TOWN OF PROSPECT
NATURAL HAZARD PRE-DISASTER MITIGATION PLAN

CENTRAL NAUGATUCK VALLEY
REGIONAL PLANNING AREA

FEMA REVIEW DRAFT

JANUARY 2008

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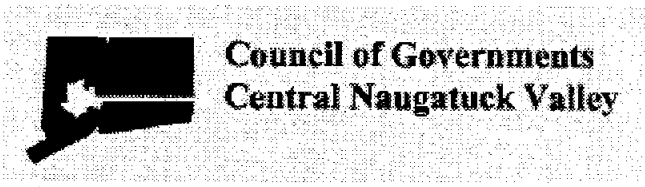
Prepared For:



Under a grant from the Federal Emergency Management Agency (FEMA) through the Connecticut Department of Environmental Protection (DEP)

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Executive Summary

1. 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 primary purpose of a pre-disaster hazard 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. These include the loss of or damage to life, property, infrastructure, and natural, cultural and economic resources from natural disasters.

3. Two meetings with town officials, field inspections, and a public information meeting were held in Prospect as of August 31, 2007 to collect information, to provide background for evaluation, and to perform outreach. The draft plan will be reviewed by municipal officials prior to sending the draft to FEMA for comments. Finally, a public hearing will be held in Prospect prior to local adoption of the plan. When adopted, the final plan will be sent again to FEMA for its approval.

4. Prospect's hilly terrain makes it particularly vulnerable to an array of natural disasters and which limit development in much of the town. Slopes and water features limit development at the northern and eastern ends of the town. In the southern half of the town, the undeveloped land is largely owned by three water supply utilities for conservation purposes, posing a strict limitation to further development in this area.

5. Two major faults exist in Town: an unnamed fault and the Western Border Fault which stretches from Milford into Massachusetts. Both are inactive.

6. Approximately 60% of the Town falls within the Canton and Charlton soils' categories which consist of very deep, well-drained soils formed in a loamy mantle.

7. The Town of Prospect drains to seven major watersheds: Ten Mile River (33% of town), Willow Brook (9%), West River (0.5%), the Naugatuck River (0.1%), Beaver Pond Brook (12%), Fulling Mill Brook (0.16%), and Beacon Hill Brook (29%). It is in the headwaters of all but the Naugatuck and West Rivers.

8. Prospect has been extremely proactive in its hazard mitigation efforts since 1983 and has been successful in convincing landowners and developers to make improvements in an effort to mitigate damage fro natural hazards such as oversized pipes and box culvert for drainage and underground utilities for new developments.

9. There are no major waterways or widespread floodplains associated with waterways in Prospect. The principal flood hazard zones tend to be associated with wetlands and water bodies at headwater locations. Inland flooding affects only a few area of Prospect: in the floodplains adjacent to rivers and along tributaries. These generally occur when snow melt coincides with spring rains and with storms of tropical origin in the late summer move to the northeast.

10. Measures for flood damage prevention, property protection, construction, public education and awareness, natural resource protection and emergency services are listed including pursuing open space acquisition, and increasing culverts sizes where appropriate.

11. The Town should perform a Master Drainage Study, including an introduction of a comprehensive catch basin maintenance program and join the community rating system to lower insurance rates for residents, and continue to keep its Emergency Operations Plan up to date.

12. A major hurricane mitigation measure is increased public awareness of evacuation routes and available shelters.

13. In the winter, icing is a serious problem along Route 69 from the town center to the Bethany town line, along Route 68 near the Department of Public Works, and along Terry Road.

14. There is the potential for catastrophic loss of life and property with the failure of the two Class C Dams (Cheshire Reservoir Dam and Waterbury Reservoir Dam #2). Failure of Waterbury Reservoir Dam #2 would have a higher impact on the residents and infrastructure of the Town of Prospect and both would significantly impact downstream areas in adjacent communities.

15. Prospect is at a low risk for wildfires. Areas at largest risk include undeveloped protected watershed lands owned by water companies which have limited access.

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 pre-disaster hazard 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 Town of Prospect, Connecticut ("Prospect" or "Town"). The HMP is relevant not only in emergency management situations, but also should be used within the Town of Prospect'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 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 Prospect'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 Town'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 Town of Prospect 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 are most likely to affect the Town of Prospect:

- 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 Town of Prospect, 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 Town. 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 Prospect'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 if necessary, *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 Town of Prospect 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 Prospect.

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

This document concludes with a strategy for implementation of the Hazard Management 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 Prospect? Is there any equity issues involved that would mean that one segment of Prospect could be treated unfairly?
- **Technical**: Will the proposed strategy work? Will it create more problems than it will solve?
- **Administrative**: Can Prospect 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 Prospect 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 Town of Prospect is a member of the Council of Governments of the Central Naugatuck Valley (COGCNV), the responsible regional planning body for Prospect and twelve other member municipalities: Beacon Falls, Bethlehem, Cheshire, Middlebury, Naugatuck, Oxford, Southbury, Thomaston, Waterbury, Watertown, Wolcott, and Woodbury. Oxford, Waterbury, Watertown, and Woodbury have existing mitigation plans, and hazard mitigation plans are being concurrently developed for the municipalities of Cheshire and Wolcott.

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 Town of Prospect will also be coordinated by the COGCNV.

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

- Robert J. Chatfield, Mayor
- William Donovan, Land Use Inspector
- Nelson Abarzua, Prospect Resident State Trooper
- Richard Mortenson, Prospect Local Emergency Planning Commission

An extensive data collection, evaluation, and outreach program was undertaken to compile information about existing hazards and mitigation in the Town, 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 initiation meeting was held June 26, 2006.*** This meeting addressed the scope of services necessary to develop this HMP. Initial input was provided by the project team.

- ***Field inspections were performed on June 28, 2006.*** Observations were made of problem areas called out by Town officials during the project initiation meeting.

- ***A project meeting with Town officials was held July 25, 2006.*** Necessary documentation was collected, and problem areas within the Town were discussed.

- ***A public information meeting was held November 20, 2006 at 7:30 P.M.*** Preliminary findings were presented and public comments solicited.

While residents were invited to the public information meeting via newspaper, few attended. Residents were also encouraged to contact the COG with comments via newspaper articles.

As another direct gauge of public interest, a thorough review of complaint files stored by the Office of the Mayor was undertaken to document problems of public concern.

Finally, the Connecticut DEP was routinely briefed and consulted throughout the development process.

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 spring 2008, contingent on receiving conditional approval from FEMA. The draft that is sent for FEMA review will be posted on the Town website and the COGCNV website to provide opportunities for public review and comment. Such comments will be incorporated into the final draft when 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 websites and the public information meeting will be placed 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 Pre-Disaster Hazard Mitigation Plan, to date.

2.0 *COMMUNITY PROFILE*

2.1 *Physical Setting*

The Town of Prospect is located in New Haven County. It is bordered by Naugatuck to the west, Waterbury to the north, Cheshire to the east, and Bethany to the south. Refer to Figure 2-1 for a location schematic, Figure 2-2 for a location map. Of the thirteen communities in the Central Naugatuck Valley Region, Prospect is ranked 7th in terms of population density.

Prospect is located within the eastern 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 low-rank metamorphic rocks of the Hudson River valley and on the east by the Triassic sediments of the Connecticut River valley. The topography of the Town ranges from gently rolling terrain in the river valleys to steep hilly terrain in several upland areas. Elevations ranging from 240 feet in the northeastern part of Town to 910 feet above sea level on top of Turkey Hill in the northwestern part of Town, based on the National Geodetic Vertical Datum of 1929. The hilly terrain of Prospect makes it particularly vulnerable to an array of natural hazards.

2.2 *Existing Land Use*

Prospect is characterized by its hills and steep slopes which limit development in much of the town. Municipal facilities are concentrated in the center of the town at the intersection of Routes 68 and 69. Commercial activity is principally located along Route 69 from the town center north. The commercial areas are surrounded by low-density residential districts interspersed with agricultural operations. Slopes and water features limit development at the northern and eastern ends of the town. In the southern half

Figure 2-1: Prospect Location Map

Source:"Roads", GDT
"Town Boundary", DEP
For general planning purposes only. Delineations may not be exact.
January 2007

0 10 20 Miles

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Figure 2-2: Prospect in the CNVR

Source:"Roads", GDT
"Town Boundary", DEP
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January 2007

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of the town, the undeveloped land is largely owned by one of three water supply operations for conservation purposes, posing a strict limitation to further development in this area. The largest concentration of industrial land uses is located about a mile west of the town center on Route 69.

