMA)-approved mitigation plan in order to be eligible to receive post-disaster Hazard Mitigation Grant Program (HMGP) grants and Pre-Disaster Mitigation (PDM) program project grant funds.
2. The Borough of Naugatuck drains to six major watersheds corresponding to the Naugatuck River, Hop Brook, Long Meadow Pond Brook, Fulling Mill Brook, Beacon Hill Brook, and Little River. All of the watersheds in Naugatuck are part of the regional Naugatuck River basin that ultimately discharges into the Housatonic River.
3. The Department of Public Works is the principal municipal department that responds to problems caused by natural hazards.
4. The Borough considers its police, fire, governmental, service and major transportation facilities to be its most important critical facilities, for these are needed to ensure that emergencies are addressed while day-to-day management of Naugatuck continues. Although none of the educational institutions in the Borough have emergency generators, they are considered critical facilities as these are used as shelters or supply distribution points. In addition, Borough personnel consider public and private water, sewer, electric, and communication utilities to be critical facilities.
5. The Borough currently does not have the capacity to shelter 10% of its population due primarily to the lack of trained staff to operate shelters.

6. The Public Works Department, Ambulance Services, Fire Department, Borough Offices, South Naugatuck CL&P Substation, and Hop Brook School are all located within a mapped dam failure inundation area, and Maple Hill School is located on the edge of a wildfire risk area.
7. According to the FEMA mapping, approximately 219 acres of land in Naugatuck are located within the 100-year flood boundary and 575 acres of land are located within the 500-year flood boundary. The municipal offices, fire department, wastewater treatment plant, Cherry Street Substation, Ecumenical Food Bank and Hop Brook School are all in 500 year floodplains, but they are not regularly impacted by flooding.
8. The Borough of Naugatuck has in place a number of measures to prevent flood damage. These include regulations and plans that control encroachment and development in and near floodplains and floodways. However, the Borough has not completed an update of its flood hazard regulations, and currently has no plans to enroll in the Community Rating System program.
9. The Borough of Naugatuck primarily attempts to mitigate flood damage and flood hazards by restricting building activities inside flood-prone areas. This process is carried out through both the Zoning Commission and the Inland Wetlands Commission.
10. Areas with flooding problems include: Spencer Street Corridor/Cherry Street/Pleasant Avenue area; the area adjacent to the Long Meadow Pond Brook and its tributary near Rubber Avenue and Harlow Court, near Mountview Plaza and north of the Baummer Dam; the lower portion of Arch Street at Long Meadow Pond Brook; and Beacon Valley Road near Beacon Falls.
11. Two preventative recommendations for the Borough to consider include joining FEMA's Community Rating System to reduce the cost of flood insurance for its residents and

requiring developers to demonstrate whether detention or retention will be the best management practice for stormwater at specific sites.

12. To streamline the permitting process, a checklist should be developed and available at several departments that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. A sample for the Borough of Naugatuck is included as Appended Table 3.
13. A hurricane striking the Borough of Naugatuck is considered a possible event each year that could cause critical damage to the Borough and its infrastructure. Emergency personnel should review potential evacuation plans to ensure timely migration of people seeking shelter in all areas of Naugatuck, and post evacuation and shelter information on the Borough website and in municipal buildings. The Building Department should have literature available regarding appropriate design standards for wind, information on tree maintenance procedures, and the role of CL&P.
14. The recent implementation of the CodeRED emergency notification system in Naugatuck is beneficial for warning residents of impending emergencies. The Borough of Naugatuck should consider including dam failure areas in its CodeRED emergency notification system.
15. Connecticut experiences at least one severe winter storm every five years, although a variety of small and medium snow and ice storms occur nearly every winter. The likelihood of a nor'easter occurring in any given winter is therefore considered high, and the likelihood of other winter storms occurring in any given winter is very high.
16. The heavily treed landscape in close proximity to densely populated residential areas in the Borough of Naugatuck can pose problems during windy summer and winter storms including power outages, traffic delays and detours, and property damages.

17. Emergency shelters, evacuation plans, and plowing routes should be posted at the municipal offices and on the Borough's website.
18. An inactive fault is located in the far southeast corner of the Borough. Even though this fault is inactive, the best mitigation for future development in the area of this fault would be to preserve or convert the fault area into municipal open space.
19. With 16 registered dams and several other minor dams in the Borough, dam failure can occur almost anywhere in Naugatuck. In addition, parts of the Borough lie within inundation areas for several Class C dams, both within and upstream of Naugatuck. The Borough should assess the condition and performance of the Donovan Road Dam and upgrade as necessary, and upgrade and repair the Ridge Lower Pond Dam located along Warren Avenue. The Borough of Naugatuck may wish to establish a Flood and Erosion Control Board to oversee local flooding and erosion problems and municipally-owned dams.
20. The Borough of Naugatuck is considered a low-risk area for wildfires. Wildfires are of concern primarily in wooded areas and other areas with poor access for fire-fighting equipment. Wildfires are considered a likely event each year, but, when one occurs, it is generally contained to a small range with limited damage to non-forested areas.
21. The 2001 Plan of Conservation and Development (Plan of C&D) indicated that there are several streets in the Borough which are inaccessible to fire trucks due to either steep grades or the narrowness of the road. These include Aetna Place, Bosco Drive, Highland Circle, Hughes Street, Joseph Road, Mitchell Street and Theresa Street. Thus it is essential that any future development on steep slopes be reviewed with an extra level of attention to ensure that new developments are not burdened by the same type of problems.

22. The 2001 Plan of C&D also indicated that the Naugatuck Fire Department (NFD) has expressed concerns regarding response times to developments in the northwest and southeast portions of the Borough. Additionally, the water pressure in some areas, particularly around the perimeter of the Borough, has been identified as a problem. These areas exhibit low-pressure situations which may inhibit the department's ability to deal with fires. Subsequent to the Plan of Conservation and Development publication in 2001, additional water lines have been extended up May Street towards the Eastside Fire Station and on Wooster Street.
23. It is important for the Borough of Naugatuck to be prepared to assist special populations including the elderly, linguistically isolated and disabled during emergencies, including wildfires.
24. In addition, there is special concern about fires in the Naugatuck State Forest in the southern part of the Borough. Fires in these areas are particularly difficult to access due to topography can spread to or from nearby municipalities. The Borough has the support of the owners of the tracts of open space to provide access to their lands in case of a wildfire.
25. The Borough of Naugatuck should consider the construction of dry hydrants throughout the Borough to provide a more reliable supply of firefighting water in areas without public water supply.
25. The Naugatuck Office of Emergency Management & Homeland Security (NEMHS) should be charged with creating and disseminating informational pamphlets and guides to public locations such as the library, post office, senior center, and Borough offices. The Borough should consider adding additional pages to its website dedicated to citizen education and preparation for natural hazard events.

26. The Office of the Mayor and the Department of Public Works in the Borough of Naugatuck will primarily be responsible for developing and implementing selected projects, including updating the Plan of Conservation and Development, Zoning Regulations, Subdivision Regulations, Wetlands Regulations, and Emergency Operations Plan to include the provisions in this plan. Some projects will be implemented by other departments.

1.0 INTRODUCTION

1.1 Background and Purpose

The term hazard refers to an extreme natural event that poses a risk to people, infrastructure, or resources. In the context of natural disasters, pre-disaster hazard mitigation is commonly defined as any sustained action that permanently reduces or eliminates long-term risk to people, property, and resources from natural hazards and their effects.

The primary purpose of a natural hazard pre-disaster mitigation plan (HMP) is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken by a community or group of communities to prevent loss of life and reduce property damages associated with the identified hazards. This HMP is prepared specifically to identify hazards in the Borough of Naugatuck, Connecticut ("Naugatuck" or "Borough"). The HMP is relevant not only in emergency management situations, but also should be used within the Borough of Naugatuck's land use, environmental, and capital improvement frameworks.

The Disaster Mitigation Act of 2000 (DMA), commonly known as the 2000 Stafford Act amendments, was approved by Congress and signed into law in October 2000, creating Public Law 106-390. The purposes of the DMA are to establish a national program for pre-disaster mitigation and streamline administration of disaster relief.

The DMA requires local communities to have a Federal Emergency Management Agency (FEMA)-approved mitigation plan in order to be eligible to receive post-disaster Hazard Mitigation Grant Program (HMGP) grants and Pre-Disaster Mitigation (PDM) program project grant funds. Once a community has a FEMA-approved hazard mitigation plan, the community is then eligible to apply for PDM project funds for mitigation activities.

The subject pre-disaster hazard mitigation plan was developed to be consistent with the requirements of the HMGP, PDM, and Flood Management Assistance (FMA) programs. These programs are briefly described below.

Pre-Disaster Mitigation (PDM) Program

The Pre-Disaster Mitigation program was authorized by Part 203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 U.S.C. 5133. The PDM program provides funds to states, territories, tribal governments, communities, and universities for hazard mitigation planning and implementation of mitigation projects prior to disasters, providing an opportunity to reduce the nation's disaster losses through pre-disaster mitigation planning and the implementation of feasible, effective, and cost-efficient mitigation measures. Funding of pre-disaster plans and projects is meant to

Mitigation Funding

Note that starting in 2008, applications for hazard mitigation grant funding are administered under the Unified Hazard Mitigation Assistance program. More information on this and the following programs can be found at FEMA's website, <http://www.fema.gov/>

reduce overall risks to populations and facilities. PDM funds should be used primarily to support mitigation activities that address natural hazards. In addition to providing a vehicle for funding, the PDM program provides an opportunity to raise risk awareness within communities.

Hazard Mitigation Grant Program (HMGP)

The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate

recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not "lost" during the recovery and reconstruction process following a disaster.

Flood Mitigation Assistance (FMA) Program

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist States and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. Three types of grants are available under FMA. These are Planning, Project, and Technical Assistance grants.

1.2 Hazard Mitigation Goals

The primary goal of this hazard mitigation plan is to ***reduce the loss of or damage to life, property, infrastructure, and natural, cultural and economic resources from natural disasters***. This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

Developing, adopting, and implementing this hazard mitigation plan is expected to:

- ❑ ***Increase access to and awareness of funding sources for hazard mitigation projects.*** Certain funding sources, such as the Pre-Disaster Mitigation Competitive Grant Program and the Hazard Mitigation Grant Program, will be available if the hazard mitigation plan is in place and approved.

- ❑ ***Identify mitigation initiatives to be implemented if and when funding becomes available.*** This HMP will identify a number of mitigation recommendations, which can then be prioritized and acted upon as funding allows.
- ❑ ***Connect hazard mitigation planning to other community planning efforts.*** This HMP can be used to guide Naugatuck's development through inter-departmental and inter-municipal coordination.
- ❑ ***Improve the mechanisms for pre- and post-disaster decision making efforts.*** This plan emphasizes actions that can be taken now to reduce or prevent future disaster damages. If the actions identified in this plan are implemented, damage from future hazard events can be minimized, thereby easing recovery and reducing the cost of repairs and reconstruction.
- ❑ ***Improve the ability to implement post-disaster recovery projects*** through development of a list of mitigation alternatives ready to be implemented.
- ❑ ***Enhance and preserve natural resource systems.*** Natural resources, such as wetlands and floodplains, provide protection against disasters such as floods and hurricanes. Proper planning and protection of natural resources can provide hazard mitigation at substantially reduced costs.
- ❑ ***Educate residents and policy makers about natural hazard risk and vulnerability.*** Education is an important tool to ensure that people make informed decisions that complement the Borough's ability to implement and maintain mitigation strategies.
- ❑ ***Complement future Community Rating System efforts.*** Implementation of certain mitigation measures may increase a community's rating, and thus the benefits that it derives from FEMA. The Borough of Naugatuck has never participated in the Community Rating System.

1.3 Identification of Hazards and Document Overview

As stated in Section 1.1, the term *hazard* refers to an extreme natural event that poses a risk to people, infrastructure, or resources. Based on a review of the Connecticut Natural Hazard Mitigation Plan and correspondence with local officials, the following have been identified as natural hazards that can potentially affect the Borough of Naugatuck:

- ☐ Inland Flooding
- ☐ Hurricanes and Tropical Storms
- ☐ Summer Storms (including lightning, hail, and heavy winds) and Tornadoes
- ☐ Winter Storms
- ☐ Earthquakes
- ☐ Dam Failure
- ☐ Wildfires

This document has been prepared with the understanding that a single *hazard effect* may be caused by multiple *hazard events*. For example, flooding may occur as a result of frequent heavy rains, a hurricane, or a winter storm. Thus, Appended Tables 1 and 2 provide summaries of the hazard events and hazard effects that impact the Borough of Naugatuck, and include criteria for characterizing the locations impacted by the hazard, the frequency of occurrence of the hazards, and the magnitude or severity of the hazards.

Despite the causes, the effects of several hazards are persistent and demand high expenditures from the Borough. In order to better identify current vulnerabilities and potential mitigation strategies associated with other hazards, each hazard has been individually discussed in a separate chapter.

This document begins with a general discussion of Naugatuck's community profile, including the physical setting, demographics, development trends, governmental structure, and sheltering capacity. Next, each chapter of this Plan is broken down into six

or seven different parts. These are *Setting*; *Hazard Assessment*; *Historic Record*; *Existing Programs, Policies, and Mitigation Measures*; *Vulnerabilities and Risk Assessment*; and *Potential Mitigation Measures, Strategies, and Alternatives*, and for chapters with several recommendations, a *Summary of Recommendations*. These are described below.

- ❑ ***Setting*** addresses the general areas that are at risk from the hazard. General land uses are identified.
- ❑ ***Hazard Assessment*** describes the specifics of a given hazard, including general characteristics, and associated effects. Also defined are associated return intervals, probability and risk, and relative magnitude.
- ❑ ***Historic Record*** is a discussion of past occurrences of the hazard, and associated damages when available.
- ❑ ***Existing Programs, Policies, and Mitigation Measures*** gives an overview of the measures that the Borough of Naugatuck is currently undertaking to mitigate the given hazard. These may take the form of ordinances and codes, structural measures such as dams, or public outreach initiatives.
- ❑ ***Vulnerabilities and Risk Assessment*** focuses on the specific areas at risk to the hazard. Specific land uses in the given areas are identified. Critical buildings and infrastructure that would be affected by the hazard are identified.
- ❑ ***Potential Mitigation Measures, Strategies, and Alternatives*** identifies mitigation alternatives, including those that may be the least cost effective or inappropriate for Naugatuck.

- ❑ ***Summary of Recommended Mitigation Measures, Strategies, and Alternatives***
provides a summary of the recommended courses of action for Naugatuck that is included in the STAPLEE analysis described below.

This document concludes with a strategy for implementation of the Natural Hazard Pre-Disaster Mitigation Plan, including a schedule, a program for monitoring and updating the plan, and a discussion of technical and financial resources.

1.4 Discussion of STAPLEE Ranking Method

To prioritize recommended mitigation measures, it is necessary to determine how effective each measure will be in reducing or preventing damage. A set of criteria commonly used by public administration officials and planners was applied to each proposed strategy. The method, called STAPLEE, stands for the "Social, Technical, Administrative, Political, Legal, Economic and Environmental" criteria for making planning decisions. The following questions were asked about the proposed mitigation strategies:

- ❑ **Social:** Is the proposed strategy socially acceptable to Naugatuck? Is there any equity issues involved that would mean that one segment of Naugatuck could be treated unfairly?
- ❑ **Technical:** Will the proposed strategy work? Will it create more problems than it will solve?
- ❑ **Administrative:** Can Naugatuck implement the strategy? Is there someone to coordinate and lead the effort?
- ❑ **Political:** Is the strategy politically acceptable? Is there public support both to implement and maintain the project?
- ❑ **Legal:** Is Naugatuck authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?

- ❑ **Economic:** What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
- ❑ **Environmental:** How will the strategy impact the environment? Will the strategy need environmental regulatory approvals?

Each proposed mitigation strategy presented in this plan was evaluated and assigned a score (Good = 3, Average = 2, Poor = 1) based on the above criteria. An evaluation matrix with the total scores from each strategy can be found in Appendix A. After each strategy is evaluated using the STAPLEE method, it is possible to prioritize the strategies according to the final score. The highest scoring is determined to be of more importance, economically, socially, environmentally and politically and, hence, prioritized over those with lower scoring.

1.5 Documentation of the Planning Process

The Borough of Naugatuck is a member of the Council of Governments of the Central Naugatuck Valley (COGCNV), the regional planning body responsible for Naugatuck and twelve other member municipalities: Beacon Falls, Bethlehem, Cheshire, Middlebury, Oxford, Prospect, Southbury, Thomaston, Waterbury, Watertown, Wolcott, and Woodbury. The municipalities of Cheshire, Prospect, Oxford, Waterbury, Watertown, Wolcott, and Woodbury have existing mitigation plans, and hazard mitigation plans are being concurrently developed for remaining municipalities.

Ms. Virginia Mason of the COGCNV coordinated the development of this Hazard Mitigation Plan. The COGCNV applied for the grant from FEMA through the Connecticut Department of Environmental Protection (DEP). The adoption of this plan in the Borough of Naugatuck will also be coordinated by the COGCNV. In addition, the COGCNV provided Geographic Information System (GIS) base mapping and created many of the figures presented in this document.

The following individuals from the Borough of Naugatuck provided information, data, studies, reports, and observations; and were involved in the development of the Plan:

- ❑ Mr. Mike Bronko, Naugatuck Mayor
- ❑ Mr. Al Pistarelli, Naugatuck Mayoral Aide
- ❑ Mr. Fran Dambowsky, Naugatuck Emergency Management & Homeland Security
- ❑ Mr. Ken Hanks, Naugatuck Deputy Fire Chief and Chairman, COGCNV Emergency Planning Committee
- ❑ Mr. James Ricci, Jr., Naugatuck Fire Department
- ❑ Mr. James R. Stewart, Naugatuck Engineer
- ❑ Mr. Keith Rosenfeld, Naugatuck Planner/Wetlands Enforcement Officer
- ❑ Mr. Hank Witkowski, Jr., Superintendent of Public Works/Streets

A data collection, evaluation, and outreach program was undertaken to compile information about existing hazards and mitigation in the Borough, as well as to identify areas that should be prioritized for hazard mitigation. The following is a list of meetings that were held to develop this Hazard Mitigation Plan:

- ❑ ***A project meeting with Borough officials was held January 23, 2008.*** Necessary documentation was collected, and problem areas within the Borough were discussed.
- ❑ ***Field inspections were performed on February 13, 2008.*** Observations were made of flooding and problem areas within the Borough after a period of heavy rain falling on frozen ground.
- ❑ ***A public information meeting was held March 3, 2008 at 6:00 P.M.*** Preliminary findings were presented and public comments solicited.

While residents were invited to the public information meeting via newspaper, no residents attended that were not Borough personnel. Ten municipal agencies and civic

organizations were invited via a mailed copy of the press release that announced the public information meeting. These included the following:

- ❑ Naugatuck River Watershed Association;
- ❑ Naugatuck Valley Health District;
- ❑ Naugatuck Chamber of Commerce;
- ❑ United Way of Greater Waterbury;
- ❑ American Red Cross – Waterbury Area;
- ❑ Naugatuck Inland Wetlands Commission;
- ❑ Naugatuck Planning Commission;
- ❑ Naugatuck Zoning Commission;
- ❑ Naugatuck Economic Development Corporation; and
- ❑ Naugatuck Economic Development Commission.

No representatives of these organizations attended the meeting. Residents were also encouraged via newspaper articles to contact the COG with comments.

It is important to note that COGCNV manages the Central Naugatuck Valley Emergency Planning Committee. This committee has begun coordinating emergency services in the region. Fire, Police, EMS, Red Cross, emergency management directors, and other departments participate in these efforts. In June 2004, over 120 responders participated in the region's first tabletop exercise on biological terrorism. Area health directors, hospitals, and other health care professionals also meet monthly with the Health and Medical Subcommittee to share information, protocols, and training. Thus, local knowledge and experience gained through the Emergency Planning Committee activities has been transferred by the COGCNV to the pre-disaster mitigation planning process.

Additional opportunities for the public to review the Plan will be implemented in advance of the public hearing to adopt this plan, tentatively scheduled for March 2009, contingent on receiving conditional approval from FEMA. The draft that is sent for FEMA review

will be posted on the Borough website (<http://www.naugatuck-ct.gov>) and the COGCNV website (<http://www.cogcnv.org>) to provide opportunities for public review and comment. Such comments will be incorporated into the final draft where applicable.

Upon receiving conditional approval from FEMA, the public hearing will be scheduled, at which time any remaining comments can be addressed. Notification of the opportunity to review the Plan on the above websites and the announcement of the public information meeting will be posted on the websites and placed in local newspapers.

If any final plan modifications result from the comment period leading up to and including the public hearing to adopt the plan, these will be submitted to FEMA as page revisions with a cover letter explaining the changes. It is not anticipated that any major modifications will occur at this phase of the project.

Appendix B contains copies of meeting minutes, field notes and observations, the public information meeting presentation, and other records that document the development of this Natural Hazard Pre-Disaster Mitigation Plan.

2.0 COMMUNITY PROFILE

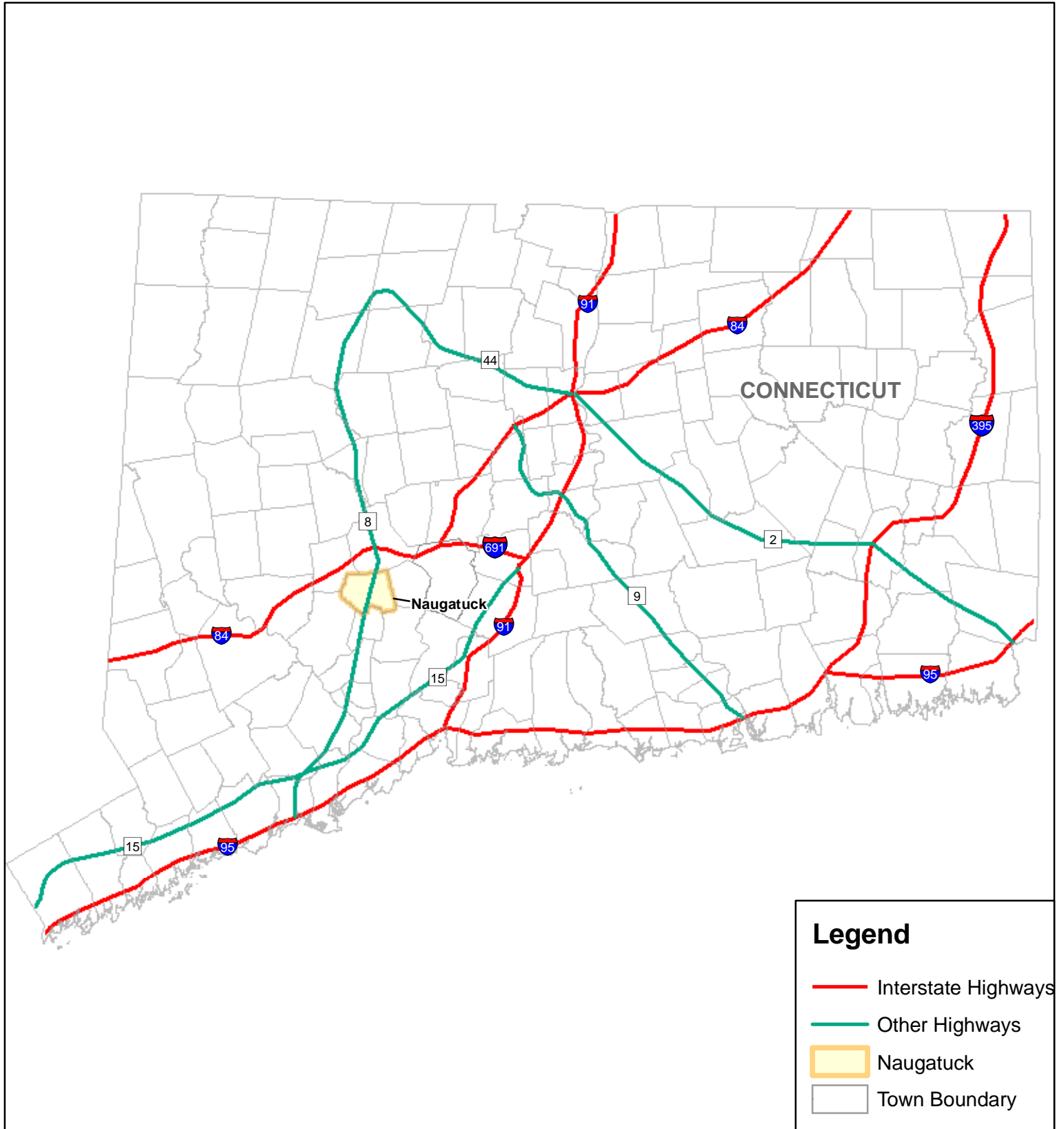
2.1 Physical Setting

The Borough of Naugatuck is located in New Haven County. It is bordered by the Town of Beacon Falls to the south, the Town of Oxford to the west, the Town of Middlebury and the City of Waterbury to the north, and the Towns of Prospect and Bethany to the east and southeast. Refer to Figure 2-1 for a location schematic and Figure 2-2 for a location map.

Naugatuck is located within the western part of the crystalline uplands, or Western Highlands, of western Connecticut. This geologic feature consists of three belts of metamorphic rocks bounded to the west by the sediments and metamorphic rocks of the Hudson River valley and on the east by the Triassic sediments of the Connecticut River valley.

The topography of the Borough is generally moderate sloping along the Naugatuck River in the central portion of the Borough in the developed area. Steeper sections of land occur in the southwestern portion of the Borough near the Naugatuck State Forest, although both the west and east sides of the community are quite hilly. Elevations range from approximately 200 feet above sea level along the Naugatuck River in the northern part of the Borough to over 870 feet above sea level near Andrews Hill in the southwestern part of the Borough, based on the National Geodetic Vertical Datum of 1929. The hilly, elevated terrain of Naugatuck makes it particularly vulnerable to an array of natural hazards. In fact, approximately 23% of land area has slopes greater than 15%.

Figure 2-1: Naugatuck Location Map



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.

"Town Boundary", DEP

For general planning purposes only. Delineations may not be exact.
September 2008

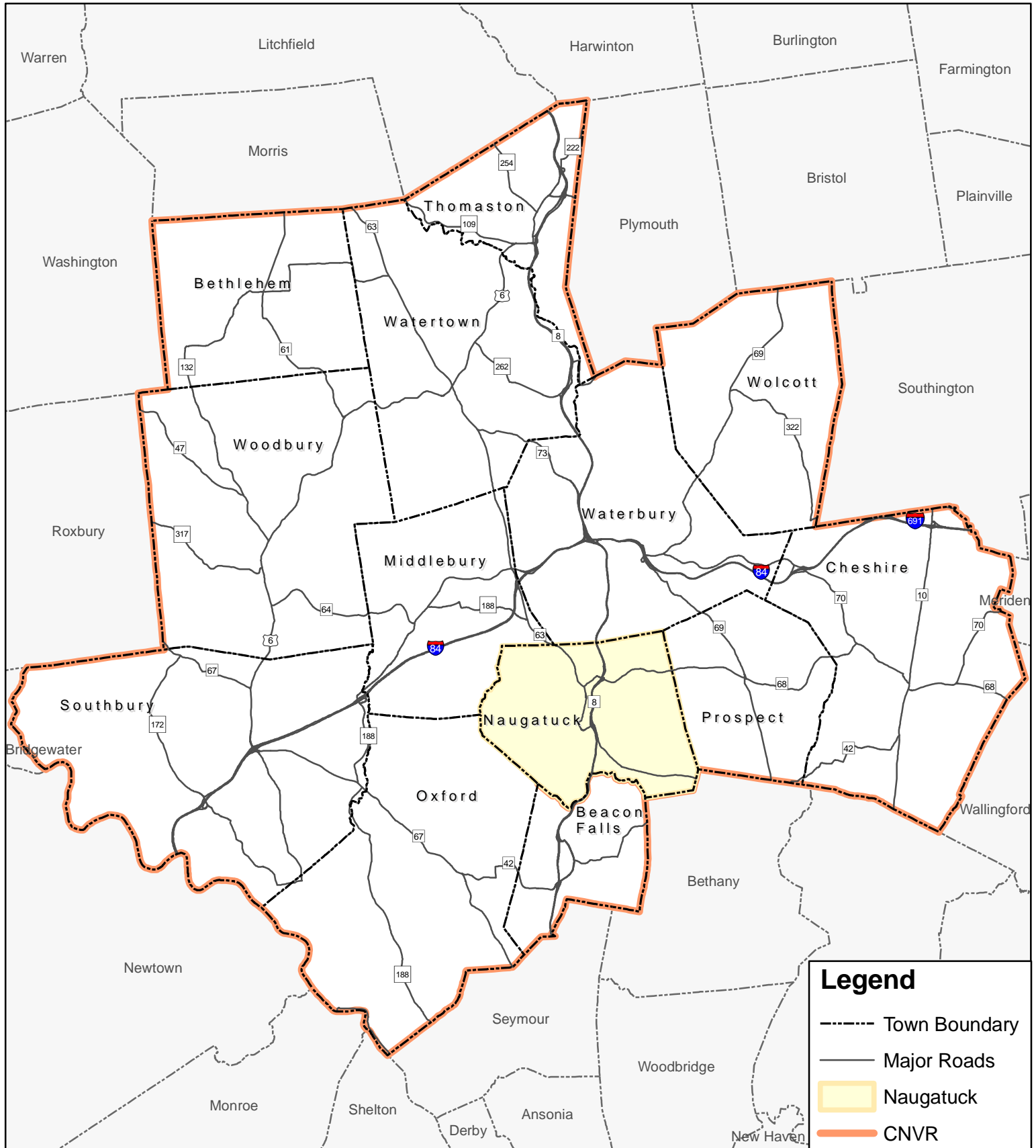


0 10 20 Miles



COUNCIL OF GOVERNMENTS
CENTRAL NAUGATUCK VALLEY

Figure 2-2: Naugatuck in the CNVR



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.

"Town Boundary", DEP

For general planning purposes only. Delineations may not be exact.
September 2008



0 2 4 Miles



COUNCIL OF GOVERNMENTS
CENTRAL NAUGATUCK VALLEY

2.2 Existing Land Use

The Borough of Naugatuck encompasses 16.4 square miles. Table 2-1 provides a summary of land use in Naugatuck by area. In addition, refer to Figure 2-3 for a map of generalized land use provided by the COGCNV.

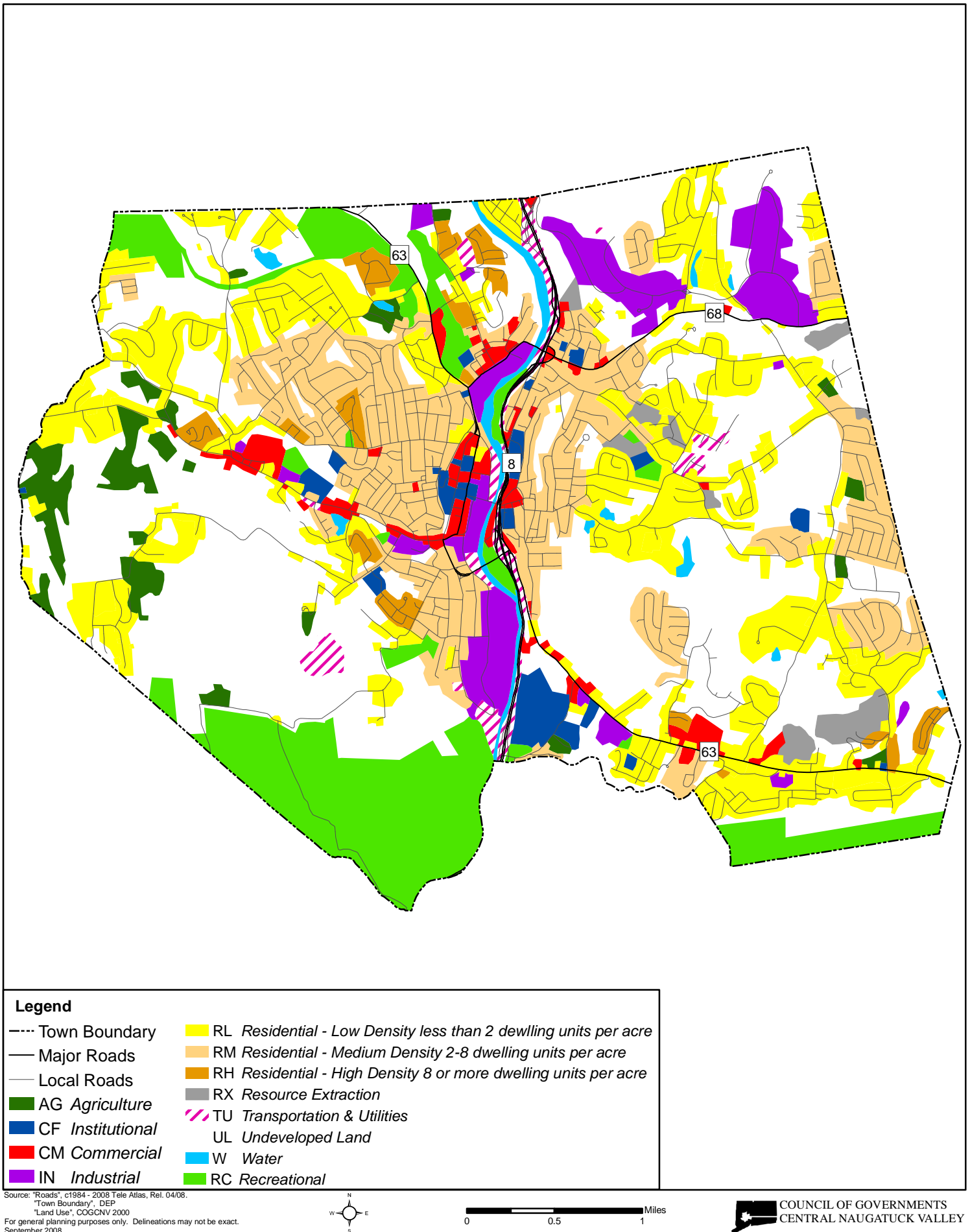
Table 2-1
Land Use by Area

Land Use	Area (acres)	Pct.
Vacant	3,990	38%
Residential - Low Density	2,088	20%
Residential - Medium Density	1,563	15%
Recreational	1,090	10%
Industrial	486	5%
Agricultural	260	2%
Commercial	233	2%
Residential - High Density	215	2%
Utilities/Transportation	187	2%
Institutional	179	2%
Mining	122	1%
Water	107	1%
Total	10,520	100%

Source: Council of Governments Central Naugatuck Valley, 2000

Naugatuck is characterized by its hills and steep slopes, which limit development in much of the Borough. Naugatuck features a linear commercial & institutional district along Route 63, the Naugatuck River and Route 8, extending from Route 68 in the north to Cherry Street in the south. To the east and west of this district are medium density residential neighborhoods. Further to the east and west, low density residential areas are interspersed with agricultural areas. Some isolated high density residential areas are dispersed throughout the Borough.

Figure 2-3: Naugatuck Generalized Land Use



A large industrial park is located in the northeast corner of Naugatuck to the north of Route 68. A large area at the southern border of the Borough is protected open space. Nearly 30% of land in Naugatuck is classified as open space, with roughly half of this area permanently protected, including State Forest, and the other half consisting of water company land and others types of open space. There is a general lack of open space along watercourses such as Fulling Mill Brook, Cold Spring Brook, Beacon Hill Brook, and Long Meadow Pond Brook. However, steep slopes along the watercourses tend to limit some development.

2.3 **Geology**

Geology is important to the occurrence and relative effects of natural hazards such as earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in Naugatuck. The following discussion highlights Naugatuck's geology at several regional scales. Geologic information discussed in the following section was acquired from GIS available from the Connecticut DEP.

In terms of North American bedrock geology, the Borough of Naugatuck is located in the northeastern part of the Appalachian Orogenic Belt, also known as the Appalachian Highlands. The Appalachian Highlands extend from Maine south into Mississippi and Alabama and were formed during the orogeny that occurred when the super-continent Pangea assembled during the late Paleozoic era. The region is generally characterized by deformed sedimentary rocks cut through by numerous thrust faults.

Bedrock Geology

Connecticut bedrock geology is comprised of several "terranes." Terranes are geologic regions that reflect the role of plate tectonics in Connecticut's natural history.

Regionally, in terms of New England bedrock geology the Borough of Naugatuck lies primarily within the Eugeosyncline Sequence. Bedrock belonging to the Eugeosyncline

Sequence are typically deformed, metamorphosed, and intruded by small to large igneous plutons.

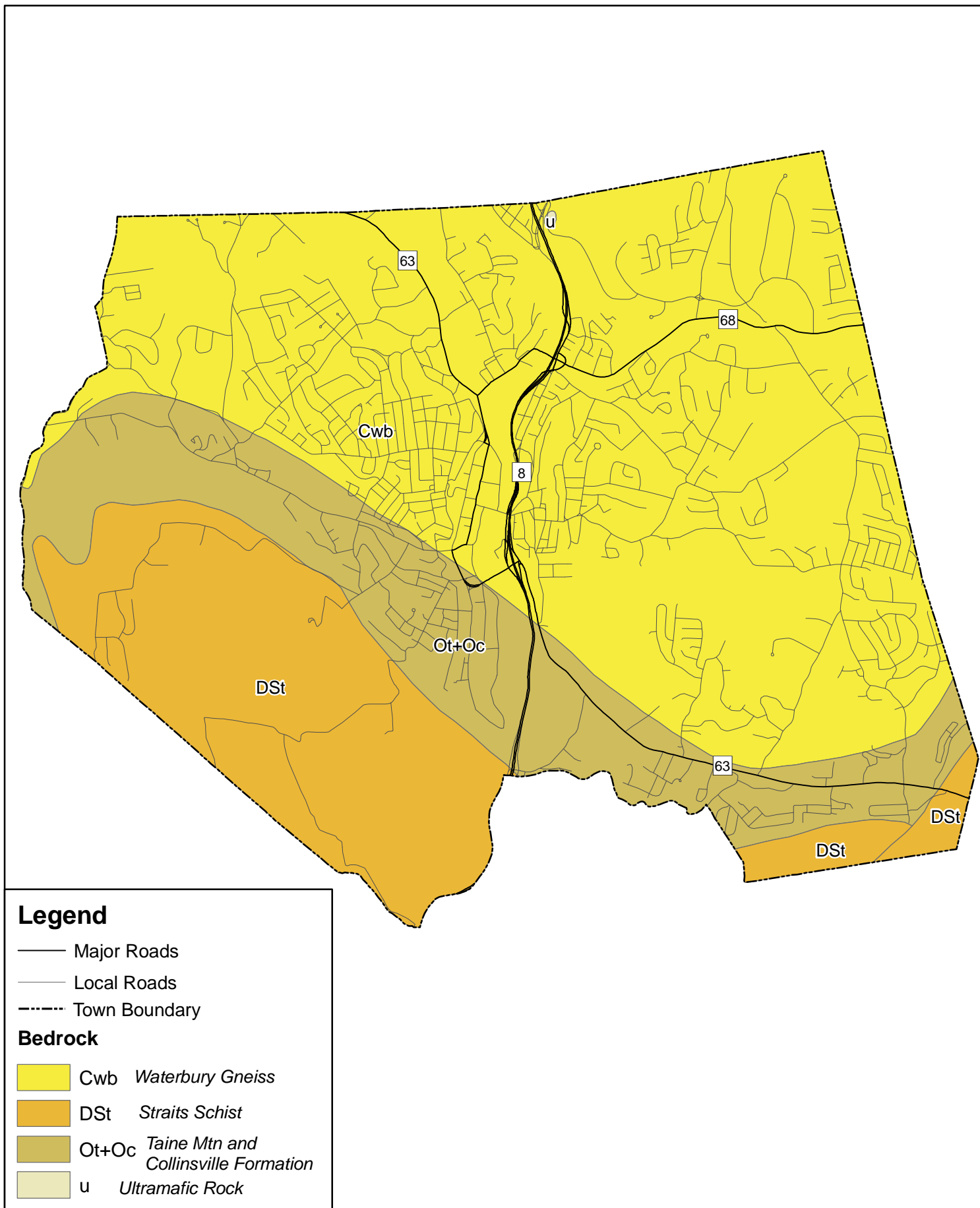
The bedrock beneath the Borough of Naugatuck is almost entirely part of the Iapetos Terrane, comprised of remnants of the Iapetos Ocean that existed before Pangaea was formed. This terrane formed when Pangaea was consolidated and its boundaries are generally coincident with the Eugeosyncline Sequence geologic province described above. The remaining bedrock in the Borough is related to the Iapetos Terrane. It is associated with the Proto-North American (Continental) Terrane / Taconic Allochthons and is known as "Displaced Iapetos Terrane."

The Borough of Naugatuck's bedrock consists primarily of metasedimentary and metaigneous schists and secondarily of metamorphic amphibolite and granofels, and metasedimentary and metaigneous gneisses within the Iapetos Terrane. The bedrock alignment trends generally southeast to northwest in the Borough, although regionally the bedrock formations appear to ring about Naugatuck while fault lines trend southwest to northeast. Refer to Figure 2-4 for a depiction of the bedrock geology in the Borough of Naugatuck.

The three primary bedrock formations in the Borough (from north to south) are Waterbury Gneiss, Taine Mountain and Collinsville Formation (undivided), and The Straits Schist. In addition, there is a small area of Ultramafic Rock in the northern part of the Borough. Bedrock outcrops are prevalent in Naugatuck, and are often be found at higher elevations and on hilltops. The primary bedrock formations are described in more detail below:

- ❑ Waterbury Gneiss consists of gray to dark-gray fine to medium-grained schist and gneiss.

Figure 2-4: Naugatuck Bedrock Geology



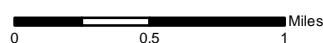
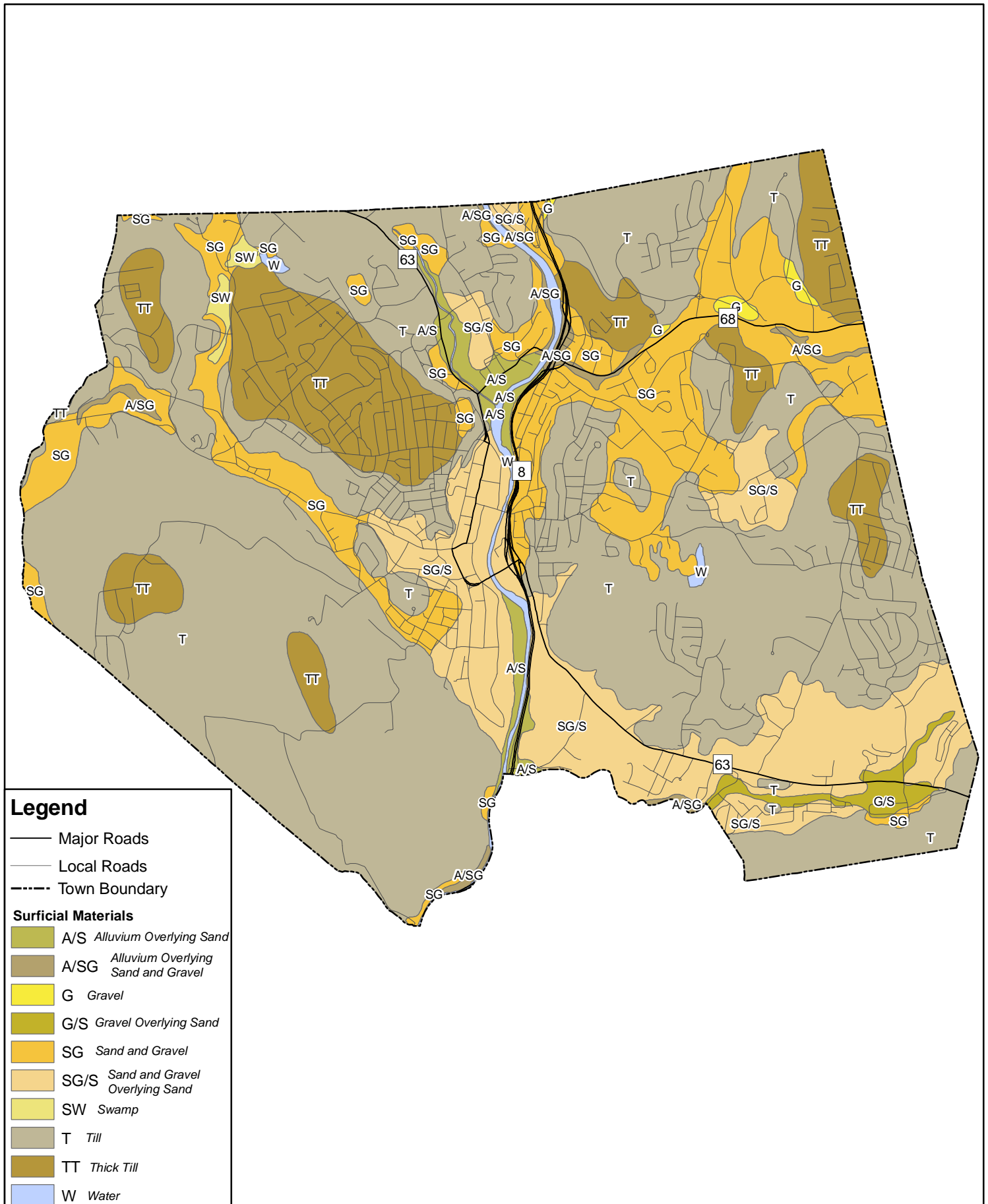
- ❑ The Taine Mountain and Collinsville Formation (undivided) consists of gray, medium grained, well-laminated granofels with gray and silvery, medium- to coarse-grained schist and dark, fine- to medium-grained amphibolite and hornblende gneiss.
- ❑ The Straits Schist is a silver to gray coarse-grained schist.

One unnamed fault is located in Naugatuck in the far southeast corner of the Borough. The fault divides an area of the Straits Schist and forms a portion of the boundary between the Straits Schist and the Taine Mountain and Collinsville Formation in this area of the Borough. This small fault runs southwest to northeast, eventually joining the Western Border Fault in Southington. The Western Border Fault is a large fault extending along the western edge of the Mesozoic Basin and stretches from Milford northwards into Massachusetts. None of these faults are active.

At least twice in the late Pleistocene, continental ice sheets moved across Connecticut. As a result, surficial geology of the Borough is characteristic of the depositional environments that occurred during glacial and postglacial periods. Refer to Figure 2-5 for a depiction of surficial geology.

Much of the Borough is covered by glacial till. Tills contain an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. This area includes nearly all of Naugatuck with the exception of the river valleys associated with the Naugatuck River and its tributary streams. Stratified sand and gravel ("stratified drift") areas are associated with the Naugatuck River, Long Meadow Pond Brook, Hop Brook, Fulling Mill Brook, and Hollow Brook and their tributaries. These deposits accumulated by glacial meltwater streams during the outwash period following the latest glacial recession.

Figure 2-5: Naugatuck Surficial Geology



The amount of stratified drift present in the Borough is important for several reasons:

- ❑ First, thicker sequences of the stratified drift are currently used by the Connecticut Water Company to provide drinking water and fire protection water via wells.
- ❑ Second, with regard to flooding, areas of stratified materials are generally coincident with inland floodplains. This is because these materials were deposited at lower elevations by glacial streams, and these valleys later were inherited by the larger of our present-day streams and rivers. However, smaller glacial till watercourses can also cause flooding, though flooding on such watercourses is rare in Naugatuck.
- ❑ Finally, the amount of stratified drift also has bearing on the relative intensity of earthquakes and the likelihood of soil subsidence in areas of fill. These topics will be discussed in later sections.

In terms of soil types, approximately 58% of the Borough falls within the Charlton-Chatfield complex, Paxton and Montauk fine sandy loams, Udorthents-Urban land complex, Hinckley Gravelly sandy loam, Woodbridge fine sandy loam, and Hollis-Chatfield rock outcrop complex (Table 2-2).

The following soil descriptions are taken in part from the official series descriptions from the United States Department of Agriculture (USDA) website.

- ❑ The Charlton-Chatfield complex consists of moderately deep to deep, well-drained, and somewhat excessively drained soils formed in glacial till. They are very nearly level to very steep soils on glaciated plains, hills, and ridges. The soil is often stony or very stony. Slope ranges from three to forty-five percent. Crystalline bedrock is at depths of 20 to 40 inches.

Table 2-2
Soils by Taxonomic Class

Soil Type	Area (acres)	Pct.
Charlton-Chatfield complex	2,172	20.6
Paxton and Montauk fine sandy loams	1,400	13.3
Udorthents-Urban land complex	949	9.0
Hinckley gravelly sandy loam	890	8.5
Woodbridge fine sandy loam	684	6.5
Hollis-Chatfield Rock outcrop complex	572	5.4
Canton and Charlton soils	491	4.7
Ridgebury, Leicester, and Whitman soils	426	4.1
Paxton-Urban land complex	330	3.1
Agawam Fine Sandy Loam	268	2.6
Charlton-Urban land complex	238	2.3
Urban land	240	2.3
Urban land-Charlton Chatfield complex	229	2.2
Hinckley-Urban land complex	220	2.1
Sutton fine sandy loam	216	2.0
Water	119	1.1
Other (18 types)	1,076	10.2
Total	10,520	100.0%

Source: 2005 Soil Survey Geographic (SSURGO) database for the State of Connecticut

- ❑ The Paxton and Montauk series consists of very deep, well-drained loamy soils formed in lodgment till derived primarily from granitic materials. The soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level to steep soils on upland till plains, hills, moraines, and drumlins. Slope ranges from 0 to forty-five percent.