In total, Prospect encompasses 14.43 square miles. Table 2-1 provides a summary of land use in Prospect by area. In addition, refer to Figure 2-3 for a map of generalized land use in the Central Naugatuck Valley Planning Region.

Table 2-1
Land Use by Area

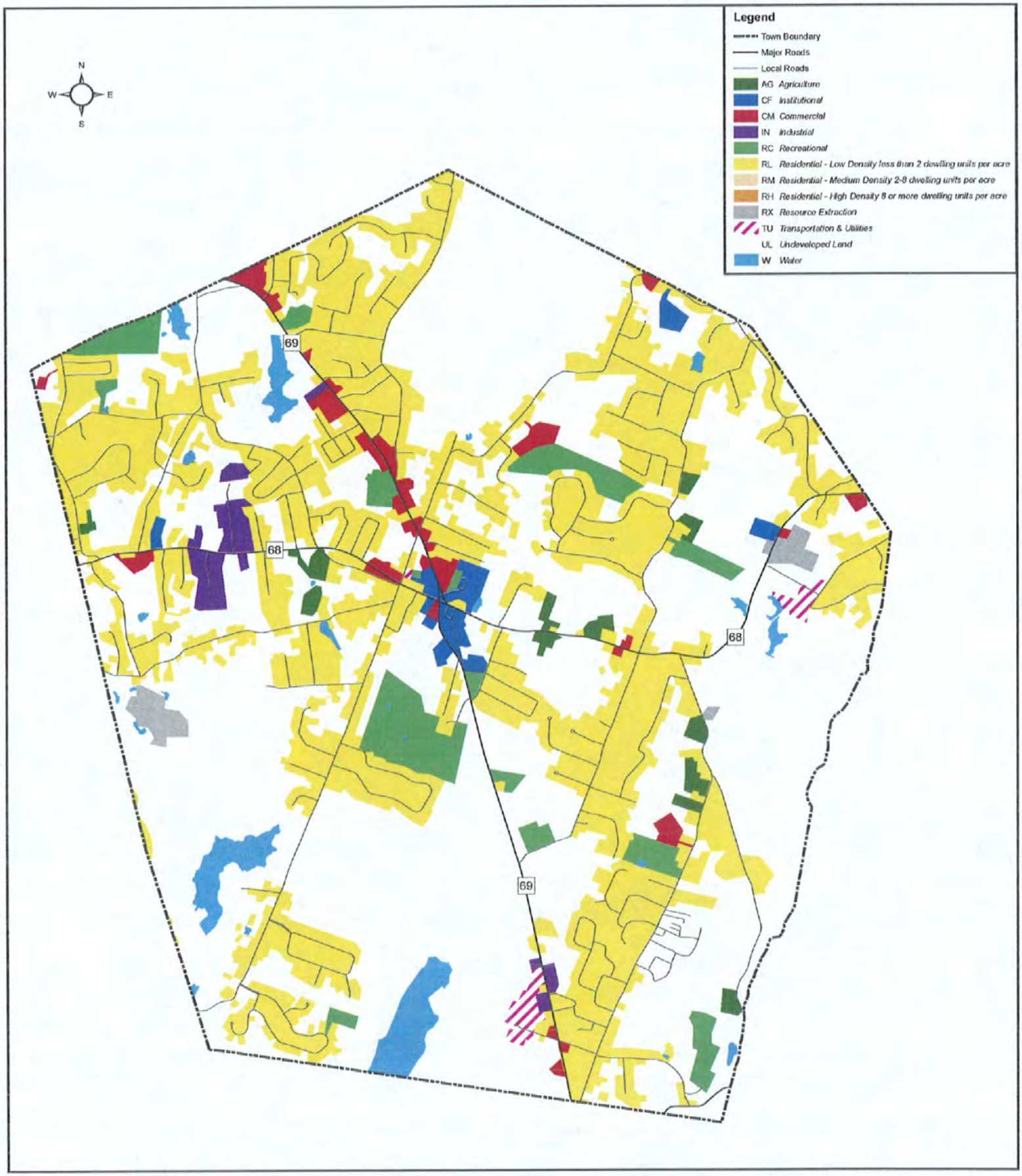
Land Use	Area (acres)	Pct.
Vacant	4875	52.8%
Residential - Low Density	3489	37.8%
Water	173	1.9%
Recreational	144	1.6%
Mining	137	1.5%
Agricultural	107	1.2%
Industrial	100	1.1%
Residential - High Density	71	0.8%
Commercial	50	0.5%
Institutional	41	0.4%
Utilities/Transportation	38	0.4%
Residential - Medium Density	15	0.2%

Source: Council of Governments Central Naugatuck Valley, 2000

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 Prospect. The following discussion highlights Prospect's geology at several regional scales.

Figure 2-3: Prospect Generalized Land Use



Source: "Roads", GDT
"Town Boundary", DEP
"Land Use", COGCNV

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

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In terms of North American bedrock geology, the Town of Prospect 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.

Regionally, in terms of New England bedrock geology the Town of Prospect lies within the Eugeosyncline Sequence. Bedrock belonging to the Eugeosyncline Sequence are typically deformed, metamorphosed, and intruded by small to large igneous plutons.

Connecticut bedrock geology is comprised of several "terranes." Terranes are geologic regions that reflect the role of plate tectonics in Connecticut's natural history. The bedrock beneath the Town of Prospect is 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 coincident with the Eugeosyncline Sequence geologic province described above.

The Town of Prospect's bedrock consists of three general lithologies: volcanic and intrusive igneous silicate gneisses, metamorphic granofels, and metasedimentary and metaigneous schists. The bedrock alignment trends northeast-southwest through the Town. Refer to Figure 2-4 for a depiction of the bedrock geology in the Town of Prospect.

The five primary bedrock formations in the Town (from west to east) are Waterbury Gneiss, Taine Mountain & Collinsville Formation, The Straits Schist, Trap Falls Formation, and Beardsley Member of Harrison Gneiss. Waterbury Gneiss is a gray- to dark-gray, fine- to medium-grained schist and gneiss. Taine Mountain & Collinsville Formation is comprised of well-layered, gray granofels. The Straits Schist is a silvery to gray, coarse grained schist. The Trap Falls formation consists of gray to silvery, partly