- ❑ The Udorthents-Urban land complex consists of moderately well drained to excessively drained soils that have been disturbed by cuffing or filling, and areas that are covered by buildings and pavement. The areas are mostly larger than five acres. The complex is about 70 percent Udorthents, 20 percent Urban land, and 10 percent other soils. Udorthents are in areas that have been cut to a depth of two feet or more or are on areas with more than two feet of fill.

- ❑ Hinckley Gravelly sand loam consists of very deep, excessively drained soils formed in water-sorted material. They are nearly level to very steep soils on terraces, outwash plains, deltas, kames, and eskers. Slope ranges from 0 to 60 percent.
- ❑ Woodbridge fine sandy loam consists of moderately well drained loamy soils formed in subglacial till. They are very deep to bedrock and moderately deep to a densic contact. They are nearly level to moderately steep soils on till plains, hills, and drumlins. Slope ranges from 0 to 25 percent. Depth to bedrock is commonly more than six feet.
- ❑ The Hollis-Chatfield rock outcrop complex consists of shallow, well-drained and somewhat excessively drained soils formed in a thin mantle of till derived mainly from gneiss, schist, and granite. They are nearly level to very steep upland soils on bedrock-controlled hills and ridges. Slope ranges from three to forty-five percent. Depth to bedrock ranges from ten to 40 inches with outcrops present.

The remainder of the Borough has soil types of consisting primarily of various fine to gravelly sandy loams, wetland soils, and urban land.

2.4 Climate

Naugatuck has an agreeable climate, characterized by moderate but distinct seasons. The average mean temperature is approximately 48 degrees, with summer temperatures in the mid-80s and winter temperatures in the upper 20's to mid-30s,

Fahrenheit. Extreme conditions raise summer temperatures to near 100 degrees and winter temperatures to below zero. Median snowfall is just over 30 inches per year as

The continued increase in precipitation only heightens the need for hazard mitigation planning, as the occurrence of floods may change in accordance with the greater precipitation.

measured at the Mount Carmel weather station in Hamden (NCDC, 2007). Median annual precipitation is 44 inches, spread evenly over the course of a year.

By comparison, average annual state-wide precipitation based on more than 100 years of record is nearly the same, at 45 inches. However, average annual precipitation in Connecticut has been increasing by 0.95 inches per decade since the end of the 19th century (Miller et. al., 2002; NCDC, 2005). Likewise, total annual precipitation in the Borough has increased over time.

2.5 **Drainage Basins and Hydrology**

The Borough of Naugatuck drains to six major watersheds corresponding to the Naugatuck River, Hop Brook, Long Meadow Pond Brook, Fulling Mill Brook, Beacon Hill Brook, and Little River. These are described below. Various ponds and streams are found within both the eastern and western sections of the Borough, which is divided by the southward-flowing Naugatuck River. All of the watersheds in Naugatuck are part of the regional Naugatuck River basin that ultimately discharges into the Housatonic River. The drainage basins are described below, and summarized in Table 2-3.

Table 2-3
Drainage Basins

Drainage Basin	Area (sq. mi)	Percent of Borough
Naugatuck River	5.96	36.2%
Long Meadow Pond Brook	3.26	19.9%
Fulling Mill Brook	2.96	18.0%
Beacon Hill Brook	2.65	16.1%
Hop Brook	1.60	9.7%
Little River	0.01	0.1%
Total	16.44	100.0%

Source: Drainage Basins, 2008 CT DEP GIS Data for Connecticut

Naugatuck River

The Naugatuck River originates near the City of Torrington and flows south almost 40 miles to meet the Housatonic River in the City of Derby, giving it a total basin area of 311 square miles. It is the only major river in Connecticut whose headwaters are within the boundaries of the state. The Naugatuck River is well-known for its rich industrial history and the many defunct dams associated with these industries.

All of the land in Naugatuck eventually drains into the Naugatuck River, but only 5.96 square miles (sq. mi) or 36.2% of the land area drains directly into the river. This area is comprised of a north-south corridor that passes through the center of the Borough. The Naugatuck River also makes up a portion of the Borough's southern boundary.

The river is joined by a number of tributaries as it flows through the Borough, including Long Meadow Pond Brook, Hop Brook, Fulling Mill Brook, Cold Spring Brook, and several unnamed streams. Egypt Brook and Little River drain through portions of the Borough before their confluence with the Naugatuck River downstream of Naugatuck, and Spruce Brook and Beacon Hill Brook join the Naugatuck River at the boundary between Naugatuck and Beacon Falls.

Much of the land surrounding the Naugatuck River is urbanized, however there are large areas in the watershed that are undeveloped, such as the area near Spruce Brook which flows through the Naugatuck State Forest in the southwest section of the watershed.

Long Meadow Pond Brook

Long Meadow Pond Brook drains 3.26 sq. mi. of land in the eastern section of the Borough (19.9% of Naugatuck's total land area). Its headwaters are located in Lake Elise in western Middlebury. From the lake, Long Meadow Pond Brook flows southward into Long Meadow Pond, a body of water with a surface area of approximately 100 acres.

Long Meadow Pond Brook continues to meander eastward through the Town of Oxford into Naugatuck, collecting a number of unnamed tributaries before passing underneath a downtown factory and falling into the Naugatuck River. Development in the watershed is concentrated in the lower reaches. Two dams lie along its reach in Naugatuck, impounding the Armory Pond and the Naugatuck Ice Company Pond.

Fulling Mill Brook

Fulling Mill Brook drains 2.96 square miles of land (18.0% of the Borough's land area) in the northeastern corner of Naugatuck. It has its headwaters in central Prospect near Brewster Pond. The Brook begins at the west edge of Brewster Pond at the Salem Road Pond Dam, and flows westward and northward across Prospect into Beer Pond. After passing through Beer Pond, the brook flows westward into Naugatuck.

Once entering Naugatuck, the Brook joins an unnamed tributary that drains Schildgen Pond, and Cold Spring Brook in the vicinity of City Hill Road and North Main Street before flowing into the Naugatuck River. In total, the Fulling Mill Brook drainage basin covers 5.38 square miles in Naugatuck, Prospect, and Waterbury.

Beacon Hill Brook

Beacon Hill Brook forms the Borough's southeastern boundary with the Town of Beacon Falls. The brook drains a total of 2.65 square miles of land within Naugatuck (16.1% of the Borough's land area) in the southeastern section of the Borough.

Beacon Hill Brook has its headwaters near the Bethany-Prospect Town line along State Route 69. It drains southwest into Bethany, entering the Long Hill Reservoir. Beacon Hill Brook flows west out of the reservoir through southeastern Naugatuck towards Straitsville. It is joined by Marks Brook west of Horton Hill Road and by Straitsville

Brook near Beacon Valley Road. The brook then begins to form the boundary between Beacon Falls and Naugatuck, eventually passing under Route 8 and reaching its confluence with the Naugatuck River. In total, Beacon Hill Brook drains 10.22 square miles of land across Naugatuck, Beacon Falls, Bethany and Prospect.

Hop Brook

Hop Brook drains 1.60 square miles of land in the northwestern section of Naugatuck (approximately 9.7% of the Borough's total land area). It originates in northwestern Middlebury and flows through parts of Watertown and Middlebury before joining the Naugatuck River in Naugatuck near the intersection of Church Street and Bridge Street. The largest body of water that Hop Brook passes through is Hop Brook Lake, a flood control reservoir located on the border between Waterbury and Middlebury, just to the north of Naugatuck.

In addition to a number of unnamed tributaries, there are several smaller named tributaries that flow into Hop Brook, including Goat Brook, Long Swamp Brook, and Welton Brook in Middlebury, and Pigeon Brook in Naugatuck. In total, Hop Brook drains 17.40 square miles of land located within the municipalities of Naugatuck, Waterbury, Middlebury, Watertown and Woodbury.

Little River

A small portion in the southwestern corner of Naugatuck (0.01 sq. mi. or 0.1% of the Borough's land area) drains to the southwest into the Little River watershed. The Little River originates in western Oxford and flows generally south-southeast towards Seymour. It is joined by several unnamed tributaries and larger tributaries including Jacks Brook and Towantic Brook before its confluence with the Naugatuck River near Route 67 in Seymour. In total, the Little River watershed drains 15.50 square miles of land in Seymour, Beacon Falls, Oxford, Middlebury and Naugatuck.

2.6 Population and Demographic Setting

The total CNV Region estimated 2005 population is 281,895 persons. The total land area is 309 square miles, for a regional population density of 912 persons per square mile. Naugatuck has a population density of 374 individuals per square mile. By comparison, Waterbury has the highest population density in the region with 3,757 individuals per square mile; Bethlehem has the lowest population density in the region with 185 individuals per square mile (Table 2-4).

Table 2-4
Population Density by Municipality, Region and State, 2005

Municipality	Total Population	Land Area (square miles)	Population Density
Beacon Falls	5,700	9.77	583
Bethlehem	3,577	19.36	185
Cheshire	28,833	32.90	876
Middlebury	7,132	17.75	402
Naugatuck	31,872	16.39	1,945
Oxford	12,309	32.88	374
Prospect	9,264	14.32	647
Southbury	19,686	39.05	504
Thomaston	7,916	12.01	659
Waterbury	107,251	28.55	3,757
Watertown	22,329	29.15	766
Wolcott	16,269	20.43	796
Woodbury	9,757	36.46	268
CNV Region	281,895	309.02	912
Connecticut	3,495,753	4844.80	722

Source: United States Census Bureau, 2005 Population Estimates

Naugatuck is 30th out of 169 municipalities in Connecticut in terms of population, with an estimated population of 31,872 in 2006. The Borough is the 22nd most densely populated municipality in the state. The population of Naugatuck increased by 18% between 1960 and 1970, by 15% between 1970 and 1980, and by 16% between 1980 and 1990. These three decades were representative of the last true development surge in recent history., as growth then dropped to 1% from 1990-2000. Growth from 2000 through 2006 was approximately 3%.

Based on analysis by the Council of Governments of the Central Naugatuck Valley in its 2008 Regional Plan, population in the region outside of Waterbury is estimated to grow about 10% from 2005 to 2025, while the state of Connecticut is expected to grow about 5% during this same timeframe. The Connecticut Office of Policy and Management estimates population growth in Naugatuck from 2005 to 2020 to be about 7%. According to the Connecticut Economic Resource Center, the median sales price of owner-occupied housing in the Borough of Naugatuck in 2006 was \$233,580, which is slightly lower than the statewide median sales price of \$275,000.

Naugatuck has populations of people who are elderly, linguistically isolated, and/or disabled. These are depicted by the five census blocks in Naugatuck on Figures 2-6, 2-7, 2-8, and 2-9. The populations with these characteristics have numerous implications for hazard mitigation, as they may require special assistance or different means of notification before disasters occur. These will be addressed as needed in subsequent sections.

2.7 Governmental Structure

The Borough of Naugatuck is governed by a Mayor-Council form of government in which legislative responsibilities are the responsibility of the Council members (known as Burgesses) and the Mayor serves as the chief executive. In addition to the Burgesses, there are boards, commissions and committees providing input and direction to Borough administrators. Also, Borough departments provide municipal services and day-to-day administration. Many of these commissions and departments play a role in hazard mitigation, including the Planning Commission, the Zoning Commission, the Conservation Commission, the Inland Wetland Commission, the Emergency Management Department, the Building Inspector, the Fire Department, the Police Department, and the Public Works/Streets Department.

Figure 2-6: Naugatuck Elderly Population

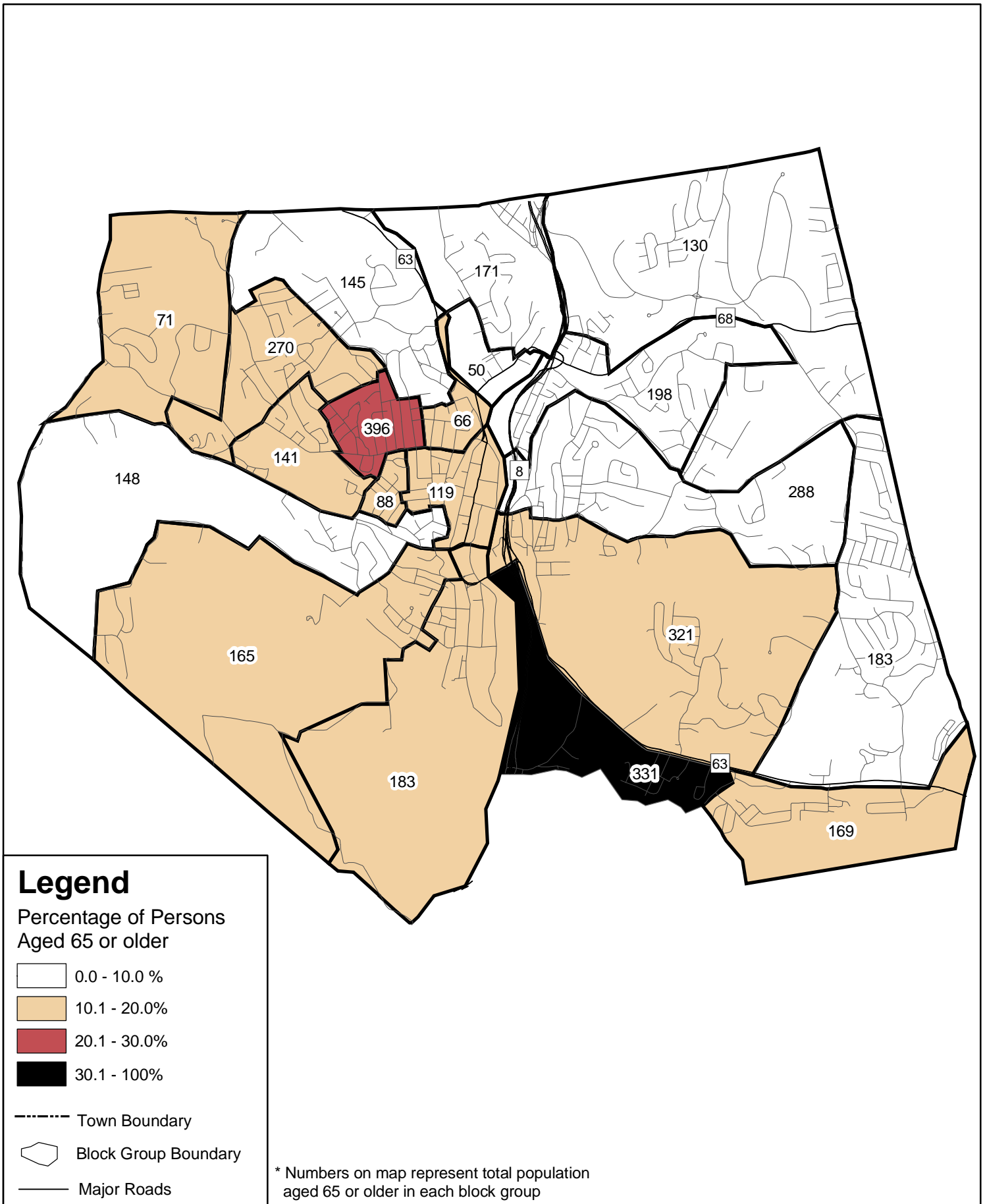


Figure 2-7: Naugatuck Linguistically Isolated Households

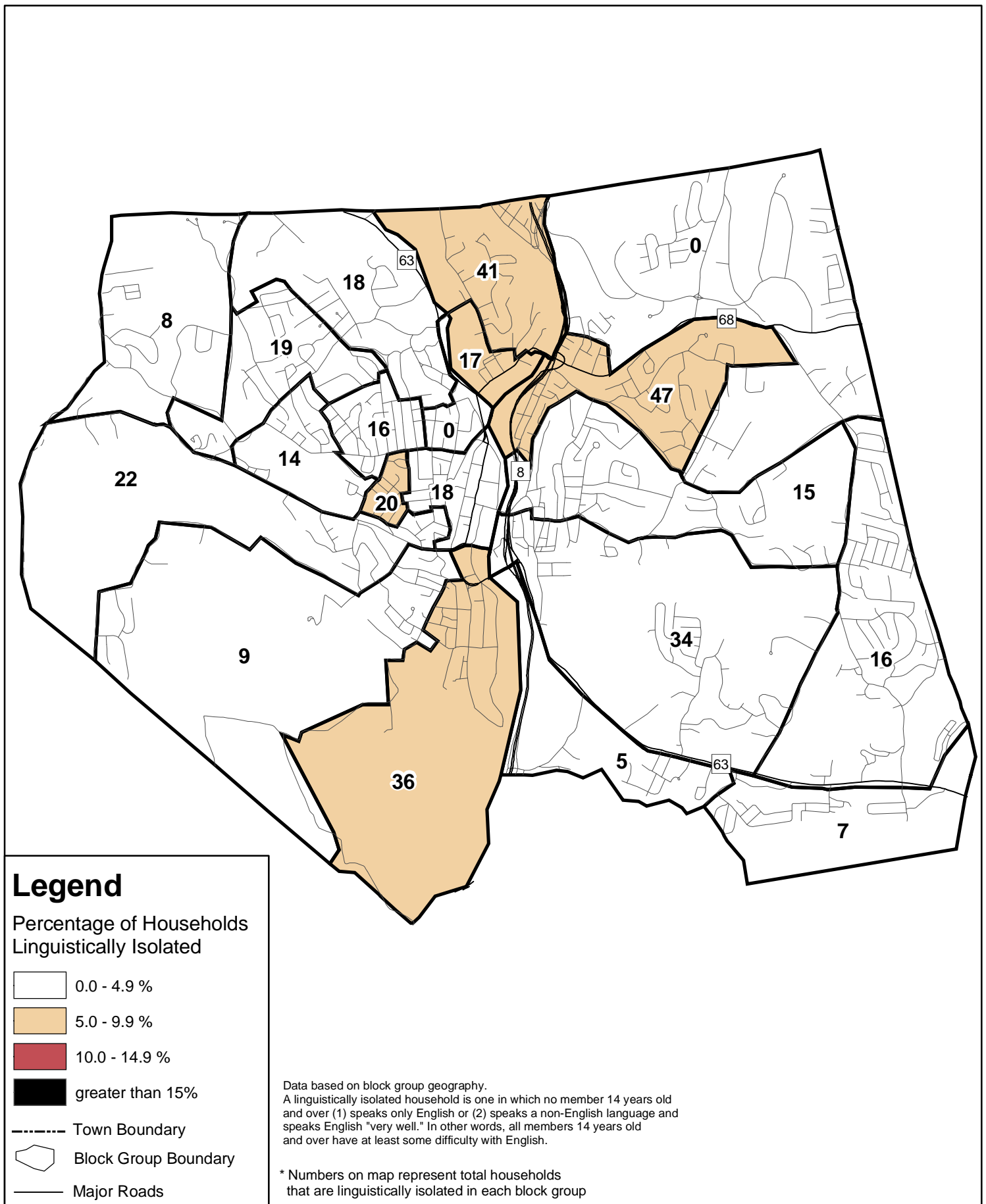
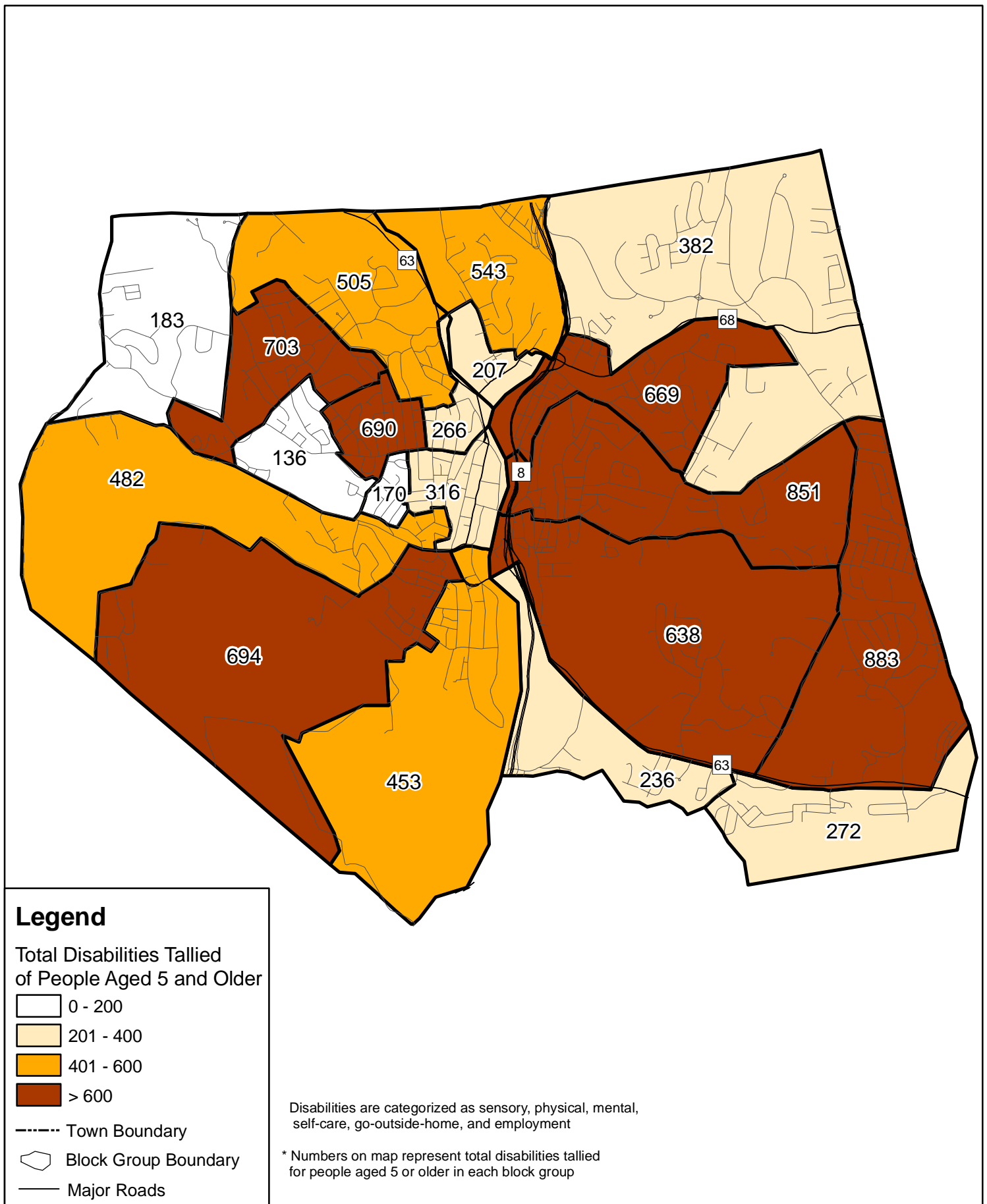


Figure 2-8: Naugatuck Disabilities Map



The Department of Public Works is the principal municipal department that responds to problems caused by natural hazards. Complaints related to Borough maintenance issues are routed to the Department of Public Works. These complaints are usually received via phone, fax, mail, or email and are recorded in a book. The complaints are investigated as necessary until remediation surrounding the individual complaint is concluded.

2.8 Development Trends

Naugatuck was settled in 1701 but the Borough was not incorporated until 1844. The settlement was agrarian in its origins, but as time passed industry developed using the Naugatuck River as a power source. Initial industries included woolen mills and metal factories.

Several landmarks in Naugatuck are representative of its prominent historic industry. Naugatuck was the site of the invention of vulcanized rubber by Charles Goodyear in the mid-1800s. As a result, Naugatuck led in the manufacturing of rubber-soled shoes, tires and other rubber-based products. The United States Rubber Company, later known as Uniroyal, was founded in 1892; the headquarters was relocated in the 1980s. The organization manufactured Keds shoes and the artificial leather known as Naugahyde. Another landmark, the Peter Paul Company, manufactured candy bars at a large factory on Route 63 starting in 1922 until the facility was closed in 2007.

The Borough has developed zoning and subdivision regulations that have general implications regarding hazard mitigation. For example, cul-de-sacs in new developments are discouraged and connectivity of roads is encouraged. Specifically, the Borough requires a 50-foot right of way for local residential streets with a turnaround located at the end of dead end streets. Cul-de-sacs can have no more than 20 homes or can be no longer than 1,000 feet, whichever constraint is more stringent. Subdivisions featuring cul-de-sacs offer a single access point for emergency services, lengthening emergency

response times and rendering those residential areas vulnerable if access is cut off by flooding or downed tree limbs.

The Borough of Naugatuck retained a consultant to review Zoning and Subdivision Regulations in 2008. The review was completed in November 2008. Most of the recommendations are related to incorporating elements of low impact development into the regulations, especially with regard to stormwater management. In some cases, this may result in modifications to roadway and cul-de-sac widths and dimensions. However, the recommendations provide for emergency service officials to continue reviewing development plans in order to ensure that any reductions in paved surface areas will not impair the ability to respond to emergencies.

The Naugatuck Subdivision Regulations require that utilities serving new developments must be installed underground wherever possible. Exceptions due to shallow bedrock are granted on a case-by-case basis. Public water supply is available throughout the majority of Naugatuck and connectivity is recommended for new developments. Where public water supply is unavailable, 25,000-gallon cisterns are required for fire protection.

Residential Development

Conventional subdivision applications have tapered off since booming in the late 1980's. In the 1990's, the average number of housing units approved in Naugatuck was about 95 per year. There are a number of residential developments under construction or being planned for the Borough, as follows:

❑ Approved Developments:

- ⇒ A 264 home subdivision located near Hunters Mountain with connections to Andrews Mountain Road and Hunters Mountain Road. The stream corridor within the property has an associated 500-year floodplain.

- ⇒ A development of 30 condominiums off Route 63 (New Haven Road) known as "Springbrook."
- ⇒ A development of 30 homes off Maple Hill Road in the eastern part of the Borough.
- ⇒ A 95 home development located off of Maple Hill Road, between Mulberry Street and Victoria Lane. The stream corridor within the property has an associated 500-year floodplain.
- ⇒ The development of 150 homes between Candee Road and Osborn Road with connections to Candee Road and Osborn Road.
- ⇒ 20 single-family units located along Route 63 (Church Street) near Hop Brook and Mill Street, adjacent to the 500-year floodplain of Pigeon Brook.
- ⇒ 15 single-family units situated around Barbers Pond off King Street, adjacent to the 500-year floodplain of Pigeon Brook and Barbers Pond.

□ Potential Developments:

- ⇒ A development of 85 single-family units is planned between Andrews Mountain Road and Guntown Road close to Long Meadow Pond Brook. The stream corridors within the property have associated 500-year floodplains.
- ⇒ There is a proposed Senior Housing development located near Spring Street.
- ⇒ Renaissance Place is a \$707 million public/private, transit-oriented development to be located on 60 acres fronting the Naugatuck River. This is the first development of its kind being designed to have a carbon neutral footprint. Much of this area is within the 500-year floodplain of the flood-controlled river. Flood control along the Naugatuck River is discussed in more detail in Section 3.0.

Commercial and Industrial Development and Open Space

Based on the Borough's 2001 Plan of Conservation and Development, a primary objective in Naugatuck is to protect natural and physical resources. Specific

recommendations to achieve this goal include efforts to increase open space acquisition. Nevertheless, the Borough is also interested in development and redevelopment as needed to ensure economic growth. Potential industrial or commercial developments in the Borough include the following:

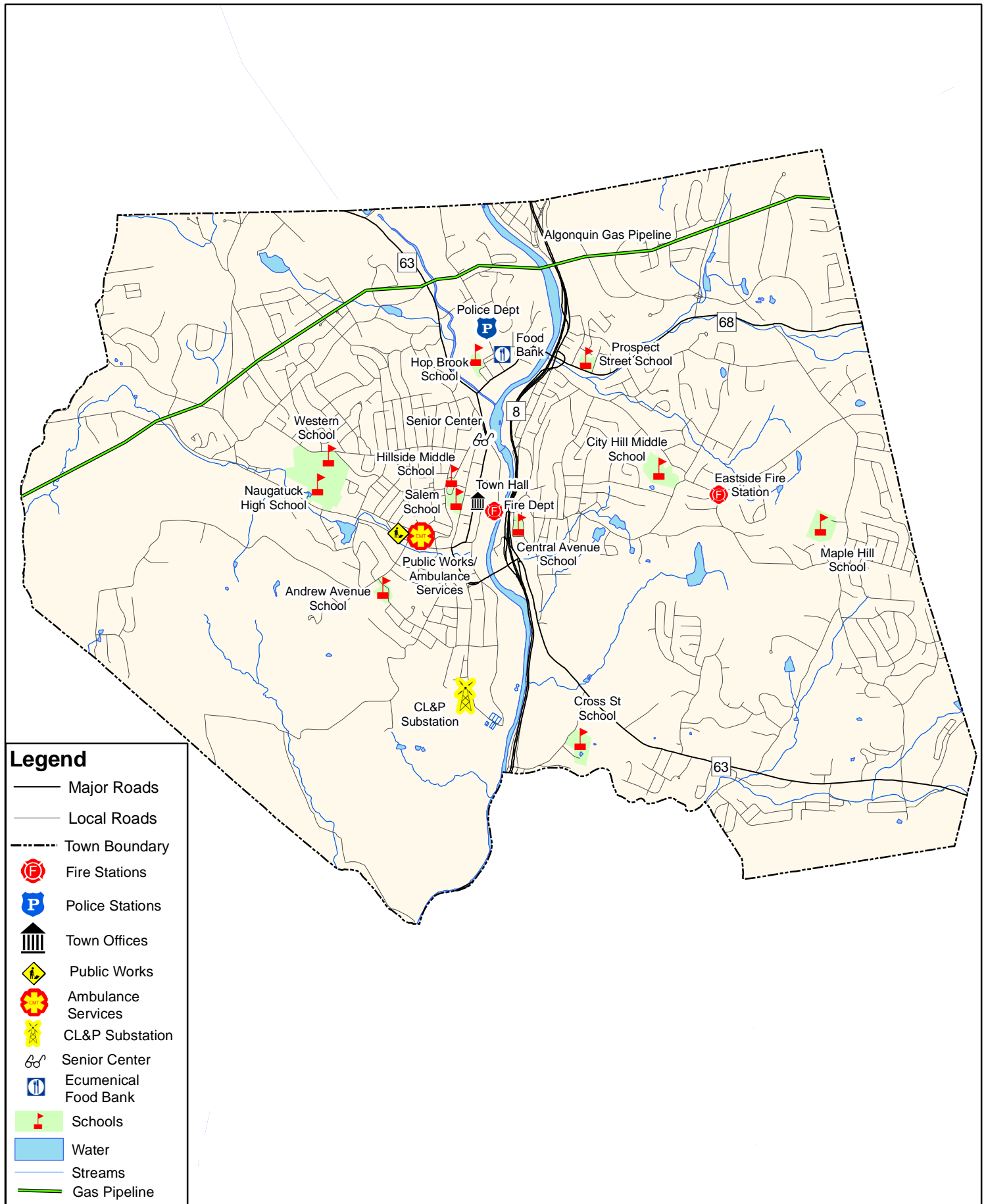
- ❑ The sprawling Uniroyal industrial property is planned to be redeveloped at some time in the future.
- ❑ Additional commercial development along Route 63 (New Haven Road) is planned in the Straitsville section of Naugatuck.
- ❑ The Peter Paul Company's candy factory closed in 2007, and it is hoped that this property will be redeveloped.

2.9 Critical Facilities and Sheltering Capacity

The Borough considers its police, fire, governmental, service and major transportation facilities to be its most important critical facilities, for these are needed to ensure that emergencies are addressed while day-to-day management of Naugatuck continues. Educational institutions are included in critical facilities as well, as these can be used as shelters. In addition, Borough personnel consider public and private water, sewer, electric, and communication utilities to be critical facilities.

A map of critical facilities is shown in Figure 2-9, and the associated list of critical facilities is provided in Table 2-5. Shelters, transportation, communications, and utilities are described in more detail below, along with a summary of the potential for these facilities to be impacted by natural hazards.

Figure 2-9: Naugatuck Critical Facilities



**Table 2-5
Critical Facilities in Naugatuck**

Type	Name	Address	Located in Floodplain?
Municipal Offices	Borough of Naugatuck Offices	229 Church Street	500-year
Police Station	Borough of Naugatuck Police Department	211 Spring Street	No
Fire Department	Naugatuck Fire Headquarters	41 Maple Street	500-year
Fire Department	Eastside Fire Station	Intersection of May Street & Osborn Road	No
EMT - Ambulance	Borough of Naugatuck Ambulance Services	246 Rubber Avenue	No
Public Works	Borough of Naugatuck Public Works Department	246 Rubber Avenue	No
Utility - Sewer	Wastewater Treatment Plant	500 Cherry Street	500-year
Utility - Water	Connecticut Water Company	(Infrastructure)	Some
Utility – Phone	Southern New England Telephone	(Infrastructure)	Some
Utility – Electric	Connecticut Light & Power South Naugatuck Substation	Cherry Street	500-year
Utility – Gas	Algonquin Gas Pipeline	Northern Naugatuck	Some
Senior Center	Naugatuck Senior Center	300 Meadow Street	No
Food Bank	Ecumenical Food Bank	75 Spring Street	500-year
School	Borough of Naugatuck High School	543 Rubber Avenue	No
School	City Hill Middle School	441 City Hill Street	No
School	Hillside Middle School	51 Hillside Avenue	No
School	Cross Street Intermediate School	120 Cross Street	No
School	Hop Brook Intermediate School	75 Crown Street	500-year
School	Andrew Avenue Elementary School	140 Andrew Avenue	No
School	Central Avenue Elementary School	28 Central Avenue	No
School	Maple Hill Elementary School	641 Maple Hill Road	No
School	Prospect Elementary School	100 Prospect Street	No
School	Salem Elementary School	124 Meadow Street	No
School	Western Elementary School	100 Pine Street	No

Source: Council of Governments Central Naugatuck Valley; Borough of Naugatuck

Shelters

Emergency shelters are considered to be an important subset of critical facilities, as they are needed in most emergency situations. The Borough of Naugatuck has designated the local schools as shelters, but none of the structures have emergency generators. Hop

Brook Intermediate School is the only designated shelter located in the 500-year floodplain, and therefore could not be used in the event of an extreme flood. City Hill School and Naugatuck High School are currently designated as emergency supply distribution points.

The specific location(s) used as shelters during an event depends on the nature and extent of the incident. The Borough currently does not have the capacity to shelter 10% of its population due to lack of trained staff to operate shelters. The Borough currently recommends that people shelter in place unless relocation is necessary due to an imminent threat, such as severe flooding.

If there is a single shelter open for a local event, the Borough would rely on volunteers from the American Red Cross to staff the shelter. Some of the local emergency volunteers have received shelter training. If the event requires several shelters, especially if the affected area extends beyond Naugatuck, the Borough would not have enough staff on hand to maintain the shelters. Regionally-located mass care facilities operated and paid for by the American Red Cross may be available during recovery operations when additional sheltering services are necessary. The Naugatuck Emergency Management Advisory Council plans on addressing sheltering issues in 2009.

In case of a power outage, it is anticipated that 10-20% of the population would relocate, although not all of those relocating would necessarily utilize the shelter facilities. While the Borough has no elderly housing facilities, The Borough Emergency Operations Plan includes a list of addresses of special needs persons that would require special assistance during an emergency. In addition, the Borough realizes that the influx of active adult housing in Borough is increasing the amount of population that requires more assistance during emergencies, and plans to account for these populations in its emergency plan updates.

Transportation

The Borough of Naugatuck does not have any hospitals or medical centers. Instead, residents use the nearby facilities in Derby and Waterbury. As a means of accessing these facilities, Naugatuck has convenient access on Route 8 that functions as the major transportation artery. Naugatuck's full-time ambulance corps staffs the ambulance service to these hospitals. If paramedics are needed, they are called in from Waterbury.

Evacuation routes are regionally defined by the Regional Evacuation Plan. No formal local evacuation plan exists. Route 8, which runs north-south through central Naugatuck, provides access to Waterbury and Interstate 84 to the north and Bridgeport and Route 15 and Interstate 95 to the south. State Route 68 also runs from Prospect in the east and merges with State Route 63 in the center of the Borough. South Main Street (Route 63) is also an evacuation route into the Town of Bethany.

Communications

The primary answering point for emergency calls is the Police Department on Spring Street. The Borough also uses enhanced 9-1-1 service through the Northwest Connecticut Public Safety Communication Center, Inc. to facilitate ambulance dispatch. Borough personnel supplement 9-1-1 service with radios. The Borough uses phone lines to enhance their radio communications. If phone service is cut off, Borough personnel rely on low-band radios and cellular communications. The Borough has also recently contracted with Emergency Communications Network, Inc. to provide "CodeRED" high-speed telephone emergency notification services. The CodeRED system is capable of telephoning warnings into areas likely to be impacted by a disaster, or into the entire Borough, at a rate of 60,000 calls per minute.

The Borough of Naugatuck is in the southeast portion of Region 5 of the Connecticut Emergency Medical Service regions. The Borough dispatch center has a high band radio

compatible with Region 5, which contains most of the COGCNV municipalities. Thus, it is important that Naugatuck maintain emergency notification systems compatible with those of Region 5, which contains most of the COGCNV municipalities. The Borough's enhanced 9-1-1 service is already compatible with much of Region 5, and Region 2 to the south. As development continues in the eastern portion of Borough, it is also important for Naugatuck 's system to be compatible with Prospect's (also Region 2) to the east. The Borough also has mutual aid agreements with all neighboring communities.

Utilities

Water service is a critical component of hazard mitigation, especially in regards to fighting wildfires. It is also necessary for everyday residential, commercial, and industrial use. The Connecticut Water Company provides potable and fire fighting water to the majority of the Borough. The Fire Department uses alternative water supplies to fight fires in the less developed areas of Naugatuck, including fire ponds and underground water tanks, and brings as much water in its tankers as possible to these fires. This is discussed further in Section 9.0.

Sewer service is an often overlooked critical facility. The Naugatuck Wastewater Treatment Plant is located at the south end of Cherry Street and serves most of the developed area of Naugatuck. Other utilities important enough to be considered critical facilities include the electric substation on Cherry Street, the Algonquin Gas Pipeline that traverses northern Naugatuck, and the electric and telephone lines in the Borough. Gas and electricity are important for both day-to-day living and emergency usage, and the telephone is used to complement emergency communications in the Borough.

Potential Impacts from Natural Hazards

Critical facilities are not regularly impacted by flooding in the Borough of Naugatuck, despite several critical facilities being located in the 500-year floodplain. Major

transportation arteries, such as State roads, are largely unaffected by flooding, and the emphasis on creating through streets has provided multiple modes of egress to the majority of neighborhoods in Naugatuck.

No critical facilities are particularly susceptible to wind, summer storms, winter storms, or earthquakes more than the rest of the Borough. However, the Public Works Department, Ambulance Services, Fire Department, Borough Offices, South Naugatuck CL&P Substation, and Hop Brook School are all located within a mapped dam failure inundation area, and Maple Hill School is located on the edge of a wildfire risk area. Subsequent sections will discuss each natural hazard in detail and include a description of populations at-risk.

3.0 INLAND FLOODING

3.1 Setting

According to FEMA, most municipalities in the United States have at least one clearly recognizable flood-prone area around a river, stream, or large body of water. These areas are outlined as Special Flood Hazard Areas (SFHA) and delineated as part of the National Flood Insurance Program (NFIP). Flood-prone areas are addressed through a combination of floodplain management criteria, ordinances, and community assistance programs sponsored by the NFIP and individual municipalities.

Many communities also have localized flooding areas outside of SFHAs. These floods tend to be shallower and chronically reoccur in the same area due to a combination of factors. Such factors include ponding, poor drainage, inadequate storm sewers, clogged culverts or catch basins, sheet flow, obstructed drainageways, sewer backup, or overbank flooding from small streams.

In general, flooding affects small areas within of Naugatuck with moderate to frequent regularity. Areas impacted by overflow of the Naugatuck River and major watercourses are generally limited to river corridors and floodplains. Indirect flooding that occurs in the floodplains adjacent to the rivers and localized nuisance flooding along tributaries is a more common problem in the Borough. This type of flooding occurs particularly along roadways as a result of inadequate drainage and other factors. The frequency of flooding in Naugatuck is considered highly likely for any given year, but flooding damage only has a limited geographic effect (refer to Appended Table 2).

3.2 **Hazard Assessment**

Flooding represents the most common and costly natural hazard in Connecticut. The state typically experiences floods in the early spring due to snowmelt and in the late summer/early autumn due to frontal systems and tropical storms, although localized flooding caused by thunderstorm activity can be significant. Flooding can occur as a result of other natural hazards, including hurricanes, summer storms, and winter storms. Flooding can also occur as a result of dam failure, which is discussed in Section 8.0, and may also cause landslides and slumps in affected areas.

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of floodplain management and to determine the need for insurance. This flood has a one percent chance of being equaled or exceeded each year. The risk of having a flood of this magnitude or greater increases when periods longer than one year are considered. For example, FEMA notes that a structure located within a 100-year flood zone has a 26% change of suffering flood damage during the term of a 30-year mortgage. Similarly, a 500-year flood has a 0.2 percent chance of occurring in a given year. The 500-year floodplain indicates areas of moderate flood hazard.

Floodplains are lands along watercourses that are subject to periodic flooding; ***floodways*** are those areas within the floodplains that convey floodwaters. Floodways are subject to water being carried at relatively high velocities and forces. The ***floodway fringe*** contains those areas of the 100-year floodplain that are outside the floodway and are subject to inundation but do not convey the floodwaters.

Flooding presents several safety hazards to people and property. Floodwaters cause massive damage to the lower levels of buildings, destroying business records, furniture, and other sentimental papers and artifacts. In addition, floodwaters can prevent emergency and commercial egress by blocking streets, deteriorate municipal drainage systems, and divert municipal staff and resources.

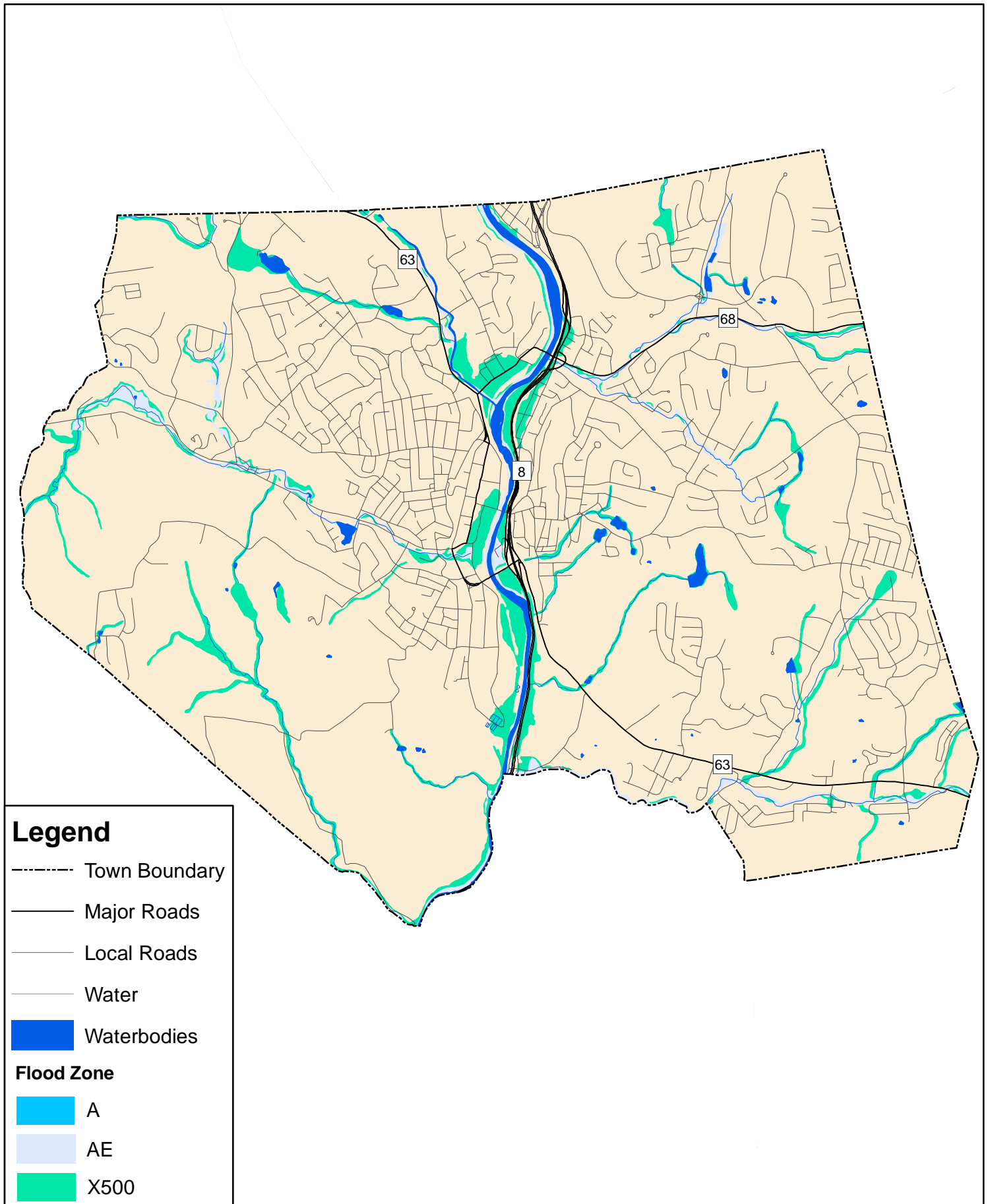
Furthermore, damp conditions trigger the growth of mold and mildew in flooded buildings, contributing to allergies, asthma, and respiratory infections. Snakes and rodents are forced out of their natural habitat and into closer contact with people, and ponded water following a flood presents a breeding ground for mosquitoes. Gasoline, pesticides, and other aqueous pollutants can be carried into areas and buildings by flood waters and soak into soil, building components, and furniture.

SFHAs in Naugatuck are delineated on Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS). An initial Flood Hazard Boundary Map was identified on June 28, 1974. The FIRM delineates areas within Naugatuck that are vulnerable to flooding and was published on August 15, 1979. The FIS was originally published in February 1979, and neither the FIS nor the FIRMs have been updated. Refer to Figure 3-1 for the areas of Naugatuck susceptible to flooding based on FEMA flood zones. Table 3-1 describes the various zones depicted on the FIRM panels for Naugatuck.

Table 3-1
FIRM Zone Descriptions

Zone	Description
A	An area inundated by 100-year flooding, for which no base flood elevations (BFEs) have been determined.
AE	An area inundated by 100-year flooding, for which BFEs have been determined.
Area Not Included	An area that is located within a community or county that is not mapped on any published FIRM.
X	An area that is determined to be outside the 100- and 500-year floodplains.
X500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

Figure 3-1: FEMA Flood Zones in Naugatuck



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.
 "Town Boundary", "Hydrography", "Flood Zones", DEP
 For general planning purposes only. Delineations may not be exact.
 September 2008



0 0.5 1 Miles



COUNCIL OF GOVERNMENTS
 CENTRAL NAUGATUCK VALLEY

In some areas of Naugatuck, flooding occurs with a much higher frequency than those mapped by FEMA. This nuisance flooding occurs from heavy rains with a much higher frequency than those used to calculate the 100-year and 500-year flood events, and often in different areas than those depicted on the FIRM panels. These frequent flooding events occur in areas with insufficient drainage; where conditions may cause flashy, localized flooding; and where poor maintenance may exacerbate drainage problems. These areas are discussed in Sections 3.3 and 3.5.

During large storms, the recurrence interval level of a flood discharge on a tributary tends to be greater than the recurrence interval level of the flood discharge on the main channel downstream. In other words, a 500-year flood event on a tributary may only contribute to a 50-year flood event downstream. This is due to the distribution of rainfall and the greater hydraulic capacity of the downstream channel to convey floodwaters. Dams and other flood control structures can also reduce the magnitude of peak flood flows. Such dams are located on the Naugatuck River upstream of the Borough of Naugatuck, in Thomaston and Torrington.

The recurrence interval level of a precipitation event also generally differs from the recurrence interval level of the associated flood. An example would be Tropical Storm Floyd in 1999, which caused rainfall on the order of a 250-year event while flood frequencies were slightly greater than a 10-year event on the Naugatuck River in the adjacent Town of Beacon Falls, immediately downstream of Naugatuck. Flood events can also be mitigated or exacerbated by in-channel and soil conditions, such as low or high flows, the presence of frozen ground, or a deep or shallow water table, as can be seen in the following historic record.

3.3 Historic Record

In every season of the year throughout its recorded history, the Borough of Naugatuck has experienced various degrees of flooding. Melting snow combined with early spring

rains have caused frequent spring flooding. Numerous flood events have occurred in late summer to early autumn resulting from storms of tropical origin moving northeast along the Atlantic coast. Winter floods result from the occasional thaw, particularly during years of heavy snow, or periods of rainfall on frozen ground. Other flood events have been caused by excessive rainfalls upon saturated soils, yielding greater than normal runoff.

Notable historic floods have occurred along the Naugatuck River in Naugatuck in November 1927, March 1936, September 1938, January 1949, and August and October 1955. All of these floods were the result of high intensity rainfall falling on saturated or frozen ground.

In terms of damage to the Borough of Naugatuck, the most severe of these was due to Hurricane Diane in August 1955. Peak daily flows along the Naugatuck River were gauged by the USGS to be 53,400 cubic feet per second (cfs) in Thomaston and 106,000 cfs in Beacon Falls, equivalent of a greater than 500-year flood event on the Naugatuck River. This hurricane is the storm of record for both stations. The August 1955 flood resulted in the loss of 36 lives and caused over \$193 million dollars in physical damages in areas downstream of the Thomaston Dam.

Flood heights related to the August 1955 storm were estimated to have a return period of 250 years in Naugatuck. The October 1955 flood had a recurrence interval of just over 100 years, and the 1936, 1938, and 1948 floods had recurrence intervals greater than 50, greater than 50, and approximately 100 years, respectively as measured in Beacon Falls.

According to the National Climatic Data Center (NCDC) Storm Events Database, there have been 28 flooding events and 20 flash flood events in New Haven County since 1993. The following are descriptions of more recent examples of floods in and around the Borough of Naugatuck as described in the NCDC Storm Events Database, and based on correspondence with municipal officials.

- ❑ April 16, 1996: A low pressure system produced heavy rainfall in New Haven and Middlesex Counties, with 12-hour rainfall amounts in New Haven County ranging from 2.8 to 6.1 inches. The storm caused three dams in Middletown and one dam in Wallingford to breach and resulted in un-insured flood damages of approximately \$1.5 million.
- ❑ March 9, 1998: Two low pressure systems formed over the southeastern United States that brought thunderstorms and heavy rainfall to New Haven County, resulting in widespread urban and small stream flooding. Water inundated several basements in Naugatuck. The storm produced wind gusts up to 55 miles per hour (mph) that contributed to scattered power outages. Rainfall amounts ranged from two and a half to four inches.
- ❑ January 15, 1999: A combination of heavy rain falling on frozen ground, snow and ice melting, and partially clogged storm drains caused widespread flash flooding of low-lying and poor drainage areas across Fairfield and New Haven Counties. Waterbury experienced significant widespread street and basement flooding.
- ❑ September 16, 1999: Torrential record rainfall preceding the remnants of Tropical Storm Floyd caused widespread urban, small stream, and river flooding. A total of 6.18 inches of rain was recorded in the nearby Town of Ansonia, and wind gusts peaked at up to 60 mph. Fairfield County was declared a disaster area, along with Litchfield and Hartford Counties. Initial cost estimates for damages to the public sector was \$1.5 million for those three counties. These estimates do not account for damages to the private sector and are based on information provided by the Connecticut Office of Emergency Management. Serious wide-spread flooding of low-lying and poor drainage areas resulted in the closure of many roads and basement flooding across Fairfield, New Haven, and Middlesex Counties.
- ❑ April 21, 2000: A series of intense thunderstorms accompanied by two to four inches of rainfall produced lightning strikes and widespread flooding of small streams, brooks, rivers, and low-lying and poor drainage areas. Hockanum Brook in the

adjacent Town of Beacon Falls was about two feet over its banks as a result of this storm.

- ❑ October 2005: Although the consistent rainfall of October 7-15, 2005 caused flooding and dam failures in most of Connecticut (most severely in northern Connecticut), the precipitation intensity and duration was such that only minor flooding occurred in Naugatuck. The Naugatuck River at Beacon Falls and Waterbury experienced significant rises within its banks.
- ❑ April 22-23, 2006: A sustained heavy rainfall caused streams to overtop their banks and drainage systems to fail throughout New Haven County. Rainfall amounts ranged from three to six inches across the region, including 4.34 inches in Naugatuck.
- ❑ June 2, 2006: An isolated severe thunderstorm produced up to eight inches of heavy rainfall that caused widespread damage in Waterbury, Wolcott, and Prospect. The storm caused slumps and drainage failures throughout the adjacent City of Waterbury, and several streets were flooded and damaged in all three municipalities.
- ❑ April 15-16, 2007: A spring nor'easter dropped over six inches of rain in the Greater Waterbury area, causing widespread flooding.
- ❑ July 19, 2007: Route 8 in the adjacent Town of Beacon Falls was closed due to flash flooding.

3.4 Existing Programs, Policies, and Mitigation Measures

Regulations and Other Methods of Prevention

The Borough of Naugatuck has in place a number of measures to prevent flood damage. These include regulations and plans that control encroachment and development in and near floodplains and floodways. Regulations, codes, and ordinances that apply to flood hazard mitigation in conjunction with and in addition to NFIP regulations include:

- ❑ ***Floodplains*** (Section 29 of the Naugatuck Zoning Regulations). This section recognizes areas of special flood hazards within the Borough as a zoning overlay and

establishes minimum standards and review procedures over the use of the land in order to reduce flooding hazard to human life and health, reduce flood damages to public and private property, minimize disruptions of commerce and governmental services, protect values, maintain the natural drainage system's capacity to safely store and transport flood water and minimize damaging flood erosion and any increases in downstream flood potential. It establishes the FIRMs and the FIS as the official maps for delineating areas of special flood hazard.

- ⇒ Section 29.5.1 requires new construction and substantial improvements to be anchored and resistant to flood damage.
- ⇒ Section 29.5.3.1 requires that no new construction be permitted in A zones with established flood elevations if the base flood elevation would be increased by more than one foot.
- ⇒ Section 29.6.1 requires that new construction and substantial improvements of any residential structure shall have the lowest floor, including the basement, elevated at least two feet above the base flood.
- ⇒ Section 29.6.2 requires that new construction and substantial improvements of any nonresidential structure shall have the lowest floor, including the basement, elevated at least two feet above the base flood, or flood proofed.
- ⇒ Section 29.6.3 provides additional requirements for mobile home parks.
- ⇒ Sections 29.6.4 and 29.7 control encroachment into floodways.
- ⇒ Section 29.6.8 requires floodplain compensation for development that reduces the holding capacity of floodplains.

An application for approval of a development in a flood plain must be submitted to the Zoning Enforcement Officer and be approved before construction can begin.

❑ ***Open Space Subdivision Plans*** (Section 35 of the Naugatuck Zoning Regulations).

This sections allows for the proposal and permitting of an "open space subdivision" to

preserve land as unsubdivided and undeveloped; for parks; for conserving natural resources; and to protect streams, rivers and ponds to avoid "flooding" and "erosion."

❑ ***The Naugatuck Subdivision Regulations*** contain numerous provisions relative to flood hazard mitigation:

- ⇒ Section 3.2.4 requires that an Engineering Report be submitted with all applications, and that it shall address impacts on floodplains, aquifers, watersheds, greenways and natural features. This report shall also include summaries of stormwater drainage designs.
- ⇒ Sections 4.3.2 and 4.4.2 require that existing and proposed watercourses, wetlands, ponds, swamps, shorelines, floodplain or flood boundaries be shown on site plans.
- ⇒ Section 4.7.7 requires delineation of floodplain or flood boundaries and base flood elevation data within the subdivision.
- ⇒ Section 5.2 requires that any lot which is "found to be unsuitable for occupancy and buildings by reason of water or flooding conditions, unsuitable soil, topography, ledge, rock or other conditions shall be combined with another contiguous lot that is suitable...."
- ⇒ Section 5.8 guides stormwater management and drainage system design to ensure peak flow attenuation or other mitigation.
- ⇒ Section 5.9 guides stormwater conveyance and stipulates the storm frequencies that must be conveyed by bridges, culverts, catch basins, etc.

❑ ***Flood Hazard Standards*** (Section 5.12 of the Subdivision Regulations) requires that:

- ⇒ 5.12.1 – Proposed subdivisions shall be consistent with the need to minimize flood damage
- ⇒ 5.12.2 – Public utilities, including adequate storm drainage, shall be designed, located and constructed to minimize flood damage.

- ⇒ 5.12.3 – Adequate storm drainage shall be provided to reduce exposure to flood damage.
 - ⇒ 5.12.4 – Base flood elevation data shall be provided for all land proposed to be subdivided, whether or not it is available from FEMA.
- ❑ ***Soil Erosion and Sediment Control Plan*** (Section 4.6 of the Naugatuck Subdivision Regulations and Section 36 of the Naugatuck Zoning Regulations). These sections require the submittal of a Soil Erosion and Sediment Control Plan with any application in which the disturbed area of such development is cumulatively more than one-half acre.
- ❑ ***Inland Wetlands and Watercourses Regulations***. These regulations define in detail the Borough of Naugatuck's requirements regarding development near wetlands, watercourses, and water bodies. Section 2 defines "Regulated Activities" covered by the Regulations. Section 4 states that no person may conduct or maintain a regulated activity without obtaining a permit. Section 7 outlines the application requirements, and requires the delineation of the boundaries of all wetlands and watercourses on the plans for Inland Wetlands and Watercourses Commission submittals. In particular:
- ⇒ Section 7.5.9 requires delineation of "floodplain limits and elevations,... drainage systems and channels...."
 - ⇒ Section 7.6.7 requires additional information regarding measures that "prevent flooding,... erosion and sedimentation and obstruction of drainage...."
 - ⇒ Section 8.6 requires providing a hydrologic analysis of runoff and peak flow.
 - ⇒ Section 10.2.1 states that the Commission must consider the environmental impact of the proposed action, including the effects on the watercourse's natural capacity to support fish and wildlife, to prevent flooding, to supply and protect surface and ground waters, to control sediment, to facilitate drainage, to control pollution, to support recreational activities, and to promote public health safety and welfare.

- ⇒ Section 10.2.7 requires evaluation of the impact of the activity on upstream and downstream wetlands and watercourses as well as impacts on the overall watershed.
 - ⇒ Section 10.2.9 requires evaluation of stormwater management.
 - ⇒ Section 10.2.10 requires consideration of, among other things, management of open spaces and detention basins.
- ❑ ***Aquifer Protection Regulations.*** These regulations replaced Section 28 of the Zoning Regulations subsequent to the State's adoption of the model aquifer protection ordinance. The regulations apply to the two aquifer protection zones in the Borough, located around the Indian Field groundwater supply in nearby Prospect (with the zone extending into Naugatuck) and the Marks Brook groundwater supply in southeastern Naugatuck. Although the regulations primarily address land uses that involve use, storage, or transfer of hazardous materials or chemicals within the aquifer protection zones, they provide an additional level of protection in the floodplains within each zone. Although the Indian Field wells are located in a floodplain in Prospect, the Marks Brook aquifer protection zone includes portions of the Marks Brook and Beacon Hill Brook floodplains in Naugatuck.
- ❑ ***Plan of Conservation & Development.*** This document from 2001 noted that about 3,028 acres of open space exists within the Borough, with approximately 1,468 acres (14%) of open space under public/private ownership and 1,560 acres (15%) of open space including lands that are not permanently protected. Section 3.C.2 identifies priority conservation areas (watercourses, water bodies, wetlands, slopes in excess of 15%, and ridgelines) and important conservation areas (public water supply watersheds, and aquifers and recharge areas, and unique or special habitat areas).

The intent of these regulations is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas of the Borough of Naugatuck by the establishment of standards designed to:

- ☐ Protect human life and public health;
- ☐ Minimize expenditure of money for costly flood control projects;
- ☐ Minimize the need for rescue and relief efforts associated with flooding;
- ☐ Ensure that purchasers of property are notified of special flood hazards;
- ☐ Ensure that all land approved for subdivision shall have proper provisions for water, drainage, and sewerage and in areas contiguous to brooks, rivers, or other bodies of water subject to flooding, and that proper provisions be made for protective flood control measures;
- ☐ Ensure that property owners are responsible for their actions;
- ☐ Ensure the continued eligibility of owners of property in Naugatuck for participation in the National Flood Insurance Program.

The Borough of Naugatuck retained a consultant to review Zoning and Subdivision Regulations in 2008. The review was completed in November 2008. Most of the recommendations are related to incorporating elements of low impact development into the regulations, especially with regard to stormwater management. In no case did a recommendation reduce any requirements related to flood hazard mitigation, and in fact, the recommendations will provide for enhanced peak flow management in new developments, if implemented. The process also resulted in a new checklist for developers, entitled "Subdivision/Site Plan Checklist for Drainage Designs" (with revision date November 2008). A copy can be found in Appendix C.

The Borough of Naugatuck Zoning Enforcement Officer serves as the NFIP administrator and oversees the enforcement NFIP regulations under the authority of the Zoning Commission. The Borough has not completed an update of its flood hazard regulations, and currently has no plans to enroll in the Community Rating System program.

The Borough of Naugatuck uses the 100-year flood lines from the FIRM and FIS delineated by FEMA as the official maps and report for determining special flood hazard

areas. FEMA has commenced its "Map Mod" program to revise the FIRMs for each County in Connecticut, and this program has been completed for parts of New Haven County. This program will create a single FIRM for New Haven County. Many municipalities with revised FIRMs from the Map Mod program are finding that more properties are in floodplains than originally believed.

Zoning and subdivision regulations require that all structures in flood hazard areas have their lowest floor (including basement) be two feet above established base flood elevations. Standards require that all proposals be consistent with the need to minimize flood damage, that public facilities and utilities be located and constructed to minimize flood damage, and that adequate drainage is provided. Wet floodproofing is required for buildings that include a fully enclosed space below the base flood elevation formed by foundation or other exterior walls. No encroachment on floodways is allowed that will raise the level of base flood elevation. The Naugatuck Inland Wetlands Commission also reviews new developments and existing land uses on and near wetlands and watercourses.

Flood Control Projects

Subsequent to the devastating floods of 1955, extensive flood control modifications have been made to the Naugatuck River basin, including the construction of five flood control dams by the ACOE. Three of these dams are located upstream of Naugatuck in the Town of Thomaston, and two others are located further upstream in Torrington. These dams are further described in Section 8.3. According to the FEMA FIS for Thomaston, these five dams can store all runoff up to a 100-year storm and provide a controlled release to the channel downstream.

Emergency Services

The Naugatuck Department of Public Works is in charge of the maintenance of the Borough's drainage systems, and performs clearing of bridges and culverts and other maintenance as needed. Drainage complaints are routed to the department and recorded. The Borough uses these documents to identify potential problems and plan for maintenance and upgrades. The Borough can also access the Automated Flood Warning System to monitor precipitation totals. The Connecticut DEP installed the Automated Flood Warning System in 1982 to monitor rainfall totals as a mitigation effort for flooding throughout the state.

The National Weather Service issues a flood watch or a flash flood watch for an area when conditions in or near the area are favorable for a flood or flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will

The Borough of Naugatuck can access the ***National Weather Service*** website at <http://weather.noaa.gov/> to obtain the latest flood watches and warnings before and during precipitation events.

occur. The National Weather Service issues a flood warning or a flash flood warning for an area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent.

In summary, the Borough of Naugatuck primarily attempts to mitigate flood damage and flood hazards by restricting building activities inside flood-prone areas. This process is carried out through both the Zoning Commission and the Inland Wetlands Commission. All watercourses are to be encroached minimally or not at all to maintain the existing flood carrying capacity. These regulations rely primarily on the FEMA-defined 100-year flood elevations to determine flood areas.

3.5 **Vulnerabilities and Risk Assessment**

This section discusses specific areas at risk to flooding within the Borough. Major land use classes and critical facilities within these areas are identified. According to the FEMA FIRMs, approximately 219 acres of land in Naugatuck are located within the 100-year flood boundary and 575 acres of land are located within the 500-year flood boundary. In addition, indirect and nuisance flooding occurs near streams and rivers throughout Naugatuck due to inadequate drainage and other factors.

The primary waterway in the Borough is the Naugatuck River, which flows north to south through the Borough. The remaining waterways in Naugatuck are mostly small streams and brooks significant for water supply and conservation purposes, with only Hop Brook noted as recreational resource. Recall from Figure 3-1 that floodplains with defined elevations are delineated for the Naugatuck River, Hop Brook, Long Meadow Pond Brook, Fulling Mill Brook, Cold Spring Brook, and Beacon Hill Brook. These watercourses, along with several additional smaller streams, have 500-year floodplains delineated by approximate methods. All of these delineated floodplains are generally limited to the areas adjacent to the streams.

Due to the large amount of buffer capacity provided by the ACOE flood control dams upstream, there is little wide-scale flooding in Naugatuck. Specific areas susceptible to flooding were identified by Borough personnel and observed by Milone & MacBroom, Inc. staff during field inspections as described in Section 1.5. Most flooding occurs due to large amounts of rainfall, sometimes falling in conjunction with snowmelt, and it often occurs due to undersized road culverts and drainage problems.

Priority Areas of Concern

- ❑ Spencer Street Corridor/Cherry Street/Pleasant Avenue – This area was cited as a significant flood-prone area during the data collection meeting, although severe damage does not occur and nuisance flooding appears to be the problem; repetitive loss properties are not located in this area. A review of historical topographic maps reveals that an unnamed stream was formerly located in this area in 1947, flowing from west to east, but it has been located in a culvert underground since at least 1954. Refer to Figure 3-2 for a depiction of the watercourse in 1947, Figure 3-3 for a depiction of the area in 1954, and Figure 3-4 for a depiction at the present time.

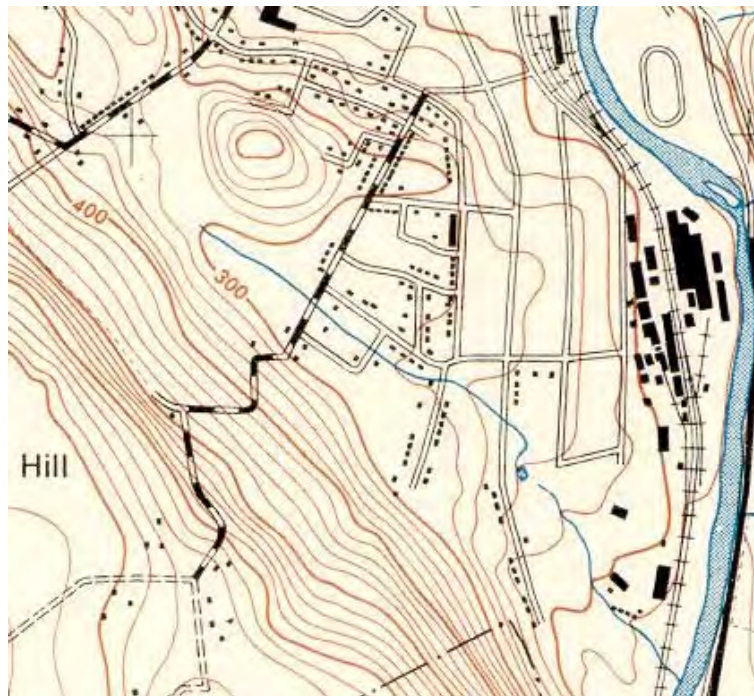


Figure 3-2 – View of 1947 Topographic Map, Spencer Street Corridor

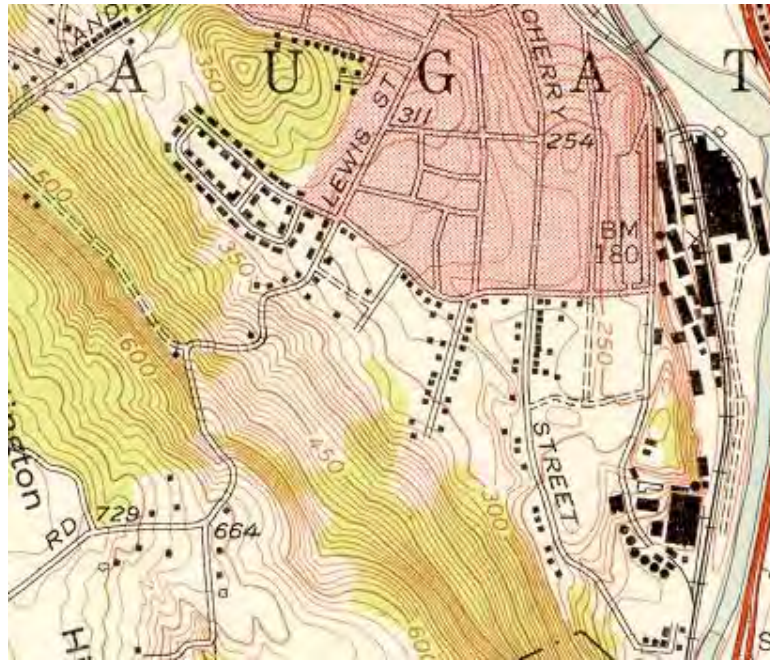


Figure 3-3 – View of 1954 Topographic Map, Spencer Street Corridor

Currently, there is a detention pond near this area with an adjacent swale from a hillside; and a stream daylights to the west of Lewis Street. Streets and homes can flood within the development during periods of heavy rainfall. Stormwater systems tied to this watercourse are also affected. It has been reported that water levels can rise so rapidly that a "geyser" forms in the storm drainage system when water gets backed up following periods of high rainfall. In fact, the historic Grant House on Cherry Street Extension was damaged due to pressures within the stormwater system.

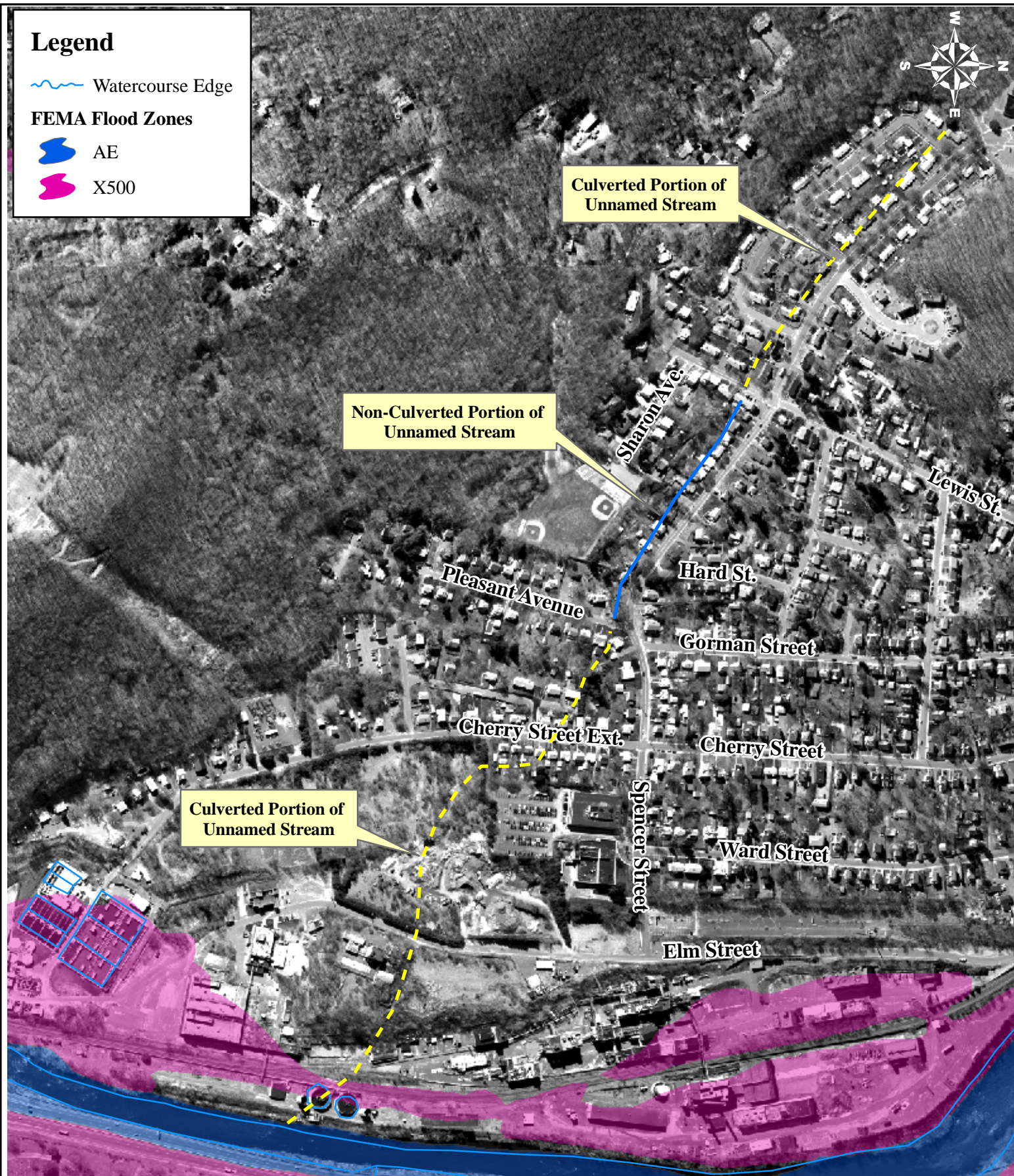
Legend

 Watercourse Edge

FEMA Flood Zones

 AE

 X500



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Engineering,
Landscape Architecture
and Environmental Science

Spencer Street/Cherry Street/ Pleasant Avenue Study Area

MMI#: 2937-02
MXD: H:\Figure3-4Spencer.mxd
SOURCE: 2004 CLEAR,
CT DEP

Naugatuck Pre-Disaster Natural Hazard Mitigation Plan

LOCATION:

Naugatuck, CT

Map By: SJB

Date: Jan. 2009

Scale: 1" = 500'

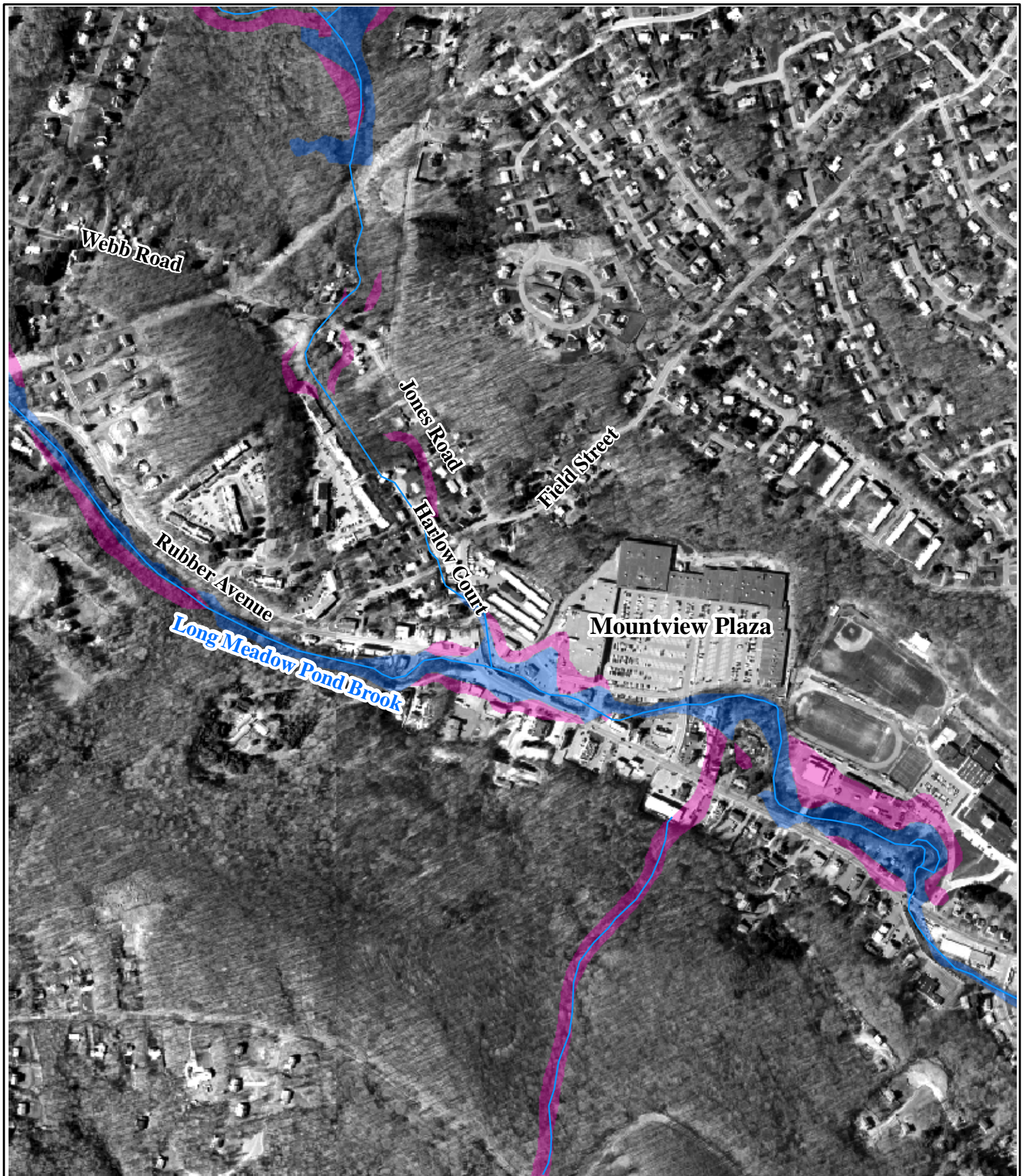
SHEET:

Figure 3-4

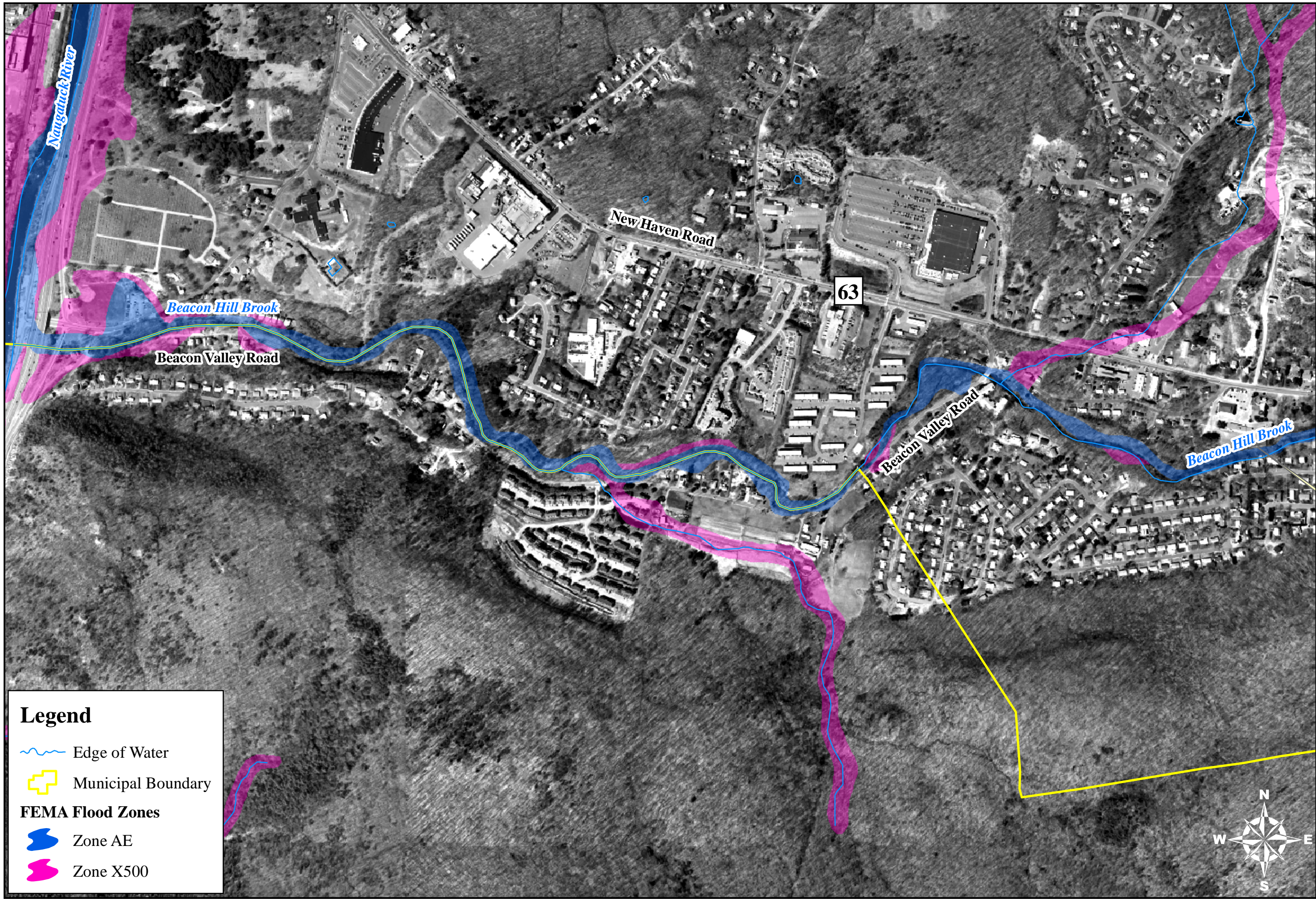
- ❑ Long Meadow Pond Brook – The corridor of this stream and its tributary (depicted on Figure 3-5) were noted by Borough personnel as experiencing flooding during heavy rainfall. The specific area of concern is located adjacent to the Long Meadow Pond Brook and its tributary near Rubber Avenue and Harlow Court, near Mountview Plaza and north of the Baummer Dam. The flooding at this site is partly associated with water entering from the vicinity of Webb Road. There have been approximately four residential or commercial sites that have been flooded in this location, though repetitive loss properties are not located in this area.
- ❑ Arch Street – The lower portion of Arch Street at Long Meadow Pond Brook receives three feet of standing water during large rainfall events. A storm drain near a vacant building is sometimes clogged, causing storm water to back up and build in the street during these storms. On one account, the standing water caused a dumpster to float.
- ❑ Beacon Valley Road – Flooding has been reported along Beacon Valley Road near Beacon Falls. This neighborhood becomes inundated with water from Beacon Hill Brook after heavy rains. See Figure 3-6 for a vicinity map.

Other Areas of Concern

- ❑ Cold Spring Brook – Although not mentioned at the data collection kick-off meeting, this corridor was investigated. The brook is very close to Brook Street and flooding could affect homes and access to Cold Spring Circle.
- ❑ Crown Spring Bridge – This bridge over Hop Brook on Bridge Street has recurring problems with flooding after periods of heavy rainfall.



<p>Engineering, Landscape Architecture and Environmental Science</p> <p>MILONE & MACBROOM®</p> <p>99 Realty Drive Cheshire, Connecticut 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com</p>	<p>Long Meadow Pond Brook Study Area</p> <p>MMI#: 2937-02 MXD: H:\Figure3-3Long.mxd SOURCE: 2004 CLEAR, CT DEP</p> <p>Naugatuck Natural Hazard Pre-Disaster Mitigation Plan</p>	<p>LOCATION: Naugatuck, CT</p> <p>Map By: SJB Date: Jan. 2009 Scale: 1" = 600'</p> <p>SHEET: Figure 3-5</p>
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Legend

Edge of Water

Municipal Boundary

FEMA Flood Zones

Zone AE

Zone X500

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Landscape Architecture
and Environmental Science

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REVISIONS		

BEACON VALLEY ROAD STUDY AREA

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN

BOROUGH OF NAUGATUCK, CONNECTICUT

S/JB	S/JB	DM
DESIGNED	DRAWN	CHECKED

SCALE: 1" = 600'

DATE: JANUARY 2009

PROJECT NO: 2937-02

MXD NAME:
H:\Figure3-2Beacon.mxd

FIGURE 3-6

SHEET NO.

- ❑ East Waterbury Road – The portion of East Waterbury Road below the Union Ice Company Dam now becomes flooded after heavy rains. As a result of the pond losing storage due to sedimentation, this problem may be worsening. During substantial rain events, the dam overtops and water spills onto East Waterbury Road. The water runs down the road and eventually re-enters the tributary to Fulling Mill Brook. Under certain conditions, water can enter homes.
- ❑ Fulling Mill Brook along Route 68 – Flooding of Route 68 has been known to occur during periods of heavy rain. The channel is near street level in some areas, and when water is overbank, it causes minor flooding.
- ❑ Highland Street near Galpin Street – This area was reported to have flooding issues after substantial rain events. The area was inspected but the alleged drainage problems were not apparent. Problems may occur under more significant events.
- ❑ May Street – The nearby unnamed stream may have the tendency to jump the culvert at the intersection with Bird Road and cause washouts in a resident's yard.
- ❑ Nichols Garage (Irving Gas Station) – This site marks the point at which Pigeon Brook flows underground before entering Hop Brook. There is a pond adjacent to the garage at this site that may have mitigated flooding problems in the past, but it has become filled with silt.
- ❑ Maple Street – A sinkhole approximately 100 feet long formed in July 2008 near the Naugatuck Fire Headquarters. The sinkhole was the result of the failure of an old storm drain.

Correspondence with the State of Connecticut NFIP Coordinator revealed that there is one Repetitive Loss Property listed for the Borough of Naugatuck. The property had one

reported flood claim in 1982 and one in 1985. It is believed that this property may be listed in error for several reasons:

- ❑ First, the NFIP Repetitive Loss Update Worksheet lists the "NFIP Community Name" as being Ottawa County, and the "Community ID#" as being 390432, placing the property in Ohio.
- ❑ Second, the "Current Property Address" is listed as being 67 Meadow Lart Road in Naugatuck, Connecticut. No "Meadow Lart" Road or "Meadow Lark" road was found on Google Maps for Ottawa County, Ohio. However, the Meadow Lark Road in Naugatuck does not have a number 67.
- ❑ Finally, the Meadow Lark Road in Naugatuck is on a hill away from streams and floodplains, making it unlikely that there is a chronic flooding problem in the area. The fact that the last flood claim for this address occurred in 1985 supports this belief.

Critical Facilities and Emergency Services

Critical facilities are not regularly impacted by flooding in the Borough of Naugatuck, despite several critical facilities (listed in Table 2-5) having locations in the 500-year floodplain. Major transportation arteries, such as State roads, are largely unaffected by flooding, and the emphasis on creating through streets has provided multiple modes of egress to the majority of neighborhoods in Naugatuck.

3.6 Potential Mitigation Measures, Strategies, and Alternatives

A number of measures can be taken to reduce the impact of a local or nuisance flood event. These include measures that prevent increases in flood losses by managing new development, measures that reduce the exposure of existing development to flood risk, and measures to preserve and restore natural resources. These are listed below under the categories of *prevention, property protection, structural projects, public education and awareness, natural resource protection, and emergency services*. All of the

recommendations discussed in the subsections below are reprinted in a bulleted list in Section 3.7.

3.6.1 Prevention

Floodplain regulations and redevelopment policies are the most common form of flood damage prevention. These are usually administered by building, zoning, planning, and/or code enforcement offices through capital improvement programs and through zoning, subdivision, and wetland ordinances.

It is important to promote coordination among the various departments that are responsible for different aspects of flood mitigation. Coordination and cooperation among departments should be reviewed every few years as specific responsibilities and staff changes.

Municipal departments should identify areas for acquisition to maintain flood protection. Acquisition of heavily damaged structures after a flood may be an economical and practical means to accomplish this. Policies can also include the design and location of utilities to areas outside of flood hazard areas, and the placement of utilities underground.

Planning and Zoning: Zoning ordinances should regulate development in flood hazard areas. Flood hazard areas should reflect a balance of development and natural areas. In addition, delineated Aquifer Protection Areas (APA) in Connecticut are often located near floodplains and can indirectly provide a level of protection against the development of certain commercial and industrial properties.

Floodplain Development Regulations: Development regulations encompass subdivision regulations, building codes, and floodplain ordinances. Site plan and new subdivision regulations should include the following:

- ❑ Requirements that every lot have a buildable area above the flood level;
- ❑ Construction and location standards for the infrastructure built by the developer, including roads, sidewalks, utility lines, storm sewers, and drainage ways; and
- ❑ A requirement that developers dedicate open space and flood flow, drainage, and maintenance easements.

Building codes should ensure that the foundation of structures will withstand flood forces and that all portions of the building subject to damage are above or otherwise protected from flooding. Floodplain ordinances should at minimum follow the requirements of the National Flood Insurance Program for subdivision and building codes. These could be included in the ordinances for zoning and building codes, or could be addressed in a separate ordinance.

The Borough should consider joining FEMA's Community Rating System to reduce the cost of flood insurance for its residents, and should consider using Borough topographic maps to develop a more accurate regulatory flood-hazard map using the published FEMA flood elevations. According to the FEMA, communities are encouraged to use different, more accurate base maps to expand upon the FIRMs published by FEMA. This is because many FIRMs were originally created using United States Geological Survey quadrangle maps with 10-foot contour intervals, but most municipalities today have contour maps of one or two-foot intervals that show more recently constructed roads, bridges, and other anthropologic features. Another approach is to record high-water marks and establish those areas inundated by a recent severe flood to be the new regulatory floodplain.

Adoption of a different floodplain map is allowed under NFIP regulations as long as the new map covers a larger floodplain than the FIRM. It should be noted that the community's map will not affect the current FIRM or alter the SFHA used for setting insurance rates or making map determinations; it can only be used by the community to

regulate floodplain areas. The FEMA Region I office has more information on this topic; contact information can be found in Section 11.

Reductions in floodplain area or revisions of a mapped floodplain can only be accomplished through revised FEMA-sponsored engineering studies or Letters of Map Change (LOMC). To date, one Letter of Map Amendment (LOMA) and no Letters of Map Revision (LOMR) have been issued under the LOMC program for the Borough of Naugatuck, so such updates are considered rare for the Borough.

Stormwater Management Policies: Development and redevelopment policies to address the prevention of flood losses must include effective stormwater management policies. Developers should be required to build detention and retention facilities where appropriate. Infiltration can be enhanced to reduce runoff volume, including the use of swales, infiltration trenches, vegetative filter strips, and permeable paving blocks. Generally, post-development stormwater should not leave a site at a rate higher than under pre-development conditions.

Standard engineering practice is to avoid the use of detention measures if the project site is located in the lower one-third of the overall watershed. The effects of detention are least effective and even detrimental if used at such locations because of the delaying effect of the peak discharge from the site that typically results when detention measures are used. By detaining stormwater in close proximity of the stream in the lower reaches of the overall watershed, the peak discharge from the site will occur later in the storm event, which will more closely coincide with the peak discharge of the stream, thus adding more flow during the peak discharge during any given storm event.

Due to its topography, Naugatuck is situated in the upper and lower parts of several watersheds. Developers should be required to demonstrate whether detention or retention will be the best management practice for stormwater at specific sites in regards to the position of each project site in the surrounding watershed.

Drainage System Maintenance: An effective drainage system must be continually maintained to ensure efficiency and functionality. Maintenance should include programs to clean out blockages caused by overgrowth and debris. Culverts should be monitored, and repaired and improved when necessary. The use of Geographic Information System (GIS) technology can greatly aid the identification and location of problem areas.

Education and Awareness: Other prevention techniques include the promotion of awareness of natural hazards among citizens, property owners, developers, and local officials. Technical assistance for local officials, including workshops, can be helpful in preparation for dealing with the massive upheaval that can accompany a severe flooding event. Research efforts to improve knowledge, develop standards, and identify and map hazard areas will better prepare a community to identify relevant hazard mitigation efforts.

The Borough of Naugatuck Inland Wetlands Commission (IWC) administers the wetland regulations and the Naugatuck Zoning Commissions administer the Zoning and Subdivision regulations. The regulations simultaneously restrict development in floodplains, wetlands, and other flood prone areas. The Zoning Enforcement Officer and the IWC (or its agents) are charged with ensuring that development follows the floodplain management regulations and inland wetlands regulations.

Based on the above guidelines and the existing roles of the IWC, the Planning Commission, the Zoning Commission, and the Zoning Enforcement Officer, one *preventive* mitigation measure is recommended. A checklist should be developed that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. This will streamline the permitting process and ensure maximum education of a developer or applicant, just as the "Subdivision/Site Plan Checklist for Drainage Designs" (revision date November 2008) attempts to accomplish. This checklist could be provided to a land use or development applicant at

several Borough departments. A sample checklist for the Borough of Naugatuck is included as Appended Table 3.

3.6.2 **Property Protection**

Steps should be taken to protect existing public and private properties. Non-structural measures for public property protection include acquisition and relocation of properties at risk for flooding, purchase of flood insurance, and relocating valuable belongings above flood levels to reduce the amount of damage caused during a flood event.

Structural flood protection techniques applicable to property protection include the construction of barriers, dry floodproofing, and wet floodproofing techniques. Barriers include levees, floodwalls, and berms, and are useful in areas subject to shallow flooding. These structural projects are discussed in Section 3.6.6 below.

Dry floodproofing refers to the act of making areas below the flood level water-tight.

Wet floodproofing refers to intentionally letting floodwater into a building to equalize interior and exterior water pressures.

For dry floodproofing, walls may be coated with compound or plastic sheathing. Openings such as windows and vents should be either permanently closed or covered with removable shields. Flood protection should only be two to three feet above the top of the foundation because building walls and floors cannot withstand the pressure of deeper water.

Wet floodproofing should only be used as a last resort. Furniture and electrical appliances should be moved away from advancing floodwaters.

All of the above *property protection* mitigation measures may be useful for Borough of Naugatuck residents to prevent damage from inland and nuisance flooding. The Borough

may wish to work with property owners along Long Meadow Pond Brook, Hop Brook, Beacon Hill Brook, Cold Spring Brook, and Fulling Mill Brook to pursue wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of any given structure is most appropriate.

3.6.3 Emergency Services

A natural hazard pre-disaster mitigation plan addresses actions that can be taken before a disaster event. In this context, emergency services that would be appropriate mitigation measures for inland flooding include:

- ❑ Forecasting systems to provide information on the time of occurrence and magnitude of flooding;
- ❑ A system to issue flood warnings to the community and responsible officials;
- ❑ Emergency protective measures, such as an Emergency Operations Plan outlining procedures for the mobilization and position of staff, equipment, and resources to facilitate evacuations and emergency floodwater control; and
- ❑ Implementing an emergency notification system that combines database and GIS mapping technologies to deliver outbound emergency notifications to geographic areas; or specific groups of people, such as emergency responder teams.

Many of the above mitigation measures are already in practice to some degree in the Borough of Naugatuck. Based on the above guidelines, a number of specific proposals for improved *emergency services* area recommended to prevent damage from inland and nuisance flooding. These are common to all hazards in this plan, and are listed in Section 10.1.

3.6.4 **Public Education and Awareness**

The objective of public education is to provide an understanding of the nature of flood risk, and the means by which that risk can be mitigated on an individual basis. Public information materials should encourage individuals to be aware of flood mitigation techniques, including discouraging the public from changing channel and detention basins in their yards, and dumping in or otherwise altering watercourses and storage basins. Individuals should be made aware of drainage system maintenance programs and other methods of mitigation. The public should also understand what to expect when a hazard event occurs, and the procedures and time frames necessary for evacuation.

Based on the above guidelines, a number of specific proposals for improved *public education* are recommended to prevent damage from inland and nuisance flooding. These are common to all hazards in this plan, and are listed in Section 10.1.

3.6.5 **Natural Resource Protection**

Floodplains can provide a number of natural resources and benefits, including storage of floodwaters, open space and recreation, water quality protection, erosion control, and preservation of natural habitats. Retaining the natural resources and functions of floodplains can not only reduce the frequency and consequences of flooding, but also minimize stormwater management and non-point pollution problems. Through natural resource planning, these objectives can be achieved at substantially reduced overall costs.

Measures for preserving floodplain functions and resources typically include:

- ❑ Adoption of floodplain regulations to control or prohibit development that will alter natural resources;
- ❑ Development and redevelopment policies focused on resource protection;
- ❑ Information and education for both community and individual decision-makers; and
- ❑ Review of community programs to identify opportunities for floodplain preservation.

Projects that improve the natural condition of areas or to restore diminished or destroyed resources can re-establish an environment in which the functions and values of these resources are again optimized. Administrative measures which assist such projects include the development of land reuse policies focused on resource restoration and review of community programs to identify opportunities for floodplain restoration.

Based on the above guidelines, the following specific *natural resource protection* mitigation measures are recommended to help prevent damage from inland and nuisance flooding:

- ❑ Pursue the acquisition of additional municipal open space properties.
- ❑ Selectively pursue conservation objectives listed in the Plan of Conservation and Development or more recent planning studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.

3.6.6 Structural Projects

Structural projects include the construction of new structures or modification of existing structures (e.g. floodproofing) to lessen the impact of a flood event. Stormwater controls such as drainage systems, detention dams and reservoirs, and culverts should be employed to lessen floodwater runoff. On-site detention can provide temporary storage of stormwater runoff. Barriers such as levees, floodwalls, and dikes physically control the hazard to protect certain areas from floodwaters. Channel alterations can be made to confine more water to the channel and accelerate flood flows. Care should be taken when using these techniques to ensure that problems are not exacerbated in other areas of the impacted watersheds. Individuals can protect private property by raising structures, and constructing walls and levees around structures.

Based on the above guidelines, the following specific *structural* mitigation measures are recommended to prevent damage from inland and nuisance flooding:

- ❑ Consider performing a Borough-wide analysis to help identify undersized and failing portions of the stormwater and drainage systems. Prioritize repairs as needed. Incorporate anecdotal information where appropriate, such as observation described in this plan regarding the nuisance flooding at May Street.
- ❑ Upgrade the drainage systems in downtown Naugatuck where necessary to enhance drainage.
- ❑ Increase maintenance of the storm drainage system near the building on Arch Street near Long Meadow Pond Brook to prevent flooding of this area.
- ❑ If necessary, increase the conveyance capacity of Crown Spring Bridge over Hop Brook at Bridge Street.
- ❑ Assess dredging options for the sediment laden Union Ice Company Pond to potentially increase its potential for flood mitigation.
- ❑ Increase the conveyance capacity of the culvert for the tributary to Fulling Mill Brook under East Waterbury Road downstream of the Union Ice Company Pond.
- ❑ Upgrade the drainage system on Highland Avenue near Galpin Street to mitigate future nuisance flooding.
- ❑ Evaluate flood mitigation options, such as dredging of the silted pond adjacent to Nichols Garage/Irvin Gas Station, where Pigeon Brook flows underground before entering Hop Brook.
- ❑ Pursue flood mitigation along the unnamed stream associated with the Spencer Street corridor, including increased conveyance capacity of the culverted portions of the stream, channel restoration or maintenance of the un-culverted section of the stream, and/or siting of detention systems.