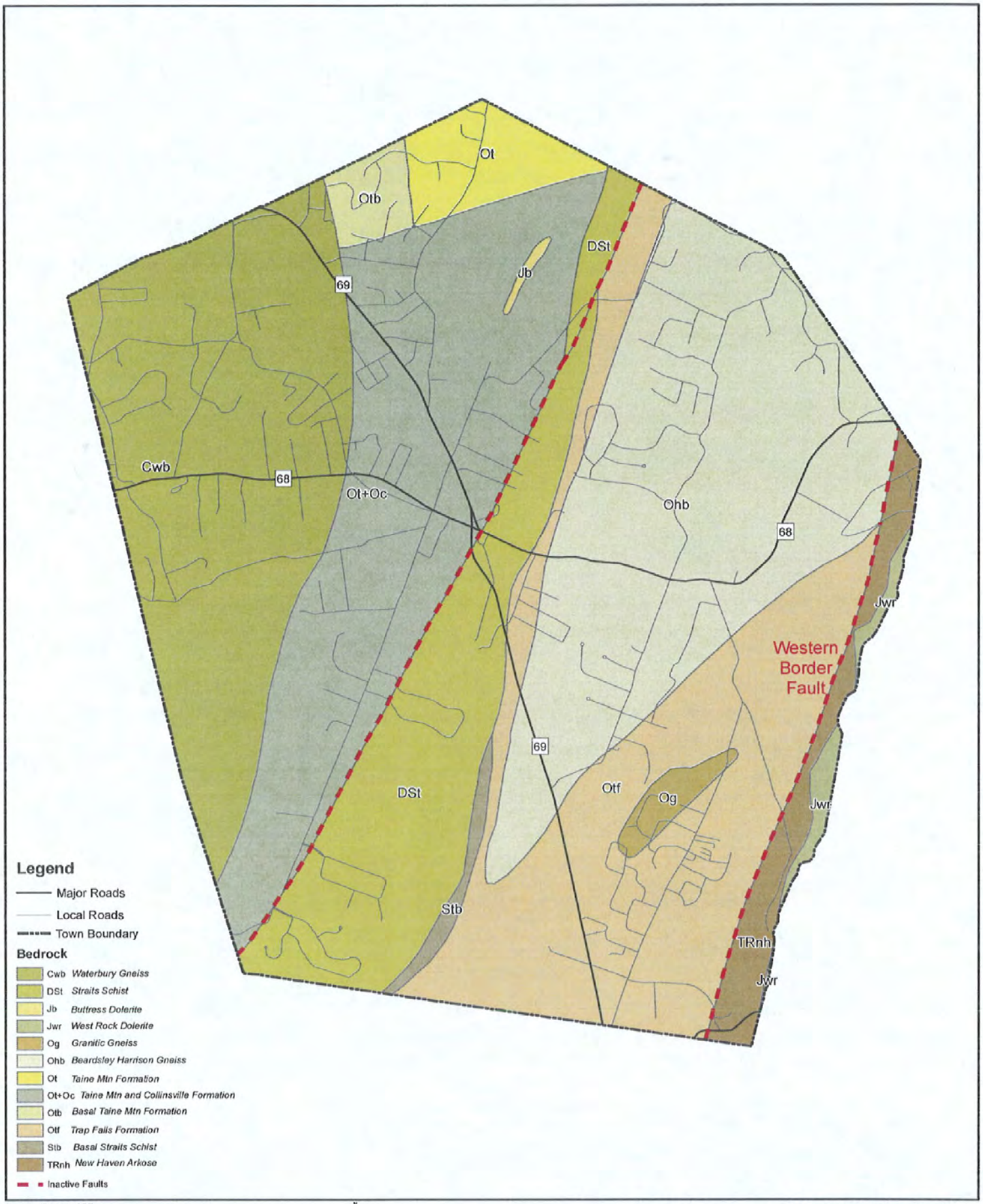
rusty-weathering, medium-grained schist, and Beardsley Member of Harrison Gneiss is gray to dark-gray, medium-grained, lineated gneiss. In addition, a small area of light-colored, foliated granitic gneiss believed to be from the Ordovician period exists in the southeastern portion of Town., and a small area of igneous buttress dolerite (basalt) exists in the northern portion of Town.

Two major faults exist in the Town: An unnamed fault and the Western Border Fault. The Western Border Fault is a large fault extending along the eastern edge of the Western Highlands and stretches from Milford northwards into Massachusetts. The unnamed fault divides Prospect from southwest to northeast. Both of these faults trace to the Jurassic period. Neither of these faults is active. Bedrock outcrops are difficult to find in Prospect due to the forested nature of the Town, although outcrops can be found at higher elevations and on hilltops. Figure 2-4 also depicts the location of known fault lines in the Town of Prospect.

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

A vast area of the Town 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 the northern, central, and southern portions of Prospect and most of the remaining area of the Town. Stratified sand and gravel ("stratified drift") areas are also associated with the major rivers and brooks throughout the Town. These deposits accumulated by glacial meltwater streams during the outwash period following the latest glacial recession.

Figure 2-4: Prospect Bedrock Geology



Source: "Roads", GDT
"Town Boundary", "Bedrock Geology", DEP
For general planning purposes only. Delineations may not be exact.
January 2007

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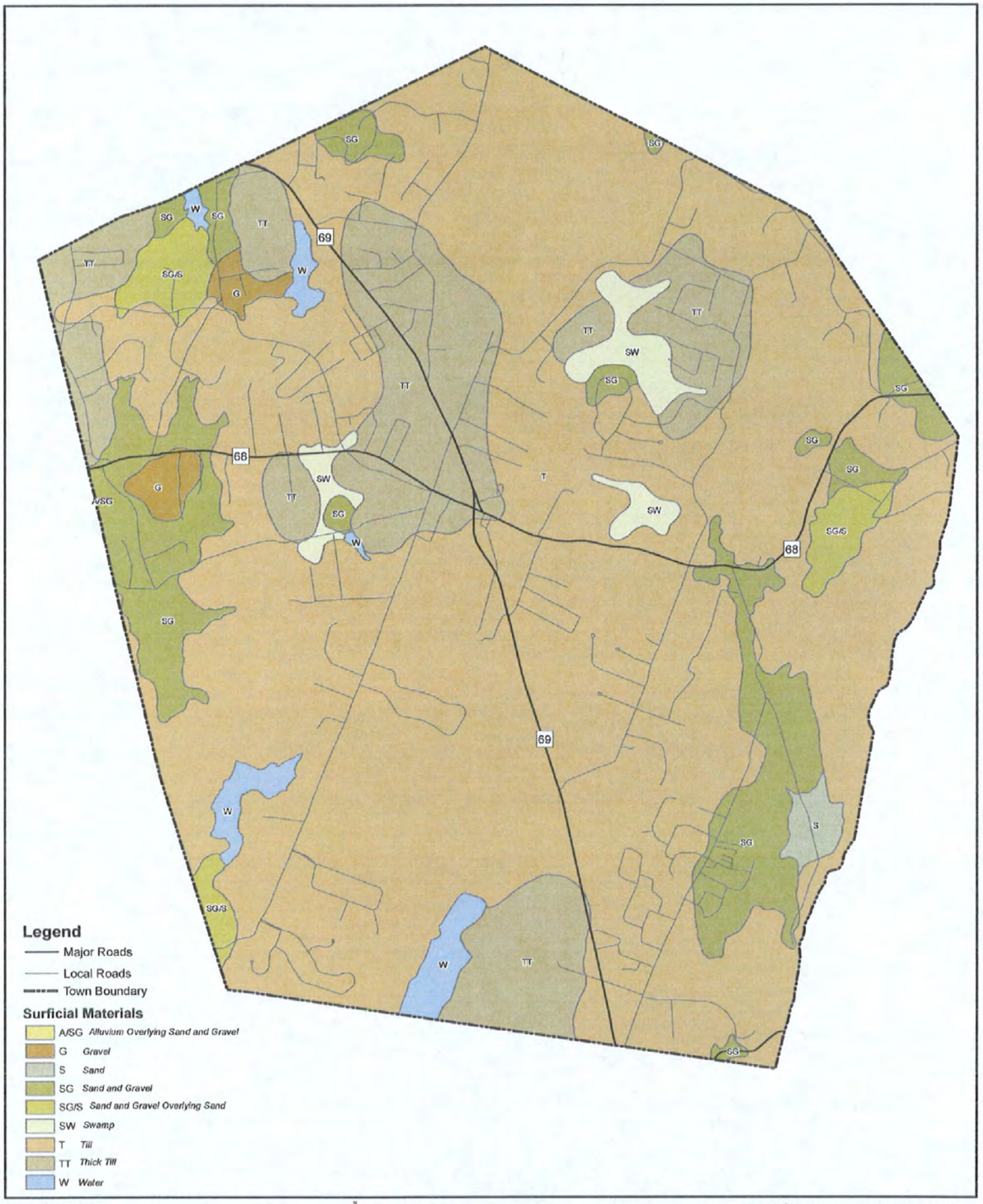
Figure 2-5: Prospect Surficial Geology



Source: "Roads", GDT
"Town Boundary", "Surficial Materials", DEP
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January 2007

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With regard to soil types, approximately 60% of the Town falls within the Canton and Charlton soils (3650 acres), Ridgebury, Leicester and Whitman soils (1028 acres), and Charlton-Chatfield complex (839 acres). The remainder of the Town has soil types of consisting primarily of various silty and sandy loams and Udorthents, disturbed soils underlying urban and built up lands where the original soil type is no longer easily identified.

The Canton and Charlton soils consists of very deep, well- drained soils formed in a loamy mantle underlain by sandy till with stones and boulders often present. The soils are found on nearly level to steep glaciated plains, hills, and ridges. Slope ranges from 0 to 50 percent. Saturated hydraulic conductivity is high in the solum and high or very high in the substratum.

Ridgebury, Leicester and Whitman soils consist of somewhat poorly drained to very poorly drained, nearly level or gently sloping soils formed in compact glacial till. These soils occupy wet, low-lying areas. Slope ranges from 0 to 3 percent. Permeability is moderate in the surface layer and subsoil but is slow or very slow to moderately rapid in the substratum.

The Charlton-Chatfield series 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 0 to 70 percent. Crystalline bedrock is at depths of 20 to 40 inches. Saturated hydraulic conductivity is moderately high to high in the mineral soil.

The amount of stratified drift present in the Town is important for several reasons as described below.

- The stratified drift in Prospect provides productive aquifers currently used by the Connecticut Water Company to provide drinking water via pumping wells to the Town of Prospect and the greater Naugatuck area.
- With regard to inland 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, such as those in northwestern and eastern Prospect.
- The amount of stratified drift also has bearing on the relative intensity of earthquakes, as large areas of fine-grained sediment present special challenges during shaking as liquefaction may occur. These topics will be discussed in later sections.

2.4 Climate

Prospect 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 28 inches per year as measured at the Mount Carmel weather station just south of Cheshire (NCDC, 2006). Median annual precipitation is 44 inches, which is 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 Town has increased over time. 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.

2.5 *Drainage Basins and Hydrology*

The Town of Prospect drains to seven major watersheds corresponding to the Ten Mile River, Willow Brook, West River, the Naugatuck River, Beaver Pond Brook, Fulling Mill Brook, and Beacon Hill Brook. These are described below. Over half of the land area of the Town of Prospect drains to the Ten Mile River and the Beacon Hill Brook. The land surface is spotted with several ponds and reservoirs and numerous streams, most of which are unnamed.

Ten Mile River

A significant portion (4.76 square miles, 32.99% of total land area of Prospect) of the Ten Mile River basin lies within the northeastern boundary of Prospect, and this area provides the headwaters for the Ten Mile River. The headwaters consist of three main streams: Mountain Brook in the north part of the basin and West Brook and Mixville Brook in the southern part of the basin. Mountain Brook drains a large marsh in Prospect, and has a single impoundment on Brooks Pond, which provides an unnamed tributary to the brook. West Brook is impounded at the West Brook Reservoir, and then empties into Mixville Brook, which is impounded at the Cheshire Reservoir in Prospect.

The Ten Mile River has its source in Prospect as the outflow of the Cheshire Reservoir at the Cheshire Reservoir Dam. The Ten Mile River flows north and is next impounded in the town of Cheshire at Mixville Pond by the Mixville Pond Dam. The river is then joined by Mountain Brook before being impounded at Moss Farms Pond / Lake Percivel by the Lake Percivel Dam. Below this dam the Ten Mile River eventually empties into the Quinnipiac River near Milldale, CT. In total, the Ten Mile River drains 20.26 square miles across Prospect, Waterbury, Cheshire, Wolcott, and Southington, CT.

Willow Brook

The southeastern town boundary of Prospect lies within the drainage area of Willow Brook. This drainage basin comprises an area of 1.24 square miles and 8.65% of Prospect's land area. The land use in southeastern Prospect is predominantly rural, and there are no dams of note on either of the two tributary streams flowing east into Cheshire to join Willow Brook. These streams are Roaring Brook to the north and Sanford Brook to the south. In total, Willow Brook drains a land area of 12.97 square miles across the towns of Cheshire, Prospect, Bethany, and Hamden.

West River

A very small portion (44.64 acres, 0.07 square miles) of Prospect lies within the West River drainage basin. This area comprises 0.48% of Prospect's land area. This section drains into an intermittent, unnamed stream and eventually into a large swamp in northeastern Bethany, CT. This swamp drains into Sanford Brook towards Lake Bethany, and the outflow from the dam on Lake Bethany marks the beginning of West River. In total, West River drains a 34.494 square mile area in the towns of Prospect, Bethany, Woodbridge, Hamden, West Haven, and New Haven, CT.

Naugatuck River

While about half of the land area in Prospect drains into the Naugatuck River, only a small portion (11.03 acres, 0.02 square miles) drains directly to the Naugatuck River. This area is in the northwestern part of the town near Clark Hill Road, comprises 0.12% of the land area in Prospect, and drains into Hills Pond Number 2 in Waterbury. The outflow from this impoundment drains through an unnamed stream to Hills Pond Number 1, and outflow from this pond empties into Hopeville Pond Brook. The total drainage area of Hopeville Pond Brook is 1.39 square miles, and most of this brook is in urban Waterbury.

The Naugatuck River originates near Torrington, CT, and winds south almost 40 miles to meet the Housatonic River in Derby, giving it a total basin area of 311.16 square miles. It is the only major river in Connecticut whose headwaters are also within the boundaries of the state. The Naugatuck River is well-known for its many defunct dams, many of which have been removed or improved for fish passage.

Beaver Pond Brook

The northern section of Prospect (1.73 square miles) lies in the drainage basin of Beaver Pond Brook. This area comprises only 11.98% of the land area of Prospect, and is largely undeveloped with some residential land use. The drainage area within Prospect drains into one of three places: An unnamed brook in the eastern part of the basin that is a tributary of Beaver Pond Brook in Waterbury, the Waterbury / Prospect Reservoir (the source of Turkey Hill Brook), or into East Mountain Reservoir and eventually into East Mountain Brook in Waterbury. Both reservoirs listed above are impounded.

Beaver Pond Brook has its headwaters in a swamp near Milloy Road in the southwestern corner of Cheshire. It flows in a westerly direction into the southeastern part of Waterbury, being joined by Turkey Hill Brook and East Mountain Brook before intersecting the Mad River at City Mills Ponds (Upper) in Waterbury. The total drainage area of Beaver Pond Brook is 5.58 square miles extends into Wolcott, Cheshire, Prospect, and Waterbury.

Fulling Mill Brook

A large portion of the northwestern side of Prospect (2.40 square miles, 16.60% of Prospect's land area) lies within the Fulling Mill Brook watershed. This brook has its headwaters in central Prospect near Brewster Pond. Fulling Mill Brook begins at the west edge of Brewster Pond at the Salem Road Pond Dam, and flows west across

Prospect into Beer Pond. After passing through the Beer Pond Dam, the brook flows west into Naugatuck, CT.

Two unnamed streams drain the northwestern side of Prospect to Reilly Pond just northwest of Beer Pond. The unnamed outlet stream from Reilly Pond flows underneath Spring Road into Passaro Pond, and outlets west into Naugatuck, joining Fulling Mill Brook near Maple Hill Road. Both Reilly Pond and Passaro Pond are impounded. Fulling Mill Brook drains a total land area of 5.38 square miles before emptying into the Naugatuck River in Naugatuck.

Beacon Hill Brook

The southwestern part of Prospect lies within the Beacon Hill Brook drainage basin. This basin comprises 4.21 square miles and 29.19% of Prospect's land area. Beacon Hill Brook has its headwaters near the Bethany / Prospect Town line near State Route 69. It drains southwest into Bethany, entering the New Naugatuck / Long Hill Reservoir which lies on the Prospect / Bethany town line. This reservoir is impounded and is also fed by two unnamed streams which drain swamps in southern Prospect. Beacon Hill Brook flows west out of the reservoir, joining with an unnamed stream near Route 63 in Bethany, and then flowing into southeastern Naugatuck through the Naugatuck State Forest near Beacon Cap. It is joined by an unnamed stream near Clark Road, and is then joined by Marks Brook west of Horton Hill Road.

Marks Brook drains most of the western side of Prospect, and has its headwaters just south of the intersection of Straitsville Road and Salem Road in central Prospect. It drains southwest into the Old Naugatuck / William Moody Reservoir, which is impounded by the Naugatuck Reservoir Dam. Marks brook continues to flow southwest into the Straitsville Reservoir, which is also impounded, and then flows southwest into Naugatuck to join with Beacon Hill Brook as described above. Beacon Hill Brook continues to flow west through a fairly developed part of Naugatuck, becoming the

boundary between the towns of Naugatuck and Beacon Falls, CT before emptying into the Naugatuck River. In total, Beacon Hill Brook drains an area of 10.21 square miles in the towns of Prospect, Bethany, Naugatuck, and Beacon Falls, CT.

2.6 *Population and Demographic Setting*

The total CNV Region population as indicated in the 2000 Census is 272,594 persons. The total land area is 309 square miles, giving a regional population density of 882 persons per square mile. Prospect has a population density of 608 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 177 individuals per square mile (Table 2-2).