3.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

Many potential mitigation concepts and activities were presented above in Section 3.6. The recommended mitigation strategies for addressing flooding problems in the Borough of Naugatuck are listed below.

Prevention

- ❑ Streamline the permitting process and work toward the highest possible education of a developer or applicant. Develop a checklist that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to the proposed project. This list could be provided to an applicant at any Borough department. A sample checklist for the Borough of Naugatuck is included as Appended Table 3.
- ❑ Consider joining FEMA's Community Rating System.
- ❑ Continue to require applications for approval of a development in a floodplain for activities within SFHAs.
- ❑ Consider requiring buildings constructed in floodprone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.
- ❑ Ensure new buildings be designed and graded to shunt drainage away from the building.
- ❑ After Map Mod has been completed, consider restudying local flood prone areas and produce new local-level regulatory floodplain maps using more exacting study techniques, including using more accurate contour information to map flood elevations provided with the FIRM.

Property & Natural Resource Protection

- ❑ Pursue the acquisition of additional municipal open space properties inside SFHAs and set it aside as greenways, parks, or other non-residential, non-commercial, or non-industrial use.
- ❑ Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.
- ❑ Work with property owners along Long Meadow Pond Brook, Hop Brook, Beacon Hill Brook, Cold Spring Brook, Fulling Mill Brook, and their tributaries to pursue wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of any given structure is most appropriate.

Structural Projects

- ❑ Consider performing a Borough-wide analysis to help identify undersized and failing portions of the stormwater and drainage systems. Prioritize repairs as needed. Incorporate anecdotal information where appropriate, such as observation described in this plan regarding the nuisance flooding at May Street.
- ❑ Upgrade the drainage systems in downtown Naugatuck where necessary to enhance drainage.
- ❑ Increase maintenance of the storm drainage system near the building on Arch Street near Long Meadow Pond Brook to prevent flooding of this area.
- ❑ If necessary, increase the conveyance capacity of Crown Spring Bridge over Hop Brook at Bridge Street.
- ❑ Assess dredging options for the sediment laden Union Ice Company Pond to potentially increase its potential for flood mitigation.

- ❑ Increase the conveyance capacity of the culvert for the tributary to Fulling Mill Brook under East Waterbury Road downstream of the Union Ice Company Pond.
- ❑ Upgrade the drainage system on Highland Avenue near Galpin Street to mitigate future nuisance flooding.
- ❑ Evaluate flood mitigation options, such as dredging of the silted pond adjacent to Nichols Garage/Irving Gas Station, where Pigeon Brook flows underground before entering Hop Brook.
- ❑ Pursue flood mitigation along the unnamed stream associated with the Spencer Street corridor, including increased conveyance capacity of the culverted portions of the stream, channel restoration or maintenance of the un-culverted section of the stream, and/or siting of detention systems.

In addition, mitigation strategies important to all hazards are included in Section 10.1.

4.0 ***HURRICANES***

4.1 ***Setting***

Hazards associated with tropical storms and hurricanes include winds, heavy rains, and inland flooding. While only some of the areas of Naugatuck are susceptible to flooding damage caused by hurricanes, wind damage can occur anywhere in the Borough.

Hurricanes therefore have the potential to affect any area within the Borough of Naugatuck. A hurricane striking the Borough of Naugatuck is considered a possible event each year that could cause critical damage to the Borough and its infrastructure (refer to Appended Table 1).

4.2 ***Hazard Assessment***

Hurricanes are a class of tropical cyclones that are defined by the National Weather Service as non-frontal, low-pressure large scale systems that develop over tropical or subtropical water and have definite organized circulations. Tropical cyclones are categorized based on the speed of the sustained (1-minute average) surface wind near the center of the storm. These categories are: Tropical Depression (winds less than 39 mph), Tropical Storm (winds 39-74 mph, inclusive) and Hurricanes (winds at least 74 mph).

A ***Hurricane Watch*** is an advisory for a specific area stating that a hurricane poses a threat to coastal and inland areas. Individuals should keep tuned to local television and radio for updates.

A ***Hurricane Warning*** is then issued when the dangerous effects of a hurricane are expected in the area within 24 hours.

The geographic areas affected by tropical cyclones are called tropical cyclone basins. The Atlantic tropical cyclone basin is one of six in the world and includes much of the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The official Atlantic

hurricane season begins on June 1 and extends through November 30 of each year, although occasionally hurricanes occur outside this period.

Inland Connecticut is vulnerable to hurricanes despite moderate hurricane occurrences when compared with other areas within the Atlantic Tropical Cyclone basin. Since hurricanes tend to weaken within 12 hours of landfall, inland areas are less susceptible to hurricane wind damages than coastal areas in Connecticut; however, the heaviest rainfall often occurs inland. Therefore, inland areas are vulnerable to inland flooding during a hurricane.

The Saffir / Simpson Scale

The Saffir / Simpson Hurricane Scale, which has been adopted by the National Hurricane Center, categorizes hurricanes based upon their intensity, and relates this intensity to damage potential. The Scale uses the sustained surface winds (1-minute average) near the center of the system to classify hurricanes into one of five categories. The Saffir / Simpson scale is provided below.

- ❑ **Category 1:** Winds 74-95 mph (64-82 kt or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs, coastal road flooding, and minor pier damage.
 - ⇒ Hurricane Diane was a Category 1 hurricane when it made landfall in North Carolina in 1955, and weakened to a tropical storm before reaching the Connecticut shoreline.
 - ⇒ Hurricane Agnes of 1971 was a Category 1 hurricane when it hit Connecticut.
 - ⇒ Hurricanes Allison of 1995 and Danny of 1997 were Category 1 hurricanes at peak intensity.

- ❑ **Category 2:** Winds 96-110 mph (83-95 kt or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood two to four hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.

- ⇒ Hurricane Bonnie of 1998 was a Category 2 hurricane when it hit the North Carolina coast.
- ⇒ Hurricane Georges of 1998 was a Category 2 hurricane when it hit the Florida Keys and the Mississippi Gulf Coast.
- ⇒ Hurricane Bob was a Category 2 hurricane when it made landfall in southern New England and New York in August of 1991.
- ⇒ Hurricane Ike was a strong Category 2 hurricane when it struck Galveston and Houston in September 2008.

- ❑ **Category 3:** Winds 111-130 mph (96-113 kt or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water three to five hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than five feet above mean sea level may be flooded inland eight miles (13 km) or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.

- ⇒ The Great New England Hurricane of 1938 was a Category 3 hurricane when it hit New York and southern New England.

- ⇒ The Great Atlantic Hurricane of 1944 was a Category 3 hurricane when it made landfall in North Carolina, Virginia, New York, and southern New England.
- ⇒ Hurricane Carol of 1954 was a Category 3 hurricane when it struck Connecticut, New York, and Rhode Island.
- ⇒ Hurricane Connie of 1955 was a Category 3 hurricane when it made landfall in North Carolina.
- ⇒ Hurricane Gloria of 1985 was a Category 3 hurricane when it made landfall in North Carolina and New York, and weakened to a Category 2 hurricane before reaching Connecticut.
- ⇒ Hurricanes Roxanne of 1995 and Fran of 1996 were Category 3 hurricanes at landfall on the Yucatan Peninsula of Mexico and in North Carolina, respectively.
- ⇒ Hurricane Katrina of August 2005 was a Category 3 hurricane when it struck Louisiana and Mississippi.
- ⇒ Hurricane Rita of September 2005 reached Category 3 as it struck Louisiana.
- ⇒ Hurricane Wilma of October 2005 was a Category 3 hurricane when it made landfall in southwestern Florida.

❑ **Category 4:** Winds 131-155 mph (114-135 kt or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water three to five hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as six miles (10 km).

- ⇒ Hurricane Donna of 1960 was a Category 4 hurricane when it made landfall in southwestern Florida, and weakened to a Category 2 hurricane when it reached Connecticut.

- ⇒ Hurricane Luis of 1995 was a Category 4 hurricane while moving over the Leeward Islands.
- ⇒ Hurricanes Felix and Opal of 1995 also reached Category 4 status at peak intensity.
- **Category 5:** Winds greater than 155 mph (135 kt or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water three to five hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.
- ⇒ Hurricane Andrew was a Category 5 hurricane when it made landfall in southeastern Florida in 1992.
- ⇒ Hurricane Mitch of 1998 was a Category 5 hurricane at peak intensity over the western Caribbean.
- ⇒ Hurricane Gilbert of 1988 was a Category 5 hurricane at peak intensity and is one of the strongest Atlantic tropical cyclones of record.

Table 4-1 lists the hurricane characteristics mentioned above as a function of category, as well as the expected central pressure.

Table 4-1
Hurricane Characteristics

Category	CENTRAL PRESSURE		WIND SPEED		SURGE Feet	Damage Potential
	Millibars	Inches	MPH	Knots		
1	>980	>28.9	74-95	64-83	4-5	Minimal
2	965-979	28.5-28.9	96-110	84-96	6-8	Moderate
3	945-964	27.9-28.5	111-130	97-113	9-12	Extensive
4	920-644	27.2-27.9	131-155	114-135	13-18	Extreme
5	<920	<27.2	>155	>135	>18	Catastrophic

The Saffir / Simpson Hurricane Scale assumes an average, uniform coastline for the continental United States and was intended as a general guide for use by public safety officials during hurricane emergencies. It does not reflect the effects of varying localized bathymetry, coastline configuration, astronomical tides, barriers or other factors that may modify storm surge heights at the local level during a single hurricane event. For inland communities such as the Borough of Naugatuck, the coastline assumption is not applicable.

According to Connecticut's 2007 Natural Hazard Mitigation Plan Update, a moderate Category 2 hurricane is expected to strike Connecticut once every ten years, whereas a Category 3 or Category 4 hurricane is expected before the year 2040. These frequencies are based partly on the historic record, described in the next section.

4.3 Historic Record

Through research efforts by NOAA's National Climate Center in cooperation with the National Hurricane Center, records of tropical cyclone occurrences within the Atlantic Cyclone Basin have been compiled from 1851 to present. These records are compiled in NOAA's Hurricane database (HURDAT), which contains historical data in the process of being reanalyzed to current scientific standards, as well as the most current hurricane

data. During HURDAT's period of record, 29 hurricanes and 67 tropical storms have passed within a 150-mile radius of Newport, Rhode Island.

Since 1900, eight direct hits and two hurricanes that did not make landfall (but passed close to the shoreline) were recorded along the Connecticut coast, of which there were four Category 3, two Category 2, and two Category 1 hurricanes (two of the ten struck Connecticut before the Saffir / Simpson scale was developed). Of the four Category 3 hurricanes, two occurred in September and two occurred in August.

The most devastating hurricane to strike Connecticut, and believed to be the strongest hurricane to hit New England in recorded history, was believed to be a Category 3 hurricane. Dubbed the "Long Island Express of September 21, 1938", this name was derived from the unusually high forward speed of the hurricane, estimated to be 70 mph. The hurricane made landfall at Long Island, New York and moved quickly northward over Connecticut into northern New England.

The majority of damage was caused from storm surge and wind damage. Surges of 10 to 12 feet were recorded along portions of the Long Island and Connecticut Coast, and 130 mile per hour winds flattened forests, destroyed nearly 5,000 cottages, farms, and homes, and damaged an estimated 15,000 more throughout New York and southern New England. Overall, the storm left an estimated 700 dead and caused physical damages in excess of 300 million 1938 United States dollars (USD).

The "Great Atlantic Hurricane" hit the Connecticut coast in September 1944. This Category 3 hurricane brought rainfall in excess of six inches to most of the state and rainfall in excess of eight to ten inches in Fairfield County. Most of the wind damage from this storm occurred in southeastern Connecticut. Injuries and storm damage were lower in this hurricane than in 1938 because of increased warning time and the fewer structures located in vulnerable areas due to the lack of rebuilding after the 1938 storm.

Another Category 3 hurricane, Hurricane Carol, struck in August of 1954 shortly after high tide and produced storm surges of 10 to 15 feet in southeastern Connecticut. Rainfall amounts of six inches were recorded in New London, and wind gusts peaked at over 100 mph. Near the coast, the combination of strong winds and storm surge damaged or destroyed thousands of buildings, and the winds toppled trees that left most of the eastern part of the state without power. Overall damages were estimated at \$461 million (1954 USD), and 60 people died as a direct result of the hurricane. Western Connecticut was largely unaffected by Hurricane Carol due to the compact nature of the storm.

The following year, back-to-back hurricanes Connie and Diane caused torrential rains and record-breaking floods in Connecticut. Hurricane Connie was a declining tropical storm when it hit Connecticut in August of 1955, producing heavy rainfall of four to six inches across the state. The saturated soil conditions exacerbated the flooding caused by Diane five days later, a Category 1 hurricane and the wettest tropical cyclone on record for the Northeast. Diane produced 14 inches of rain in a 30-hour period, causing destructive flooding conditions along nearly every major river system in the state.

The Mad and Still Rivers in Winsted, the Naugatuck, the Farmington, and the Quinebaug River in northeastern Connecticut caused the most damage. The floodwaters resulted in over 100 deaths, left 86,000 unemployed, and caused an estimated \$200 million in damages (1955 USD). For comparison, the total property taxes levied by all Connecticut municipalities in 1954 amounted to \$194.1 million. A description of damage caused by the storm in the Borough of Naugatuck was included in Section 3.3. As a result of the 1955 flooding, the ACOE installed flood control dams in the Naugatuck River watershed, as detailed in Section 3 and Section 8.

More recently, flooding and winds associated with hurricanes have caused extensive shoreline erosion and related damage. In September of 1985, hurricane Gloria passed over the coastline as a Category 2 hurricane. The hurricane struck at low tide, resulting in low to moderate storm surges along the coast. The storm produced up to six inches of

rain in some areas and heavy winds which damaged structures and uprooted trees. Over 500,000 people suffered significant power outages.

Hurricane Bob, a Category 2 hurricane that made landfall in 1991, caused storm surge damage along the Connecticut coast, but was more extensively felt in Rhode Island and Massachusetts. Heavy winds were felt across eastern Connecticut with gusts up to 100 mph recorded, and the storm was responsible for six deaths in the state. Total damage in southern New England was approximately \$1.5 billion (1991 USD).

The most recent tropical cyclone to impact Connecticut was tropical storm Floyd in 1999. Floyd is the storm of record in the Connecticut Natural Hazard Mitigation Plan and is discussed in more detail in Section 3.3. Tropical Storm Floyd caused power outages throughout New England and at least one death in Connecticut.

4.4 Existing Programs, Policies, and Mitigation Measures

Existing mitigation measures appropriate for inland flooding have been discussed in Section 3. These include ordinances, codes, and regulations that have been enacted to minimize flood damage. In addition, various structures exist to protect certain areas, including dams and riprap.

Wind loading requirements are addressed through the state building code. The Connecticut Building Code was amended in 2005 and adopted with an effective date of December 31, 2005. The new code specifies the design wind speed for construction in all the Connecticut municipalities, with the addition of split zones for some municipalities. For example, for municipalities along the Merritt Parkway such as Fairfield and Trumbull, wind speed criteria are different north and south of the Parkway in relation to the distance from the shoreline. Effective December 31, 2005, the design wind speed for Naugatuck is 100 miles per hour. Naugatuck has adopted the Connecticut Building Code as its building code.

Parts or all of tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. Currently tree maintenance is coordinated by the Borough Engineering Department and the Tree Warden, who is part of the Department of Public Works. Naugatuck residents can request a review of any hazardous trees that they believe belongs to the Borough and is creating a hazardous condition. The Engineering Department will dispatch a crew to determine if the tree is on Borough property and Naugatuck's Tree Warden will determine if the tree must be trimmed or removed. The Borough will only remove or trim trees that are determined to be hazardous, dead, or obstructing vision for vehicular traffic. CL&P also performs tree maintenance, but landowners are primarily responsible for conducting tree maintenance on private property away from Borough property. The Borough attempts to close roads at convenient intersections rather than at the location of the downed tree or branch. In addition, all utilities in new subdivisions must be located underground whenever possible in order to mitigate storm-related damages.

As explained in Section 2.9, the Borough of Naugatuck has buildings that can be used as shelters for evacuees. However, as none of these buildings have generators, and as the Borough has limited staffing available, the Borough generally has residents shelter in place unless there is an immediate need for evacuation. As hurricanes generally pass an area within a day's time, additional shelters can be set up after the storm as needed for long-term evacuees, or regional mass care facilities operated by the American Red Cross could be utilized.

The Borough relies on radio and television to spread information on the location and availability of shelters. During a disaster, the Borough will notify residents of emergency information on a neighborhood basis using its CodeRED emergency notification service. Prior to severe storm events, the Borough ensures that warning/notification systems and communication equipment is working properly, and prepares for the possible evacuation of impacted areas.

4.5 Vulnerabilities and Risk Assessment

It is generally believed that New England is long overdue for another major hurricane strike. Recall that according to the 2007 Connecticut Natural Hazard Mitigation Plan Update, a moderate Category II storm is expected to strike the state once per decade. The Borough of Naugatuck is less vulnerable to hurricane damage than coastal municipalities in Connecticut because it does not need to deal with the effects of storm surge.

The Borough of Naugatuck is vulnerable to hurricane damage from wind and flooding, and from any tornadoes accompanying the storm. Areas of known and potential flooding problems are discussed in Section 3, and tornadoes will be discussed in Section 5. Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes. Debris such as signs, roofing material, and small items left outside become flying missiles in hurricanes. Extensive damage to trees, towers, aboveground and underground utility lines (from uprooted trees), and fallen poles cause considerable disruption for residents. Streets may be flooded or blocked by fallen branches, poles, or trees, preventing egress. Downed power lines from heavy winds can also start fires, so adequate fire protection is important.

There are five mobile home parks in the Borough of Naugatuck that are considered to be at increased risk of being damaged by high winds associated with tropical storm systems:

- ❑ Idlevue Mobile Home Park on Lewis Hill off Duncan Avenue in the northwestern section of Naugatuck;
- ❑ Riverview Mobile Home Estates on Thunderbird Drive in the northern part of Naugatuck overlooking the Naugatuck River;
- ❑ The Davis Mobile Home Park at 117 Lewis Street;
- ❑ The Weber Mobile Home Park at 137 Lewis Street; and
- ❑ Gendron's Valley Mobile Home Park at 108 Clark Hill Road.

As the residents and businesses of the State of Connecticut become more dependent on the internet and mobile communications, the impact of hurricanes on commerce will continue to increase. A major hurricane has the potential of causing complete disruption of power and communications for up several weeks, rendering electronic devices and those that rely on utility towers and lines inoperative. According to the Connecticut DEP, this is a significant risk that cannot be quantitatively estimated.

As the Borough of Naugatuck is not affected by storm surge, hurricane sheltering needs have not been calculated by the Army Corps of Engineers for the Borough. The Borough of Naugatuck determines sheltering need based upon areas damaged within the Borough. Under limited emergency conditions, a high percentage of evacuees will seek shelter with friends or relatives rather than go to established shelters. During extended power outages, it is believed that only 10% to 20% of the affected population of Naugatuck will relocate, though many of this number will again stay with friends or relatives rather than go to established shelters.

4.6 Potential Mitigation Measures, Strategies, and Alternatives

Many potential mitigation measures for hurricanes include those appropriate for inland flooding. These were presented in Section 3.6. However, hurricane mitigation measures must also address the effects of heavy winds that are inherently caused by hurricanes. Mitigation for wind damage is therefore emphasized in the subsections below.

4.6.1 Prevention

Although hurricanes and tropical storms cannot be prevented, a number of methods are available to continue preventing damage from the storms, and perhaps to mitigate damage. The following actions have been identified as potential preventive measures:

- ❑ Continue Borough-wide tree limb inspection and maintenance programs to ensure that the potential for downed power lines is diminished.
- ❑ Continue location of utilities underground in new developments or as related to redevelopment.
- ❑ As required by law, continue to review the currently enacted Emergency Operations Plan for the Borough and update when necessary.

4.6.2 Property Protection

Potential mitigation measures include designs for hazard-resistant construction and retrofitting techniques. These may take the form of increased wind and flood resistance, as well as the use of storm shutters over exposed glass and the inclusion of hurricane straps to hold roofs to buildings. Compliance with the amended Connecticut Building Code for wind speeds is necessary. Literature should be made available by the Building Department and the Planning and Zoning Commission to developers during the permitting process regarding these design standards.

4.6.3 Public Education and Awareness

The public should be made aware of evacuation routes and available shelters. A number of specific proposals for improved public education are recommended to prevent damage and loss of life during hurricanes. These are common to all hazards in this plan, and are listed in Section 10.1.

4.6.4 Emergency Services

The Emergency Operation Plan of the Borough of Naugatuck includes guidelines and specifications for communication of hurricane warnings and watches, as well as for a call

for evacuation. The public needs to be made aware in advance of a hurricane event of evacuation routes and the locations of public shelters, which could be accomplished by placing this information on the Borough website and by creating informational displays in local municipal buildings. In addition, Naugatuck should identify and prepare additional facilities for evacuation and sheltering needs. The Borough should also review its mutual aid agreements and update as necessary to ensure help is available as needed.

4.6.5 Structural Projects

Structural projects for wind damage mitigation are not possible.

4.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

While many potential mitigation activities were addressed in Section 4.6, the recommended mitigation strategies for mitigating hurricane and tropical storm winds in the Borough of Naugatuck are listed below.

- ☐ Continue Borough-wide tree limb inspection and maintenance programs to ensure that the potential for downed power lines is diminished.
- ☐ Focus tree limb maintenance and inspections along Route 63, Route 68, Spring Street, Union City Road, and other evacuation routes. Increase inspections of trees on private property near power lines and Borough right-of-ways.
- ☐ Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.
- ☐ Review potential evacuation plans to ensure timely migration of people seeking shelter in all areas of Naugatuck, and post evacuation and shelter information on the Borough website and in municipal buildings.
- ☐ Provide for the Building Department to have literature available regarding appropriate design standards for wind.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

5.0 SUMMER STORMS & TORNADOES

5.1 Setting

Like hurricanes and winter storms, summer storms and tornadoes have the potential to affect any area within the Borough of Naugatuck. Furthermore, because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the Borough without harming another. The entire Borough of Naugatuck is therefore susceptible to summer storms (including heavy rain, flash flooding, wind, hail, and lightning) and tornadoes.

Based on the historic record, it is considered highly likely that a summer storm that includes lightning will impact the Borough of Naugatuck each year, although lightning strikes have a limited effect. Strong winds and hail are considered likely to occur during such storms but also generally have limited effects. A tornado is considered a possible event in New Haven County each year that could cause significant damage to a small area (refer to Appended Table 2).

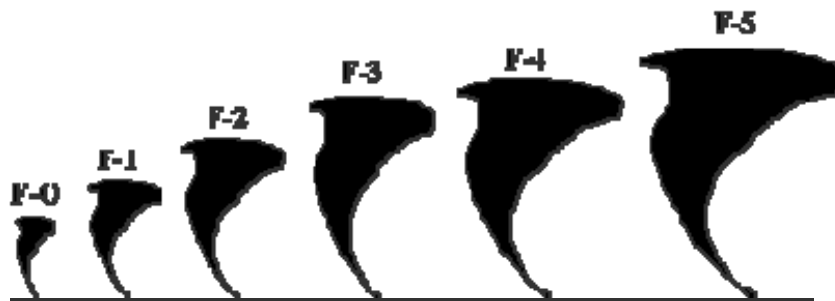
5.2 Hazard Assessment

Heavy wind (including tornadoes and downbursts), lightning, heavy rain, hail, and flash floods are the primary hazards associated with summer storms. Inland flooding and flash flooding caused by heavy rainfall was covered in Section 3.0 of this plan and will not be discussed in detail here.

Tornadoes

Tornadoes are spawned by certain thunderstorms. NOAA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." The Fujita scale was accepted as the official classification system for tornado damage for many years following its publication in 1971. The Fujita scale rated the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure. The scale ranked tornadoes using the now-familiar notation of F0 through F5, increasing with wind speed and intensity. The following graphic of the Fujita scale is provided by FEMA. A description of the scale follows in Table 5-1.

Fujita Tornado Scale



**Table 5-1
Fujita Scale**

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.

Table 5-1 (Continued)
Fujita Scale

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 winds that would surround the F6 winds. Missiles, such as cars and refrigerators, would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

According to NOAA, weak tornadoes (F0 and F1) account for approximately 69% of all tornadoes. Strong tornadoes (F2 and F3) account for approximately 29% of all tornadoes. Violent tornadoes (F4 and above) are rare but extremely destructive, and account for only 2% of all tornadoes.

The Enhanced Fujita Scale was released by NOAA for implementation on February 1, 2007. According to the NOAA web site, the Enhanced Fujita Scale was developed in response to a number of weaknesses to the Fujita Scale that were apparent over the years, including the subjectivity of the original scale based on damage, the use of the worst damage to classify the tornado, the fact that structures have different construction depending on location within the United States, and an overestimation of wind speeds for F3 and greater.

The Enhanced F-scale is still a set of wind estimates based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to 28 specific indicators. Table 5-2 relates the Fujita and enhanced Fujita scales.

Table 5-2
Enhanced Fujita Scale

Fujita Scale			Derived EF Scale		Operational EF Scale	
<i>F Number</i>	<i>Fastest 1/4-mile (mph)</i>	<i>3 Second Gust (mph)</i>	<i>EF Number</i>	<i>3 Second Gust (mph)</i>	<i>EF Number</i>	<i>3 Second Gust (mph)</i>
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

The historic record of tornadoes is discussed in Section 5.3. The pattern of occurrence in Connecticut is expected to remain unchanged according to the Connecticut Natural Hazards Mitigation Plan (2007). The highest relative risk for tornadoes in the state is Litchfield and Hartford Counties, followed by New Haven, Fairfield, Tolland, Middlesex, Windham, and finally New London County. By virtue of its location in New Haven County, the Borough of Naugatuck is therefore at a relatively higher risk of tornadoes compared to most of the state.

Lightning

Lightning is a circuit of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges.

However, when the potential between the positive and negative charges becomes too great, a discharge of electricity (lightning) occurs.

In-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom. Cloud to cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom of a second cloud. Cloud to ground lightning is the most dangerous. In summertime, most cloud to ground lightning occurs between the negative charges near the bottom of the cloud and positive charges on the ground.

According to NOAA's National Weather Service, lightning reportedly kills an average of 80 people per year in the United States, in addition to an average of 300 lightning injuries per year. Most lightning deaths and injuries occur outdoors, with 45% of lightning casualties occurring in open fields and ballparks, 23% under trees, and 14% involving water activities. Only 15 lightning-related fatalities occurred in Connecticut between 1959 and 2005, and only one occurred between 1998 and 2007. Most recently, on June 8, 2008, lightning struck a pavilion at Hammonasset Beach in Madison, Connecticut, injuring five and killing one.

Thunderstorms occur 18 to 35 days each year in Connecticut. According to a report by meteorologist Joe Furey on Fox 61 News, 2008 was an abnormal year for thunderstorms, with 20 days of thunderstorm activity occurring by the end of July.

In general, thunderstorms in Connecticut are more frequent in the western and northern parts of the state, and less frequent in the southern and eastern parts. Although lightning is usually associated with thunderstorms, it can occur on almost any day. The likelihood of lightning strikes in the Naugatuck area is very high during any given thunderstorm, although no one area of the Borough is at higher risk of lightning strikes.

Downbursts

A downburst is a severe localized wind blasting down from a thunderstorm. They are more common than tornadoes in Connecticut. These "straight line" winds are

distinguishable from tornadic activity by the pattern of destruction and debris.

Depending on the size and location of these events, the destruction to property may be significant. Downbursts may be categorized as microbursts (affecting an area less than 2.5 miles in diameter) or macrobursts (affecting an area at least 2.5 miles in diameter).

It is difficult to find statistical data regarding frequency of downburst activity. However, downburst activity is, on occasion, mistaken for tornado activity in Connecticut, indicating that it is a relatively uncommon yet persistent hazard. The risk to the Borough of Naugatuck is believed to be low to moderate for any given year.

Downbursts may be categorized as ***microbursts*** (affecting an area less than 2.5 miles in diameter) or ***macrobursts*** (affecting an area at least 2.5 miles in diameter).

Hail

Hailstones are chunks of ice that grow as updrafts in thunderstorms keep them in the atmosphere. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. While crops are the major victims of hail, it is also a hazard to vehicles and property.

Hailstorms typically occur in at least one part of Connecticut each year during a severe thunderstorm. As with thunderstorms, hailstorms are more frequent in the northwest and western portions of the state, and less frequent in the southern and eastern portions. Overall, the risk of at least one hailstorm occurring in Naugatuck is moderate in any given year.

5.3 Historic Record

The National Climatic Data Center (NCDC) lists 13 tornado events in New Haven County since 1950. This includes one F4 rated tornado, two F3 rated tornadoes, three F2

rated tornadoes, three F1 rated tornadoes, two F0 rated tornadoes, and two undefined tornadoes. Property damages from tornados in the County totaled approximately 280 million dollars. Table 5-3 lists the tornado events for New Haven County.

Table 5-3
Tornado Events in New Haven County Since 1950

Date	Fujita Tornado Scale	Property Damage	Wind Speed
October 24, 1955	F2	\$3,000	113 – 157 mph
August 29, 1959	F-	\$0	Unknown
May 24, 1962	F3	\$2,500,000	158 – 206 mph
July 29, 1971	F3	\$250,000	158 – 206 mph
September 18, 1973	F2	\$0	113 – 157 mph
July 28, 1982	F1	\$3,000	73 – 112 mph
July 10, 1989	F2	\$25,000,000	113 – 157 mph
July 10, 1989	F4	\$250,000,000	207 – 260 mph
May 29, 1995	F-	\$10,000	Unknown
May 29, 1995	F1	\$50,000	73 – 112 mph
July 23, 1995	F0	\$0	40 – 72 mph
July 3, 1996	F1	\$2,000,000	73 – 112 mph
May 31, 2002	F0	\$0	40 – 72 mph

A limited selection of summer storm damage in and around Naugatuck, taken from the NCDC Storm Events database, is listed below:

- ❑ September 9, 1994 – Lightning strikes were reported from Milford to Naugatuck.
- ❑ April 4, 1995 – A roof was blown off of one house and two other homes were damaged by thunderstorm winds in Naugatuck.
- ❑ May 29, 1995: Severe thunderstorm winds were reported in the vicinity of Seymour and Naugatuck.
- ❑ August 2, 1995 – Severe thunderstorms were reported between Oxford and Naugatuck. The storm downed several trees and power lines as it moved across Connecticut.
- ❑ October 21, 1995 – A squall line generated thunderstorms that downed several trees and power lines. Several vehicles were damaged by the falling trees.

- ❑ July 15, 1997: Clusters of slow-moving severe thunderstorms produced high winds (50 miles per hour), hail, and heavy rain across New Haven County. Lightning struck four hilltop houses in eastern Naugatuck, causing minor damage.
- ❑ June 30, 1998: Two rounds of thunderstorms affected New Haven County, producing frequent lightning and heavy rain. Lightning struck a house in the Ridge Subdivision of Naugatuck, causing damage to a bedroom wall in the morning. In the afternoon, severe thunderstorms produced high winds, large hail, and frequent lightning that downed many trees in New Haven County.
- ❑ August 11, 1998: An isolated severe thunderstorm produced a wet microburst of high winds and heavy rain over Naugatuck. The 61 mph winds caused a three-quarter of a mile wide area of widespread tree damage from Highland Avenue to Woodland Street (about one to one and a half miles in length). Two people were injured when a large tree fell on their second floor porch on High Street.
- ❑ January 18, 1999: Thunderstorms produced a brief period of high winds, lightning, and torrential rain. Lightning struck a house on Osborn Road in Naugatuck, and struck a house on Keefe Street in Waterbury. The rainfall caused minor flooding of low-lying and poor drainage areas including streets and basements.
- ❑ September 16, 1999 – In addition to the flooding damages described in Section 3.3, the remnants of Tropical Storm Floyd also produced wind gusts up to 60 miles per hour in New Haven County, causing widespread downing of trees and power lines. Significant power outages were reported.
- ❑ May 18, 2000: A line of severe thunderstorms produced damaging wind gusts up to 70 mph, primarily small hail, heavy rain, and lightning. Spotters reported downed trees, tree limbs, and wires in Waterbury, and one-half inch diameter hail was reported in Naugatuck.
- ❑ June 11, 2001: Locally severe thunderstorms produced high winds that downed trees and power lines across portions of southern Connecticut, and heavy rains that caused areas of flooding on roadways and in low-lying areas. 50 mph winds were reported in Naugatuck.

- ❑ June 16, 2002 – A severe thunderstorm produced large hail and damaging wind gusts as it moved east across Connecticut. Spotters reported 0.75-inch diameter hail in Waterbury, and high winds downed trees in Naugatuck.
- ❑ August 21, 2004 – Trees were downed in Beacon Falls and Southbury as a result of thunderstorms accompanied by 50 mph wind gusts.
- ❑ July 28, 2006 – Severe thunderstorms produced high winds up to 50 mph that downed many trees and power lines across the state, including in nearby Beacon Falls.
- ❑ June 5, 2007: Severe thunderstorms produced large hail (up to 1.75 inches in diameter) that accumulated up to one inch in depth along the Interstate 84 corridor. The storms also produced damaging winds and two to three inches of heavy rainfall that caused flash flooding throughout the area. The flash flooding resulted in lane closures on Prospect Street in Naugatuck.
- ❑ July 28, 2007: Thunderstorms produced torrential rain and high winds and flash flooding in parts of New Haven and Middlesex Counties. Old Firehouse Road in Naugatuck was closed due to flooding.

5.4 **Existing Programs, Policies, and Mitigation Measures**

Warning is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. Tables 5-4 and 5-5 list the National Oceanic and Atmospheric Administration (NOAA) Watches and Warnings, respectively, as pertaining to actions to be taken by emergency management personnel in connection with summer storms and tornadoes.

A severe thunderstorm watch is issued by the National Weather Service when the weather conditions are such that a severe thunderstorm (winds greater than 58 miles per hour, or hail three-fourths of an inch or greater) is likely to develop.

A severe thunderstorm warning is issued when a severe thunderstorm has been sighted or indicated by weather radar.

**Table 5-4
NOAA Weather Watches**

Weather Condition	Meaning	Actions
Severe Thunderstorm	Severe thunderstorms are possible in your area.	Notify personnel, and watch for severe weather.
Tornado	Tornadoes are possible in your area.	Notify personnel, and be prepared to move quickly if a warning is issued.
Flash Flood	It is possible that rains will cause flash flooding in your area.	Notify personnel to watch for street or river flooding.

**Table 5-5
NOAA Weather Warnings**

Weather Condition	Meaning	Actions
Severe Thunderstorm	Severe thunderstorms are occurring or are imminent in your area.	Notify personnel and watch for severe conditions or damage (i.e. downed power lines and trees. Take appropriate actions listed in local emergency plans.
Tornado	Tornadoes are occurring or are imminent in your area.	Notify personnel, watch for severe weather and ensure personnel are protected. Take appropriate actions listed in emergency plans.
Flash Flood	Flash flooding is occurring or imminent in your area.	Watch local rivers and streams. Be prepared to evacuate low-lying areas. Take appropriate actions listed in emergency plans.

Aside from warnings, several other methods of mitigation for wind damage are employed in Naugatuck. Continued location of utilities underground is an important method of reducing wind damage to utilities and the resulting loss of services. The Connecticut Building Codes include guidelines for Wind Load Criteria that are specific to each municipality, as explained in Section 4.0. In addition, specific mitigation measures address debris removal and tree trimming.

In the Borough of Naugatuck, the local utilities are responsible for tree branch removal and maintenance above and near their lines. In addition, all new developments in

Naugatuck must place utilities underground wherever possible. The Public Works Department also performs annual tree maintenance on municipal right of ways.

Municipal responsibilities relative to tornado mitigation and preparedness include:

- ❑ Developing and disseminating emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- ❑ Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- ❑ Periodically test and exercise tornado response plans.
- ❑ Put emergency personnel on standby at tornado 'watch' stage.

5.5 Vulnerabilities and Risk Assessment

The central and southern portions of the United States are at higher risk for lightning and thunderstorms than is the northeast. However, more deaths from lightning occur on the East Coast than elsewhere, according to FEMA. Lightning-related fatalities have declined in recent years due to increased education and awareness.

Most thunderstorm damage is caused by straight-line winds exceeding 100 mph. Straight-line winds occur as the first gust of a thunderstorm or from the downburst from a thunderstorm, and have no associated rotation. Naugatuck is particularly susceptible to damage from high winds due to its high elevation and heavily treed landscape.

Heavy winds can take down trees near power lines, leading to the start and spread of fires. Such fires can be extremely dangerous during the summer months during dry and drought conditions. Most downed power lines in Naugatuck are detected quickly and any associated fires are quickly extinguished. However, it is important to have adequate water supply for fire protection to ensure this level of safety is maintained.

According to Borough personnel, the most susceptible areas of Borough to wind damage are the mobile home parks listed in Section 4.5. Other areas of Borough are more susceptible to damage from falling branches and trees than from actual wind damage.

5.6 Potential Mitigation Measures, Strategies, and Alternatives

Both the FEMA and the NOAA websites contain valuable information regarding preparing for a protecting

More information is available at:

FEMA – <http://www.fema.gov/library/>
NOAA – <http://www.nssl.noaa.gov/NWSTornado/>

oneself during a tornado, as well as information on a number of other natural hazards.

Available information from FEMA includes:

- ☐ Design and construction guidance for creating and identifying community shelters;
- ☐ Recommendations to better protect your business, community, and home from tornado damage, including construction and design guidelines for structures;
- ☐ Ways to better protect property from wind damage;
- ☐ Ways to protect property from flooding damage; and
- ☐ Construction of safe rooms within homes.

NOAA information includes a discussion of family preparedness procedures and the best physical locations during a storm event. Although tornadoes pose a legitimate threat to public safety, their occurrence is considered too infrequent to justify the construction of tornado shelters. Residents should be encouraged to purchase a NOAA weather radio containing an alarm feature.

The recent implementation of the CodeRED emergency notification system in Naugatuck is beneficial for warning residents of an impending tornado. The Emergency Management Department has a page on its website

(http://www.naugatuck-ct.gov/Emergency_Management.htm) to encourage residents to become part of the CodeRED database. A community warning system that relies on radios and television is less effective at warning residents during the night when the majority of the community is asleep. This fact was evidenced most recently by the severe storm that struck Lake County, Florida on February 2, 2007. This powerful storm that included several tornadoes struck at about 3:15 AM. According to National Public Radio, local broadcast stations had difficulty warning residents due to the lack of listeners and viewers and encouraged those awake to telephone warnings into the affected area.

Specific mitigation steps that can be taken to prevent property damage and protect property are given below.

Prevention

- ☐ Continue or increase tree limb inspection programs to ensure that the potential for downed power lines is minimized.
- ☐ Continue to place utilities underground.

Property protection

- ☐ Continue to require compliance with the amended Connecticut Building Code for wind speeds.
- ☐ Provide for the Building Department to make literature available during the permitting process regarding appropriate design standards.

5.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

The following actions are recommended to mitigate for winds, hail, tornadoes, and downbursts:

- ❑ Increase tree limb maintenance and inspections, especially in the downtown areas.
- ❑ Perform outreach regarding dangerous trees on private property.
- ❑ Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas
- ❑ Continue to require compliance with the amended Connecticut Building Code for wind speeds.
- ❑ Provide for the Building Department or the Planning and Zoning Commission to make literature available during the permitting process regarding appropriate design standards.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

6.0 WINTER STORMS

6.1 Setting

Similar to summer storms and tornadoes, winter storms have the potential to affect any area of the Borough of Naugatuck. However, unlike summer storms, winter events and the hazards that result (wind, snow, and ice) have more widespread geographic extent. The entire Borough of Naugatuck is susceptible to winter storms. In general, winter storms are considered highly likely to occur each year (major storms are less frequent), and the hazards that result (nor'easter winds, snow, and blizzard conditions) can potentially have a significant effect over a large area of the Borough (refer to Appended Tables 1 and 2).

6.2 Hazard Assessment

This section focuses on those effects commonly associated with winter storms, including those from blizzards, ice storms, heavy snow, freezing rain and extreme cold. Most deaths from winter storms are indirectly related to the storm, such as from traffic accidents on icy roads and

According to the *National Weather Service*, approximately 70% of winter deaths related to snow and ice occur in automobiles, and approximately 25% of deaths occur from people being caught in the cold. In relation to deaths from exposure to cold, 50% are people over 60 years old, 75% are male, and 20% occur in the home.

hypothermia from prolonged exposure to cold. Damage to trees and tree limbs and the resultant downing of utility cables are a common effect of these types of events. Secondary effects include loss of power and heat.

The classic winter storm in New England is the nor'easter, which is caused by a warm moist, low pressure system moving up from the south colliding with a cold, dry high pressure system moving down from the north. The nor'easter derives its name from the northeast winds typically accompanying such storms, and such storms tend to produce a

large amount of precipitation. Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice pellets, flooding, heavy winds, and extreme cold. The National Weather Service defines a blizzard as having winds over 35 mph with snow with blowing snow that reduces visibility to less than one-quarter mile for at least three hours.

Connecticut experiences at least one severe winter storm every five years, although a variety of small and medium snow and ice storms occur nearly every winter. The likelihood of a nor'easter occurring in any given winter is therefore considered high, and the likelihood of other winter storms occurring in any given winter is very high.

The Northeast Snowfall Impact Scale (NESIS) was developed by Paul Kocin and Louis Uccellini (Kocin and Uccellini, 2004) and is used by NOAA to characterize and rank high-impact Northeast snowstorms. These storms have wide areas of snowfall with accumulations of ten inches and above. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements, thus giving an indication of a storm's societal impacts.

NESIS values are calculated within a geographical information system (GIS). The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score, which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers. Table 6-1 presents the NESIS categories, their corresponding NESIS values, and a descriptive adjective.

Table 6-1
NESIS Categories

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

6.3 Historic Record

Seven major winter nor'easters have occurred in Connecticut during the past 30 years (in 1979, 1983, 1988, 1992, 1996, 2003, and 2006). The 1992 nor'easter, in particular, caused the third-highest tides ever recorded in Long Island Sound and damaged 6,000 coastal homes. Inland areas received up to four feet of snow. Winter Storm Ginger in 1996 caused up to 27 inches of snow 24 hours and shut down the State of Connecticut for an entire day. The nor'easter which occurred on February 12 and 13, 2006 resulted in 18 to 24 inches of snow across Connecticut and was rated on NESIS as a Category 3 "Major" storm across the northeast. This storm ranked 20th out of 33 major winter storms ranked by NESIS for the northeastern United States since 1956, and produced 21 inches of snow in Seymour and 23 inches of snow in Waterbury.

The most damaging winter storms are not always nor'easters. According to the NCDC, there have been 135 snow and ice events in the State of Connecticut between 1993 and March 2008, causing over \$18 million in damages. Notably, heavy snow in December 1996 caused \$6 million in property damage. Snow removal and power restoration for a winter storm event spanning March 31 and April 1, 1997 cost \$1 million. On March 5, 2001, heavy snow caused \$5 million in damages, followed by another heavy snow event four days later that caused an additional \$2 million in damages. The last documented

winter storm event that qualified as a blizzard was Winter Storm Ginger in January of 1996. These events were recorded for various counties throughout the state.

Catastrophic ice storms are less frequent in Connecticut than the rest of New England due to the close proximity of the warmer waters of the Atlantic Ocean and Long Island Sound. The most severe ice storm in Connecticut on record was Ice Storm Felix on December 18, 1973. This storm resulted in two deaths and widespread power outages throughout the state. An ice storm in November of 2002 that hit Litchfield and western Hartford Counties resulted in \$2.5 million in public sector damages.

Additional examples of recent winter storms to affect New Haven County, taken from the NCDC database, include:

- ❑ March 13 to 14, 1993 – A powerful storm caused blizzard conditions and up to 21 inches of snow in Litchfield County, with less snowfall occurring in New Haven County. 40,000 power outages and \$550,000 in property damage was reported throughout Connecticut.
- ❑ December 23, 1994 – An unusual snow-less late December storm caused gale force winds across the state. The high winds caused widespread power outages affecting up to 130,000 customers statewide. Numerous trees and limbs were blown down, damaging property, vehicles, and power lines to a total of five million dollars in damages. Peak wind gusts of up to 64 miles per hour were reported.
- ❑ January 12, 1995 – Light snow and sleet changed to light freezing rain, coating highways with ice. Up to 200 accidents occurred on state highways.
- ❑ April 9, 1996 – A late winter storm produced heavy wet snow across most of southern Connecticut. The weight of the snow caused numerous trees and power lines to fall. Snowfall amounts ranged from three to 14 inches across New Haven County.
- ❑ April 1, 1997 – A low pressure system produced morning rain and afternoon wet snow during the afternoon. Strong gusty winds up to 40 mph combined with the wet

snow to cause power lines and trees to fall. Nine inches of snow was reported in Beacon Falls.

- ❑ December 29, 1997 – A low pressure system produced sustained winds of 30 to 40 mph with gusts up to 59 knots, with damage to trees and power lines reported in Ansonia and Naugatuck.
- ❑ January 15, 1998 – An ice storm caused widespread and numerous traffic accidents across northern New Haven County, with at least one-half inch of ice accumulating on trees and power lines. Several roads were closed due to severe icing.
- ❑ March 15, 1999 – Light rain changed to wet snow that became heavy overnight, downing numerous tree limbs and power lines across the region. Snowfall amounts in New Haven County ranged from eight to 11 inches.
- ❑ January 25, 2000 – A winter storm produced up to two inches of snow per hour in northern New Haven County, which changed into sleet and freezing rain as the storm progressed. Snowfall was measured at 6.3 inches in neighboring Beacon Falls and seven inches in neighboring Waterbury, and the snow was accompanied by wind gusts up to 45 mph.
- ❑ December 12, 2000 – High winds produced peak wind gusts of up to 58 mph in northern New Haven County, downing many trees onto houses, cars, power lines, and streets and causing significant property damage and power outages in Naugatuck and Waterbury.
- ❑ December 30, 2000: A winter storm produced six to 12 inches of snow across northern New Haven County. There were numerous reports of thunder and lightning along with high winds that caused near-blizzard conditions. Twelve inches of snow was reported in Naugatuck.
- ❑ February 5, 2001 – A winter storm produced bands of heavy wet snow across New Haven County, with amounts ranging from ten to 20 inches reported. The heavy snow caused numerous fallen tree limbs that snapped power lines, power outages, and caused many traffic accidents.

- ❑ November 27, 2002 – Bands of heavy snow passed over northern New Haven County, producing seven inches of snow in neighboring Beacon Falls and nine inches in neighboring Waterbury.
- ❑ December 5, 2003 – A winter storm produced occasionally heavy snow with accumulations of up to 13 inches in Oxford. Wind gusts of at least 35 mph combined with the snow to create "white-out" conditions that caused major widespread impacts to mass transit across the entire region.
- ❑ January 28, 2004: A winter storm produced six to 11 inches of snow across Connecticut, and produced six inches of snow in Naugatuck and eight in Waterbury.
- ❑ February 25, 2005 – A winter storm produced snow amounts of five to 10 inches across the state.
- ❑ March 8, 2005 – A strong arctic cold front intensified as it swept across Connecticut, causing rain to change to snow and temperatures to fall from the 40s to the 20s, and produced northwest winds up to 55 mph. Near blizzard conditions occurred for a short time, with snowfall amounts ranging from three to six inches. The sudden drop in temperature resulted in a "flash-freeze" across roads that resulted in hundreds of vehicle accidents.
- ❑ March 12, 2005 – A band of heavy snow oriented from south to north across New Haven County produced snowfall totaling nine inches at rates in excess of two inches per hour as measured in neighboring Beacon Falls.
- ❑ March 24, 2005 – A late winter storm produced six inches of snow in neighboring Beacon Falls.
- ❑ December 9, 2005 – A winter storm produced six to 12 inches of snow across Connecticut.
- ❑ January 9, 2008 – Gusty winter winds caused a partial collapse of a building under construction in neighboring Oxford.

6.4 Existing Programs, Policies, and Mitigation Measures

Existing programs applicable to flooding and wind are the same as those discussed in Sections 3.0 and 4.0. Programs that are specific to winter storms are generally those related to preparing plows, sand and salt trucks; tree-trimming to protect power lines; and other associated snow removal and response preparations.

As it is almost guaranteed that winter storms will occur annually in Connecticut, it is important for municipalities to budget for and then allocate fiscal resources for snow management. The Borough ensures that all warning/notification and communications systems are ready before a storm, and ensures that appropriate equipment and supplies, especially snow removal equipment, are in place and in good working order. The Borough also prepares for the possible evacuation and sheltering of some populations which could be impacted by the upcoming storm (especially the elderly and special needs persons).

The Borough of Naugatuck's streets are plowed with a combination of Borough trucks and private contractors. Each section of the Borough has a crew assigned to it. Plow trucks are first dispatched to the areas of Naugatuck with higher elevations as it begins to snow. During emergencies, a plow vehicle can be dispatched ahead of an emergency vehicle.

6.5 Vulnerabilities and Risk Assessment

As mentioned for summer storms, the heavily treed landscape in close proximity to densely populated residential areas in the Borough of Naugatuck poses problems in relation to blizzard condition damage. Tree limbs and some building structures may not be suited to withstand high wind and snow loads. Ice can damage or collapse power

lines, render steep gradients impassable for motorists, undermine foundations, and cause "flood" damage from freezing water pipes in basements.