Table 2-2

Population Density by Municipality, Region and State, 2000

Municipality	Total Population	Land Area (square miles)	Population Density
Beacon Falls	5,246	9.77	537
Bethlehem	3,422	19.36	177
Cheshire	28,543	32.90	868
Middlebury	6,451	17.75	363
Naugatuck	30,989	16.39	1,891
Oxford	9,821	32.88	299
Prospect	8,707	14.43	608
Southbury	18,567	39.05	475
Thomaston	7,503	12.01	625
Waterbury	107,271	28.55	3,757
Watertown	21,661	29.15	743
Wolcott	15,215	20.43	745
Woodbury	9,198	36.46	252
CNV Region	272,594	309.02	882
Connecticut	3,405,565	4844.80	703

Source: United States Census Bureau, 2000 Census of Population and Housing, Summary File 1

Prospect is 103rd out of 169 municipalities in Connecticut in terms of population, with an estimated population of 8,707 in 2000. Annual growth of 0.7% is expected from 2005-2010. The Town is the 69th most densely populated municipality in the state.

According the 2000 Census of Population and Housing from the United States Census Bureau, the median value of owner-occupied housing in the Town of Prospect was $180,700, which is higher than the statewide median value of $166,900.

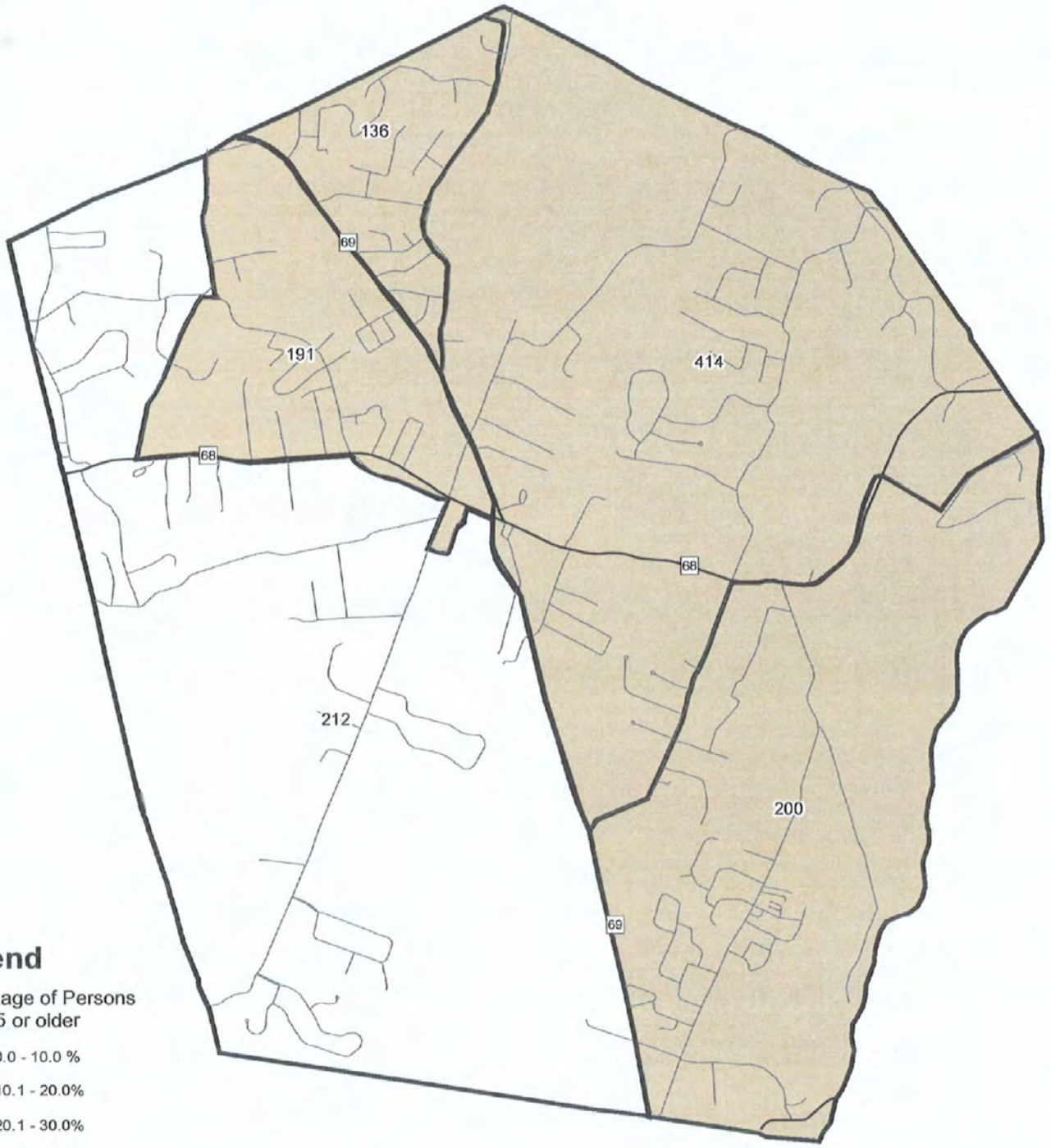
Prospect was incorporated in 1827 as a combination of adjacent portions of Waterbury and Cheshire. Historically an agricultural town, Prospect developed limited industrial capacity in the second half of the 19th century. Manufacturing facilities employing water power were concentrated in the Rag Hollow area of town near the Cheshire border. Other manufacturing facilities were dispersed throughout the town. The manufacturing of matches was a prevalent industry in Prospect. By the turn of the century, most manufacturing had relocated to industrial centers in Waterbury, Naugatuck or Cheshire, and many residents resumed agricultural activities, primarily dairy and egg production. Prospect experienced dramatic residential development in the mid-20th century, growing by 50% from 1960-70. Growth dropped to 4% from 1970-80 and rose again to 12% from 1990-2000.

Prospect has populations of people who are elderly, linguistically isolated, and/or disabled. These are depicted by census block on Figures 2-6, 2-7, and 2-8. 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 Town of Prospect is governed by a Mayor-Council form of government. The Town Council serves as the legislative body of the Town, responsible for policy, ordinances,

Figure 2-6: Prospect Elderly Population



Legend

Percentage of Persons Aged 65 or older

- 0.0 - 10.0 %
- 10.1 - 20.0%
- 20.1 - 30.0%
- 30.1 - 100%

Town Boundary

Block Group Boundary

Major Roads

* Numbers on map represent total population aged 65 or older in each block group

Source: "Roads", c1984 - 2006 Tele Atlas, Rel. 10/06.
"Town Boundary", DEP
"Age", "Block Groups", 2000 Census
For general planning purposes only. Delineations may not be exact.
October 2007

N W E S

0 0.5 1 Miles

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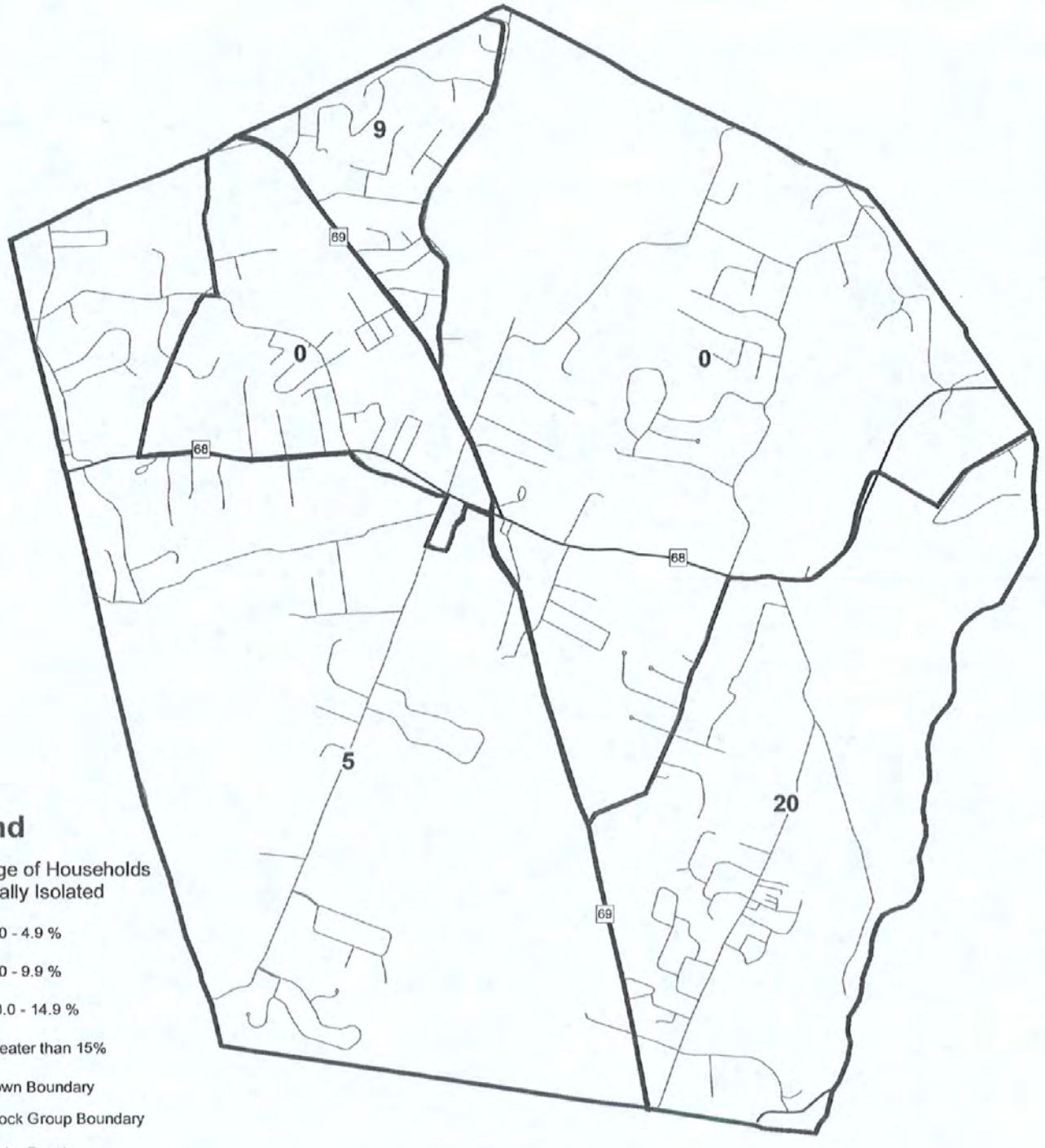
Figure 2-7: Prospect Linguistically Isolated Households



Legend

Percentage of Households Linguistically Isolated

- 0.0 - 4.9 %
- 5.0 - 9.9 %
- 10.0 - 14.9 %
- greater than 15%
- Town Boundary
- Block Group Boundary
- Major Roads

Data based on block group geography.
A linguistically isolated household is one in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English "very well." In other words, all members 14 years old and over have at least some difficulty with English.

* Numbers on map represent total households that are linguistically isolated in each block group

Source: "Roads", c1984 - 2006 Tele Atlas, Rel. 10/06.
"Town Boundary", DEP
"Linguistically Isolated", "Block Groups", 2000 Census
For general planning purposes only. Delineations may not be exact.
October 2007

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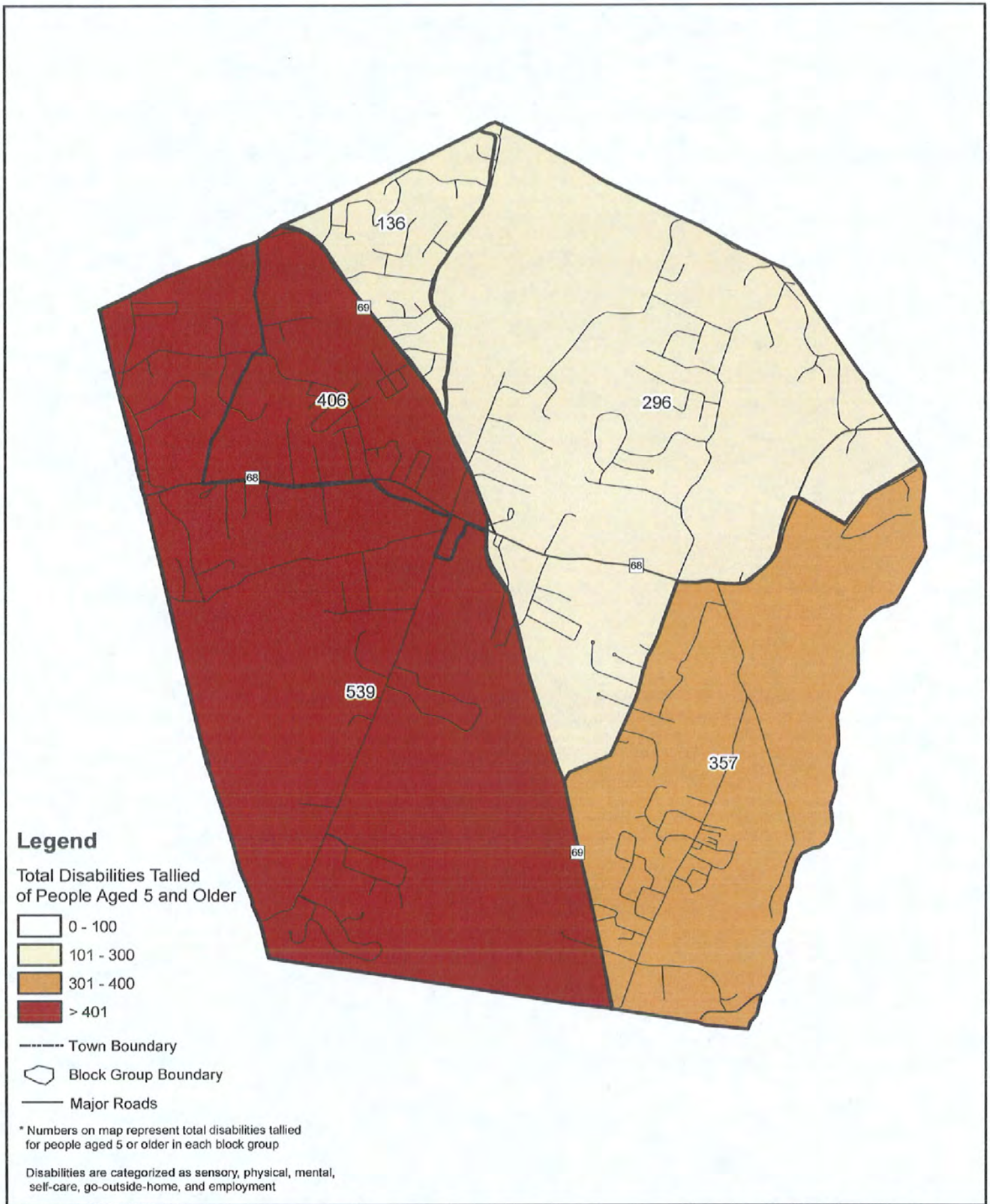
Figure 2-8: Prospect Disabilities Map



and the general operating and capital budgets. In addition to the Town Council and the Mayor, there are boards, commissions and committees providing input and direction to Town Council and Town administrators. Also, there are town departments providing municipal services and day-to-day administration. Many of these commissions and departments play a role in hazard mitigation, including the Planning and Zoning Commission, the Zoning Board of Appeals, the Inland-Wetlands Commission, the Building Inspector, the Civil Preparedness Director and Advisory Board, and the Fire Department.

Complaints related to Town maintenance issues are logged by the Office of the Mayor and reviewed monthly. These complaints are usually received via phone, fax, mail, or email and are recorded using standardized paper forms. The complaints are investigated as necessary until remediation surrounding the individual complaint is concluded.

2.8 Development Trends

Based on the Town's 2002 Plan of Conservation and Development Update, the top priorities of the Town include preservation of the Town's historic character and aesthetic and environmental qualities, as well as maintenance of public and private open spaces. Residential development is expected to consist primarily of low-density single-family housing. Expected growth locations for residential development are areas between Waterbury Road and Union City Road; areas along Scott Road and Summit Road; and areas at the east end of Salem Road and the northerly end of Straitsville Road.

Residential development has slowed in recent years. From 1996-2005, an average of about 43 single-family permits were issued on an annual basis. The desired type of commercial development in Prospect is small, neighborhood-scale retail and service locations. The potential sites for future industrial development include the vicinity of Scott Road and Union City Road.