In addition, winter storms present additional problems for motorists all over the state. As the population of Connecticut and its dependence on transportation continues to increase, the vulnerability of the state to winter storms also increases. There is a high propensity for traffic accidents and traffic jams during heavy snow and even light icing events. Roads may become impassable, inhibiting the ability of emergency equipment to reach trouble spots and the accessibility to medical and shelter facilities. Stranded motorists, especially senior and/or handicapped citizens, are at particularly high risk of injury or death from exposure during a blizzard. After a storm, snow piled on the sides of roadways can inhibit line of sight and reflect a blinding amount of sunlight, making driving difficult. When coupled with slippery road conditions, poor sightlines and heavy glare create dangerous driving conditions.

As there is over 720 feet in elevation difference between the high point and low point in the Borough, Naugatuck can experience snow in the hills while it rains in the downtown area. The Borough relies on its personnel to report areas receiving snow in the higher elevations, as there are many hills in Naugatuck which can make driving difficult in icy weather.

As for other winter hazards, drifting snow is not as large a problem in Naugatuck as in other areas, but it can still occur. This problem is mitigated through municipal plowing efforts. Ice jams are not a problem in Naugatuck.

Recall from Figure 2-7, Figure 2-8, and Figure 2-9 that elderly, linguistically isolated, and disabled populations reside in the Borough of Naugatuck. It is possible that significant populations impacted by a severe winter storm could consist of the elderly, linguistically isolated households, and people with disabilities. Thus, it is important for

Naugatuck's emergency personnel to be prepared to assist these special populations during emergencies such as winter storms.

6.6 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for flooding caused by nor'easters include those appropriate for flooding. These were presented in Section 3.6. Winter storm mitigation measures must also address blizzard, snow, and ice hazards. These are emphasized below. Note that structural projects are generally not applicable to hazard mitigation for wind, blizzard, snow, and ice hazards.

6.6.1 Prevention

Cold air, wind, snow, and ice can not be prevented from impacting any particular area. Thus, mitigation should be focused on property protection and emergency services (discussed below) and prevention of damage as caused by breakage of tree limbs.

Previous recommendations for tree limb inspections and maintenance in Sections 4.0 and 5.0 are thus applicable to winter storm hazards, as well. As mentioned previously, utilities in Naugatuck should continue to be placed underground where possible. This can occur in connection with new development and also in connection with redevelopment work. Underground utilities cannot be damaged by heavy snow, ice, and winter winds.

6.6.2 Property Protection

Property can be protected during winter storms through the use of shutters, storm doors, and storm windows. Where flat roofs are used on structures, snow removal is important as the heavy load from collecting snow may exceed the bearing capacity of the structure.

Heating coils may be used to remove snow from flat roofs. Pipes should be adequately insulated to protect against freezing and bursting. All of these recommendations should apply to new construction, although they may also be applied to existing buildings during renovations. Finally, as recommended in previous sections, compliance with the amended Connecticut Building Code for wind speeds is necessary.

6.6.3 Public Education and Awareness

The public is typically more aware of the hazardous effects of snow, ice, and cold weather than they are with regard to other hazards discussed in this plan. Nevertheless, people are still stranded in automobiles, get caught outside their homes in adverse weather conditions, and suffer heart failure while shoveling during each winter in Connecticut. Public education should therefore focus on safety tips and reminders to individuals about how to prepare for cold and icy weather, including stocking homes, preparing vehicles, and taking care of themselves during winter storms.

6.6.4 Emergency Services

Emergency services personnel and departments such as Police and Fire should identify areas which may be difficult to access during winter storm events and devise contingency plans to continue servicing those areas during moderate storms. The creation of through streets with new developments increases the amount of egress for residents and emergency personnel into neighborhoods.

The Borough of Naugatuck has established plowing routes that prioritize access to and from critical facilities. Residents should be made aware of the plow routes in order to plan how to best access critical facilities during storms, perhaps by posting the general routes on the Borough website. Such routes should also be posted other municipal buildings, such as the library and the post office. It is recognized that plowing critical

facilities may not be a priority to all residents, as people typically expect their own roads to be cleared as soon as possible.

Available shelters should also be advertised and their locations known to the public prior to a storm event. Local schools, which are designated as shelters, should be equipped with emergency generators to provide backup power. Finally, mutual aid agreements with surrounding municipalities should be reviewed and updated as necessary to ensure help will be available when needed.

6.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

Most of the recommendations in Sections 3.6 for mitigating flooding are suitable for mitigation of flooding caused by winter storms. These are not repeated in this subsection. While many potential mitigation activities for the remaining winter storm hazards were addressed in Section 6.6, the recommended mitigation strategies for mitigating wind, snow, and ice in the Borough of Naugatuck are listed below.

- ☐ Increase tree limb maintenance and inspections, especially in the downtown areas.
- ☐ Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas
- ☐ Review and post evacuation plans to ensure timely migration of people seeking shelter in all areas of Naugatuck.
- ☐ Post a list of Borough sheltering facilities and snow plowing prioritization in the municipal offices and on the Borough's website so residents can best plan how to access to critical facilities during a winter storm event.
- ☐ Continue to encourage two modes of egress into every neighborhood by the creation of through streets.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

7.0 EARTHQUAKES

7.1 Setting

The entire Borough of Naugatuck is susceptible to earthquakes. However, even though earthquakes have the potential to occur anywhere both in the Borough and in the northeastern United States, the effects may be felt differently in some areas based on the type of geology. In general, earthquakes are considered a hazard that is possible to occur, but that may cause significant effects to a large area of the Borough (Appended Table 1).

7.2 Hazard Assessment

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and telephone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time without warning.

The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of the Richter scale and the Mercalli scale, respectively.

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

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

The effect of an earthquake on the Earth's surface is called the intensity. The Modified Mercalli Intensity Scale consists of a series of key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects.

The following is a description of the 12 levels of Modified Mercalli intensity from the USGS.

- I. Not felt except by a very few under especially favorable conditions.
- II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are destroyed. Object thrown in the air.

Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known faults. Instead, earthquakes with epicenters in Connecticut are referred to

as intra-plate activity. Bedrock in Connecticut and New England in general is highly capable of transmitting seismic energy; thus, the area impacted by an earthquake in Connecticut can be four to 40 times greater than that of California. In addition, population density is up to 3.5 times greater in Connecticut than in California, potentially putting a greater number of people at risk.

The built environment in Connecticut includes old, non-reinforced masonry that is not seismically designed. Those who live or work in non-reinforced masonry buildings, especially those built on filled land or unstable soils are at the highest risk for injury due to the occurrence of an earthquake.

7.3 **Historic Record**

According to the USGS Earthquake Hazards Program, Connecticut is a region of very minor seismic activity. This assessment is based on lack of historical and instrumental reports of strong earthquakes. However, earthquakes do occur in this region. The New England states regularly register seismic events.

According to the Northeast Region Emergency Consortium, there were 137 recorded earthquakes in Connecticut between 1568 and 1989. The most severe earthquake in Connecticut's history occurred at East Haddam on May 16, 1791. Stone walls and chimneys were toppled during this quake. Additional instances of seismic activity occurring in and around Connecticut includes is provided below, based on information provided in USGS documents, the Connecticut Natural Hazards Mitigation Plan (2007), other municipal hazard mitigation plans, and newspaper articles.

- ❑ A devastating earthquake near Three Rivers, Quebec on February 5, 1663 caused moderate damage in parts of Connecticut.
- ❑ Strong earthquakes in Massachusetts in November 1727 and November 1755 were felt strongly in Connecticut.

- ❑ In April 1837, a moderate tremor occurred at Hartford, causing alarm but little damage.
- ❑ In August 1840, another moderate tremor with its epicenter 10 to 20 miles north of New Haven shook Hartford buildings but caused little damage.
- ❑ In October 1845, an Intensity V earthquake occurred in Bridgeport. An Intensity V earthquake would be approximately 4.3 on the Richter scale.
- ❑ On June 30, 1858, New Haven and Derby were shaken by a moderate tremor.
- ❑ On July 28, 1875, an early morning tremor caused Intensity V damage throughout Connecticut and Massachusetts.
- ❑ The second strongest earthquake to impact Connecticut occurred near Hartford on November 14, 1925. No significant damage was reported.
- ❑ The Timiskaming, Ontario earthquake of November 1935 caused minor damage as far south as Cornwall, Connecticut. This earthquake affected one million square miles of Canada and the United States.
- ❑ An earthquake near Massena, New York in September 1944 produced mild effects in Hartford, Marion, New Haven, and Meriden, Connecticut.
- ❑ An Intensity V earthquake was reported in Stamford in March of 1953, causing shaking but no damage.
- ❑ On November 3, 1968, another Intensity V earthquake in southern Connecticut caused minor damage in Madison and Chester.
- ❑ Recent earthquake activity has been recorded near New Haven in 1988, 1989, and 1990 (2.0, 2.8, and 2.8 in magnitude, respectively), in Greenwich in 1991 (3.0 magnitude), and on Long Island in East Hampton, New York in 1992.
- ❑ The most recent earthquake to occur in Connecticut occurred on March 11, 2008. It was a 2.0 magnitude with its epicenter three miles northwest of the center of Chester.

7.4 Existing Programs, Policies, and Mitigation Measures

The Connecticut Building Codes include design criteria for buildings specific to municipality, as adopted by the Building Officials and Code Administrators (BOCA).

These include the seismic coefficients for building design in the Borough of Naugatuck. The Borough has adopted these codes for new construction and they are enforced by the Borough Building Inspector. Due to the infrequent nature of damaging earthquakes, land use policies in the Borough of Naugatuck do not directly address earthquake hazards.

The Zoning Regulations of the Borough of Naugatuck (Section 24.10) states no more than 25 percent of the Minimum Buildable Area shall contain slopes in excess of 25 percent. Section 36.1 of the Zoning Regulations requires a Sediment and Erosion Control Plan be submitted when the disturbed area of a site is greater than one-half acre. The Plan of Conservation and Development suggests that areas of greater than 15% slopes be defined as un-buildable area. In particular, Goal #3 item #4 of the Plan of Conservation and Development states "Establish development standards for single-family housing on slopes."

7.5 Vulnerabilities and Risk Assessment

According to the USGS, Connecticut is at a low risk for experiencing a damaging earthquake. The USGS has determined that the State of Connecticut has a 10% chance that at some point in a 50-year period an earthquake would cause peak acceleration (ground shaking) values of 4% to 8% of the force of gravity. To appreciate why these values of ground shaking are expressed as a percentage of the force of gravity, note that it requires more than 100% of the force of gravity to throw objects up in the air.

In terms of felt effects and damage, ground motion at the level of several percent of gravity corresponds to the threshold of damage to buildings and houses (an earthquake intensity of approximately V). For comparison, reports of "dishes, windows and doors disturbed" corresponds to an intensity of about IV, or about 2% of gravity. Reports of "some chimneys broken" correspond to an intensity of about VII, or about 10% to 20% of gravity. According to the USGS National Seismic Hazard Mapping Project (2008), an

earthquake impacting the Borough of Naugatuck has a 2% chance of exceeding a peak acceleration of 10-12% of the force of gravity in a 50-year period.

According to the FEMA HAZUS-HM Estimated Annualized Earthquake Losses for the United States (2008) document, FEMA used probabilistic curves developed by the USGS for the National Earthquakes Hazards Reduction Program to calculate Annualized Earthquake Losses (AEL) for the United States. Based on the results of this study, FEMA calculated the AEL for Connecticut to be \$11,622,000. This value placed Connecticut 30th out of the 50 states in terms of AEL. The magnitude of this value stems from the fact that Connecticut has a large building inventory that would be damaged in a severe earthquake, and takes into account the lack of damaging earthquakes in the historical record.

The ***AEL*** is the expected losses due to earthquakes each year. Note that this number represents a long term average; thus actual earthquake losses may be much greater or non-existent for a particular year.

The current Connecticut Natural Hazard Mitigation Plan (2007) states that "there is a 66% chance that an earthquake of a 2.7 magnitude or greater" will occur in the area of Naugatuck. According to the previous Connecticut Natural Hazard Mitigation Plan (2004), the State of Connecticut Department of Emergency Management noted the chance that a damaging earthquake of magnitude 5.0 or greater will occur within the State in any one year is 5%, and that the odds of an earthquake of magnitude 6.0 are about one in 300 each year. Therefore, the Borough of Naugatuck is unlikely to experience a damaging earthquake in any given year. This belief is reinforced by the timeline and damages recorded in the historical record presented in Section 7.3.

Surficial earth materials behave differently in response to seismic activity. Unconsolidated materials such as sand and artificial fill can amplify the shaking associated with an earthquake. In addition, artificial fill material has

Liquefaction is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapid loading. It occurs in soils at or near saturation, especially the finer textured soils.

the potential for liquefaction. When liquefaction occurs, the strength of the soil decreases, reducing the ability of soil to support building foundations or bridges is reduced. Increased shaking and liquefaction can cause greater damage to buildings and structures, and a greater loss of life.

As explained in Section 2.3, several areas in the Borough of Naugatuck are underlain by sand and gravel. Figure 2-5 depicts surficial materials in the Borough. Structures in these areas are at increased risk from earthquakes due to amplification of seismic energy and/or collapse. The best mitigation for future development in areas of sandy material may be application of the most stringent building codes, or possibly the prohibition of certain types of vulnerable construction in these areas. The areas that are not at increased risk during an earthquake due to unstable soils are the areas in Figure 2-5 underlain by glacial till.

One inactive fault is located in Naugatuck in the far southeast corner of the Borough. Even though this fault is inactive, the best mitigation for future development in the area of this fault would be to preserve or convert the fault area into municipal open space. Much of the fault area lies within the Naugatuck State Forest and the area is already set aside as rural.

Areas of steep slopes can collapse during an earthquake, creating landslides. Seismic activity can also break utility lines, such as water mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric and gas mains. Dam failure can also pose a significant threat to developed areas during an earthquake. For this Plan, dam failure has been addressed separately in Section 9.0.

7.6 Potential Mitigation Measures, Strategies, and Alternatives

As earthquakes are difficult to predict and can affect the entire Borough of Naugatuck, potential mitigation can only include adherence to building codes, education of residents, and adequate planning. The following potential mitigation measures have been identified:

- ☐ Continue to require adherence to the state building codes.
- ☐ Preserve or convert areas of inactive faults to municipal open space.
- ☐ Consider preventing certain types of development, such as residential development, in areas prone to collapse.
- ☐ Ensure that future implementation of Goal #3 item #4 of the Plan of Conservation and Development ("Establish development standards for single-family housing on slopes") considers earthquake risks.
- ☐ Continue regulating development of slopes greater than 20%, and consider setting a prohibition on development of steep slopes.
- ☐ Ensure that municipal departments have adequate backup facilities in case earthquake damage occurs.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

8.0 DAM FAILURE

8.1 Setting

Dam failures can be triggered suddenly, with little or no warning, from other natural disasters such as floods and earthquakes. Dam failures often occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail.

With 16 registered dams and potentially several other minor dams in the Borough, dam failure can occur almost anywhere in Naugatuck. In addition, parts of the Borough lie within inundation areas for several Class C dams. While flooding from a dam failure generally has a small geographic extent, the effects are potentially catastrophic. Fortunately, a major dam failure is considered only a possible natural hazard event in any given year (Appended Table 2).

8.2 Hazard Assessment

The Connecticut DEP administers the statewide Dam Safety Program, and designates a classification to each state-registered dam based on its potential hazard.

- ❑ *Class AA* dams are negligible hazard potential dams that upon failure would result in no measurable damage to roadways and structures, and negligible economic loss.
- ❑ *Class A* dams are low hazard potential dams that upon failure would result in damage to agricultural land and unimproved roadways, with minimal economic loss.
- ❑ *Class BB* dams are moderate hazard potential dams that upon failure would result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate economic loss.

- ❑ *Class B* dams are significant hazard potential dams that upon failure would result in possible loss of life, minor damage to habitable structures, residences, hospitals, convalescent homes, schools, and the like, damage or interruption of service of utilities, damage to primary roadways, and significant economic loss.
- ❑ *Class C* dams are high potential hazard dams that upon failure would result in loss of life and major damage to habitable structures, residences, hospitals, convalescent homes, schools, and main highways with great economic loss.

As of 1996, there were 16 DEP-registered dams within the Borough of Naugatuck, of which three are Class A, five are Class BB, four are Class B, three are Class C and one is undefined. The list of Class B and C dams was updated by the DEP in 2007. These are listed in Table 8-1.

Table 8-1
Dams Registered with the DEP in the Borough of Naugatuck

Number	Name	Class
8801	Candee Reservoir Dam	BB
8802	Thurston Pond Dam	C
8803	May Street Pond South Dam	B
8804	May Street Pond North Dam	B
8805	Mulberry Reservoir Dam	C
8806	Union Ice Company Pond Dam	BB
8807	Schildgen Pond Dam	BB*
8808	Baummer Dam	A
8809	Armory Pond Dam	A
8810	Uniroyal Diversion Dam	-
8811	Straitsville Pond Dam	A
8812	Union City Dam	BB
8813	Straitsville Reservoir Dam	B
8814	Hop Brook Dam	C
8815	Ridge Lower Pond Dam	BB
8816	Ridge Upper Pond Dam	BB

*Rated a Class B dam in 1996, but was no longer rated Class B in 2007.

This section discusses only the possible effects of failure of significant and high hazard (Class B & C) dams. Failure of a Class C dam has the potential for loss of life and

property damage totaling millions of dollars. Failure of a Class B dam has the potential for loss of life and minor damage to property and critical facilities.

The three Class C dams located in the Borough of Naugatuck include the Thurston Pond Dam, the Mulberry Reservoir Dam, and the Hop Brook Dam. In addition, there are four other Class C dams upstream of Naugatuck whose failure would impact Borough residents, as listed in Table 8-2 below. Because the hazard areas overlap, these Class B and C dams, along with their dam failure inundation areas are shown in Figures 8-1 and 8-2.

Table 8-2
Class C Dams Upstream of the Borough of Naugatuck

Number	Name	Watercourse in Naugatuck	Municipality
803	Long Hill Reservoir Dam	Beacon Hill Brook	Bethany
14001	Thomaston Dam	Naugatuck River	Thomaston
14007	Black Rock Dam	Naugatuck River	Thomaston
14008	Northfield Brook Dam	Naugatuck River	Thomaston

Note that the Black Rock Dam, Hop Brook Dam, and Thomaston Dam have progressively larger inundation areas depicted on Figure 8-1. For example, the Thomaston Dam inundation area (purple) is only visible at the edges of the Black Rock Dam inundation area (yellow) although it completely underlies (is wider than) the Black Rock Dam inundation area.

8.3 Historic Record

Approximately 200 notable dam and reservoir failures occurred worldwide in the twentieth century. More than 8,000 people died in these disasters. The following is a listing of some of the more catastrophic dam failures in Connecticut's recent history:

Figure 8-1: High Hazard Dams in Naugatuck

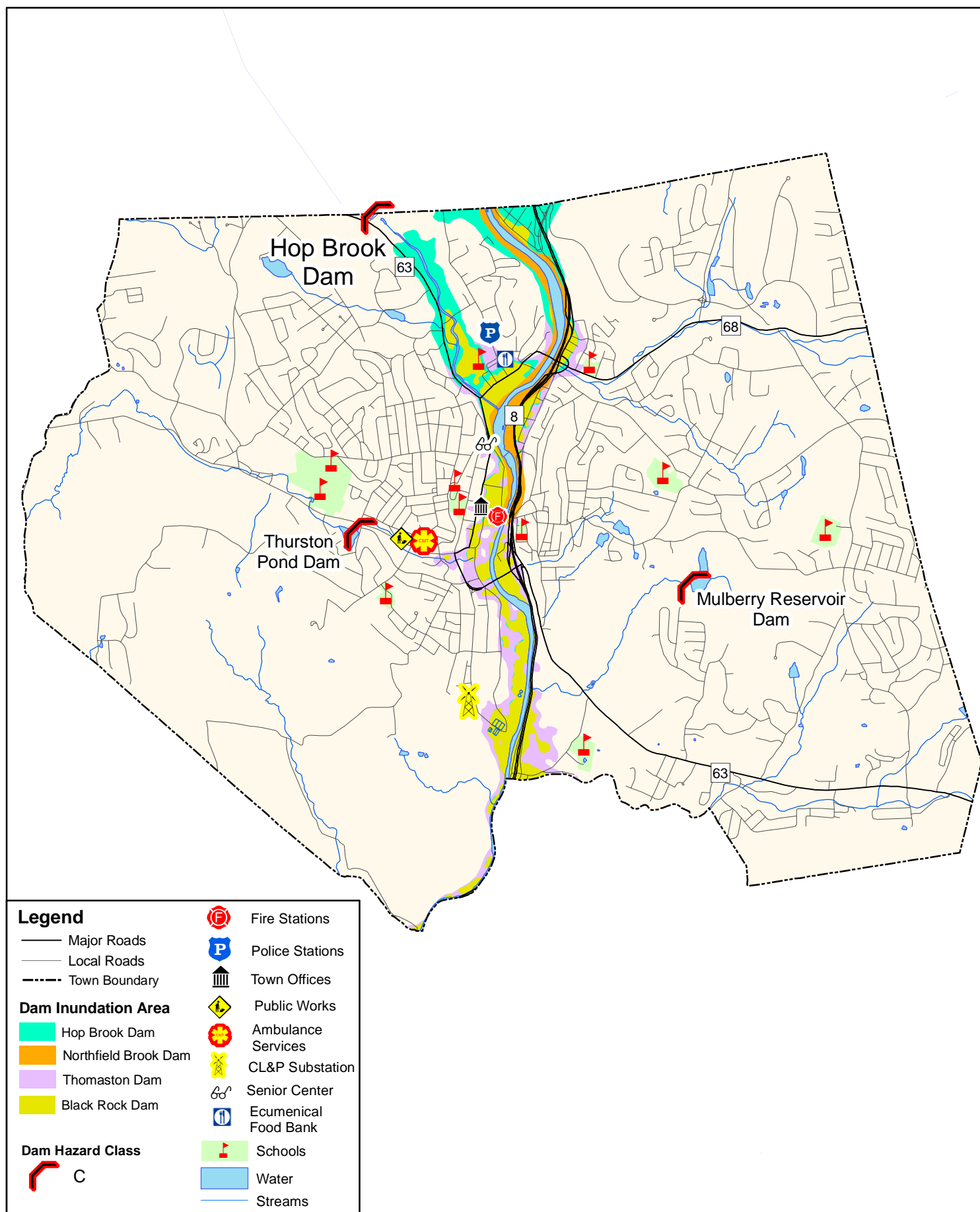
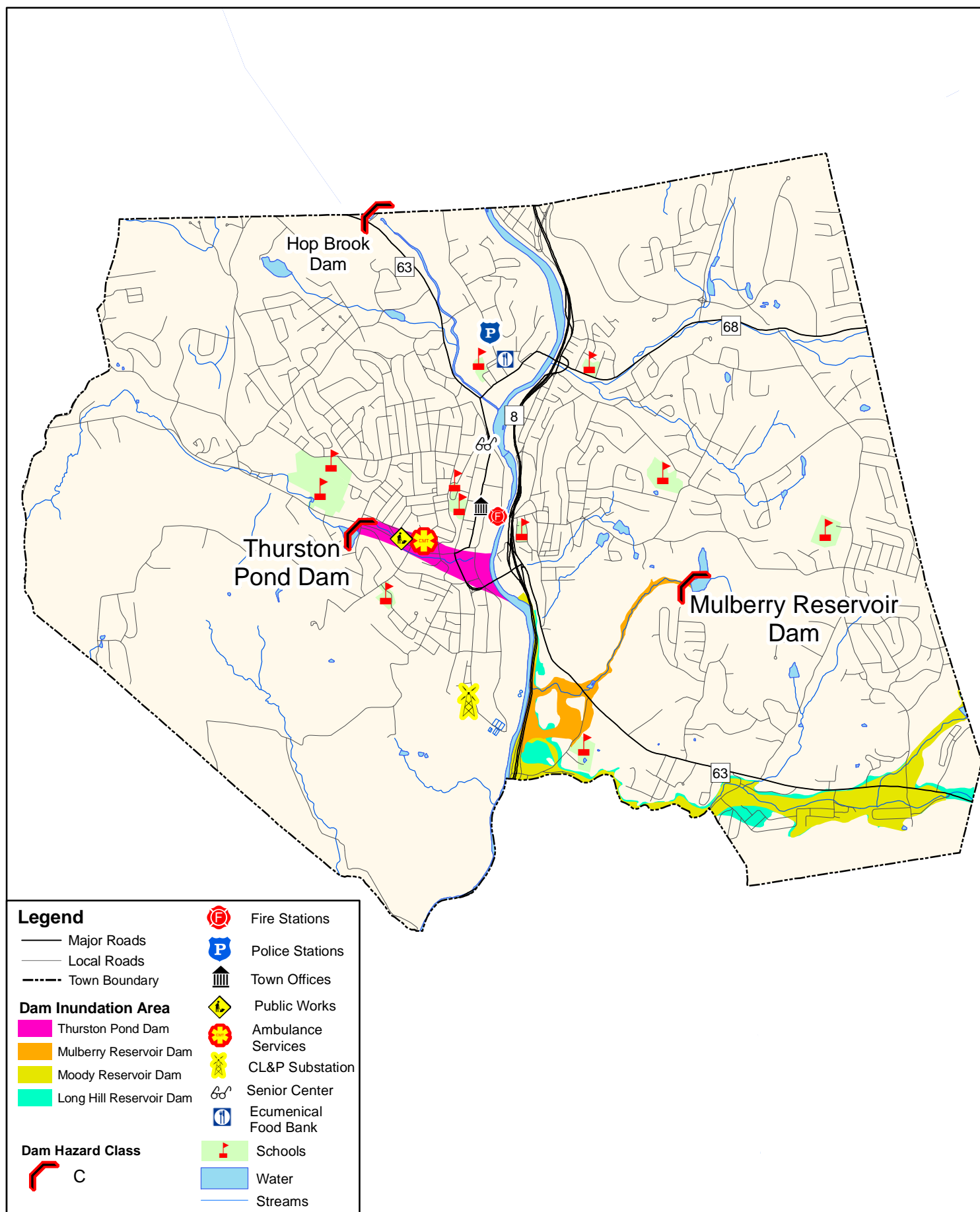


Figure 8-2: High Hazard Dams in Naugatuck



- ❑ 1938 and 1955: Exact numbers of dam failures caused by these floods are unavailable, but Connecticut DEP believes that more dams were damaged in these events than in the 1982 or 2005 flooding events.
- ❑ 1961: Crystal Lake dam in Middletown failed, injuring three and severely damaging 11 homes.
- ❑ 1963: Failure of the Spaulding Pond Dam in Norwich caused six deaths and six million dollars in damage (1963 dollars).
- ❑ June 5-6, 1982: Connecticut experienced a severe flood that caused 17 dams to fail and seriously damaged 31 others. Failure of the Bushy Hill Pond Dam in Deep River caused \$50 million in damages, and the remaining dam failures caused nearly \$20 million in damages.

More recently, the NCDC reports that flash flooding on April 16, 1996 caused three small dams in Middletown and one in Wallingford to breach, and the Connecticut DEP reported that the sustained heavy rainfall from October 7 to 15, 2005 caused 14 complete or partial dam failures and damage to 30 other dams throughout the State. A sample of damaged dams is summarized in Table 8-3:

Table 8-3
Dams Damaged Due to Flooding from October 2005 Storms

Number	Name	Location	Class	Damage Type	Ownership
-----	Somerville Pond Dam	Somers	--	Partial Breach	DEP
4701	Windsorville Dam	East Windsor	BB	Minor Damage	Private
10503	Mile Creek Dam	Old Lyme	B	Full Breach	Private
-----	Staffordville Reservoir #3	Union	--	Partial Breach	CT Water Co.
8003	Hanover Pond Dam	Meriden	C	Partial Breach	Meriden
-----	ABB Pond Dam	Bloomfield	--	Minor Damage	Private
4905	Springborn Dam	Enfield	BB	Minor Damage	DEP
13904	Cains Pond Dam	Suffield	A	Full Breach	Private
13906	Schwartz Pond Dam	Suffield	BB	Partial Breach	Private
14519	Sessions Meadow Dam	Union	BB	Minor Damage	DEP

No major dam failures have occurred in the Borough of Naugatuck. According to Borough personnel, the dams throughout Borough are in varying stages of condition, with

the Class C Hop Brook Dam (maintained by the ACOE) believed to be in good to excellent condition. The upstream flood control dams described in Section 3.4 are also reportedly in good to excellent condition. The following paragraphs provide a description and highlight the general condition of each Class C & B dam based on information available at the Connecticut DEP.

Class C Dams Located within the Borough of Naugatuck

- ❑ Thurston Pond Dam – This dam, also known as the New Dam, is owned by Chemtura Corporation. Thurston pond is located on Long Meadow Pond Brook at the southwest corner of the intersection of Rubber Avenue and Melbourne Street and covers a surface area of approximately 4.5 acres. It consists of an of an earth embankment with a stone masonry overflow spillway located at the right end of the dam, and outlet works located at the right abutment. The total length of the dam, including the spillway section, is 510 feet. The maximum height is 20 feet. The stone masonry overflow spillway section has an upstream earth embankment of unknown section, a concrete cap and a batter of six inches per vertical foot on the downstream face. The outlet works consist of a concrete intake structure with inlet and outlet gates which can discharge water through a 24-inch concrete pipe to downstream locations or through an 18-inch concrete pipe into the stream below the dam. The spillway capacity is 2,500 cfs, or 37% of the Test Flood Outflow. The dam is believed to be in good condition.

- ❑ Mulberry Reservoir Dam – The Mulberry Reservoir is owned by the Connecticut Water Company and is used for public water supply. The reservoir covers a surface area of approximately 8.3 acres and it receives its inflow from a 2.4 acre wetland located approximately 1,040 feet upstream on an unnamed tributary. The dam consists of an earth embankment, constructed of impervious materials with a pervious zone and toe drain on the downstream side. The dam is 580 feet in length with a top width of 20 feet, a maximum height of 66 feet, and upstream and downstream slopes

of two feet horizontal to one foot vertical. A 40-foot long concrete spillway with discharge chute and stilling basin is located near the right end of the dam. The outlet works located near the center of the dam consist of a 12-inch cast iron blowoff and a 12-inch cast iron supply main through the dam, both controlled by manually operated gates located in an upstream gatehouse. The dam is considered to be in good condition. ACOE hydraulic analyses indicate that the capacity of the existing spillway is 1,600 cfs with the reservoir at elevation 574.78 (at top of dam). The calculations show the spillway is capable of passing 400% of the probable maximum flood without overtopping the dam.

- ❑ Hop Brook Dam – This ACOE flood control dam is located on Hop Brook at the Waterbury and Naugatuck corporate boundary. It consists of a rolled-earth fill with rock slope 520 feet long with a maximum height of 97 feet above the river bed. Outlet works include a three foot by five foot concrete rectangular conduit founded in rock. The dam is maintained by the ACOE and is believed to be in excellent condition.

Class C Dams Located Upstream of the Borough of Naugatuck

- ❑ Thomaston Dam – This ACOE flood control dam is located on the Naugatuck River in northeastern Thomaston and consists of an earth and rock-fill dam that was completed in 1970. The dam is 142 feet high and 2,000 feet long. Outlet works are founded on bedrock under the dam, and there is a side channel spillway 450 feet long on the left abutment. The reservoir has a storage capacity of 42,000 acre-feet. At spillway height, a 950 acre pool would extend about 6.5 miles upstream. The ACOE owns all the land behind the dam that would be affected by the backwater conditions up to 465 feet, and has flood easements in this area up to an elevation of 499 feet, which is 5 feet above the spillway. The dam is maintained by the ACOE and is believed to be in excellent condition.

- ❑ Black Rock Dam – This ACOE flood control dam is located on Branch Brook downstream of Wigwam Dam along the Thomaston-Watertown boundary in Black Rock State Park. It consists of an earth-fill dam 933 feet long and 154 feet high and was completed in 1970. Outlet works include a gated four-foot by five-foot concrete conduit in the right abutment of the dam, and a chute spillway with a 140-foot long crest adjacent to the right abutment. The reservoir has a storage capacity of 8,700 acre-feet. At spillway height, a 190 acre pool would extend approximately 1.8 miles upstream. The ACOE owns all the land behind the dam that would be affected by the backwater conditions and has easements up to the spillway crest elevation. The dam is maintained by the ACOE and is believed to be in excellent condition.

- ❑ Northfield Brook Dam – This ACOE flood control dam is located on Northfield Brook approximately 1.3 miles upstream of the Naugatuck River in the Town of Thomaston. It consists of an earth-fill dam 810 feet long and 118 feet high and was completed in 1966. Outlet works include a chute spillway with an ogee weir that is 72 feet long, and a three-by-three-foot gate controlling discharged into a 36-inch conduit founded on rock in the right abutment. The reservoir has a storage capacity of 2,430 acre-feet. At spillway height, a 67 acre pool would extend approximately 1.25 miles upstream. The dam is maintained by the ACOE and is believed to be in excellent condition.

Class B Dams Located within the Borough of Naugatuck

- ❑ May Street Pond North Dam – The May Street Pond North Dam (Vanasse's Pond) is owned by James, John and Robert Vanasse. The pond covers a surface area of approximately 2.5 acres and receives its inflow from an unnamed brook that drains a private pond located approximately 600 feet upstream and approximately 260 feet west of Gabriel Drive. The dam is an earthen dam with a concrete spillway at the southwestern portion of the dam, and is believed to be in good condition.

- ❑ May Street Pond South Dam – The May Street Pond South (Griesbach’s Pond) Dam is owned by Dr. Hans Griesbach, a resident of May Street in Naugatuck. The pond covers a surface area of approximately 2.06 acres and receives its inflow primarily from groundwater. The dam is an earthen dam with a concrete spillway at the southeastern portion of the dam, and is believed to be in good condition.
- ❑ Long Hill Reservoir Dam – The Long Hill Reservoir, also known as the New Naugatuck Reservoir, is owned by the Connecticut Water Company and used for water supply. The reservoir covers a surface area of approximately 87.4 acres in the Towns of Bethany and Prospect, and the reservoir receives its inflow from Beacon Hill Brook and several unnamed tributaries. The dam is an earthen dam with a rock fill slope with a concrete spillway in the southeastern portion of the dam. The dam is maintained by the Connecticut Water Company and believed to be in good to excellent condition.
- ❑ Straitsville Reservoir Dam – The Straitsville Reservoir is owned by the Connecticut Water Company and is used for water supply. The reservoir covers a surface area of approximately 2.07 acres in Naugatuck and Prospect, and the reservoir receives its inflow from Marks Brook. The dam is an earthen dam with a rock fill slopes with a spillway at the southeastern portion of the dam, and is believed to be in good to excellent condition.

8.4 Existing Programs, Policies, and Mitigation Measures

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

Dam Inspection Regulations require that over 600 dams in Connecticut be inspected annually. The DEP currently prioritizes inspections of those dams which pose the greatest potential threat to downstream persons and properties. Dams found to be unsafe under the inspection program must be repaired by the owner. Depending on the severity of the identified deficiency, an owner is allowed reasonable time to make the required repairs or remove the dam. If a dam owner fails to make necessary repairs to the subject structure, the DEP may issue an administrative order requiring the owner to restore the structure to a safe condition and may refer noncompliance with such an order to the Attorney General's Office for enforcement. As a means of last resort, the DEP Commissioner is empowered by statute to remove or correct, at the expense of the owner, any unsafe structures which present a clear and present danger to public safety.

Dams regulated by the DEP must be designed to pass the 100-year rainfall event with one foot of freeboard, a factor of safety against overtopping.

Critical and high hazard dams are required to meet a design standard greater than the 100-year rainfall event.

Owners of Class C dams are required to maintain emergency operations plans. The ACOE is responsible for maintaining the plans for the Thomaston Dam, Hop Brook Dam, Northfield Brook Dam, and Black Rock Dam. The Connecticut Water Company maintains the plans for the Long Hill Reservoir Dam and the Mulberry Reservoir Dam. Chemtura Corporation is responsible for maintaining such a plan for the Thurston Pond Dam.

8.5 **Vulnerabilities and Risk Assessment**

The dam failure inundation areas described below for the four ACOE Class C dams were redrawn from inundation maps provided by the ACOE. Thus, the dam failure inundation areas shown in Figure 8-1

Inundation areas are considered by the ACOE to be sensitive information. Figure 8-1 in this Plan may not be reprinted as stand-alone information; it may only be disseminated within the confines of this Plan. For any questions regarding the use or disposition of this map please contact the ACOE Security Officer at (978) 318-8007.

are for planning purposes only and do not replace the official ACOE maps. Similarly, the dam failure inundation areas for Long Hill Reservoir Dam, Mulberry Reservoir Dam, and Moody Reservoir Dam was redrawn from mapping provided by the Connecticut Water Company, and is for planning purposes only.

By definition, failure of Class C dams may cause catastrophic loss of life and property. Of the seven Class C dams whose failure would be likely to impact the Borough of Naugatuck, the failure of Hop Brook Dam or Thomaston Dam would likely have the highest impact on the residents and infrastructure of the Borough of Naugatuck. However, the failure of any of these dams would have significant impacts within the Borough. These impacts are described in general detail below.

Black Rock Dam

Black Rock Dam is owned by the ACOE and provides flood control along Branch Brook in Black Rock State Park. Based on dam failure inundation maps provided by the ACOE, a dam failure at full pool height would cause flooding along the Branch Brook and Naugatuck River corridors all the way to downtown Beacon Falls. Flood heights would be outside the 500-year floodplain in the center of the Borough, though flood heights would be less than a failure of Hop Brook Dam. As with a Hop Brook Dam failure, several critical facilities in the downtown area would be flooded.

Hop Brook Dam

Hop Brook Dam is owned by the ACOE and provides flood control along Hop Brook. Based on dam failure inundation maps provided by the ACOE, a dam failure at full pool height would cause flooding along Hop Brook and the Naugatuck River corridors all the way to Derby. The most concentrated damage would likely occur along the Route 63 corridor, and many of the critical facilities in the downtown area would be flooded.

Long Hill Reservoir Dam

Long Hill Reservoir is owned by the Connecticut Water Company. The downstream corridor is developed with many residential and some commercial and industrial properties. The dam failure inundation area extends along Route 63 and Beacon Valley Road. Critical facilities in the Borough of Naugatuck are not in the inundation area, but many residential structures south of Route 63 in the southeast section of the Borough would be flooded if the dam failed. A dam failure could trap residents in the Cotton Hollow Road area as well if the bridge were undermined.

Mulberry Reservoir Dam

Mulberry Reservoir is owned by the Connecticut Water Company. The downstream corridor is undeveloped forested land for approximately 650 feet, after which there is a large area of residential developments. The dam failure inundation area follows the unnamed tributary to the Naugatuck River and would not appear to directly affect the residential developments south and southeast of the dam. The inundation area becomes wider after the unnamed tributary passes under Route 63, encompassing a large portion of Grove and St. James Cemeteries. Critical facilities in the Borough of Naugatuck are not located in the inundation area.

Northfield Brook Dam

The Northfield Brook impoundment is contained by the ACOE-owned flood control dam. The downstream corridor is developed with many residential properties. Based on dam failure inundation maps provided by the ACOE, a dam failure at full pool height would cause flooding along Northfield Brook and the Naugatuck River all the way into central Naugatuck. The inundation area is nearly coincidental with that of the Black Rock Dam failure inundation area. Flood heights would be less than the 500-year floodplain in the center of the Borough, however many of the critical facilities in the downtown area would be flooded.

Thomaston Dam

Thomaston Dam is owned by the ACOE and is designed to impound floodwaters from the Naugatuck River and Leadmine Brook. Based on dam failure inundation maps provided by the ACOE, a dam failure at full pool height (worst-case scenario) would cause flooding along the Naugatuck River corridor all the way to the Housatonic River in Derby. Much of downtown Naugatuck would experience some degree of flooding, including many of the critical facilities in the Borough (Figure 8-1). Such a failure would cause backwater conditions along Beacon Hill Brook and past St. James Cemetery up to the western end of Beacon Valley Road. A breach at full height would cause flooding greater than the mapped 500-year flood event for Naugatuck.

Thurston Pond Dam

Thurston pond is owned by Chemtura Corporation. The downstream corridor is a mixture of medium density residential development and commercial and industrial developments. Based on dam failure inundation maps in the Emergency Operations Plan on file at the DEP, a dam failure at full pool height would cause flooding along Long Meadow Brook all the way to the central portion of the Borough along the Naugatuck River. Critical facilities such as Public Works and Ambulance Services would be affected by this flooding. The dam is believed to be in good condition.

Other Dams

There are other dams within and around Naugatuck that could impact on the residents or infrastructure of the Borough if they failed. Some are Class B (significant hazard) dams, while the others are lower hazard or minor dams with problems have been brought to the attention of the Borough.

- ❑ May Street Pond North (Vanasse's Pond) Dam: Should this Class B dam fail, 10-15 houses along June Street, Bird Road, Spruce Drive, and Homestead Avenue could experience flooding.
- ❑ May Street Pond South (Griesbach's Pond) Dam: Should this Class B dam fail, a few houses along the dead-end streets of Hickory Road and Woodland Street would likely experience flooding, and a few homes on High Street could also be flooded.
- ❑ Straitsville Reservoir Dam: Should this Class B dam fail, the initial impact area would be the condominium development along Horton Road. It is anticipated that the peak outflow of 6,200 cfs would raise the water elevation downstream between one foot and six feet, with a maximum of three to four feet of flooding expected within the condominiums. It is expected that the condominiums would flood within minutes and hit maximum flood level in ten to fifteen minutes. Flooding in this area would be exacerbated if the failure of Moody Reservoir Dam (a Class B dam located upstream in Prospect) triggered the failure of Straitsville Reservoir Dam. In this scenario, the dam failure inundation area would be similar to the inundation area shown for Moody Reservoir Dam on Figure 8-2.
- ❑ Ridge Lower Pond Dam: This Class BB dam impounds a retention pond located at the end of Warren Avenue below the Ridge Development. It was noted by Borough personnel as needing repair at the data collection meeting. The insufficiency of the dam poses a threat to buildings on Warren Avenue and (to a lesser extent) on New Haven Road.
- ❑ Donovan Road Dam: This unregistered dam on the pond labeled as "Water Company Pond No. 1" on USGS Topographic Maps was mentioned at the data collection meeting as having the potential to cause flooding.

8.6 Potential Mitigation Measures, Strategies, and Alternatives

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

The Borough of Naugatuck should work with Connecticut DEP to stay up to date on the evolution of Emergency Operations Plans and Dam Failure Analyses for the Class C ACOE dams and Connecticut Water Company dams in Thomaston, Naugatuck, Prospect and Bethany, as well as the three Class C dams within the Borough. When possible, copies of these documents should be made available at the Borough Offices for reference and public viewing.

Regarding lower hazard dams, the Borough should assess the condition and performance of the Donovan Road Dam and upgrade as necessary, and upgrade and repair the Ridge Lower Pond Dam located along Warren Avenue. The latter project should be coordinated with the DEP. The Borough should also consider implementing occasional Borough inspections of lower hazard dams in the Borough.

The Connecticut DEP also administers the Flood and Erosion Control Board program, which can provide non-competitive state funding for repair of municipality-owned dams. Funding is limited by the state bond commission. State statute Section 25-84 allows municipalities to form Flood and Erosion Control Boards, but municipalities must take action to create the board within the context of the local government, such as by revising the municipal charter. The Borough of Naugatuck may wish to establish such a Flood and Erosion Control Board to oversee local flooding and erosion problems and municipal dams. More information regarding the Flood and Erosion Control Board program can be found at http://www.ct.gov/dep/lib/dep/water_inland/flood_mgmt/fecb_program.pdf.

The Borough of Naugatuck should consider including dam failure areas in its CodeRED emergency notification system. This system combines database and GIS mapping technologies to deliver outbound emergency notifications to geographic areas or specific groups of people such as emergency responder teams at a rate of up to 60,000 calls per hour. This technology should be used to warn downstream residents of an impending dam failure and facilitate evacuation.

In addition, there are several suggested potential mitigation strategies which are applicable to all hazards in this plan. These are outlined in the Section 10.1.

9.0 WILDFIRES

9.1 Setting

The ensuing discussion about wildfires is focused on the undeveloped wooded and shrubby areas of Naugatuck, along with low-density and medium density suburban type development found at the margins of these areas known as the wildland interface. Structural fires in higher density areas are not considered.

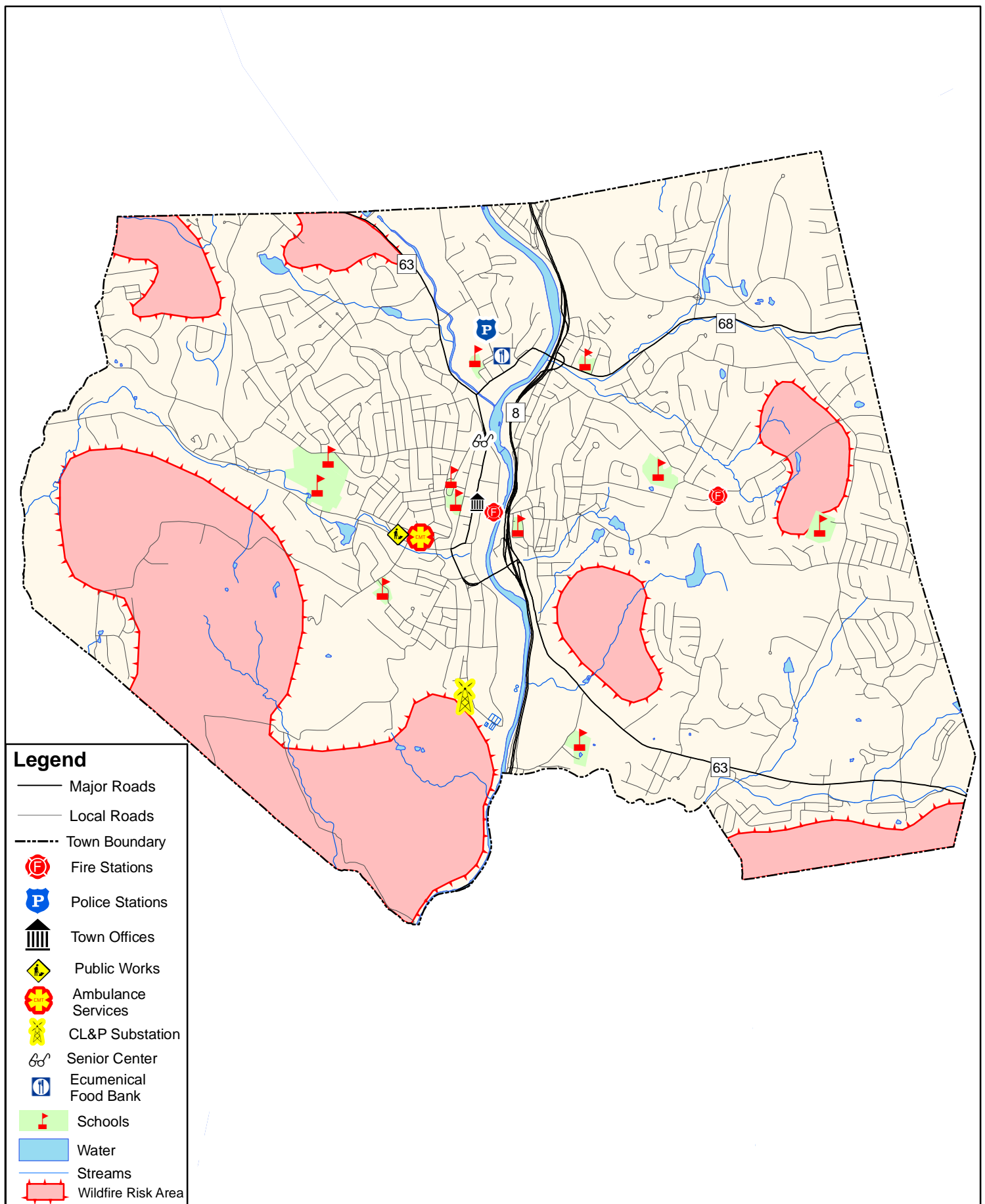
The Borough of Naugatuck is considered a low-risk area for wildfires. Wildfires are of particular concern in wooded areas and other areas with poor access for fire-fighting equipment. Figure 9-1 presents the wildfire risk areas for the Borough of Naugatuck. Hazards associated with wildfires include property damage and loss of habitat. Wildfires are considered a likely event each year, but when one occurs it is generally contained to a small range with limited damage to non-forested areas.

9.2 Hazard Assessment

The current Connecticut Hazard Mitigation Plan does not specifically define wildfires separate from forest fires, but wildfires are well-defined by the Massachusetts Hazard Mitigation Plan as being "highly destructive, uncontrollable fires." Although the term brings to mind images of tall trees engulfed in flames, wildfires can occur as brush and shrub fires, especially under dry conditions. Wildfires are also known as "wildland fires."

Nationwide, humans have caused approximately 90% of all wildfires in the last decade. Accidental and negligent acts include unattended campfires, sparks, burning debris, and irresponsibly discarded cigarettes. The remaining 10% of fires are caused mostly by lightning.

Figure 9-1: Naugatuck Wildfire Risk Area



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.
 "Town Boundary", DEP
 "Facilities", Naugatuck
 "Wildfire", COGCV
 For general planning purposes only. Delineations may not be exact.
 October 2008



0 0.5 1 Miles



COUNCIL OF GOVERNMENTS
 CENTRAL NAUGATUCK VALLEY

Nevertheless, wildfires are also a natural process, and their suppression is now recognized to have created a larger fire hazard, as live and dead vegetation accumulates in areas where fire has been prevented. In addition, the absence of fire has altered or disrupted the cycle of natural plant succession and wildlife habitat in many areas. Consequently, federal, state and local agencies are committed to finding ways such as prescribed burning to reintroduce fire into natural ecosystems, while recognizing that fire fighting and suppression are still important.

Connecticut has a particular vulnerability to fire hazards where urban development and wildland areas are in close proximity. The "wildland/urban interface" is where many such fires are fought. Wildland areas are subject to fires because of weather conditions and fuel supply. An isolated wildland fire may not be a threat, but the combined effect of having residences, businesses, and lifelines near a wildland area causes increased risk to life and property. Thus, a fire that might have been allowed to burn itself out with a minimum of fire fighting or containment in the past is now fought to prevent fire damage to surrounding homes and commercial areas, as well as smoke threats to health and safety in these areas.

9.3 Historic Record

According to the Connecticut Natural Hazards Mitigation Plan (2007), Connecticut enacted its first state-wide forest fire control system in 1905, when the state was largely rural with very little secondary growth forest. By 1927, the state had most of the statutory foundations for today's forest fire control programs and policies in place, such as the State Forest Fire Warden system, a network of fire lookout towers and patrols, and regulations regarding open burning. The severe fire weather in the 1940's prompted the state legislature to join the Northeastern Interstate Forest Fire Protection Compact with its neighbors in 1949. Today, most of Connecticut's forested areas are secondary growth forests. According to the Connecticut DEP, forest has reclaimed over 500,000 acres of land that was used for agriculture in 1914. However, that new forest has been

fragmented in the past few decades by residential development. The urban/wildland interface is increasing each year as sprawl extends further out from Connecticut's cities.

The technology used to combat wildfires has significantly improved since the early 20th century. An improved transportation network, coupled with advances in firefighting equipment, communication technology, and training, has improved the ability of firefighters to minimize damage due to wildfires in the state. For example, radio and cellular technologies have greatly improved fire fighting command capabilities.

According to the Climate of 2008 Wildfire Season Summary presented by the NCDC, an average of 4.6 million acres per year in the United States was burned by wildfires since 1985. This translates to a nationwide mean of 60 acres per fire (at a mean of approximately 77,000 fires per year). The number one cause of wildfires is arson, with about half of all wildfires being intentionally set.

Wildfire statistics for Connecticut are much lower than the national average. According to the USDA Forest Service Annual Wildfire Summary Report for 1994 through 2003, an average of 600 acres per year in Connecticut was burned by wildfires during this period. In general, the fires are small and detected quickly, with most wildfires being contained to less than 10 acres in size.

Traditionally, the highest forest fire danger in Connecticut occurs in the spring from mid-March to mid-May. The worst wildfire year for Connecticut in the past decade occurred during the extremely hot and dry summer of 1999. Over 1733 acres of Connecticut burned in 345 separate wildfires, an average of about five acres per fire. Only one wildfire occurred between 1994 and 2003 that burned over 300 acres, and a wildfire in 1986 in the Mattatuck State Forest in the nearby Town of Watertown, CT burned 300 acres. More recently, a 30-acre wildfire occurred in Oxford on April 19, 2008.

Up to 14% of the land area of Naugatuck is publicly protected open space with an additional 15% being privately held open space, and fires have occurred in wildlands throughout the Borough. Specifically, personnel from the Borough of Naugatuck noted that fires have occurred in the Huntington Hill section of the Naugatuck State Forest in Naugatuck. Such fires are usually caused by arson or from campfires that spread out of control. Fires that start in Naugatuck in this area are sometimes allowed to burn due to the topography, and the fires can spread to other parts of the forest near the urban/wildland interface or south into Beacon Falls.

9.4 Existing Programs, Policies, and Mitigation Measures

Existing mitigation for wildland fire control is typically focused on the Borough of Naugatuck Fire Department (NFD) training and maintaining an adequate supply of equipment. The Borough of Naugatuck Zoning Regulations and Subdivision Regulations require that the Fire Marshal review all plans for subdivisions and commercial developments to ensure that the requirements for fire safety are met. The Fire Marshal's Office is also responsible for the enforcement of the State of Connecticut Life Safety Code, investigation of fire safety complaints, fire investigation and fire prevention programs.

Unlike wildfires on the west coast of the United States where the fires are allowed to burn toward development and then stopped, the NFD goes to the fires whenever possible. This proactive approach is believed to be effective for controlling wildfires. The Fire Department has some water storage capability, but primarily relies on Connecticut Water Company's water service to fight fires in the central part of Borough. In the remainder of the Borough, the NFD relies on the use of local water bodies and its tanker trucks to supply fire fighting water, and water cisterns installed in more recent outlying subdivisions.

The NFD is often a first responder for fires that happen in the Naugatuck State Forest, and coordinates with the Beacon Falls, Oxford, and Bethany Fire Departments to control these forest fires. The Fire Department has two fire stations in the Borough; one station is located on Maple Avenue in the downtown area, and the other is located on May Street on the east side of the Naugatuck River. The Fire Department has two Class A pump trucks, a 105-foot rear mount ladder truck with a fire pump, and a rescue truck. The NFD is equipped for structure fires, confined space entry, trench rescue, motor vehicle rescue, basic hazardous materials response, and surface water/ice rescue. The NFD also has two spare Class A pump trucks, and the Borough also has mutual aid agreements with all of its neighbors.

Finally, the DEP Forestry Division uses the rainfall data recorded by the Automated Flood Warning system (see Section 3.4) to compile forest fire probability forecasts. This allows the Division and the Borough of Naugatuck to monitor the drier areas of the state in an effort to reduce forest fire risk.

9.5 Vulnerabilities and Risk Assessment

The most common causes of wildfires are arson, lightning strikes, and fires started from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas. The extensive forests and fields covering the state are prime locations for a wildfire. In many areas, structures and subdivisions are built abutting forest borders, creating areas of particular vulnerability. Wildfires are more common in rural areas than in developed areas, as most fires in populated areas are quickly noticed and contained. The likelihood of a severe wildfire developing is lessened by the vast network of water features in the state, which create natural breaks likely to stop the spread of a fire. During long periods of drought, these natural features may dry up, increasing the vulnerability of the state to wildfires.

According to the Connecticut DEP, the actual forest fire risk in Connecticut is low due to several factors. First, the overall incidence of forest fires is very low. Secondly, as the wildfire/forest fire prone areas become fragmented due to development, the local fire departments have increased access to those neighborhoods for fire fighting equipment. Third, the problematic interface areas are site specific, such as driveways too narrow to permit emergency vehicles. Finally, trained fire fighters at the local and state level are readily available to fight fires in the state, and inter-municipal cooperation on such instances is common.

The 2001 Plan of Conservation and Development indicated that there are several streets in the Borough which are inaccessible to fire trucks due to either steep grades or the narrowness of the road. These include Aetna Place, Bosco Drive, Highland Circle, Hughes Street, Joseph Road, Mitchell Street and Theresa Street. Although this document is primarily concerned with the Borough's ability to address wildfires versus structural fires, the existing problem is indicative of issues with current development standards. Thus it is essential that any future development on steep slopes be reviewed with an extra level of attention to ensure that new developments are not burdened by the same type of problems.

Based on the historic record presented in Section 9.3, most wildfires in Connecticut are relatively small. In the drought year of 1999, the average wildfire burned five acres. In comparison, the most extreme wildfires recorded since 1986 each burned 300 acres. Given the availability of fire fighting water in the Borough (including the use of nearby water bodies), the proactive stance regarding fires, and long-standing mutual aid assurances the NFD has with neighboring communities, it is believed that the low end of this acreage is possible in Naugatuck as well, with the larger acreage reserved for very infrequent severe events.

The wildfire risk areas presented in Figure 9-1 were defined as being contiguous wooded areas greater than 50 acres in size that have limited access in areas near public water

service, and contiguous wooded areas greater than 20 acres in size with limited access in the remainder of the Borough. These areas are generally associated with wooded water company lands, state owned forests, and Borough-owned and privately held open space. As each area borders residential sections of the Borough, residents on the outskirts of these risk areas are the most vulnerable to fire, heat, and smoke effects of wildfires.

The 2001 Plan of Conservation and Development also indicated that the NFD has expressed concerns regarding response times to developments in the northwest and southeast portions of the Borough. Additionally, the water pressure in some areas, particularly around the perimeter of the Borough, has been identified as a problem. These areas exhibit low-pressure situations which may inhibit the department's ability to deal with fires. The Borough requires that new developments provide adequate water for fire protection, either by water mains from the Connecticut Water Company or underground cisterns at a minimum size of 25,000 gallons. Subsequent to the Plan of Conservation and Development publication in 2001, additional water lines have been extended up May Street towards the Eastside Fire Station and on Wooster Street.

Despite having a large amount of forest/urban interface, the overall risk of wildfires occurring in the Borough of Naugatuck is also considered to be low. Such fires fail to spread far due speed of detection and strong fire response. As most of the Borough has fire-fighting water available nearby, a large amount of water can be made readily available for fire fighting equipment, and tankers from other towns can provide additional fire support for outlying fires.

Recall from Figure 2-6, Figure 2-7, and Figure 2-8 that elderly, linguistically isolated, and disabled populations reside in the Borough of Naugatuck. In comparing these figures with the wildfire risk areas presented in Figure 9-1, it is possible that up to a thousand of the population impacted by a wildfire could consist of the elderly, several tens could consist of linguistically isolated households, and many residents with disabilities could

reside near wildfire impact areas. Thus, it is important for the Borough of Naugatuck to be prepared to assist these special populations during emergencies, including wildfires.

In summary, limited access forest areas in the outskirts of the Borough near new development are considered most at risk from wildfires, primarily as a result of limited supplies of fire-fighting water and emergency vehicle access. In addition, there is special concern about fires in the Naugatuck State Forest in the southern part of the Borough. Fires in these areas are particularly difficult to access due to topography can spread to or from nearby municipalities. The Borough has the support of the owners of the tracts of open space to provide access to their lands in case of a wildfire.

Should a wildfire occur, it seems reasonable to estimate that the average area to burn would be five acres, consistent with the state average during long period of drought. In the case of an extreme wildfire during a long drought on forested lands, it is estimated that up to 300 acres could burn before containment due to the limited access of those lands. Residential areas bordering such lands would also be vulnerable to wildfire, but would likely be more impacted by heat and smoke than by structure fires due to the strong fire response in the Borough and its mutual aid agreements.

9.6 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for wildfires include a mixture of prevention, education, and emergency planning. Although educational materials are available through the Fire Department, they should be made available at other municipal offices as well. Education of homeowners on methods of protecting their homes is far more effective than trying to steer growth away from potential wildfire areas, especially given that the available land that is environmentally appropriate for development may be forested.

Water system improvements are an important class of potential mitigation for wildfires. The following recommendations could be implemented to mitigate forest fire risk:

- ❑ The Connecticut Water Company should continue to extend the public water supply systems into areas that require water for fire protection.
- ❑ The Connecticut Water Company should continue to identify and upgrade those portions of the public water supply systems that are substandard from the standpoint of adequate pressure and volume for fire-fighting purposes.
- ❑ The Borough of Naugatuck should consider the construction of dry hydrants throughout the Borough to provide a more reliable supply of firefighting water in areas without public water supply.
- ❑ The Borough should also continue to require fire protection tanks for subdivisions away from public water service.

Other potential mitigation strategies for preventing wildfires include:

- ❑ Continue to promote inter-municipal cooperation in fire fighting efforts;
- ❑ Continue to support public outreach programs to increase awareness of forest fire danger and how to use common fire fighting equipment;
- ❑ Continue having the Fire Marshal review subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles and have proper means for fire protection;
- ❑ Provide outreach programs on how to properly manage burning and campfires on private property;
- ❑ Distribute copies of a booklet such as "Is Your Home Protected from Wildfire Disaster? – A Homeowner's Guide to Wildfire Retrofit" when developers and homeowners pick up or drop off applications;
- ❑ Patrol Borough-owned open space and parks to prevent unauthorized campfires;
- ❑ Enforce regulations and permits for open burning; and
- ❑ Continue to place utilities underground.

In addition, specific recommendations that apply to all hazards are listed in Section 10.1.

10.0 RECOMMENDATIONS

10.1 Additional Recommendations

Recommendations that are applicable to two, three, or four hazards were discussed in the applicable subsections of Sections 3.0 through 9.0. For example, placing utilities underground is a recommendation for hurricane, summer storm, winter storm, and wildfire mitigation. A remaining class of recommendations is applicable to all hazards, because it includes recommendations for improving public safety and planning for emergency response. Instead of repeating these recommendations in section after section of this Plan, these are described herein.

Informing and educating the public about how to protect themselves and their property from natural hazards is essential to any successful hazard mitigation strategy. The Naugatuck Office of Emergency Management & Homeland Security (NEMHS) should be charged with creating and disseminating informational pamphlets and guides to public locations such as the library, post office, senior center, and Borough offices. In particular, additional guides are recommended regarding fire protection, fire safety, and the importance of prevention. Such pamphlets include *"Are you ready? A Guide to Citizen Preparedness"* co-published by the American Red Cross, FEMA, and the National Oceanic & Atmospheric Administration and includes recommendations for dealing with heat waves, hurricanes, tornadoes, thunderstorms, flooding, fire, and winter storms. Other pamphlets include:

- ❑ *"Food & Water in an Emergency"*
- ❑ *"Disaster Supply Kit"*
- ❑ *"Family Disaster Plan"*
- ❑ *"Preparing for Disaster for People with Disabilities and Other Special Needs", and*
- ❑ *Helping Children Cope with Disaster"*

In addition, the Borough should consider adding additional pages to its website dedicated to citizen education and preparation for natural hazard events.

A community warning system that relies on radios and television is less effective at warning residents during the night when the majority of the community is asleep. Thus, the ongoing implementation of CodeRED is a boon for emergency response in Naugatuck. Databases should be set up as best possible for hazards with a specific geographic extent, particularly dam failure. Residents should also be encouraged to purchase a NOAA weather radio containing an alarm feature. In addition, the Borough Emergency Operations Plan should continue to be reviewed and updated at least once annually.

10.2 Summary of Specific Recommendations

Recommendations have been presented throughout this document in individual sections as related to each natural hazard. This section lists all recommendations of the Plan without any priority ranking. Recommendations that span multiple hazards are only reprinted once in this section under the most appropriate hazard event. Refer to the matrix in Appendix A for recommendations with scores based on the STAPLEE methodology described in Section 1.0.

All Hazards

- ☐ Disseminate informational pamphlets regarding natural hazards to public locations.
- ☐ Add pages to the Borough website (<http://www.naugatuck-ct.gov/index.htm>) dedicated to citizen education and preparation for natural hazard events.
- ☐ Continue implementation of the CodeRED emergency notification system.
- ☐ Encourage residents to purchase and use NOAA weather radios with alarm features.

- ❑ As required by law, continue to annually review and update the Borough Emergency Operations Plan.
- ❑ Continue reviewing subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles.
- ❑ Upgrade at least one secondary shelter that is unlikely to be impacted by natural hazards into a primary shelter facility. Attempt to acquire the resources necessary to be able to shelter 10% of the population of Naugatuck.
- ❑ Continue to encourage two modes of egress into every neighborhood by the creation of through streets.

Flooding

Prevention

- ❑ Streamline the permitting process and work toward the highest possible education of a developer or applicant. Develop a checklist that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to the proposed project. This list could be provided to an applicant at any Borough department. A sample checklist for the Borough of Naugatuck is included as Appended Table 3.
- ❑ Consider joining FEMA's Community Rating System.
- ❑ Continue to require applications for approval of a development in a floodplain for activities within SFHAs.
- ❑ Consider requiring buildings constructed in floodprone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.
- ❑ Ensure new buildings be designed and graded to shunt drainage away from the building.
- ❑ After Map Mod has been completed, consider restudying local flood prone areas and produce new local-level regulatory floodplain maps using more exacting study

techniques, including using more accurate contour information to map flood elevations provided with the FIRM.

Property & Natural Resource Protection

- ❑ Pursue the acquisition of additional municipal open space properties inside SFHAs and set it aside as greenways, parks, or other non-residential, non-commercial, or non-industrial use.
- ❑ Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.
- ❑ Work with property owners along Long Meadow Pond Brook, Hop Brook, Beacon Hill Brook, Cold Spring Brook, Fulling Mill Brook, and their tributaries to pursue wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of any given structure is most appropriate.

Structural Projects

- ❑ Consider performing a Borough-wide analysis to help identify undersized and failing portions of the stormwater and drainage systems. Prioritize repairs as needed. Incorporate anecdotal information where appropriate, such as observations described in this plan regarding the nuisance flooding at May Street.
- ❑ Upgrade the drainage systems in downtown Naugatuck where necessary to enhance drainage.
- ❑ Increase maintenance of the storm drainage system near the building on Arch Street near Long Meadow Pond Brook to prevent flooding of this area.
- ❑ If necessary, increase the conveyance capacity of Crown Spring Bridge over Hop Brook at Bridge Street.

- ❑ Assess dredging options for the sediment laden Union Ice Company Pond to potentially increase its potential for flood mitigation.
- ❑ Increase the conveyance capacity of the culvert for the tributary to Fulling Mill Brook under East Waterbury Road downstream of the Union Ice Company Pond.
- ❑ Upgrade the drainage system on Highland Avenue near Galpin Street to mitigate future nuisance flooding.
- ❑ Evaluate flood mitigation options, such as dredging of the silted pond adjacent to Nichols Garage/Irving Gas Station, where Pigeon Brook flows underground before entering Hop Brook.
- ❑ Pursue flood mitigation along the unnamed stream associated with the Spencer Street corridor, including increased conveyance capacity of the culverted portions of the stream, channel restoration or maintenance of the un-culverted section of the stream, and/or siting of detention systems.

Wind Damage Related to Hurricanes, Summer Storms, and Winter Storms

- ❑ Continue Borough-wide tree limb inspection and maintenance programs to ensure that the potential for downed power lines is diminished.
- ❑ Focus tree limb maintenance and inspections along Route 63, Route 68, Spring Street, Union City Road, and other evacuation routes. Increase inspections of trees on private property near power lines and Borough right-of-ways.
- ❑ Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.
- ❑ Review potential evacuation plans to ensure timely migration of people seeking shelter in all areas of Naugatuck, and post evacuation and shelter information on the Borough website and in municipal buildings.
- ❑ Provide for the Building Department to have literature available regarding appropriate design standards for wind.

Winter Storms

- ❑ Post a list of Borough sheltering facilities and snow plowing prioritization in the municipal offices and on the Borough's website so residents can best plan how to access to critical facilities during a winter storm event.

Earthquakes

- ❑ Continue to require adherence to the state building codes.
- ❑ Preserve or convert areas of inactive faults to municipal open space.
- ❑ Consider preventing certain types of development, such as residential development, in areas prone to collapse.
- ❑ Ensure that future implementation of Goal #3 item #4 of the Plan of Conservation and Development ("Establish development standards for single-family housing on slopes") considers earthquake risks.
- ❑ Continue regulating development of slopes greater than 20%, and consider setting a prohibition on development of steep slopes.
- ❑ Ensure that municipal departments have adequate backup facilities in case earthquake damage occurs.

Dam Failure

- ❑ Work with Connecticut DEP to stay up to date on revisions and updates to the Emergency Operations Plans and Dam Failure Analyses for the Class C ACOE dams and the Connecticut Water Company dams in Thomaston, Naugatuck, Prospect and Bethany, as well as the three Class C dams within the Borough.
- ❑ Consider including dam failure areas in the CodeRED emergency notification system. This technology should be used to warn downstream residents of a potential or impending dam failure and facilitate evacuation.

- ❑ The Borough should assess the condition and performance of the Donovan Road Dam and upgrade as necessary, and upgrade and repair the Ridge Lower Pond Dam located along Warren Avenue. The latter project should be coordinated with the DEP.
- ❑ The Borough should also consider implementing occasional Borough inspections of lower hazard dams in the Borough.

Wildfires

- ❑ The Connecticut Water Company should continue to extend the public water supply systems into areas that require water for fire protection.
- ❑ The Connecticut Water Company should continue to identify and upgrade those portions of the public water supply systems that are substandard from the standpoint of adequate pressure and volume for fire-fighting purposes.
- ❑ The Borough of Naugatuck should consider the construction of dry hydrants throughout the Borough to provide a more reliable supply of firefighting water in areas without public water supply.
- ❑ The Borough should also continue to require fire protection tanks for subdivisions away from public water service.
- ❑ Continue to promote inter-municipal cooperation in fire fighting efforts.
- ❑ Continue to support public outreach programs to increase awareness of forest fire danger and how to use common fire fighting equipment.
- ❑ Provide outreach programs on how to properly manage burning and campfires on private property.
- ❑ Patrol Borough-owned open space and parks to prevent unauthorized campfires; and
- ❑ Enforce regulations and permits for open burning.

10.3 Sources of Funding

The following sources of funding and technical assistance may be available for the priority projects listed above. This information comes from the FEMA website

(<http://www.fema.gov/government/grant/index.shtm>). Funding requirements and contact information is given in Section 11.4.

FEMA (Federal Emergency Management Agency) Grants and Assistance Programs

Buffer Zone Protection Program (BZPP)

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

This grant provides security and risk management capabilities at State and local level for Tier I and II critical infrastructure sites that are considered high-risk/high-consequence facilities. Each State with a BZPP site is eligible to submit applications for its local communities to participate in and receive funding under the program. The funding for this grant is based on the number, type, and character of the site.

Citizen Corps Program National Emergency Technology Guard (NET Guard) Pilot Program

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

The purpose of this grant, under the Homeland Security Act of 2002, is to re-establish a communication network in the event that the current information systems is attacked and rendered inoperable. A total of \$80,000 may be available to each applicant provided they are a locality that meets the required criteria.

Community Disaster Loan Program

http://www.fema.gov/government/grant/fs_cdl.shtm

This program provides funds to any eligible jurisdiction in a designated disaster area that has suffered a substantial loss of tax and other revenue. The assistance is in the form of loans not to exceed twenty-five percent of the local government's annual operating budget for the fiscal year in which the major disaster occurs, up to a maximum of five million dollars.

Competitive Training Grants Program (CTGP)

<http://www.fema.gov/emergency/ctgp/index.shtm>

Funds allocated from this program will be used to bolster training and education for Homeland Security. Applicants, if funded, must deliver innovative training/education programs to its trainees.

Emergency Food and Shelter Program

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

This program was created in 1983 to supplement the work of local social service organizations, both private and governmental, to help people in need of emergency assistance.

Emergency Management Performance Grants

<http://www.fema.gov/emergency/empg/empg.shtm>

The Emergency Management Performance Grant (EMPG) is designed to assist local and state governments in maintaining and strengthening the existing all-hazards, natural and man-made, emergency management capabilities. Allocations of this fund is authorized by the 9/11 Commission Act of 2007, and grant amount is determined demographically at the state and local level.

Emergency Operations Center (EOC) Grant Program

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

The Emergency Operations Center Grant is designated to support the needed construction, renovation or improvement of emergency operation centers at the State, Local, or Tribal governments. The State Administrative Agency (SAA) is the only eligible entity able to apply for the available funding on behalf of qualified State, local, and tribal EOCs.

Flood Mitigation Assistance (FMA) Program

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

The FMA was created as part of the National Flood Insurance Reform Act of 1994 with the goal of reducing or eliminating claims under the NFIP. FEMA provides funds in the form of planning grants for Flood Mitigation Plans and project grants to implement measures to reduce flood losses, including elevation, acquisition, or relocation of NFIP-insured structures. Repetitive loss properties are prioritized under this program. This grant program is administered through the DEP.

Hazard Mitigation Grant Program (HMGP)

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

The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. This grant program is administered through the DEP.

Homeland Security Grant Program (HSGP)

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

The objective of the FY 2008 HSGP is to enhance the response, preparedness, and recovery of local, State, and tribal governments in the event of a disaster or terrorist attack. Eligible applicants include all 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, Northern Mariana Islands, and the Virgin Islands. Risk and effectiveness, along with a peer review, determine the amount allocated to each applicant.

Interoperable Emergency Communications Grant Program

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

Funding through the Interoperable Emergency Communications Grant Program will enable States, Territories, local units of government, and tribal communities to implement their Statewide Communication Interoperability Plans (SCIP) in conjunction with the National Emergency Communications Plan (NECP) to further enhance interoperability. The only applicants eligible for funding through this grant are State Administration Agencies.

Intercity Bus Security Grant Program (IBSGP)

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

The mission of the IBSGP is to maintain the protection of intercity bus systems and public transportation from terrorism. The only eligible grantees for this program are private operators servicing at least 50 trips annually along fixed established routes.

National Flood Insurance Program (NFIP)

<http://www.fema.gov/library/viewRecord.do?id=3005>

This program enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Municipalities that join the associated Community Rating System can gain discounts of flood insurance for their residents.

Pre-Disaster Mitigation Grant Program

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

The purpose of the PDM program is to fund communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are provided to states, territories, Indian tribal governments, communities, and universities, which, in turn, provide sub-grants to local governments. PDM grants are awarded on a competitive basis. This grant program is administered through the DEP.

Port Security Grant Program (PSGP)

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

The goal of the PSGP is to provide protection of critical port infrastructure from terrorism, involving explosive and non-conventional weapons. Protection includes enhancing training, recovery, prevention, management, response and awareness. Those who may apply include owners of federally regulated terminals, facilities, U.S. inspected passenger vessels, state and local agencies, and local stakeholders.

Public Assistance Grant Program

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

The Public Assistance Grant Program (PA) is designed to assist State, Tribal and local governments, and certain types of private non-profit organizations in recovering from major disasters or emergencies. Along with helping to recover, this grant also encourages prevention against potential future disasters by strengthening hazard mitigation during the recovery process. The first grantee to apply and receive the PA would usually be the State, and the State could then allocate the granted funds to the sub-grantees in need of assistance.

Regional Catastrophic Preparedness Grant Program (RCPGP)

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

The main focus of RCPGP is to strengthen the national preparedness against any catastrophic event within the designated Tier I and Tier II Urban Areas. RCPGP will fund the designated Tier I and II Urban areas only.

Repetitive Flood Claims Program

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

The Repetitive Flood Claims (RFC) grant program was set into place to assist States or communities with insured properties that have had prior claims to the National Flood Insurance Program (NFIP) but do not meet the requirements for FMA. This grant is provided to eligible States/Tribes/Territories that, in turn, will allocate sub-grants to local governments.

Severe Repetitive Loss (SRL) Program

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

The SRL provides funding to reduce or eliminate the long-term risk of flood damage to SRL structures insured under the NFIP. This program is for residential properties only, and eligible project activities include acquisition and demolition or relocation of the structure with conversion of the property to open space, elevation, minor localized flood reduction projects, and dry flood proofing (historic properties only).

Transit Security Grant Program (TSGP)

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

The purpose of TSGP is to bolster security and safety for public transit infrastructure within Urban Areas throughout the United States. Applicable grantees include only the state Governor and the designated State Administrative Agency (SAA) appointed to obligate program funds to the appropriate transit agencies.

Trucking Security Program (TSP)

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

The TSP provides funding for an anti-terrorism and security awareness program for highway professionals in support of the National Preparedness Guidelines. All applicants are accepted so long as they support all four funding priority areas: participant identification and recruitment; training; communications; and information analysis and distribution for an anti-terrorism and security awareness program.

Urban Areas Security Initiative Nonprofit Security Grant Program (UASI-NSGP)

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

The UASI-NSGP specifically targets major areas of concern, those being areas designated as having the highest level of terrorist threat or vulnerability, and aims to improve the protection and preparedness of potentially targeted organizations. Applicants only include non-profit organizations deemed as having a high risk to terrorism and who reside within the areas of concern.

U.S. Fire Administration**Assistance to Firefighters Grant Program (AFGP)**

<http://www.firegrantsupport.com/afg/>

<http://www.usfa.dhs.gov/fireservice/grants/>

The primary goal of the Assistance to Firefighters Grants (AFG) is to meet the firefighting and emergency response needs of fire departments and nonaffiliated emergency medical services organizations. Since 2001, AFG has helped firefighters and other first responders to obtain critically needed equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards. The Grant Programs Directorate of the Federal Emergency Management Agency administers the grants in cooperation with the U.S. Fire Administration.

Fire Prevention & Safety Grants (FP&S)

<http://www.firegrantsupport.com/fps/>

The Fire Prevention and Safety Grants (FP&S) are part of the Assistance to Firefighters Grants (AFG) and are under the purview of the Grant Programs Directorate in the Federal Emergency Management Agency. FP&S grants support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire prevention and public safety education campaigns, juvenile firesetter interventions, media campaigns, and arson prevention and awareness programs.

Reimbursement for Firefighting on Federal Property

<http://www.usfa.dhs.gov/fireservice/grants/rfff/>

Reimbursement may be made to fire departments for fighting fires on property owned by the federal government for firefighting costs over and above normal operating costs. Claims are submitted directed to the U.S. Fire Administration. For more information, please contact Tim Ganley at (301) 447-1358.

Staffing for Adequate Fire & Emergency Response (SAFER)

<http://www.firegrantsupport.com/safer/>

The goal of SAFER is to enhance the local fire departments' abilities to comply with staffing, response and operational standards established by NFPA and OSHA (NFPA 1710 and/or NFPA 1720 and OSHA 1910.134 - see <http://www.nfpa.org/SAFERActGrant> for more details). Specifically, SAFER funds should assist local fire departments to increase their staffing and deployment capabilities in order to respond to emergencies whenever they may occur. As a result of the enhanced staffing, response times should be sufficiently reduced with an appropriate number of personnel assembled at the incident scene. Also, the enhanced staffing should provide that all front-line/first-due apparatus of SAFER grantees have a minimum of four trained personnel to meet the OSHA standards referenced above. Ultimately, a faster, safer and more efficient incident scene will be established and communities will have more adequate protection from fire and fire-related hazards.

Other Grant Programs

Flood Mitigation

- ❑ U.S. Army Corps of Engineers – *50/50 match funding for flood proofing and flood preparedness projects.*
- ❑ U.S. Department of Agriculture – *financial assistance to reduce flood damage in small watersheds and to improve water quality.*
- ❑ CT Department of Environmental Protection – *assistance to municipalities to solve flooding and dam repair problems through the Flood and Erosion Control Board Program.*

Hurricane Mitigation

- ❑ FEMA State Hurricane Program - *financial and technical assistance to local governments to support mitigation of hurricanes and coastal storms.*
- ❑ FEMA Hurricane Program Property Protection – *grants to hurricane prone states to implement hurricane mitigation projects.*

General Hazard Mitigation

- ❑ Americorps – *teams may be available to assist with landscaping projects such as surveying, tree planting, restoration, construction, and environmental education, and provide volunteers to help communities respond to natural hazard-related disasters.*

Erosion Control and Wetland Protection

- ❑ U.S. Department of Agriculture – *technical assistance for erosion control.*
- ❑ CT Department of Environmental Protection – *assistance to municipalities to solve beach erosion problems through the Flood and Erosion Control Board Program.*

- ❑ North American Wetlands Conservation Act Grants Program – *funding for projects that support long term wetlands acquisition, restoration, and/or enhancement. Requires a 1-to-1 funds match.*

11.0 PLAN IMPLEMENTATION

11.1 Implementation Strategy and Schedule

The Council of Governments of the Central Naugatuck Valley is authorized to update this HMP as needed, coordinate its adoption with the Borough of Naugatuck, and guide it through the FEMA approval process.

The individual recommendations of the hazard mitigation plan must be implemented by the municipal departments that oversee these activities. The Office of the Mayor and the Department of Public Works in the Borough of Naugatuck will primarily be responsible for developing and implementing selected projects, those some projects will also be implemented by other departments. Appendix A incorporates an implementation strategy and schedule, detailing the responsible department and anticipated time frame for the specific recommendations listed throughout this document.

Upon adoption, the Plan will be made available to all Borough departments and agencies as a planning tool to be used in conjunction with existing documents. It is expected that revisions to other Borough plans and regulations, such as the Plan of Conservation and Development, department annual budgets, and the Zoning and Subdivision Regulations will reference this plan and its updates. The Office of the Mayor will be responsible for ensuring that the actions identified in this plan are incorporated into ongoing Borough planning activities, and that the information and requirements of this plan are incorporated into existing planning documents within five years from the date of adoption or when other plans are updated, whichever is sooner.

The Office of the Mayor will be responsible for assigning appropriate Borough officials to update the Plan of Conservation and Development, Zoning Regulations, Subdivision Regulations, Wetlands Regulations, and Emergency Operations Plan to include the

provisions in this plan. Should a general revision be too cumbersome or cost prohibitive, simple addendums to these documents will be added that include the provisions of this plan. The Plan of Conservation and Development and the Emergency Operations Plan are the two documents most likely to benefit from the inclusion of this Plan into the Borough's library of planning documents.

Finally, information and projects in this planning document will be included in the annual budget and capital improvement plans as part of implementing the projects recommended in this plan. This will primarily include the annual budget and capital improvement projects lists maintained and updated by the Department of Public Works.

11.2 Progress Monitoring and Public Participation

The Office of the Mayor will be the party responsible for monitoring the successful implementation of the Plan as part of its oversight of all municipal departments. Such monitoring may include periodic reports to the COGCNV regarding certain projects, meetings, site visits, and telephone calls as befits the project being implemented. The COGCNV will coordinate an annual discussion for review and evaluation of the plan. Participants in this review may include, but need not be limited to, representatives of the departments listed in Section 11.1.

Matters to be reviewed will include the goals and objectives of the original plan, hazards or disasters that occurred during the preceding period, mitigation activities that have been accomplished to date, a discussion of reasons that implementation may be behind schedule, and recommendations for new projects and revised activities. The annual discussion will be conducted in the late summer or autumn, at least three months before the annual application cycle for pre-disaster grants closes. This will enable a list of possible projects to be circulated for Borough Departments to review, with sufficient time for developing an application.

Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the Plan. Public input may be solicited through community meetings and input to web-based information gathering tools. Public comment on changes to the Plan may be sought through posting of public notices, and notifications posted to the website of the Council of Governments of the Central Naugatuck Valley, as well as of the Borough of Naugatuck.

11.3 Updating the Plan

The Borough of Naugatuck plans to formally update the plan at least once every five years. The COGCNV will remind the Borough to formally update the plan within this timeframe. More frequent updates can be accomplished if a consensus to do so is reached by the Board of Mayor and Burgesses. The COGCNV will update the plan for the Borough if the Borough of Naugatuck submits a request to the COGCNV and secures funding enabling the COGCNV to do so.

To develop the plan update, committee will be formed consisting of representatives of many of the same departments solicited for input to this plan. In addition, local business leaders, community and neighborhood group leaders, relevant private and non-profit interest groups, and the six neighboring municipalities will be solicited for representation, including the following:

- ❑ The Central Naugatuck Valley Emergency Planning Committee, managed by the COGCNV;
- ❑ Naugatuck River Watershed Association;
- ❑ Key organizations from the list presented on Page 1-10;
- ❑ Town of Beacon Falls Public Works Department and Planning Department;
- ❑ Town of Bethany Public Works Department and Planning Department;
- ❑ Town of Middlebury Public Works Department and Planning Department;
- ❑ Town of Oxford Public Works Department and Planning Department;

- ❑ Town of Prospect Public Works Department and Planning Department; and
- ❑ City of Waterbury Public Works Department and Planning Department.

Updates may include deleting recommendations as projects are completed, adding recommendations as new hazard effects arise, or modifying hazard vulnerabilities as land use changes. In addition, the list of shelters and critical facilities should be updated as necessary, or at least every five years.

11.4 Technical and 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
99 High Street, 6th floor
Boston, MA 02110
(617) 956-7506
<http://www.fema.gov/>

Mitigation Division

The Mitigation Division is comprised of three branches that administer all of FEMA's hazard mitigation programs. The **Risk Analysis Branch** applies planning and engineering principles to identify hazards, assess vulnerabilities, and develop strategies to manage the risks associated with natural hazards. The **Risk Reduction Branch** promotes the use of land use controls and building practices to manage and assess risk in both the existing built developments and future development areas in both pre- and post-disaster environments. The **Risk Insurance Branch** mitigates flood losses by providing affordable flood insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations.

FEMA Programs administered by the Risk Analysis Branch include:

- ❑ *Flood Hazard Mapping Program*, which maintains and updates National Flood Insurance Program maps;
- ❑ *National Dam Safety Program*, which provides state assistance funds, research, and training in dam safety procedures;
- ❑ *National Hurricane Program*, which conducts and supports projects and activities that help protect communities from hurricane hazards; and
- ❑ *Mitigation Planning*, a process for states and communities to identify policies, activities, and tools that can reduce or eliminate long-term risk to life and property from a hazard event.

FEMA Programs administered by the Risk Reduction Branch include:

- ❑ *Hazard Mitigation Grant Program (HMGP)*, which provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration;
- ❑ *Flood Mitigation Assistance Program (FMA)*, which provides funds to assist states and communities to implement measures that reduce or eliminate long-term risk of flood damage to structures insurable under the National Flood Insurance Program;
- ❑ *Pre-Disaster Mitigation Grant Program (PDM)*, which provides program funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event;
- ❑ *Severe Repetitive Loss Program (SRL)*, which provides funding to reduce or eliminate the long-term risk of flood damage to "severe repetitive loss" structures insured under the National Flood Insurance Program;
- ❑ *Community Rating System (CRS)*, a voluntary incentive program under the National Flood Insurance Program that recognizes and encourages community floodplain management activities; and
- ❑ *National Earthquake Hazards Reduction Program (NEHRP)*, which in conjunction with state and regional organizations supports state and local programs designed to protect citizens from earthquake hazard.

The Risk Insurance Branch oversees the *National Flood Insurance Program (NFIP)*, which enables property owners in participating communities to purchase flood insurance. The NFIP assists communities in complying with the requirements of the program and publishes flood hazard maps and flood insurance studies to determine areas of risk.

FEMA also can provide information on past and current acquisition, relocation, and retrofitting programs, and has expertise in many natural and technological hazards. FEMA also provides funding for training state and local officials at Emergency Management Institute in Emmitsburg, Maryland.

The Mitigation Directorate also 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. Services include 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 mitigation 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.

Response & Recovery Division

As part of the National Response Plan, this division provides information on dollar amounts of past disaster assistance including Public Assistance, Individual Assistance, and Temporary Housing, as well as information on retrofitting and acquisition/relocation initiatives. The Response & Recovery Division also provides mobile emergency response support to disaster areas, supports the National Disaster Medical System, and provides urban search and rescue teams for disaster victims in confined spaces.

The division also coordinates federal disaster assistance programs. The Public Assistance Grant Program (PA) that provides 75% grants for mitigation projects to protect eligible damaged public and private non-profit facilities from future damage. "Minimization" grants at 100% are available through the Individuals and Family Grant Program. The Hazard Mitigation Grant Program and the Fire Management Assistance Grant Program are also administered by this division.

Computer Sciences Corporation

New England Regional Insurance Manager
Bureau and Statistical Office
(781) 848-1908

Corporate Headquarters
3170 Fairview Park Drive
Falls Church, VA 22042
(703) 876-1000
<http://www.csc.com/>

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 leaders, insurance agents, and communities.

Small Business Administration

Region I
10 Causeway Street, Suite 812
Boston, MA 02222-1093
(617) 565-8416
<http://www.sba.gov/>

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. These loans can be used in combination with the new "mitigation insurance" under the NFIP, or in lieu of that coverage.

Environmental Protection Agency

Region I
1 Congress Street, Suite 1100
Boston, MA 02114-2023
(888) 372-7341

Provides grants for restoration and repair, and educational activities, including:

- ❑ *Capitalization Grants for State Revolving Funds*: Low interest loans to governments to repair, replace, or relocate wastewater treatment plans 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. Department of Housing and Urban Development

20 Church Street, 19th Floor
 Hartford, CT 06103-3220
 (860) 240-4800
<http://www.hud.gov/>

The U.S. Department of Housing and Urban Development offers *Community Development Block Grants (CDBG)* to communities with populations greater than 50,000, who may contact HUD directly regarding CDGB. 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 that create an "imminent threat." The funds have been used in the past to replace (and redesign) bridges where flood damage eliminates police and fire access to the other side of the waterway. Funds are also available for smaller municipalities through the State Administered CDBG program participated in by the State of Connecticut.

U.S. Army Corps of Engineers

Institute for Water Resources
 7701 Telegraph Road
 Alexandria, VA 22315
 (703) 428-8015
<http://www.iwr.usace.army.mil/>

The Corps provides 100% funding for floodplain management planning and technical assistance to states and local governments 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 are 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

Northeast River Forecast Center

445 Myles Standish Blvd.

Taunton, MA 02780

(508) 824-5116

<http://www.nws.noaa.gov/>

The National Weather Service 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

Steve Golden, Program Leader

Rivers, Trails, & Conservation Assistance

15 State Street

Boston, MA 02109

(617) 223-5123

<http://www.nps.gov/rtca/>

The National Park Service provides technical assistance to community groups and local, state, and federal government agencies to conserve rivers, preserve open space, and develop trails and greenways, as well as identify non-structural options for floodplain development.

U.S. Fish and Wildlife Service

New England Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5087

(603) 223-2541

<http://www.fws.gov/>

The U.S. Fish and Wildlife Service provide technical and financial assistance to restore wetlands and riparian habitats through the North American Wetland Conservation Fund and Partners for Wildlife programs. It also administers the *North American Wetlands Conservation Act Grants Program*, which provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands

projects in the United States, Canada, and Mexico. Funds are available for projects focusing on protecting, restoring, and/or enhancing critical habitat.

U.S. Department of Agriculture

Natural Resources Conservation Service (formerly SCS)

Connecticut Office

344 Merrow Road, Suite A

Tolland, CT 06084-3917

(860) 871-4011

The Natural Resources Conservation Service provides technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts on land-use and conservation planning, resource development, stormwater management, flood prevention, erosion control and sediment reduction, detailed soil surveys, watershed/river basin planning and recreation, and 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.

Regional Resources

Northeast States Emergency Consortium

1 West Water Street, Suite 205

Wakefield, MA 01880

(781) 224-9876

<http://www.serve.com/NESEC/>

The Northeast States Emergency Consortium (NESEC) develops, promotes, and coordinates "all-hazards" emergency management activities throughout the Northeast. NESEC works in partnership with public and private organizations to reduce losses of life and property. They provide support in areas including interstate coordination and public awareness and education, along with reinforcing interactions between all levels of government, academia, non-profit organizations, and the private sector.

State Resources

Connecticut Department of Economic and Community Development

505 Hudson Street
Hartford, CT 06106-7106
(860) 270-8000
<http://www.ct.gov/ecd/>

The Connecticut Department of Economic and Community Development administers HUD's State CDBG Program, awarding smaller communities and rural areas grants for use in revitalizing neighborhoods, expanding affordable housing and economic opportunities, and improving community facilities and services.

Connecticut Department of Environmental Protection

79 Elm Street
Hartford, CT 06106-5127
(860) 424-3000
<http://www.dep.state.ct.us/>

The Connecticut DEP includes several divisions with various functions related to hazard mitigation:

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. Other programs within the division include:

- ❑ *National Flood Insurance Program State Coordinator:* Provides 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 including the delineation of floodways.
- ❑ *State Hazard Mitigation Officer (shared role with the Department of Emergency Management and Homeland Security):* Hazard mitigation planning and policy; oversight of administration of the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. Has the responsibility of making certain that the Natural Hazard Mitigation Plan is updated every 3 years.
- ❑ *Flood Warning and Forecasting Service:* 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. This service has helped the public respond much faster in flooding condition.

- ❑ *Flood & Erosion Control Board Program:* Provides assistance to municipalities to solve flooding, beach erosion and dam repair problems. Have the power to construct and repair flood and erosion management systems. 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 to 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 localities. Also controls flood management and natural disaster mitigations.
- ❑ *Dam Safety Program:* Charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. Regulates the operation and maintenance of dams in the state. Permits the construction, repair or alteration of dams, dikes or similar structures and maintains a registration database of all known dams statewide. This program also operates a statewide inspection program.
- ❑ *Rivers Restoration Grant Program:* Administers funding and grants under the Clean Water Act involving river restoration, and reviews and provides assistance with such projects.

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 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 (OLISP) - Administers the Coastal Area Management Act (CAM) program and Long Island Sound License Plate Program.

Connecticut Department of Emergency Management and Homeland Security

25 Sigourney Street, 6th Floor

Hartford, CT 06106-5042

(860) 256-0800

<http://www.ct.gov/demhs/>

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

Connecticut Department of Public Safety

1111 Country Club Road

Middletown, CT 06457

(860) 685-8190

<http://www.ct.gov/dps/>

Office of the State Building Inspector - The Office of the State Building Inspector is responsible for administering and enforcing the Connecticut State Building Code, and is also responsible for the municipal Building Inspector Training Program.

Connecticut Department of Transportation

2800 Berlin Turnpike

Newington, CT 06131-7546

(860) 594-2000

<http://www.ct.gov/dot/>

The Department of Transportation administers the federal Intermodal Surface Transportation Efficiency Act (ISTEA) that 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 be mitigation related.

Private and Other Resources

The Association of State Floodplain Managers (ASFPM)

2809 Fish Hatchery Road, Suite 204
Madison, WI 53713
(608) 274-0123
<http://www.floods.org/>

ASFPM is a professional association of state employees that assist communities with the NFIP with a membership of over 1,000. ASFPM has developed a series of technical and topical research papers, and a series of Proceedings from their annual conferences. Many "mitigation success stories" have been documented through these resources, and provide a good starting point for planning.

Institute for Business & Home Safety

4775 East Fowler Avenue
Tampa, FL 33617
(813) 286-3400
<http://www.ibhs.org/>

A non-profit organization put together by the insurance industry to research ways of reducing the social and economic impacts of natural hazards. The Institute advocates the development and implementation of building codes and standards nationwide and may be a good source of model code language.

Multidisciplinary Center for Earthquake Engineering and Research (MCEER)

University at Buffalo
State University of New York
Red Jacket Quadrangle
Buffalo, New York 14261
(716) 645-3391
<http://mceer.buffalo.edu/>

A source for earthquake statistics, research, and for engineering and planning advice.

**The National Association of Flood & Stormwater Management Agencies
(NAFSMA)**

1301 K Street, NW, Suite 800 East
Washington, DC 20005
(202) 218-4122
<http://www.nafsma.org>

NAFSMA is an organization of public agencies who strive to protect lives, property, and economic activity from the adverse impacts of stormwater by advocating public policy, encouraging technology, and conducting educational programs. NAFSMA is a voice in national politics on water resources management issues concerning stormwater management, disaster assistance, flood insurance, and federal flood management policy.

National Emergency Management Association (NEMA)

P.O. Box 11910
Lexington, KY 40578
(859)-244-8000
<http://www.nemaweb.org/>

A national association of state emergency management directors and other emergency management officials, the NEMA Mitigation Committee is a strong voice to FEMA in shaping all-hazard mitigation policy in the nation. NEMA is also an excellent source of technical assistance.

Natural Hazards Center

University of Colorado at Boulder
482 UCB
Boulder, CO 80309-0482
(303) 492-6818
<http://www.colorado.edu/hazards/>

The Natural Hazards Center 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. (NEFSMA)

c/o MA DEM
100 Cambridge Street
Boston, MA 02202

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.

Volunteer Organizations - Volunteer organizations including the American Red Cross, the Salvation Army, Habitat for Humanity, and the Mennonite Disaster Service are often available to help after disasters. Service Organizations such as the Lions Club, Elks Club, and the Veterans of Foreign Wars are also available. Habitat for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings while 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, allowing the funds to be used for mitigation and other projects than cannot be funded elsewhere.

Americorps - Americorps is the recently installed National Community Service Organization. It is a network of local, state, and national service programs that connects volunteers with nonprofits, public agencies, and faith-based and community organizations to help meet our country's critical needs in education, public safety, health, and the environment. Through their service and the volunteers they mobilize, AmeriCorps members address critical needs in communities throughout America, including helping communities respond to disasters. Some states have trained Americorps members to help during flood-fight situations, such as by filling and placing sandbags.

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APPENDED TABLES

Appended Table 1 Hazard Event Ranking

Each hazard may have multiple effects; for example, a hurricane causes high winds and inland flooding. Some hazards may have similar effects; for example, hurricanes and earthquakes may cause dam failure.