Subdivisions featuring cul-de-sacs offer only 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. In Prospect, cul-de-sacs in new developments are discouraged and connectivity of roads is encouraged. Cul-de-sacs in Prospect must be a minimum of 60' wide at the end. A cul-de-sac must be able to allow a school bus to turn around without it backing up. A maximum of 20 houses are allowed on dead-end streets, and a 50' town right of way must be included at the end. New roads that are not dead ends must be a minimum of 30' wide.

The Town of Prospect has been extremely proactive in its hazard mitigation efforts since 1983 and has been successful in convincing landowners and developers to make improvements in an effort to mitigate damage from natural hazards. For example, subdivisions must use oversized pipes and box culverts for drainage, and no twin culverts are allowed. In addition, utilities serving new developments must be installed underground; exceptions due to shallow bedrock are granted on a case-by-case basis.

2.9 Critical Facilities and Sheltering Capacity

The Town considers its police, fire, governmental, 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 Prospect continues. Convalescent homes and the mobile home park are included with critical facilities, as these house populations of individuals that would require special assistance during an emergency. Educational institutions are often included in critical facilities as well, as these are often used as shelters.

A map of critical facilities by number is shown in Figure 2-9, and the associated list of critical facilities is provided in Table 2-3. Shelters, communications, transportation, public water, and sanitary sewer facilities are described in more detail below.

Figure 2-9: Prospect Critical Facilities

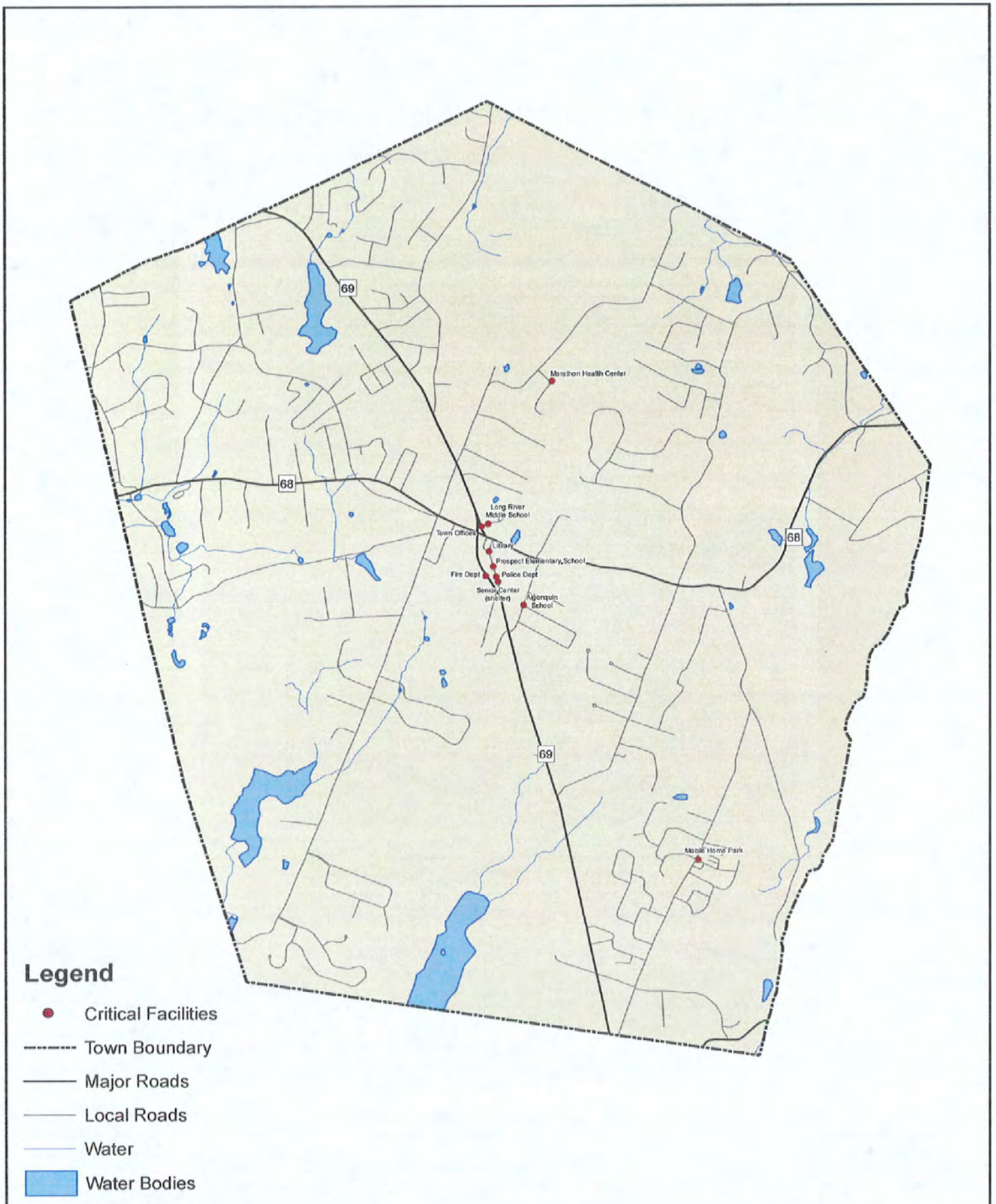


Table 2-3
Critical Facilities in Prospect

Type	Name	Address	Located in Floodplain?
Fire Dept	Prospect Fire Dept (designated shelter)	26 New Haven Rd	No
Library	Prospect Library	17 Center St	No
Mobile Home Park	n/a	Cook Road	No
Nursing Home	Marathon Health Center	25 Royal Crest Drive	No
Police Station	Prospect Police Dept	8 Center St	No
School	Algonquin School	30 Coer Road	No
School	Long River Middle School	38 Columbia Ave	No
School	Prospect Community Elementary School	12 Center St	No
Town Office	Prospect Town Offices	36 Center St	No
Town Office	Prospect Senior Center (designated shelter)	6 Center Street	No

Source: COGCNV

Shelters

Emergency shelters are considered to be an important subset of critical facilities, as they are needed most in emergency situations. Prospect has two designated emergency shelters, the Fire Department on New Haven Road, and the Senior Center on Center Street. Both facilities have auxiliary generators for emergency power and both are readily accessible from the center of town. The Fire Department facility has an overall capacity of approximately 300, and the Senior Center has an overall capacity of about 175. Both facilities have working kitchens. The Town Offices building can also be considered for sheltering purposes on an as-needed basis.

These buildings have been designated as public shelter facilities by meeting specific ARC guidelines. Amenities and operating costs of the designated shelters including expenses for food, cooking equipment, emergency power services, bedding, etc., are the responsibilities of the community and generally are not paid for by the ARC. The police and fire departments staff the shelters.

In case of an extended 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. Many communities only intend to use these facilities on a temporary basis for providing shelter until hazards such as hurricanes diminish. 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.

Communications

Through the Emergency Planning Committee, the COGCNV is assisting municipalities in their investigations of instituting an emergency notification system in the area to further enhance emergency response. A similar system desired by the Town is one that would send text messages to mobile phones to notify residents of emergencies. This type of system could also be used to inform residents of expected duration of power outages. Known communication dead spots in Prospect include Route 42 and Straitsville Road. Thus, alternative systems will be required for alerting residents in these areas.

It is important to note that effective January 1, 2008, the Town of Prospect will be in the southeast corner of Region 5 of the Connecticut Emergency Medical Service regions. Thus, it is important that Prospect institute emergency notification systems compatible with those of Region 5 and Region 2 to the east and south. Region 5 will contain most of the COGCNV municipalities.

Transportation

The Town of Prospect has no hospitals or medical centers; instead, most residents use the facilities in nearby Waterbury. As a means of accessing these facilities or evacuating the area, Prospect has convenient access on two state routes that function as major transportation arteries. Route 69, which runs north-south through the center of Prospect, provides access to Waterbury to the north and Bethany towards the south. Route 68 runs

east-west through the center of Prospect and provides access to Naugatuck to the west and Cheshire to the east. Although there are no interstate highways within the town, I-84 can be accessed via Route 69 in Waterbury - located about four miles from the Town center - or via Route 68 east to Route 70 west in Cheshire. Route 8, a major north-south transportation artery in the CNV region, can be accessed via Route 68 west approximately four miles west from the Town center.