Natural Hazards	Location	Frequency of Occurrence	Magnitude / Severity	Rank
	1 = small 2 = medium 3 = large	0 = unlikely 1 = possible 2 = likely 3 = highly likely	1 = limited 2 = significant 3 = critical 4 = catastrophic	
Winter Storms	3	3	2	8
Hurricanes	3	1	3	7
Summer Storms and Tornadoes	2	3	2	7
Earthquakes	3	1	2	6
Wildfires	1	2	1	4

Location

1 = small	isolated to specific area during one event
2 = medium	multiple areas during one event
3 = large	significant portion of the town during one event

Frequency of Occurrence

0 = unlikely	less than 1% probability in the next 100 years
1 = possible	between 1 and 10% probability in the next year; or at least one chance in next 100 years
2 = likely	between 10 and 100% probability in the next year; or at least one chance in next 10 years
3 = highly likely	near 100% probability in the next year

Magnitude / Severity

1 = limited	injuries and/or illnesses are treatable with first aid; minor "quality of life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%
2 = significant	injuries and / or illnesses do not result in permanent disability; shutdown of several critical facilities for more than one week; property severely damaged <25% and >10%
3 = critical	injuries and / or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged <50% and >25%
4 = catastrophic	multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

Frequency of Occurrence, Magnitude / Severity, and Potential Damages based on historical data from NOAA National Climatic Data Center

Appended Table 2 Hazard Effect Ranking

*Some effects may have a common cause; for example, a hurricane causes high winds and inland flooding.
Some effects may have similar causes; for example, hurricanes and nor'easters both cause heavy winds.*

Natural Hazard Effects	Location	Frequency of Occurrence	Magnitude / Severity	Rank
	1 = small 2 = medium 3 = large	0 = unlikely 1 = possible 2 = likely 3 = highly likely	1 = limited 2 = significant 3 = critical 4 = catastrophic	
Nor'Easter Winds	3	3	2	8
Snow	3	3	2	8
Blizzard	3	3	2	8
Hurricane Winds	3	1	3	7
Ice	3	2	2	7
Flooding from Dam Failure	2	1	4	7
Thunderstorm Winds	2	2	2	6
Tornado Winds	2	1	3	6
Shaking	3	1	2	6
Inland Flooding	1	3	1	5
Flooding from Poor Drainage	1	3	1	5
Lightning	1	3	1	5
Falling Trees/Branches	1	3	1	5
Hail	1	2	1	4
Fire/Heat	1	2	1	4
Smoke	1	2	1	4

Location

1 = small	isolated to specific area during one event
2 = medium	multiple areas during one event
3 = large	significant portion of the town during one event

Frequency of Occurrence

0 = unlikely	less than 1% probability in the next 100 years
1 = possible	between 1 and 10% probability in the next year; or at least one chance in next 100 years
2 = likely	between 10 and 100% probability in the next year; or at least one chance in next 10 years
3 = highly likely	near 100% probability in the next year

Magnitude / Severity

1 = limited	injuries and/or illnesses are treatable with first aid; minor "quality of life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%
2 = significant	injuries and / or illnesses do not result in permanent disability; shutdown of several critical facilities for more than one week; property severely damaged <25% and >10%
3 = critical	injuries and / or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged <50% and >25%
4 = catastrophic	multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

Frequency of Occurrence, Magnitude / Severity, and Potential Damages based on historical data from NOAA National Climatic Data Center

Appended Table 3.
Development Permit Checklist for Hazard Mitigation
and Effective Emergency Management

	Zoning Regulations	Subdivision Regulations	Inland Wetland Regulations	Plan of Conservation & Development (2001)
Aquifer Protection Zone Defines protection zones over the primary and secondary recharge areas of the Indian Well Field and the Marks Brook Well Field. Restricts uses in the zone and requires that an Aquifer Protection Zone permit be obtained before any building permit can be issued for development	28 <input type="checkbox"/>			
Flood Plains Recognizes areas of special flood hazards within the Borough and establishes minimum standards and review procedures over the use of the land. Establishes the FIRMs and the FIS as the official maps for delineating areas of special flood hazard. Restricts uses in the floodplain, requires flood protection for structures, controls the alterations of flood plains, and authorizes the Zoning Commission to administer and enforce the provisions of the regulations. Prohibits encroachments, fill, and substantial improvements unless certification is provided showing that such improvements will result in no increase in flood levels during the base flood discharge	29 <input type="checkbox"/>			
Soil Erosion and Sediment Control Plan Requires the submittal of a Soil Erosion and Sediment Control Plan with any application in which the disturbed area of such development is cumulatively more than one-half acre	36 <input type="checkbox"/>	4.6 <input type="checkbox"/>		
General Design Standards Requires that an Engineering Report be submitted with all applications that addresses impacts on floodplains, aquifers, watersheds, greenways and natural features. The report shall also include summaries on stormwater drainage designs and means to provide sanitary sewer disposal and water supply.		3.2.4 <input type="checkbox"/>		
Suitable Developable Land Restricts development on unsuitable land based on water or flooding conditions, unsuitable soil, topography, ledge, rock or other conditions		5.2 <input type="checkbox"/>		

***Appended Table 3.
Development Permit Checklist for Hazard Mitigation
and Effective Emergency Management***

	Zoning Regulations	Subdivision Regulations	Inland Wetland Regulations	Plan of Conservation & Development (2001)
<p>Flood Control</p> <p>Proposed subdivisions shall be consistent with the need to minimize flood damage and public utilities, including adequate storm drainage, shall be designed, located and constructed to minimize flood damage. Base flood elevation data shall be provided for all land proposed to be subdivided</p> <p>Environmental Impact</p> <p>The Commission must consider the environmental impact of the proposed action, including the effects on the watercourse's natural capacity to support fish and wildlife, to prevent flooding, to supply and protect surface and ground waters, to control sediment, to facilitate drainage, to control pollution, to support recreational activities, and to promote public health safety and welfare; any alternatives, and any measures that would mitigate the impact of the proposed activity, such as technical improvements or safeguards to reduce the environmental impacts.</p> <p>Priority Conservation Areas</p> <p>Identifies priority conservation areas (watercourses, water bodies, wetlands, slopes in excess of 15%, and ridgelines) and important conservation areas (public water supply watersheds, and aquifers and recharge areas, and unique or special habitat areas).</p>		<p>5.12 <input type="checkbox"/></p>	<p>10.2 <input type="checkbox"/></p>	<p>3.C.2 <input type="checkbox"/></p>

APPENDIX A
STAPLEE MATRIX

Strategies Listed by Primary Report Section for Naugatuck	Responsible Department ¹	Schedule	Associated Report Sections							Category	STAPLEE Criteria							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Good = 3, Average =2, and Poor = 1							
											Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	STAPLEE Sum of Scores
		A. Ongoing								1. Prevention								
		B. 2009-2013								2. Property Protection								
		C. 2014-2018								3. Natural Resource Prot.								
		D. 2019-2023								4. Structural Projects								
										5. Public Information								
ALL HAZARDS																		
Dissemination of informational pamphlets regarding natural hazards to public locations	Emergency Mgmt.	A	x	x	x	x	x	x	x	1,2,5	3	3	3	3	3	3	3	21
Add pages to the Borough website dedicated to citizen education and preparation for natural hazard events	Emergency Mgmt.	B	x	x	x	x	x	x	x	1,2,5	3	3	3	3	3	2	2	19
Continue implementation of CodeRED emergency notification system	Mayor	A	x	x	x	x	x	x	x	1,5	3	3	2	3	3	3	2	19
Encourage residents to purchase and use NOAA weather radios with alarm features	Emergency Mgmt.	B	x	x	x	x	x	x	x	1,5	3	3	3	3	3	2	2	19
Continue to review and update Emergency Operations Plan at least once annually	Emergency Mgmt.	A	x	x	x	x	x	x	x	1	3	3	3	3	3	3	3	21
Continue reviewing subdivision applications to ensure new neighborhoods are sized to accommodate emergency vehicles	Emergency Mgmt.	A	x	x	x	x	x	x	x	2	3	3	2	3	3	3	2	19
Upgrade at least one secondary shelter to a primary shelter, and attempt to have the resources to shelter 10% of population	Emergency Mgmt.	B	x	x	x	x	x	x	x	1, 4	3	3	2	2	3	2	2	17
Continue to encourage two modes of access into every neighborhood by the creation of through streets	PZC	A	x	x	x	x	x	x	x	1	2	2	3	3	3	2	1	16
INLAND FLOODING																		
Prevention																		
Streamline the permitting process and develop a checklist to ensure maximum education of developer or applicant	PZC/ZEO	B	x	x	x	x	x		x	1	3	2	2	3	3	3	3	19
Consider joining FEMA's Community Rating System	Mayor	B	x	x	x	x				1	2	3	2	3	3	2	1	16
Continue to require application approval for activities within SFHAs	PZC	A	x	x	x	x		x		1, 3	2	3	3	2	3	3	3	19
Consider requiring new buildings constructed in flood prone areas to be protected to the highest recorded flood level	PZC	B	x	x	x	x				1,2	2	2	2	2	3	3	1	15
Ensure that new buildings be designed and graded to shunt drainage away from the building	PZC	B	x	x	x	x				1,2	2	2	3	3	3	3	1	17
After the MapMod Program, use Borough two-foot contour maps to develop more exact regulatory flood maps using FEMA flood elevations	Engineering	C	x	x	x	x				1	2	3	2	2	2	3	1	15
Property and Natural Resource Protection																		
Acquire open space properties within SFHAs and set aside as greenways, parks, or other non-residential, non-commercial, or non-industrial use	Mayor	B,C,D	x	x	x	x		x		2,3	3	2	2	3	3	3	3	19
Selectively pursue conservation objectives listed in the Plan of Conservation & Development	Mayor	B,C,D	x	x	x	x				3	3	2	2	3	3	2	3	18
Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains	PZC	A	x	x	x	x	x	x	x	3	2	3	3	2	3	2	3	18
Consider local floodproofing or elevation options for floodprone homes along various watercourses in Naugatuck	Engineering	B,C	x	x	x	x		x		2,4	3	2	2	3	2	2	2	16
Structural Projects																		
Consider a Borough-wide analysis to identify undersized and failing portions of drainage systems, and prioritize repairs as needed	Engineering, DPW	B	x	x	x	x		x		2,4	3	3	2	3	3	3	1	18
Upgrade the drainage systems in downtown areas to enhance drainage	Engineering, DPW	B	x	x	x	x				2,4	3	2	2	3	3	3	1	17
Increase maintenance of drainage systems on Arch Street near Long Meadow Pond Brook	DPW	B, C, D	x	x	x	x		x		2,4	3	3	3	3	3	3	1	19
If necessary, increase conveyance of Crown Spring Bridge over Hop Brook at Bridge Street	Engineering, DPW	B	x	x	x	x		x		4	2	2	2	3	3	2	1	15
Assess dredging options for Union Ice Company Pond to potentially increase its potential for flood mitigation	Engineering	B	x	x	x	x				4	2	2	2	3	3	2	2	16
Increase conveyance capacity of culvert under East Waterbury Road downstream of Union Ice Company Pond	Engineering, DPW	B	x	x	x	x		x		4	2	2	2	3	3	2	1	15
Evaluate flood mitigation options near underground culvert along Pigeon Brook	Engineering	B	x	x	x	x				2,4	3	3	2	3	3	2	1	17
Pursue flood mitigation options along unnamed stream in Spencer Street corridor	Engineering, DPW	B	x	x	x	x				2,4	3	3	2	3	3	2	1	17
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, AND WINTER STORMS																		
Continue Borough-wide tree limb inspection and maintenance to diminish potential for downed power lines	DPW	A		x	x	x	x		x	1,2,3	3	3	3	3	3	2	2	19
Focus tree limb maintenance and inspections along Route 63 & 68, Spring Street, Union City Road, and other evacuation routes	DPW	B, C, D		x	x	x	x		x	1,2	3	2	2	3	3	3	2	18
Increase inspections of trees on private property near power lines and Borough right-of-ways	DPW	B, C, D		x	x	x	x			1	3	2	2	3	3	3	2	18
Continue to require that utilities be placed underground in new developments and pursue funding to move them underground in existing areas	PZC, Mayor	A	x	x	x	x		x	x	2	3	2	2	3	3	3	2	18
Review and disseminate evacuation plans to ensure timely evacuation of shelterees from all areas of Town	Emergency Mgmt.	B, C, D	x	x	x	x	x	x	x	1,5	3	3	3	3	3	3	1	19
Provide for the Building Department to make literature available during the permitting process regarding appropriate design standards	PZC/ZEO	B		x	x	x				1	3	3	3	3	3	3	1	19

Strategies Listed by Primary Report Section for Naugatuck	Responsible Department ¹	Schedule	Associated Report Sections							Category	STAPLEE Criteria							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Good = 3, Average =2, and Poor = 1							
											Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	STAPLEE Sum of Scores
		A. Ongoing								1. Prevention								
		B. 2009-2013								2. Property Protection								
		C. 2014-2018								3. Natural Resource Prot.								
		D. 2019-2023								4. Structural Projects								
										5. Public Information								
WINTER STORMS																		
Compile and post a final list of plowing routes, prioritizing egress to shelters and critical facilities	DPW	B	x							5	3	3	2	3	3	2	1	17
EARTHQUAKES																		
Continue to require adherence to the state building codes	PZC	A		x	x	x	x			1	2	3	3	3	3	3	1	18
Preserve or convert areas of inactive faults to municipal open space	Mayor	B					x			2,3	2	2	2	2	2	2	3	15
Consider preventing residential development in areas prone to collapse, such as on or below steep slopes	PZC	B					x			1	2	3	3	2	3	2	2	17
Ensure that future implementation of Goal #3 Item #4 of the Plan of Conservation and Development considers earthquake risks	PZC	B					x			1,2	3	3	2	3	3	2	2	18
Consider regulating development in areas on or below steep slopes (slopes exceeding 20%)	PZC	B					x			2,3	2	3	3	3	3	3	3	20
Ensure that municipal departments have adequate backup facilities (power generation, heat, water, etc.) in case earthquake damage occurs	Emergency Mgmt.	B		x	x	x	x			1	3	2	2	3	2	2	1	15
DAM FAILURE																		
Stay current on the development of EOPs and Dam Failure Analyses for Class C and B dams whose failure could impact Naugatuck	Engineering	A						x		2	3	3	3	3	3	3	2	20
Include dam failure inundation areas in the CodeRED contact database	Emergency Mgmt.	B	x					x		1,2	3	3	3	3	3	3	2	20
Assess the condition and performance of the Donovan Road dam and upgrade as necessary	Engineering, DPW	B	x					x		1,2,3,4	3	3	2	3	3	3	2	19
Upgrade and repair the Ridge Lower Pond Dam along Warren Avenue	Engineering, DPW	B	x					x		1,2,3,4	3	3	2	3	3	3	2	19
Consider implementing Borough inspections of lower hazard dams	Engineering	B	x					x		2	2	3	2	2	1	3	2	15
WILDFIRES																		
Continue to have CTWC extend/upgrade the public water supply systems into areas requiring water for fire protection	Engineering	A			x				x	2,3,4	3	2	3	3	3	3	2	19
Encourage CTWC to identify and upgrade those portions of the water system that are substandard for fire protection	Emergency Mgmt.	A			x				x	2,3	3	2	2	3	3	3	1	17
Consider constructing dry hydrants to provide an additional supply of firefighting water in areas without water service	Emergency Mgmt.	B			x				x	2,3,4	3	2	2	3	2	3	2	17
Continue to require storage tanks in subdivisions away from water service	Emergency Mgmt.	A			x				x	2,3,4	3	3	3	3	3	3	1	19
Continue to promote inter-municipal cooperation in fire-fighting efforts	Emergency Mgmt.	A			x				x	1	3	3	3	3	3	3	3	21
Continue to support public outreach programs to increase awareness of forest fire danger and how to use common fire fighting equipment	Emergency Mgmt.	A							x	5	3	3	3	3	3	3	3	21
Provide outreach programs on how to properly manage burning and campfires on private property	Emergency Mgmt.	B							x	2,3,5	3	3	2	3	3	2	3	19
Patrol Borough-owned open space and parks to prevent campfires	Police Dept.	B							x	3	2	2	2	3	3	2	3	17
Enforce regulations and permits for open burning	Police Dept.	A							x	1,3	2	2	2	3	3	3	3	18

¹Notes
PZC = Planning Commission and Zoning Commission
ZEO = Zoning Enforcement Officer
DPW = Department of Public Works

APPENDIX B
DOCUMENTATION OF PLAN DEVELOPMENT

APPENDIX B

PREFACE

An extensive data collection, evaluation, and outreach program was undertaken to compile information about existing hazards and mitigation in the Borough of Naugatuck as well as to identify areas that should be prioritized for hazard mitigation. Documentation of this process is provided within the following sets of meeting minutes and field reports.

Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR NAUGATUCK Council of Governments Central Naugatuck Valley Initial Data Collection Meeting January 23, 2008

I. Welcome & Introductions

The following individuals attended the data collection meeting:

- ☐ David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- ☐ Samuel Eisenbeiser, Fitzgerald & Halliday, Inc. (FHI)
- ☐ Shawn Goulet, Milone & MacBroom, Inc. (MMI)
- ☐ Virginia Mason, Council of Governments Central Naugatuck Valley (CGCNV)
- ☐ Mike Bronko, Naugatuck Mayor
- ☐ Al Pistarelli, Naugatuck Mayoral Aide
- ☐ Fran Dambowsky, Naugatuck Emergency Management & Homeland Security
- ☐ Ken Hanks, Naugatuck Deputy Fire Chief
- ☐ James R. Stewart, Naugatuck Engineer
- ☐ Keith Rosenfeld, Naugatuck Town Planner/Wetlands Enforcement Officer
- ☐ Hank Witkoski, Jr., Superintendent of Public Works/Streets

II. Description and Need for Hazard Mitigation Plans / Disaster Mitigation Act of 2000

Virginia and David described the basis for the natural hazard planning process and possible outcomes. Naugatuck is responsible for a 1/8 cost share through in-kind services. Mayor Bronko assigned Fran as the point of contact person for the project. Copies of the Waterbury and New Haven plans were passed around.

III. Project Scope and Schedule

The project scope was described, including project initiation and data collection, the vulnerability assessment, public meetings, development of recommendations, and the FEMA Review and Plan adoption. A 14-month schedule was presented.

IV. Hazards to Address

The Naugatuck plan will likely address flooding, hurricanes and tropical storms, winter storms and nor'easters, summer storms and tornadoes, earthquakes, dam failure, and wildfires.

V. Discussion of Hazard Mitigation Procedures in Effect & Problem Areas

It was mentioned that utilities must be located underground and that connectivity needs to be encouraged throughout the Borough. Keith said that an updated Plan of Conservation and Development Plan will likely be put into the budget for next year. New development in the Borough deals with flooding largely by avoiding crossings and using setbacks. The FEMA study is from 1979 and is in need of updating. Lastly, there was mention that someone from the Borough will investigate any filings with FEMA from residents of the Borough regarding flooding and any associated damage(s) to their properties.

The informational public meeting was scheduled for the first Monday in March (March 3rd) at 6:00 PM before the Burgesses. An example of a prior press release will be sent to all attendees.

A. Emergency Response Capabilities & Evacuation Routes

The Borough has implemented the CodeRED Emergency Notification System for emergency notifications. Evacuation routes are regionally defined by the Regional Evacuation Plan. No local evacuation plan exists. Ken stated that he would forward a copy of the Emergency Operations Plan to those attendees who wished to review it.

Zoning and Subdivision Regulations

Keith mentioned that all pertinent regulations are on the Borough website ([Borough of Naugatuck, CT-Zoning Regulations](#)) and if there are any questions or problems regarding their download to contact him.

B. Noted Flooding and/or Drainage Problem Areas

Complaints associated with flooding and/or drainage problems eventually reach the Borough's Engineering Department.

- ❑ Due to its high density of residential housing, the location of Spencer Street/Cherry Street/Pleasant Avenue was determined, after discussion, to be the highest rated flooding problem area in the Borough. A review of historical topographic maps reveals that a stream was located in this area in 1947 but not in 1954. Currently, there is a detention pond near this area with an adjacent swale from the hillside; and a stream to the west of Lewis Street. The result of these modifications is the flooding of streets within the development, and with the right scenario, homes. Water levels can rise so rapidly that a "geyser" has formed when water gets backed up in the storm drainage system following periods of high rainfall. The Grant House on Cherry Street Extension was damaged due to pressures within the stormwater system.

- ❑ Determined as the second area of flooding is the location adjacent to the upper Meadow Pond Brook and its tributary near Rubber Avenue and Harlow Court. This is north of the Baummer Dam. There have been approximately four residential or commercial sites that have been flooded in this location. The road becomes inundated with water following heavy rainfall. The flooding at this site is associated with water entering from Webb Road.
- ❑ The site of Nichols Garage (Irving Gas Station) is where Pigeon Brook flows underground before entering Hop Brook. There is a silted pond adjacent to the garage at this site. There may be flooding problems at this location.
- ❑ The portion of East Waterbury Road below the Union Ice Company Pond Dam becomes flooded after heavy rains as a result of the pond being filled with sediment. During substantial rain events, the dam and pond overtop and water spills onto East Waterbury Road. The water runs down the road and eventually re-enters the tributary to Fulling Mill Brook. With the right elements, water does enter homes.
- ❑ The Ridge Lower Pond dam located along Warren Avenue is in need of repair. The dam's insufficiency poses a threat to the residents of the Ridge Development. There was some discussion of possible DEP involvement in the repair.
- ❑ Repeated flooding has taken place along Beacon Valley Road (near Beacon Falls) which becomes inundated with water from Beacon Hill Brook after heavy rains.
- ❑ The Crown Spring Bridge located on Bridge Street has recurring issues with flooding after periods of heavy rainfall.
- ❑ Highland Avenue near Galpin Street becomes flooded after substantial rain events.
- ❑ The bottom of Arch Street receives three feet of standing water during large rainfall events. A storm drain near a vacant building is not normally cleaned, causing storm water to back-up and build in the street during these storms. On one account, the standing water caused a dumpster to float.
- ❑ Last July a sinkhole of approximately 100 feet formed along Maple Street near the Fire Department. The sinkhole was the result of the failure of an old storm drain.
- ❑ The Donovan Road Dam was listed as a place of potential flooding, but may not need to be addressed for this project.

C. Approved Developments

The following housing developments have been approved or are underway:

- ❑ A 264 home subdivision located near Hunters Mountain. This subdivision has connections to Andrews Mountain Road and Hunters Mountain Road.
- ❑ A development of 30 condominiums ("Springbrook").
- ❑ A development of 30 homes at Maple Hill Road and Salem Road near Fulling Mill Brook.
- ❑ A 95 home development located off of Maple Hill Road, between Mulberry Street and Victoria Lane.
- ❑ The development of 150 homes situated between Candee Road and Osborn Road. This development has connections to Candee Road and Osborn Road.
- ❑ 20 single-family units are located along Rt. 63 (Church Street) near Hop Brook and Mill Street.
- ❑ 15 single-family units are situated around Barbers Pond off of King Street.

D. *Potential Developments*

- ❑ A development of 85 single-family units is planned between Andrews Mountain Road and Guntown Road close to Long Meadow Pond Brook.
- ❑ There is a proposed Senior Housing development located near School Street.
- ❑ Renaissance Place is proposed to lie along Water Street and adjacent to the Naugatuck River.
- ❑ Uniroyal is planned to be redeveloped at some time in the future.
- ❑ Additional commercial development along Rt. 63 (New Haven Road) is planned in the Straitsville section of Naugatuck.
- ❑ The Peter Paul factory will eventually be redeveloped.

VI. *Acquisitions*

- ❑ *A Profile of the Central Naugatuck Valley Region: 2007 (CGCNV)*

Name	Department	Phone Number	Email Address
KEN HANKS	NAUGATUCK FERE	203-720-2081	DCNTD@SNET.NET
AL PISTARELLI	MAYOR OFFICE	203-720-7208	ALPISTARELLI@NAUGATUCK-CT.GOV
David Murphy	Milone & MacBroom, Inc.	203 271-1773	dave.m@miloneandmacbroom.com
SHAWN GOULET	MILONE & MACBROOM, INC.	203-271-1773	shawng@miloneandmacbroom.com
SAM EISENBERGER	FITZGERALD & HANLIDAY	860-446-2102	skeisenber@shipm.com
FRAN DAMBOWSKY	Naugatuck Engineering & METALS	203 723 1799	FDAMBOWSKY@NAUGATUCK-CT.GOV
VIRGINIA HASON	COGNV	203-757-0535	VHASON@COGNV.ORG
JAMES R STEWART	Naugatuck Engineering	203 720-7005	JStewart@NaugatuckCT.gov
Keith Rosenfeld	Land Use Office	203-720-3396	KRosenfeld@naugatuckCT.gov
MIKE BRONKO	MAYOR	720 7009	MBRONKO@NAUGATUCK-CT.GOV
HANK WITKOSKI JR	SUPT. OF STREETS	720-7071	HWITKOSKI@NAUGATUCK-CT.GOV

Background

Connecticut experienced a period of heavy rains on frozen ground on February 13, 2008. Precipitation measured 1.35 inches over approximately 9 hours in nearby Litchfield and 1.62 inches in Waterbury. Areas of potential flooding compiled during the initial data collection meeting (in Naugatuck) and areas near mapped floodplains and watercourses (in Beacon Falls) were targeted for inspections. The data collection meeting in Beacon Falls (scheduled for February 19, 2008) will help identify potential flood areas for subsequent inspections.

Photographs

Naugatuck

1. East Waterbury Road, downstream of road
2. East Waterbury Road, upstream of road
3. East Waterbury Road
4. Brook Street at Cold Spring Circle
5. May Street at Bird Road (view of drainage where it jumped the curb and washed out a yard)
6. Arch Street
7. Harlow Court at Field Street (facing southeast from Field)
8. Northwest fork of brook at Webb Road
9. Northeast fork of brook at Webb Road
10. Brook at Webb Road (downstream)
11. Dam at propane facility
12. Dam at propane facility
13. Downstream (east) from Lewis Street near Spencer Street
14. Same brook at Sharon Avenue

Beacon Falls

15. Stream at Skokorat Road
16. Stream at Skokorat Road
17. Stream junction at Skokorat Road & Bethany Road
18. Hockanum Brook at Blackberry Hill Road
19. Hockanum Brook at intersection
20. Along south side of Blackberry Hill Road
21. Along east side of Skokorat Road
22. Hockanum Brook along Bethany Road
23. Trailer park along Naugatuck River
24. Trailer park drainage swale

- 25. Swamp Brook at Lancaster Drive
- 26. Low spot along Lopus Road
- 27. Along Beacon Valley Road on south side of Beacon Hill Brook

Naugatuck again

- 28. Along Little River Drive

Naugatuck Discussion

Downstream of Union Ice Company Pond – Photos 1-3 depict this area along East Waterbury Road. The stream was high but it was flowing through the culvert under the road and had not jumped the road. However, a large amount of stormwater was running down the road.



Cold Spring Brook – Although not mentioned at the data collection kick-off meeting, this corridor was investigated. The brook is very close to Brook Street and could affect homes and access to Cold Spring Circle.



Unnamed Stream along May Street – This stream may have jumped the culvert at the intersection with Bird Road. Photo 5 shows a washout in a resident's yard.



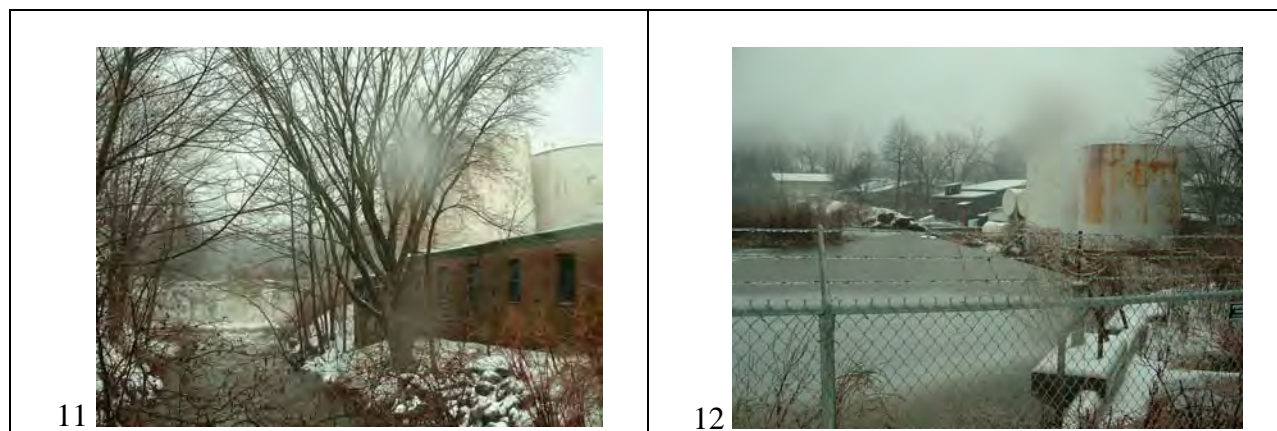
Unnamed stream along Hickory & Woodland Streets – This area was inspected but the brook was not visible and drainage problems were not apparent.

Highland Street near Galpin Street – This area was inspected but the alleged drainage problems were not apparent.

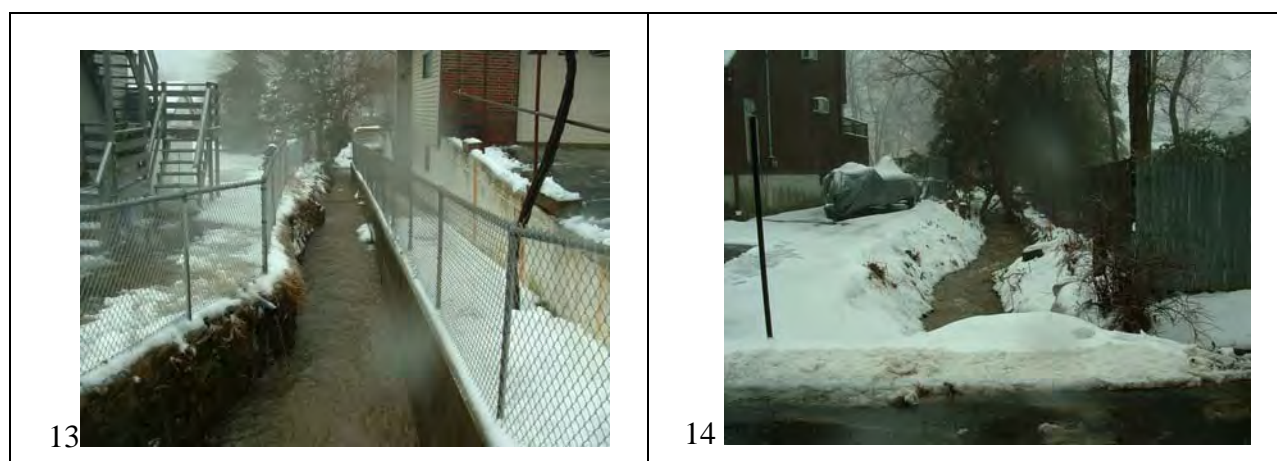
Long Meadow Pond Brook – This stream corridor and its tributary were noted as floodprone during the data collection meeting. Photos 6-12 correspond to this area. Photo 6 shows the commercial property that floods when stormwater can't enter the brook, which is adjacent to the property. Photos 7-10 show the unnamed brook that flows under Webb Road from the north, beneath Harlow Court, and then joins Long Meadow Pond Brook at Rubber Avenue & Neumann Stream. Photo 7 shows the proximity to the homes and yards, whereas Photos 8-10 show the low level of the road in relation to the two forks of the tributary stream.



Photos 11 and 12 show the dam immediately adjacent to the fuel facility at New Dam Pond.



Spencer Street Corridor – This area was cited as a major floodprone area during the data collection meeting. A review of historical topographic maps revealed that a stream was formerly located in this area, but it has been mainly buried in a culvert. Photos 13 and 14 show the stream where it is not underground, although it is apparent that the channel has been modified.



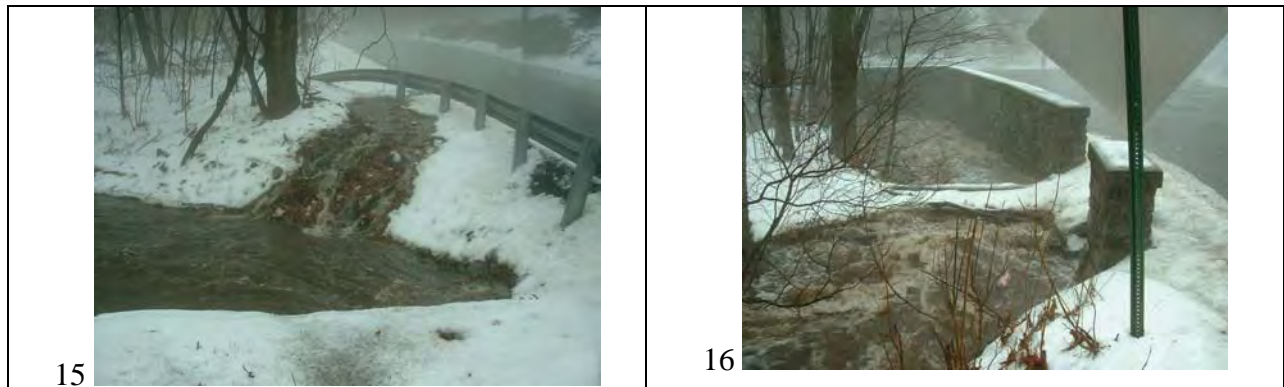
Beacon Hill Brook Corridor – This area was mentioned in the data collection meeting. Photo 28 shows the elevation of Little River Road (a dead-end street along the floodplain) in relation to Beacon Hill Brook.

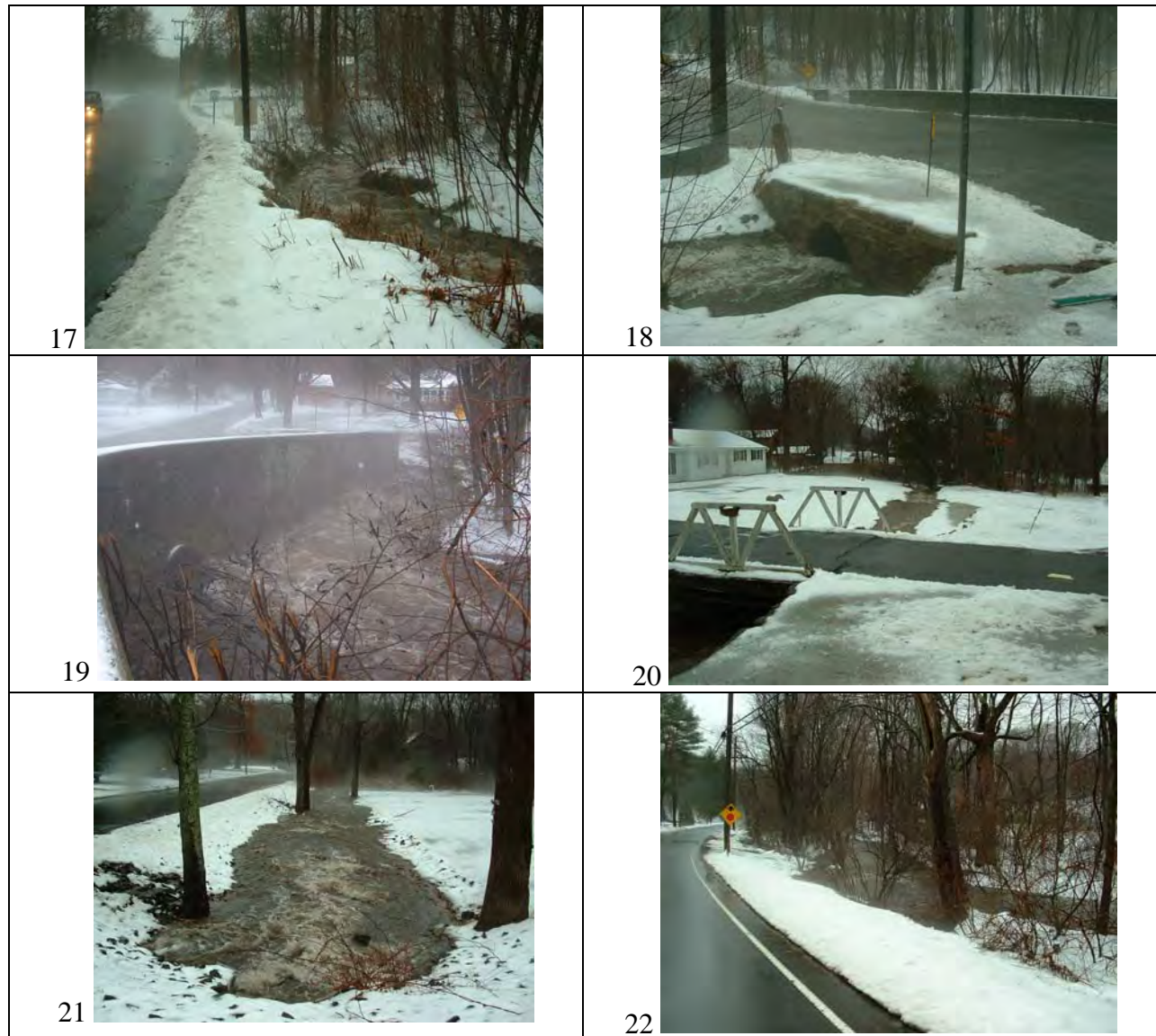


Beacon Falls Discussion

Stream along Burton Road – Problems were not observed along this stream.

Hockanum Brook Corridor – This brook flows from east to west, generally along Route 42 (Bethany Road). A number of streams converge at the Blackberry Hill Road and Munson Road intersection, creating a potential flood situation. All photos show areas that are in 100 and 500-year floodplains. Photos 15, 16, 17, and 21 show the unnamed stream that flows down along Skokorat Road. Photo 18 is Hockanum Brook before the tributary joins it, and Photo 19 shows the combined stream. Photo 20 is the other tributary along Blackberry Hill Road, and Photo 22 is Hockanum Brook further downstream along Route 42.





Naugatuck River – Old Turnpike Road abuts the river and homes along the north end (Shasta Terrace) are in the 500-year floodplain. Likewise, homes along Nancy & Hubbell Avenues and Railroad Avenue are in the floodplain. However, problems were not noted in these areas for this storm event. The industries south of Railroad Avenue are visible across the river from South Main Street, and the potential for flooding was apparent, with the river already in the trees for this storm event. The elevations of the warehouses are not much higher than the river, and the warehouses are in the 500-year floodplain.

River Trailer Parks – The trailer parks near the Seymour town line are partly located in the 100-year floodplain and entirely located in the 500-year floodplain. Photo 23 shows the edge of the park at the river, and photo 24 shows an internal drainage swale. Although the river was high, it was not in danger of flooding the trailer park.



Swamp Brook Corridor – Problems were not evident at the large industrial building on Route 42 located in the floodplain, but a beaver dam and high pond level (near the road) were observed downstream at Lancaster Road. It is possible that the impoundment can flood the road.



Lopus Road – A low point in the road was observed with evidence of strong drainage to both sides. This area crosses a small stream.



Beacon Hill Brook Corridor – This area was mentioned in the Naugatuck data collection meeting. Photo 27 shows the elevation of Beacon Valley Road in relation to Beacon Hill Brook. Parts of the road lie along the margin of the floodplain.





February 26, 2008

James Jordan
Chairman
Planning Commission
29 Elmwood Street
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Jordan,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

In order to successfully develop the local mitigation plans, a significant public outreach effort is required by FEMA. In addition, FEMA requests that stakeholders such as land trusts, neighborhood groups, chambers of commerce, health districts, watershed associations, and educational institutions be invited to provide input. Therefore, COGCNV invites your participation at one or more of the public informational meetings listed below:

<i>Meeting</i>	<i>Date</i>	<i>Time</i>	<i>Location</i>
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Bethlehem	<i>To Be Determined</i>		

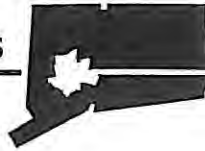
Correspondence will be mailed within the next two weeks with a date, time, and location for the meeting in Bethlehem. Please contact the COGCNV at 203-757-0535 or vmason@cogcnv.org if you have any questions about the planning process or the meetings.

We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


Virginia Mason

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February 26, 2008

David Prendergast

CEO

Naugatuck Economic Development Corporation

195 Water Street

Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Prendergast,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Sincerely,

Virginia Mason

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February 26, 2008

Diana Raczkowski
Borough of Naugatuck
1042 May Street
Naugatuck, CT 06770**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Ms. Raczkowski,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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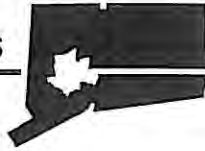
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Sincerely,

Virginia Mason

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February 26, 2008

Jason Bashura
Emergency Response Coordinator
Naugatuck Valley Health District
98 Bank Street
Seymour, CT 06483

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Bashura,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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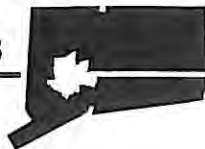
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Sincerely,

Virginia Mason, SA
Virginia Mason

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February 26, 2008

Kristen Bulkovitch
President
United Way of Greater Waterbury
P.O. Box 2688
Waterbury, CT 06723-2688

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Ms. Bulkovitch,

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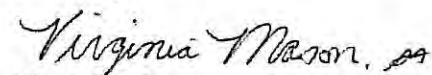
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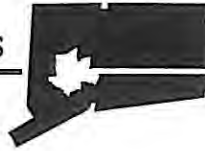
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Virginia Mason

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February 26, 2008

Bob Gregorski
 President
 Naugatuck River Watershed Association
 PO Box 122
 Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
 Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Gregorski,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Virginia Mason

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February 26, 2008

Michael Ciacciarella
Chairman
Zoning Commission
34 Donovan Road
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Ciacciarella,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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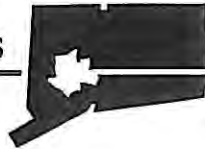
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Sincerely,

Virginia Mason, SA
Virginia Mason

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February 26, 2008

Chester Cornacchia
Chairman
Economic Development Commission
PO Box 66
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Cornacchia,

The Council of Governments Central Naugatuck Valley (COGCV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

In order to successfully develop the local mitigation plans, a significant public outreach effort is required by FEMA. In addition, FEMA requests that stakeholders such as land trusts, neighborhood groups, chambers of commerce, health districts, watershed associations, and educational institutions be invited to provide input. Therefore, COGCV invites your participation at one or more of the public informational meetings listed below:

<i>Meeting</i>	<i>Date</i>	<i>Time</i>	<i>Location</i>
Naugatuck	March 3, 2008	6:00 PM	Town Hall
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Beacon Falls	April 3, 2008	7:00 PM	Town Hall
Middlebury	April 7, 2008	6:30 PM	Town Hall
Bethlehem	<i>To Be Determined</i>		

Correspondence will be mailed within the next two weeks with a date, time, and location for the meeting in Bethlehem. Please contact the COGCV at 203-757-0535 or vmason@cogcnv.org if you have any questions about the planning process or the meetings.

We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,

Virginia Mason
Virginia Mason

T:\Projects\Emergency Planning\Pre-Disaster Mitigation\Predisaster FY 06\Letter to Stakeholders.doc



February 26, 2008

Mary Davis
Chairman
Inland Wetlands Commission
PO Box 345
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Ms. Davis,

The Council of Governments Central Naugatuck Valley (COGCV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.


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Virginia Mason

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February 26, 2008

Eileen Gordon
Executive Director
American Red Cross
22 Park Place
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Ms. Gordon,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Sincerely,

Virginia Mason

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February 28, 2008

Richard Stubbs
American Red Cross Waterbury Area
64 Holmes Avenue
Waterbury, CT 06710

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. ~~Stubbs~~ *Rich*,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Sincerely,

Virginia Mason

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February 28, 2008

Nicki Pelletier
Naugatuck Chamber of Commerce
195 Water Street
Naugatuck, CT 06770

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Ms. Pelletier,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Sincerely,

Virginia Mason

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LOCAL ISSUES

Seymour river faces changes in alleged lawsuit on payment with

SEYMOUR — A lawsuit filed in Superior Court last week by the town of Seymour against the state of Connecticut, alleging that the state owes the town \$1.5 million for damages to the Seymour River, may lead to changes in the way the state manages the river.

Natural disasters meeting scheduled in Naugatuck

NAUGATUCK — A meeting to discuss the importance of planning to avoid effects of natural disasters in the community will take place at 6 p.m. Monday at the Borough Hall.

Oxford awarded grant to give presentation on substance abuse

OXFORD — School and police officials recently received a grant to conduct a presentation in May on substance abuse for students at Oxford High School.

Inside 3B

Deaths 5-6B

Deaths 5-6B

Deaths 5-6B

Deaths 5-6B

Deaths 5-6B

Deaths 5-6B

A swan song for the stacks

Former University stacks to come down in Naugatuck

NAUGATUCK — The stacks of books that once filled the former University of Naugatuck stacks are being dismantled and sold.

Defense tactics

Borough mulls new zone for Hershey

NAUGATUCK — The town of Naugatuck is considering a new zone for the Hershey property.

Beacon Falls touted at forum as business lure

BEACON FALLS — The town of Beacon Falls is being touted as a business lure at a forum in Naugatuck.

Event draws 50 local, state and business eyes

BEACON FALLS — A forum in Naugatuck drew 50 local, state and business eyes.

Beacon Falls touted at forum as business lure

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Beacon Falls touted at forum as business lure

strait, third-degree strangulation and driving a motor vehicle while under suspension.

Natural disasters meeting scheduled in Naugatuck

NAUGATUCK — Borough residents can attend a meeting next week on the importance of planning to avoid effects of natural disasters in the community.

The meeting will take place at 6 p.m. Monday at the Borough Hall. Naugatuck is one of six municipalities that successfully applied through the Council of Governments of the Central Naugatuck Valley for a planning grant to identify natural hazards and ways the town can reduce their impact.

Milone & MacBroom Inc., the consultants, is seeking input from the public about possible local natural hazards such as hurricanes, floods, severe thunderstorms, wildfires and earthquakes.

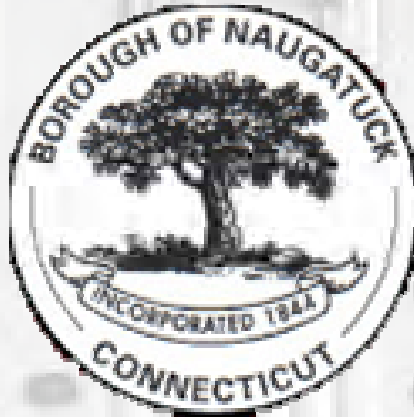
The consultants will develop a plan to identify actions that can be taken before a disaster to reduce the loss of life and property, and it will be submitted to the Federal Emergency Management Agency.

Oxford awarded grant to give presentation on substance abuse

OXFORD — School and police officials recently received a grant to conduct a presentation in May on substance abuse for students at Oxford High School.

Officer David Ives, who is also the school resource officer, and Assistant Principal Glenn Lungerini applied for the Valley United Way's Youth

Natural Hazard Pre-Disaster Mitigation Plan Naugatuck, Connecticut



Presented by:



**David Murphy, P.E. – Associate
Milone & MacBroom, Inc.**



**Sam Eisenbeiser, AICP
Fitzgerald & Halliday, Inc.**

March 3, 2008

History of Hazard Mitigation Plans



- **Authority**

- Disaster Mitigation Act of 2000 (amendments to Stafford Act of 1988)

- **Goal of Disaster Mitigation Act**

- Encourage disaster preparedness
- Encourage hazard mitigation measures to reduce losses of life and property



Municipalities Currently Involved in the Regional Mitigation Planning Process

- Beacon Falls
- Bethlehem
- Middlebury
- Naugatuck
- Southbury
- Thomaston



Local municipalities must have a FEMA approved Hazard Mitigation Plan in place to receive federal grant funds for hazard mitigation projects



Selection of FEMA Pre-Disaster Mitigation Grants: 2003-2006

List does not include seismic, wind retrofit, home acquisition, and planning projects

<i>State</i>	<i>Description</i>	<i>Grant</i>
Colorado	Detention pond	\$3,000,000
Oregon	Water conduit replacement	\$3,000,000
Washington	Road elevation	\$3,000,000
Oregon	Floodplain restoration	\$2,984,236
Colorado	Watershed mitigation	\$2,497,216
Georgia	Drainage improvements	\$1,764,356
Massachusetts	Pond flood hazard project	\$1,745,700
Oregon	Ice storm retrofit	\$1,570,836
North Dakota	Power transmission replacement	\$1,511,250
Texas	Home elevations	\$1,507,005
Florida	Storm sewer pump station	\$1,500,000
Massachusetts	Flood hazard mitigation project	\$1,079,925
Kansas	Effluent pump station	\$765,000
South Dakota	Flood channel restoration	\$580,657
Massachusetts	Culvert project	\$525,000
Texas	Storm shelter	\$475,712
Massachusetts	Housing elevation and retrofit	\$473,640
Utah	Fire station retrofit	\$374,254
Washington	Downtown flood prevention project	\$255,000
New York	WWTP Floodwall construction	\$223,200
Massachusetts	Road mitigation project	\$186,348
Massachusetts	Flood mitigation project	\$145,503
Vermont	Road mitigation project	\$140,441
New Hampshire	Water planning for firefighting	\$134,810
Oregon	Bridge scour relocation project	\$116,709
New Hampshire	Box culvert project	\$102,000
Missouri	Bank stabilization	\$48,750
Tennessee	Utility protection	\$40,564
Wisconsin	Waterway stabilization	\$12,909



What is a Natural Hazard ?

- An extreme natural event that poses a risk to people, infrastructure, and resources



What is Hazard Mitigation?

- ***Pre-disaster*** actions that reduce or eliminate long-term risk to people, property, and resources from natural hazards and their effects



A Road Closure During / After a Large Scale Rainfall Event is a Type of Hazard Mitigation



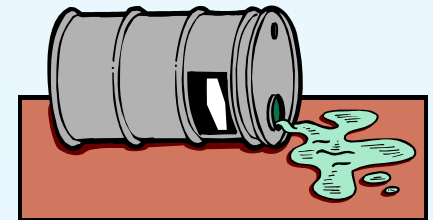
Long-Term Goals of Hazard Mitigation

- Reduce loss / damage to life, property, and infrastructure
- Reduce the cost to residents and businesses
- Educate residents and policy-makers about natural hazard risk and vulnerability
- Connect hazard mitigation planning to other community planning efforts
- Enhance and preserve natural resource systems in the community



What a Hazard Mitigation Plan Does Not Address

- Terrorism and Sabotage
- Disaster Response and Recovery
- Human Induced Emergencies (some fires, hazardous spills and contamination, disease, etc.)



Components of Hazard Mitigation Planning Process

- Identify natural hazards that could occur in Naugatuck
- Evaluate the vulnerability of structures and populations and identify critical facilities and areas of concern
- Assess adequacy of mitigation measures currently in place
- Evaluate potential mitigation measures that could be undertaken to reduce the risk and vulnerability
- Develop recommendations for future mitigation actions



Naugatuck's Critical Facilities

- Emergency Services – Police, Fire, Ambulance
- Municipal Facilities – Borough Hall, Municipal Buildings, Department of Public Works
- High Schools – Used as Shelters



Naugatuck Fire Department

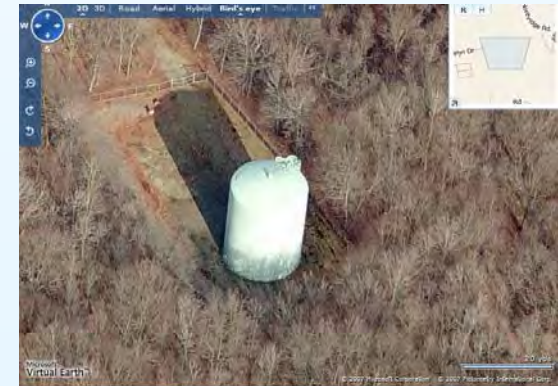


Western School



Naugatuck's Critical Facilities

- Health Care and Assisted Living
- Water Utilities – Tanks, Pumping Stations
- Wastewater Utilities – Pumping Stations and Treatment Plants



Potential Mitigation Measures

- Utilization of CodeRED Emergency Notification System
- Adopt local legislation that limits or regulates development in vulnerable areas
- Public education programs – dissemination of public safety information
- Construction of structural measures
- Allocate technical and financial resources for mitigation programs
- Preserve critical land areas and natural systems
- Research and / or technical assistance for local officials



Primary Natural Hazards Facing Naugatuck

- Inland flooding
- Winter storms, nor'easters, heavy snow, blizzards, ice storms
- Hurricanes
- Summer storms, tornadoes, thunderstorms, lightning, hail
- Dam failure
- Wildfires
- Earthquakes



Modified Channels Pose Threats
During Heavy Rain Storms



Hurricanes

- Winds
- Heavy rain / flooding



Church Street & Park Place



Church Street Road Damage



1955 Flooding



Summer Storms and Tornadoes



Lightning over Boston

- Heavy wind / tornadoes / downbursts
- Lightning
- Heavy rain
- Hail



Tornado in KS



Flooding in MN



Winter Storms

- Blizzards and nor'easters
- Heavy snow and drifts
- Freezing rain / ice



CT River April 2007



Blizzard of 1978 - CT



Dam Failure

- Severe rains or earthquakes can cause failure
- Possibility of loss of life and millions of dollars in property damage



Dam Adjacent to the Fuel Facility off Rubber Avenue



Wildfires

- Naugatuck has low to moderate risk of wildfires
- Fire
- Heat
- Smoke

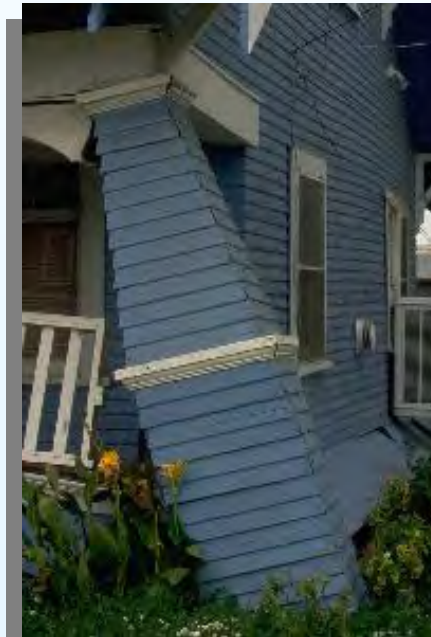


Photo courtesy of FEMA



Earthquakes

- Naugatuck is in an area of minor seismic activity
- Can cause dam failure
 - ◆ Shaking
 - ◆ Liquefaction
 - ◆ Secondary (Slides/Slumps)



Photos courtesy of FEMA



Area-Specific Problems

- Roadway and property flooding at rivers and streams
 - ◆ Long Meadow Pond Brook
 - ◆ Spencer Street Area
 - ◆ Downstream of Union Ice Company Pond
 - ◆ Along Beacon Hill Brook
 - ◆ Other Streams and Localized Problems
- Flooding caused by poor drainage



Flooding at Rivers and Streams

- Long Meadow Pond Brooks and its tributaries



Harlow Court at Field Street



Webb Road



Arch Street



Flooding at Rivers and Streams

- Spencer Street Corridor:
 - ◆ In close proximity to homes and streets within the Spencer Street neighborhood
 - ◆ Portions of stream are in culverts



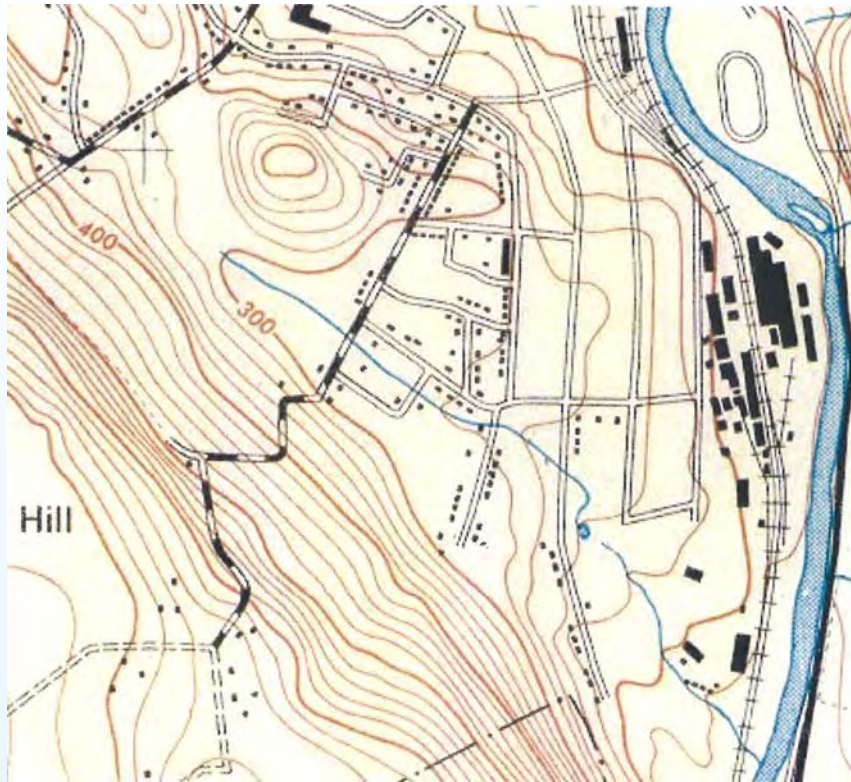
Lewis Street



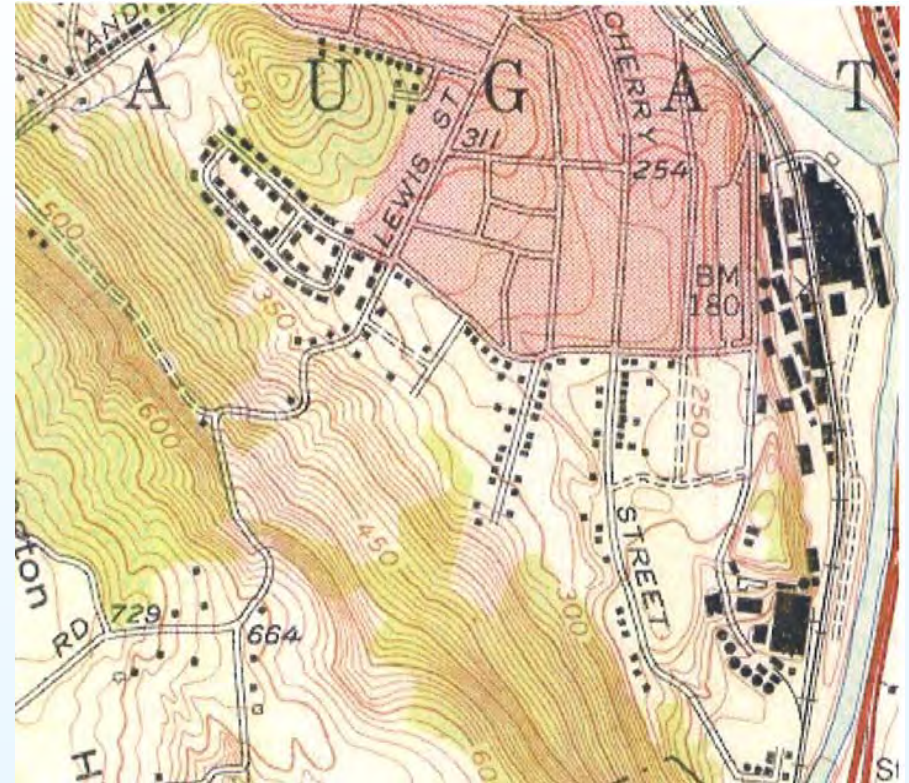
Sharon Avenue



Flooding at Rivers and Streams



The Spencer Street area that experiences flooding, in 1947



By 1954, the stream was gone and development had increased



Flooding at Rivers and Streams

- Downstream of Union Ice Company Pond:



East Waterbury Road



Flooding at Rivers and Streams

- Along Beacon Hill Brook:



Little River Drive at Beacon Hill Brook



Flooding at Rivers and Streams

- Other Streams and Localized Problems:



Brook Street near Cold Spring Circle



Flooding Caused by Poor Drainage

- Locations Damaged During February 13, 2008 Storm:
 - ◆ Unnamed Stream along May Street may have jumped the culvert at the intersection with Bird Road



A wash out along May Street



Next Steps

- Incorporate input from residents
- Rank hazard vulnerability
- Develop a response strategy
- Prepare the draft plan with recommendations for review by the Borough and the public
- Adopt and implement the plan



Questions and Additions

[illegible]

Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR NAUGATUCK Council of Governments Central Naugatuck Valley Public Information Meeting March 3, 2008

I. Welcome & Introductions

The following individuals attended the public meeting:

- ☐ David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- ☐ Shawn Goulet, MMI
- ☐ Samuel Eisenbeiser, Fitzgerald & Halliday, Inc. (FHI)
- ☐ Virginia Mason, Council of Governments Central Naugatuck Valley (CGCNV)
- ☐ Ken Hanks, Naugatuck FD
- ☐ James Ricci, Jr., Naugatuck FD

Ms. Mason introduced the project team and the project, explaining the COG's role in the project, the goals of the Disaster Mitigation Act, and the relationship to the FEMA pre-disaster and post-disaster funding processes.

II. Power Point: "Natural Hazard Pre-Disaster Mitigation Plan, Bethlehem, Connecticut"

Because nobody from the public was in attendance, Mr. Murphy presented the power point slideshow using the handouts.

III. Questions, Comments, and Discussion

- ☐ Fulling Mill Brook along Route 68 should be described in the plan, as flooding can occur.
- ☐ Hop Brook Dam is Class C but considered to be in good condition.



Engineering,
Landscape Architecture
and Environmental Science

MILONE & MACBROOM®

June 9, 2008

Mr. Steven A. Andon
United States Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742

**RE: Natural Hazard Pre-Disaster Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston
MMI #2937-02**

Dear Steve:

As I discussed with you in our phone conversation on Friday, June 6, 2008, the Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for the municipalities of Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston, Connecticut. Milone & MacBroom, Inc. (MMI) has been hired by the COGCNV to assist in the preparation of these six plans. These plans are being funded under a grant from the Federal Emergency Management Agency (FEMA) under its Pre-Disaster Mitigation (PDM) program.

The purpose of these plans is two-fold. First, plan development and adoption is required in order for each municipality to be eligible for certain pre-disaster mitigation funds from FEMA under the PDM program, as well as a greater portion of post-disaster funding under the Hazard Mitigation Grant Program (HMGP). Second, these plans are designed to be used as planning documents in each municipality, similar to existing Plans of Conservation and Development. The plans will be used by the municipalities in land use, development, emergency operations, and other long-range planning decisions. One of the main emphases of the plan is to provide a list of problematic areas related to natural hazards (flooding, wind, blizzards, lightning, hail, earthquakes, dam failure, and wildfires) and a list of proposed projects that can reduce or eliminate the effect of the hazard to that area. Thus, these plans will also be used in the formulation of capital budget decisions. As such, these plans must be officially adopted by the local municipality and approved by FEMA in order to be considered valid. Once adopted, information in these plans is in the public domain and available in the local town halls and library.

MMI has already prepared four plans for the COGCNV, three of which have been approved by FEMA and adopted by its respective municipality. The fourth is conditionally approved by FEMA but not yet adopted by the town. During the review process for the initial plans, FEMA requested "hazards with a geographic boundary (wildfire, dam failure...) must specifically

John M. Milone, P.E.
James G. MacBroom, P.E.
Vincent C. McDermott, FASLA, AICP

Robert A. Jackson, L.S.
John R. Gilmore, P.E.
Edward A. Hart, P.E.
Thomas R. Sheil, L.A.
Stephen R. Dietzko, P.E.
Jeanine Armstrong Bonin, P.E.
Alan Win. Mess, P.E.

David W. Dickson, L.A.
Thomas J. Daly, P.E.
W. Andrew Greene, P.E.
Darin L. Overton, P.E.
Anthony A. Ciriello, P.E.
Nicole Burnham, P.E.
Mark Arigoni, L.A.
Michael J. Joyce, P.E.
Michael F. Mansfield, L.S.
David Murphy, P.E.
Henry Dittman, P.E.
David Sullivan, P.E.

Rodney I. Shaw, L.A.
David R. Bragg, P.E., L.S.
William A. Root, M.E.S.
Garret Harlow, L.A.
Thomas P. Balskis, P.E.
Paul F. Mills, P.E.
Penelope B. Saulnier, L.A.
Kishor Patel, P.E.
Ted G. Crawford, P.E., LEED AP
Steven D. George, P.E.
Ryan R. Chmielewski, L.A.
Reuben S. Jones, III, P.E.
Keith S. Robbins, L.A.
Bruce S. Surface, P.E.
John Hammer, L.A.
Scott G. Bristol, LEP
Gary Fontanella, P.E.
William J. Nagle, Jr., L.S.
John Mike Wilson, P.E.
Ryan McEvoy, P.E.
Nicholas M. Fomenko, P.E.
Andrew T. Manning, P.E.
George G. Kaufman, P.E.

Mr. Steven A. Andon
June 9, 2008
Page 2

address where the hazard will occur." This request is shown at the bottom of page 6 of the attached crosswalk for the town of Cheshire.


In the previous four plans, no dams managed by the United States Army Corps of Engineers (ACOE) were present, and dam failure inundation areas were available for several of these dams at the Connecticut Department of Environmental Protection (DEP) to fulfill the FEMA requirement. Unfortunately, the dam failure analyses for the ACOE dams in Thomaston (Thomaston Dam, Black Rock Dam, and Northfield Dam) and Naugatuck (Hop Brook Dam) were not available at the time of our review. DEP personnel suggested contacting the ACOE directly to review the inundation areas for inclusion in the current set of plans.

MMI would like to obtain copies of the dam failure inundation area mapping for the above-mentioned dams managed by the ACOE in the municipalities of Thomaston and Naugatuck, Connecticut. If provided, these areas will be presented in the plans but will be labeled "for planning purposes only." The ACOE documents will remain the official source of the hazard area.

MMI understands that much of the information contained within the Dam Failure Analysis for each dam is now considered sensitive information for official use only and that this request is subject to internal ACOE legal review. We hope that you will be able to assist in this very important project, and we look forward to hearing from you soon. If you have any additional questions regarding this project, please feel free to contact me or David Murphy at (203) 271-1773.

Very truly yours,

MILONE & MACBROOM, INC.



Scott J. Bighinatti
Environmental Scientist

Attachment

2937-02-jn908-ltr.doc

LOCAL HAZARD MITIGATION PLAN REVIEW CROSSWALK

FEMA REGION I

Jurisdiction: Cheshire, CT

Local Mitigation Plan Review and Approval Status

Jurisdiction: Cheshire, CT	Title of Plan: Mitigation	Date of Plan: August 2007
Local Point of Contact: David Murphy	Address: Council of Governments Central Naugatuck Valley 60 N Main St, 3 rd Floor Waterbury, CT 06702-1403	
Title: Associate		
Agency: Mellone & McBroome 99 Realty Dr, Cheshire, CT 06410		
Phone Number: 203.271.1773	E-Mail: Virginia Mason at COG	

State Reviewer:	Title:	Date:
------------------------	---------------	--------------

FEMA Reviewer: Clayton King	Title: Community Planner	Date: First Draft: September 27, 2007 Revised Draft:
Date Received in FEMA Region I	First Draft: September 16, 2007 Revised Draft:	
Plan Not Approved	Plan Not Approved	
Plan Approved		
Date Approved		

Jurisdiction:		NFIP Status *			CRS Class
		Y	N	N/A	
1. City of Cheshire	CID 090074# Current Effective Map 04/15/02	✓			

* Notes: Y = Participating N = Not Participating N/A = Not Mapped

PREREQUISITE(S)

Adoption by the Local Governing Body

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted the plan?		Not Met <u>Required Revisions</u> Once conditionally approved by FEMA. The Plan must be adopted by the local governing body of jurisdiction. The Plan must include a copy of the adoption documentation	✓	
B. Is supporting documentation, such as a resolution, included?	App. C	Not Met <u>Required Revisions:</u> The Plan must include a copy of the adoption documentation – dated, signed by the appropriate members of the local governing body, and preferably stamped/sealed by the Town or City Clerk (or equivalent) – in order to document that the Plan has been adopted. The plan does not include an unsigned sample resolution.	✓	
SUMMARY SCORE			✓	

Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the plan indicate the specific jurisdictions represented in the plan?				n/a
B. For each jurisdiction, has the local governing body adopted the plan?				n/a
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?				n/a
SUMMARY SCORE				n/a

Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the plan describe how each jurisdiction participated in the plan's development?				n/a
SUMMARY SCORE				
				n/a

PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the plan?	Ch 1 pg 8-10 App B	No formal process is shown; however, the plan provides the dates of meetings and what occurred at each meeting which is sufficient process information.		✓
B. Does the plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Ch 1 pg 8-10 App B	Ms. Virginia Mason of COGCNV led the development. Participants in the plan committee are shown pg 1-8.		✓

LOCAL HAZARD MITIGATION PLAN REVIEW CROSSWALK

FEMA REGION I

Jurisdiction: Cheshire, CT

C. Does the plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Ch 1 Pg 8 App B	The public was invited to comment during the making of the plan. An invitation via newspaper to the Oct. 18 meeting is included in App B. However, no documentation or narrative is found to show that the public was given the opportunity to view a pre-adoption plan. Required Revisions: Explain how the public was given the opportunity to comment on the plan prior to formal plan approval. It will be sufficient to document participation prior to plan approval at this time while this and other revisions are being made.	✓	
D. Was there an opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Ch 1 Pg 8 App B	Other jurisdictions participate in the COG and the COG is concurrently developing plans for several of them. The June 26 meeting included representation by the mayor of Prospect and officials from Cheshire. Other than these public officials from neighboring jurisdictions, involvement in the development of the Plan by other parties is not described. All of the committee members are city employees. Required Revisions: Discuss how local businesses, community leaders, educators, and other relevant private and nonprofit interests groups participated in the plan development.	✓	
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Ch 1 Pg 8 App B	Pg 1-9 states that field inspections were made, and then the information gathered was used in the development of the plan.		✓
SUMMARY SCORE				✓

RISK ASSESSMENT: §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment shall include a] description of the type ... of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan include a description of the types of all natural hazards that affect the jurisdiction? If the hazard identification omits (without explanation) any hazards commonly recognized as threats to the jurisdiction, this part of the plan cannot receive a Satisfactory score. Consult with the State Hazard Mitigation Officer to identify applicable hazards that may occur in the planning area.	1.5 3.1, 4.1, 5.3, 6.1, 7.1, 8.1, 9.1, 10.1, 5.5	A description for each hazard including hail was made and is acceptable. Hail is bundled with tornado, but FEMA does not consider hail as a wind event. The unbundling of the hazards is essential in developing the rest of the Plan. If hail is going to be eliminated then hail must be discussed along with a legitimate justification for its dismissal early on in the Plan. If hail will remain as a hazard then all the other required sections and elements for it must be met. Recommended Revisions: Identify all hazards considered. Use standard names for hazard types depicted in FEMA guides or matrix in back of crosswalk to ensure uniformity and aid mitigation actions. Describe the hazard identification process and list the identification sources. Provide an explanation for eliminating any hazards from consideration.		✓
SUMMARY SCORE				
				✓

Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the plan?	2.5, 3.1 & map, 4.9, 5.1, 6.1, 7.1, 8.1 & map, 9.2 & map, 10.1-2, 5.6	The class C dams are located on a map. General information about where wildfire may occur in any town is found. No location information is found for Hail. Hazards with a recognizable geographic boundary (wildfire, dam failure...) must specifically address where the hazard will occur. Include the dam inundation area behind each of the class C dams. Describe where the wildfire concern is for this city in particular. I.e. where is this city's urban interface? State that hail can happen anywhere in the city.	✓	

B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the plan?	3.7-3.8, 4.5, 5.1, 6.2, 7.2, 8.2, 9.1-2, 10.1-2, 5.6	Information about wildfire in Connecticut and the nearby city of Watertown is provided. Required Revisions: The plan must include "magnitude or severity" for wildfire. Give an estimate of the number of acres which could burn or the amount of urban interface which would be affected in an average and in a worst case scenario wildfire.	✓	
C. Does the plan provide information on previous occurrences of each hazard addressed in the plan?	3.6, 4.3 & 6, 5.6, 6.3, 7.4, 8.4, 9.5, 10.2 & 3, 5.8	Good historical accounts provided.		✓
D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the plan?	3.2, 4.5, 5.4, 6.2, 7.5, 8.3, 9.9, 10.1, 5.6	Each hazard includes some type of determination such as likely or unlikely; however, the plan should include a basis which defines these terms. Recommended Revisions: If a qualitative assignment is used, define each category rating. It is best to define the scale as a percentage of chance of occurrence in a year. This can be done through an analysis of the previous events. Describe the methodology or sources used to determine the probability for each natural hazard.		✓
SUMMARY SCORE			✓	

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Location in the Plan (section or annex and page #)			SCORE	
Reviewer's Comments			N	S
Element				
A. Does the plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	3.2 & 13, 4.10, 5.11, 6.5&6, 7.3, 8.9, 9.1, 10.4, 5.6	General description of things vulnerable in any city is provided for wildfire. Recommended Revisions: Discuss what in this city is vulnerable to wildfire. A discussion about the number of people or special populations at risk, such as the elderly, disabled, or others with special needs, their consideration in the risk assessment will enable the development of appropriate actions to assist such populations during or after a disaster.		✓
B. Does the plan address the impact of each hazard on the jurisdiction?	Not Found	The plan does not include impact information. Required Revisions: Describe each hazard's potential impact (kind and level of damage to buildings, infrastructure, and critical facilities) on the jurisdiction's vulnerability to each hazard. Additional technical assistance provided. Recommended Revisions: <ul style="list-style-type: none">This information could be presented in terms of dollar value, percent of damage, days of duration, etc. An easy method to do this: <ul style="list-style-type: none">Present the structure information in a table format, indicating the impact (e.g., high, medium, low) by hazard. For example wind might have a low impact on a solid building, but because the building is in the floodplain the flood impact would be high. Explain the rating system used and the process followed to determine impact.	✓	
SUMMARY SCORE			✓	

Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area ...

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?	Ch 2 pg 22	<p>Critical facilities are found in a table on pg 2-22. None are located in the flood plain.</p> <p>Recommended Revisions: Identify the type and number of existing buildings, infrastructure, and critical facilities within each hazard area, for each hazard except flood. For flood area, identify type and number of existing buildings and infrastructure.</p> <p>Additional Suggestions: Identify the kinds of buildings (e.g., residential, commercial, institutional, recreational, industrial, and municipal); infrastructure, (e.g., roadways, bridges, utilities, and communications systems); and critical facilities (e.g., shelters, hospitals, police, and fire stations). Describe the process or method used for identifying existing buildings, infrastructure, and critical facilities. If limited data are available, focus on identifying critical facilities located in the identified hazard areas and identify the collection of data for the remaining buildings and infrastructure as an action item in the mitigation strategy.</p> <p>Inventory structures located within areas that have repeatedly flooded and collect information on past insurance claims. At a minimum, describe repetitive loss neighborhoods or areas in the plan.</p>	✓	
B. Does the plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?	Ch 2 pg 20-21	<p>Some mention is made that R-40 and R-80 zoned areas have the capacity for residential development. Utilities in new subdivisions are underground.</p> <p>Recommended Revisions: Identify the type and number of future buildings, infrastructure, and critical facilities within each hazard area.</p> <p>Additional Suggestions: Identify the types of buildings (e.g., residential, commercial, institutional, recreational, industrial, and municipal buildings); infrastructure, (e.g., roadways, bridges, utilities, and communications systems); and critical facilities (e.g., shelters, hospitals, police, and fire stations).</p>	✓	

Jurisdiction: Cheshire, CT

		Information on proposed buildings, infrastructure, and critical facilities, including planned and approved development, may be based on information in the comprehensive or land use plan and zoning maps. Identify buildings, infrastructure, and critical facilities that are vulnerable to more than one hazard. Describe the process or method used for identifying future buildings, infrastructure, and critical facilities.		
SUMMARY SCORE			✓	

Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate ...

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan estimate potential dollar losses to vulnerable structures?	Not found	Recommended Revisions: The plan should describe vulnerability in terms of dollar losses for each identified hazard. Consider infrastructure, structures, content and function losses, and economic loss. Additional Suggestions: Provide an estimate for each identified hazard. Include, when resources permit, estimates for structure, contents, and function losses to present a full picture of the total loss for each building, infrastructure, and critical facility. Select the most likely event for each identified hazard (e.g., 100-year flood) and estimate the likely losses associated with this event. Include a composite loss map to locate high potential loss areas to help the jurisdiction focus its mitigation priorities. Note any data limitations for estimating losses and include in the mitigation strategy actions for collecting the data to improve future loss estimate efforts.	✓	
B. Does the plan describe the methodology used to prepare the estimate?	Not found	Recommended Revisions: Describe the methodology used to estimate losses.	✓	
SUMMARY SCORE			✓	

Jurisdiction: Cheshire, CT

Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan describe land uses and development trends?	2.18 - 19	<p>Some mention is made that R-40 and R-80 zoned areas have the capacity for residential development. Utilities in new subdivisions are underground.</p> <p>Recommended Revisions:</p> <p>The Plan should provide a general description of current land use and expected future development trends within the jurisdiction to assist mitigation considerations for future land use planning decisions. If no future development is anticipated, plans should justify why growth will not occur.</p> <p>Describe development trends occurring within the jurisdiction (location, expected intensity, and pace by land use).</p> <p>Additional Suggestions:</p> <p>Describe existing land use densities in the identified hazard areas.</p> <p>Describe future land use density. Such information may be obtained from your regional or local planning office, comprehensive plan, or zoning maps. Future development information helps to define appropriate mitigation approaches, and the locations in which these approaches should be applied. This information can also be used reduce development in hazard areas.</p> <p>Overlay a land use map with identified hazard areas.</p> <p>Note any data limitations for determining development trends and include in the mitigation strategy actions for collecting the data to complete and improve future vulnerability assessment efforts.</p>	✓	
SUMMARY SCORE			✓	

Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	n/a			n/a
SUMMARY SCORE				

MITIGATION STRATEGY: §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(ii): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards? (GOALS are long-term; represent what the community wants to achieve, such as "eliminate flood damage"; and are based on the risk assessment findings.)	Ch 1 pg 3-4	Satisfactory		✓
SUMMARY SCORE				
				✓

Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?	3.31, 4.10, 5.11, 6.8, 7.6, 8.9, 9.14, 10.5, 11.1	If hail is identified as a hazard, then mitigation must be included for hail to satisfy this element. This element passes with the hazards currently identified. Many of the actions are referred to as recommendations or		✓

		potential actions. Many of the actions begin with the word "consider." Enough actions included appropriate language for the plan to pass. The planner should be careful about including too much passive language because action items that will only encourage, consider, assume, pursue, or such as that are not acceptable.		
B Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?	Pg 3.36	The plan will require flood hazard areas, subdivision, and commercial and industrial zoning permit applications to provide flood elevation and location data, particularly for Ten Mile River, Mill River, and the Quinnipiac River.		✓
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?	Pg 3.37	The action to excavate East Sindall stream to a depth of 30 inches to restore original flow capacity reduced by debris deposition from upstream erosion will protect the property along Allen Ave.		✓

SUMMARY SCORE

✓

Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the mitigation strategy include how the actions are prioritized ? (For example, is there a discussion of the process and criteria used?)	Pg 1.7 App A	The plan states that STAPLE+E was used to prioritize its actions.		✓
B. Does the mitigation strategy address how the actions will be implemented and administered ? (For example, does it identify the responsible department, existing and potential resources, and timeframe?)	Pg. 12.2- 12.4 App. A	App. A chart shows responsible department and timeframe for actions. 12.1 – 12.4 shows financial resources.		✓
C. Does the prioritization process include an emphasis on the use of a cost-benefit review (see page 3-36 of <i>Multi-Hazard Mitigation Planning Guidance</i>) to maximize benefits?	Pg 1.7 App A	A cost benefit review is part of STAPLE+E.		✓

SUMMARY SCORE

✓

Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A Does the plan include at least one identifiable action item for each jurisdiction requesting FEMA approval of the plan?	n/a			n/a
<u>SUMMARY SCORE</u>				
				n/a

PLAN MAINTENANCE PROCESS

Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan describe the method and schedule for monitoring the plan? (For example, does it identify the party responsible for monitoring and include a schedule for reports, site visits, phone calls, and meetings?)	Pg 12.1	"... a review of the mitigation actions that have been accomplished to date, a discussion of why they may be behind schedule..." will be made at the end of each year. This sentence is enough to pass this element, but process of monitoring should be expanded. Recommended Revisions: Monitoring should include periodic reports, meetings, site visits, and phone calls. Monitoring is the process of seeing that the plans actions are being accomplished.		✓
B. Does the plan describe the method and schedule for evaluating the plan? (For example, does it identify the party responsible for evaluating the plan and include the criteria used to evaluate the plan?)	Pg 12.1 - 12.2	Although the plan does not mention an evaluation, the method by which it reviews itself includes an evaluation. The plan will be reviewed annually to determine if its goals and objectives are still valid considering hazards or disasters that occurred during the previous year. Recommendations for new actions or projects will be made.		✓
C. Does the plan describe the method and schedule for updating the plan within the five-year cycle?	Pg 12.2	The plan will be updated by the Central Naugatuck Valley COG within the 5 year cycle.		✓
<u>SUMMARY SCORE</u>				
				✓

Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan identify other local planning mechanisms available for incorporating the requirements of the mitigation plan?	Not found 3.27-31 3.35-36	Some of the action items found in the plan e.g. pg. 3.35 include mechanisms which could be used to meet this element. Required Revisions: Identify other planning mechanisms available for incorporating the planning requirements. Technical Assistance This section requires a list of other plans which will have information or requirements from the plan incorporated into them. Identification will provide what other plans will be effected by the mitigation plan. What: Other plans may include: annual budgets, comprehensive plans, capital improvement plans, zoning and building codes.	✓	
B. Does the plan include a process by which the local government will incorporate the requirements in other plans, when appropriate?	Not found	Required Revisions: Include the implementation process for incorporating the requirements into other plans. Technical Assistance This element concerns the process of incorporating information or requirements into other plans. The process will provide information concerning who, when and how of incorporation. Who: The mitigation plan can provide the name of a specific department in charge. If the group or department is generally undefined i.e. "city department, then the plan shall give a name or title of the person who will actually incorporate the mitigation plan into other plans. When: The mitigation plan must mention the time its information or requirements will be incorporated into other plans. This time is often during update or review of other plans. However, the plan must give the date (month and year) of the incorporating plans' review cycles. If an	✓	

Jurisdiction: Cheshire, CT

		<p>incorporating plan's review cycle is greater than five years, then this plan's review cycle is too long, because the current mitigation plan cannot be incorporated. In this case a special provision must be made to incorporate the mitigation plan within five years.</p> <p>The mitigation plan does not have to be incorporated during another plan's review cycle, so the mitigation plan may simply state that it will be incorporated within a certain number of years provided this is within five years.</p> <p>How: The mitigation plan shall provide information as to how incorporation will be accomplished. The plan may state which department will work with which department or who will coordinate with whom. The plan may utilize meetings, conduct periodic reviews of plans and policies, and provide technical assistance for implementation.</p> <p>Pg 48 of the blue book demonstrates incorporation.</p> <p>http://www.fema.gov/library/viewRecord.do?id=2615</p>		
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SUMMARY SCORE

✓	
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Continued Public Involvement

Requirement §301.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Pg. 12.2	Community meetings and input to web-based information gathering tools will allow for public comment.		✓
<u>SUMMARY SCORE</u>				✓

From: KNadeau@ctwater.com
Sent: Thursday, August 14, 2008 9:25 AM
To: Scott Bighinatti
Subject: Re: Hazard Mitigation Planning in CTWC service areas

Scott,
I will scan the inundation maps that I have and email them to you, and then see what we have or think for expanded service area.
Keith

From: "Scott Bighinatti" <scottb@miloneandmacbroom.com>
To: <KNadeau@ctwater.com>
Cc:
Sent: 08/13/2008 03:18 PM
Subject: Hazard Mitigation Planning in CTWC service areas

Hi Keith,

As you may be aware, David Murphy and I are writing Natural Hazard Mitigation Plans for the Council of Governments of the Central Naugatuck Valley. These plans will cover several natural hazards that could cause damages and/or loss of life due to flooding, wildfires, dam failure, hurricanes, etc. Municipalities that have these plans in place will be able to apply for funding for hazard mitigation projects through various FEMA grant programs before and after a disaster event. Would you be willing to assist us in this project by providing us the following information?

1. A brief description of any plans Connecticut Water Company has to expand or upgrade water service for fire protection in Thomaston, Middlebury, and Naugatuck (plans to expand water service will be included in the "Wildfires" section of the associated plans to show where the existing wildfire risk area will be reduced in the near future);
2. A copy of the Dam Failure Inundation Maps from the EOPs for the following Connecticut Water Company dams (such mapping has been requested by FEMA for these plans for Class C and B dams which may impact infrastructure and critical facilities):
 - a. New Naugatuck Reservoir Dam in Bethany (Beacon Hill Brook which flows into Beacon Falls)
 - b. Mulberry Reservoir Dam in Naugatuck
 - c. Straitsville Reservoir Dam in Naugatuck
 - d. Plymouth Reservoir in Plymouth (outflows into Thomaston)

In the case of the dam failure inundation maps, the figures in each plan will not replace those within the EOP for the respective dam. These figures will instead show a general

inundation area in relation to critical facilities. A pdf copy of these maps would be perfect.

Please let myself or David Murphy know if you can assist us in this important project. If you have any questions, please feel free to contact us.

Thanks for your help,

Scott

Scott J. Bighinatti
Environmental Scientist
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scottb@miloneandmacbroom.com

APPENDIX C
SUBDIVISION/SITE PLAN CHECKLIST FOR DRAINAGE DESIGNS (NOV. 2008)

**The Borough of Naugatuck
Engineering Department**

Subdivision/Site Plan Checklist for Drainage Designs

November 2008

The following items shall be submitted with all Subdivision and Site Plan applications:

General Information			
Item	Yes	No	Comments
1. Site Map			
2. Location Map			
3. Boring or Test Pit Data			
4. Infiltration test results if infiltration is proposed.			
Hydrology / Detention Evaluation			
Item	Yes	No	Comments
1. Watershed Map including off-site areas that drain onto site, common analysis point(s) and drainage paths for both pre- and post-development conditions			
2. Subwatershed maps with NRCS soil types (pre- and post-development)			
3. Curve Number (CN) computations			
4. Time of Concentration (Tc) computations			
5. Model input for 2, 10, 25, 50 and 100-year storms			
6. Table presenting model output for each analysis point for the 2, 10, 25, 50, and 100 year storms, including: <ul style="list-style-type: none"> ▪ Peak flows for pre-development ▪ Post-development without detention ▪ Post-development with detention 			
7. Detention basin design information including, but not limited to: <ul style="list-style-type: none"> ▪ Storage volume based on contour areas ▪ Detail(s) of outlet structure(s) ▪ Stormwater routings through outlet structures(s) ▪ Infiltration test results ▪ Planting plan by certified Landscape Architect or Created Wetlands Planting Plan by certified Wetland Biologist 			

8. If increasing flows to an existing system, a capacity analysis of the existing system.			
9. Water Quality Volume (WQV), Water Quality Flow (WQF), and Stream Channel Protection Criteria, as appropriate.			
Drainage Design (10-year storm)			
Item	Yes	No	Comments
1. Watershed map to each inlet structure.			
2. Pipe sizing computations			
3. Hydraulic Grade Line (HGL) computations.			
4. Gutter flow analysis.			
5. Stormwater Quality			
6. Swale sizing computations			
7. Outlet protection sizing			
Erosion and Sedimentation Control Plan			
Item	Yes	No	Comments
1. Proposed measures per 2002 Plan.			
2. Notes on implementation.			
3. Description of maintenance schedule			
Reports			
Item	Yes	No	Comments
1. Report on groundwater impacts for proposed infiltration structures.			
2. Reports on wetlands and other surface waters.			
3. Report on water quality impacts to receiving waters.			
4. Report on impacts on biological populations/ecological communities including fish, wildlife (vertebrate and invertebrates), and vegetation.			
5. Flood study/calculations			

APPENDIX D
RECORD OF MUNICIPAL ADOPTION

S Bighinatti

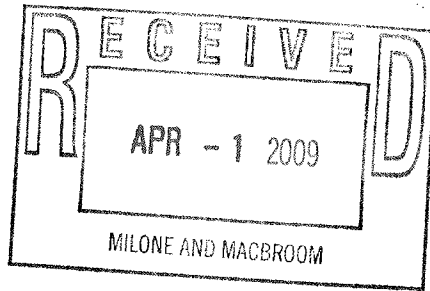
U.S. Department of Homeland Security
Region I
99 High St. 6th Floor
Boston, MA 02110-2320



FEMA

March 27, 2009

The Honorable Mike Bronko, Mayor
Borough of Naugatuck
Town Hall
229 Church Street
Naugatuck, CT 06770



COPY

Dear Mayor Bronko:


Thank you for the opportunity to review the Borough of Naugatuck Natural Hazard Pre-Disaster Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR Parts 201 and 206). The plan satisfactorily meets all of the mandatory requirements of the regulations except §201.6(c)(5), adoption by the local governing body.

Federal regulations require that a plan must include documentation of its formal adoption by the local governing body (e.g., Mayor). Accordingly, this letter reflects a conditional approval of the plan until we receive a copy of its signed and stamped adoption resolution. Once this adoption resolution has been received and accepted, FEMA Region I will send a formal letter of approval to you confirming the Borough of Naugatuck's eligibility to apply for Mitigation Grants administered by FEMA. If the plan is not adopted within one calendar year of FEMA's conditional approval, the jurisdiction must update the entire plan and resubmit it for FEMA review.

Along with a copy of the plan's adoption resolution, please also be sure to submit an electronic version of the plan. FEMA must upload complete, electronic versions of all approved plans into the National Emergency Management Information System (NEMIS) database. Acceptable electronic formats include a .doc or .pdf file and may be submitted to us on a CD.

Thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Congratulations once again for achieving this milestone and ensuring a safer future for the residents of the Borough of Naugatuck. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,


Kevin M. Merli, Director
Mitigation Division

Enclosure

Cc: Art Christian, CT State Hazard Mitigation Officer
Scott Bighinatti, Environmental Scientist, Milone & MacBroom
Virginia Mason, Assistant Director, COGCNV

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR	X	
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) AND		N/A
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		N/A
Planning Process	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		X
Risk Assessment	N	S
5. Identifying Hazards: §201.6(c)(2)(i)		X
6. Profiling Hazards: §201.6(c)(2)(i)		X
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		X
8. Assessing Vulnerability: Addressing Repetitive Loss Properties: §201.6(c)(2)(ii)		X
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)	X	
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	X	
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		X
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		N/A

*States that have additional requirements can add them in the appropriate sections of the Local Multi-Hazard Mitigation Planning Guidance or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

**Plan conditionally approved pending receipt of adoption documentation

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		X
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(i)		X
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		X
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		X
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		N/A
Plan Maintenance Process	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)		X
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		X
20. Continued Public Involvement: §201.6(c)(4)(iii)		X
Additional State Requirements*	N	S
Insert State Requirement		
Insert State Requirement		
Insert State Requirement		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED	
See Reviewer's Comments	
PLAN APPROVED	X**

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

Local Mitigation Plan Review and Approval Status

Jurisdiction: Borough of Naugatuck, CT	Title of Plan: Town of Borough of Naugatuck, CT Natural Hazard Pre-Disaster Mitigation Plan	Date of Plan: November 2008
Local Point of Contact: Scott Bighinatti	Address: 99 Realty Drive Cheshire, Connecticut 06702	
Title: Environmental Scientist		
Agency: Milone & MacBroom		
Phone Number: (203) 271-1773	E-Mail: scottb@miloneandmacbroom.com	

State Reviewer:	Title:	Date:
------------------------	---------------	--------------

FEMA Reviewer: Reid Dominie	Title: Hazard Mitigation Specialist	Date: February 2009
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Conditionally Approved		
Date Approved		

Jurisdiction:	NFIP Status*				CRS Class
	Y	N	N/A		
Borough of Naugatuck, CT	X				

* Notes: Y = Participating N = Not Participating N/A = Not Mapped

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

PREREQUISITE(S)

1. Adoption by the Local Governing Body

Requirement §201.6(c)(5): [The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted new or updated plan?			X	
B. Is supporting documentation, such as a resolution, included?			X	
SUMMARY SCORE			X	

2. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan indicate the specific jurisdictions represented in the plan?				
B. For each jurisdiction, has the local governing body adopted the new or updated plan?				
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?				
SUMMARY SCORE				N/A

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan describe how each jurisdiction participated in the plan's development?				
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?				
SUMMARY SCORE				N/A

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the new or updated plan?	Pg 1-8 to 1-11	The Plan provides a detailed description of the planning process.		X
B. Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Pg 1-8 to 1-11	Ms. Virginia Mason of COGCNV spearheaded the development of Borough of Naugatuck's Plan. The Borough personnel involved in the planning process are listed on page 1-9.		X
C. Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Pg 1-8 to 1-11	The Public was invited to participate in the planning process via newspaper and were also encouraged to "contact the COG with comments" (1-10). No residents attended the public information meeting, aside from the Borough personnel. Additional public comments will be heard at the tentatively scheduled Plan adoption meeting in February 2009.		X
D. Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Pg 1-8 to 1-11	"Ten municipal agencies and civic organizations were invited via a mailed copy of the press release that announced the public information meeting" (1-9). These entities are listed on page 1-10 and included neighboring communities. "No representatives of these organizations attended the meeting" (1-10).		X
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Pg 1-8 to 1-11 Section 12	The Plan cites the CT State Hazard Mitigation Plan, as well as the Massachusetts State Hazard Mitigation Plan. Plans and Studies are referenced throughout the Plan and cited in Section 12.0. Under each hazard section, a subsection analyzes existing programs, policies and mitigation measures.		X
F. Does the updated plan document how the planning team reviewed and analyzed each section of the		This is a new Plan.		N/A

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

4. Documentation of the Planning Process

Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

- (2) An opportunity for and participation of communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): [The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

[illegible]

RISK ASSESSMENT: §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): [The risk assessment **shall** include a] description of the type ... of all natural hazards that can affect the jurisdiction.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?	Pg 1-5	The Plan lists the identified hazards on page 1-5, "based on a review of the Connecticut Natural Hazard Mitigation Plan and correspondence with local officials."		X
SUMMARY SCORE				X

6. Profiling Hazards

Requirement §201.6(c)(2)(i): [The risk assessment **shall** include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?	Sections 3-9	Each hazard is granted its own section, under which fall the following subsections: setting; hazard assessment; historic record; existing programs, policies and mitigation measures; vulnerabilities and risk assessment; and potential mitigation		X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

			measures, strategies and alternatives.		
B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?	Sections 3-9		See above		X
C. Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?	Sections 3-9		See Above		X
D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?	Sections 3-9		See Above		X
SUMMARY SCORE					X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	Sections 3-9	Each hazard is granted its own section, under which fall the following subsections: setting; hazard assessment; historic record; existing programs, policies and mitigation measures; vulnerabilities and risk assessment; and potential mitigation measures, strategies and alternatives.		X
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Sections 3-9	See above		X
SUMMARY SCORE				X

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?	Pg 3-23	Note: This requirement becomes effective for all local plans approved after October 1, 2008. "Correspondence with the State of Connecticut NFIP Coordinator revealed that there is one Repetitive Loss Property listed for the Borough of Naugatuck. The property had one reported flood claim in 1982 and one in 1985. It is believed that this property may be listed in error for several reasons" (3-23).		X
SUMMARY SCORE				X

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area ...

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?	Pg 2-26 to 2-32	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing. Critical Facilities in Borough of Naugatuck are listed and mapped.		X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.	X	
SUMMARY SCORE			X	

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan *should* describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate . . .

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?	Not Found	<i>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</i>	X	
B. Does the new or updated plan describe the methodology used to prepare the estimate?	Not Found	<i>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</i>	X	
SUMMARY SCORE			X	

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan *should* describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe land uses and development trends?	Pg 2-23 to 2-26	<i>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</i>		X
SUMMARY SCORE				X

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment *must* assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?				
SUMMARY SCORE				N/A

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

MITIGATION STRATEGY: §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?	Pg 1-3 to 1-4	Hazard Mitigation Goals are listed. In future updates of the Plan, we recommend that a description of the process used to develop these goals be provided.		X
SUMMARY SCORE				X

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?	Sections 3-9 and Specifically Section 10	A summary of proposed mitigation actions can be found on pages 10-2 to 10-7		X
B Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?	Sections 3-9 and Specifically Section 10			X
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?	Sections 3-9 and Specifically Section 10			X
SUMMARY SCORE				X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	Pg 3-3 & 3-13	Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008. The Plan includes the publication date of its FIRM of April 15, 1979. The Borough of Naugatuck Zoning Enforcement Officer serves as the NFIP administrator overseeing the flood regulations.		X
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Pg 10-2 to 10-7	Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008. The Plan proposes such actions as "Consider joining a FEMA's Community Rating System" and considering a restudy of local flood prone areas and "produce new local level regulatory maps... (10-2)"		X
SUMMARY SCORE				X

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated mitigation strategy include how the actions are prioritized ? (For example, is there a discussion of the process and criteria used?)	Pg 1-7 to 1-8	The Plan provides a discussion of STAPLEE ranking method used to prioritize the Town's mitigation actions.		X
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?	Pg 11-1 and Appendix A			X
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?	Pg 1-8	STAPLEE		X
D. Does the new or updated mitigation strategy include a cost-benefit review of the proposed projects and their associated costs?		This is a new Plan.		N/A

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

<p>1. Local Mitigation Plan Review</p>			
		SUMMARY SCORE	X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?				
B. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (<i>i.e.</i> , deferred), does the updated plan describe why no changes occurred?				
SUMMARY SCORE				N/A

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?	Pg 11-2	"The Office of the Mayor will be the party responsible for monitoring the successful implementation of the Plan as part of its oversight of all municipal departments" (11-2). The method and schedule for monitoring the Plan is discussed.		X
B. Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (<i>i.e.</i> the responsible department)?	Pg 11-2 to 11-4			X
C. Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?	Pg 11-3	"The Borough of Naugatuck plans to formally update the plan at least once every five years. The COGCNV will remind the Borough to formally update the plan within this timeframe" (11-3).		X
SUMMARY SCORE				X

Borough of Naugatuck, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): [The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Element	Location in the Plan (section or annex and page #)		Reviewer's Comments	SCORE	
				N	S
A. Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Pg 11-1 to 11-2		"It is expected that revisions of other Borough plans and regulations, such as the Plan of Conservation and Development, department annual budgets, and the Zoning and Subdivision Regulations, will reference this plan and its updates" (11-1).		X
B. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?	Pg 11-1 to 11-2		"The Office of the Mayor will be responsible for ensuring that the actions identified in this plan are incorporated into ongoing Borough planning activities..." (11-1).		X
C. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?			This is a new Plan.		N/A
SUMMARY SCORE					X

Continued Public Involvement

Requirement §201.6(c)(4)(iii): [The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.

Element	Location in the Plan (section or annex and page #)		Reviewer's Comments	SCORE	
				N	S
A. Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Pg 11-3		"Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the Plan. Public input may be solicited through community meetings and input to web-based information gathering tools. Public comment on changes to the Plan may be sought through posting of public notices, and notifications posted to the website of the Council of Governments of the Central Naugatuck Valley, as well as the website of the Borough of Naugatuck" (11-3).		X
SUMMARY SCORE					X

ERRATA TO BE PRESENTED APRIL 7, 2009
Natural Hazard Pre-Disaster Mitigation Plan
Borough of Naugatuck, Connecticut

The following errata sheet denotes changes to the Borough of Naugatuck Natural Hazard Pre-Disaster Mitigation Plan from the one conditionally approved by FEMA in March 2009. The pagination in the Table of Contents was updated to reflect these changes as necessary.

Section 2 – Community Profile

Page 2-27, 2-28, and 2-31	Added the Algonquin Gas Pipeline to Table 2-5, Figure 2-9, and to the Utilities discussion in Section 2.9 (Critical Facilities).
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