Public Water System

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 Town of Prospect has been encouraging the extension of public water mains as a part of new subdivisions. This is discussed further in Section 9.0.

Sanitary Sewer System

The Town's municipal sewer system is an often overlooked critical facility. While most of the municipal sewer lines are gravity-driven, there are areas of the Town that require pumping stations to deliver sewerage from local sewer lines to the municipal sewer system. Such stations that do not have emergency power generation present additional problems for residents during extended power outages, such as at Boulder Brook Court. This is discussed in more detail in Section 6.5.

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 the SFHA. 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, inland flooding affects a small area of Prospect with moderate to frequent regularity. The primary drainage basins in Prospect are the Ten Mile River, Beacon Hill Brook, Fulling Mill Brook, Beaver Pond Brook, and Willow Brook. A thorough discussion of these drainage areas is included in Section 2.5. Only a few areas are impacted by overflow from the major river and brook systems with moderate regularity, but these areas are generally limited to areas adjacent to the rivers. Localized nuisance flooding along tributaries is a more common problem resulting from inadequate drainage and other factors. The frequency of flooding in Prospect is considered likely to highly likely depending on the source of the flooding, but flooding damage causes only a limited effect (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. This flood has a one percent chance of being equaled or exceeded each year, and is expected to be exceeded once on the average during any 100-year period. The risk of having a flood of this magnitude or greater increases when periods longer than one year are considered. 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.

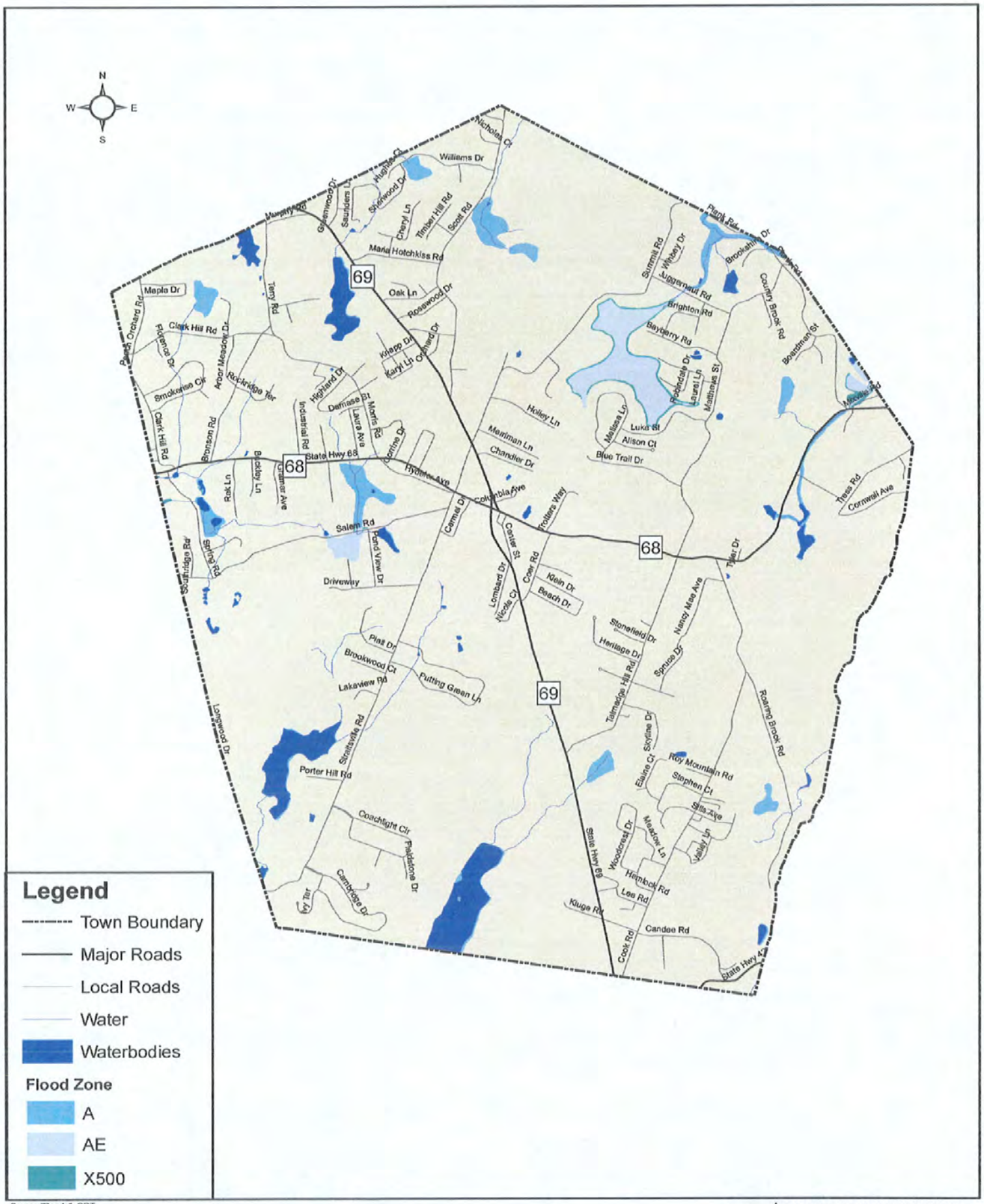
Furthermore, damp conditions trigger the growth of mold and mildew in flooded buildings, contributing to allergies, asthma, and respiratory infections. Snakes and rodents are forced out of their natural habitat and into closer contact with people, and ponded water following a flood provides a breeding 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 Prospect are delineated on Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS). These maps demonstrate areas within Prospect that are vulnerable to flooding. The FIRMs were published on February 4, 1977 and updated on May 16, 1995. The FIS was originally published on May 16, 1995. Refer to Figure 3-1 for the areas of Prospect susceptible to flooding based on FEMA flood zones. Table 3-1 describes the various zones depicted on the FIRM panels for Prospect.

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 Prospect



Source: "Roads", GDT
"Hydrography", "Flood Zone", "Town Boundary", DEP
For general planning purposes only. Delineations may not be exact.
January 2007

0 0.5 1 Miles

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In some areas of Prospect, flooding occurs from heavy rains with a much higher frequency than those mapped by FEMA. This nuisance flooding occurs from heavy rains with a much higher frequency than 100-year and 500-year 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. For example, while the 1955 floods (See Section 3.3 below) have been estimated to be a 50- to 500-year flood across all streams in Connecticut, the floods were less than 10-year flood events on the Quinnipiac River in Wallingford. Dams and other flood control structures can also reduce the magnitude of peak flood flows, as occurs on the Naugatuck River, the Quinnipiac River, and their tributaries.

The recurrence interval level of a precipitation event also generally differs from the recurrence interval level of the associated flood. For example, on April 16, 1996, six inches of rain fell in 18 hours in New Haven County. This was classified as a greater than 50-year frequency storm, but caused an approximately 25-year flood event on the Quinnipiac River in Wallingford. According to the National Climatic Data Center (NCDC), this flood event caused $1.5 million in property damage in New Haven County.

Another example would be of tropical storm Floyd in 1999, which caused rainfall on the order of a 250-year event while flood frequencies were less than a 10-year event on the Quinnipiac River in Wallingford. Flood events can also be mitigated or exacerbated by

in-channel and soil conditions, such as low or high flows, or a deep or shallow water table, as can be seen in the following historic record.

FEMA commenced the Flood Map Modernization program for New Haven County, Connecticut in August 2007. The "Map Mod" program will result in an updated comprehensive FIS report for New Haven County and one FIRM. It is anticipated that the Map Mod program will enable a more accurate representation of floodplains in Prospect. However, the Map Mod program will not re-establish flood elevations along any river or stream where channel modifications have occurred and/or flood control measures are in place.

3.3 Historic Record

In every season of the year throughout its recorded history, the Town of Prospect 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.

Major historic floods have occurred in Prospect in March 1936, January and September 1938, January 1949, and August and October 1955. In terms of damage to the Town of Prospect, the most severe of these was damage associated with the September 1938 hurricane and flood.

The flood of record at the USGS gauge on the Quinnipiac River in Wallingford was recorded on June 6, 1982, when the instantaneous discharge reached 8,200 cubic feet per second. This exceeded the 500-year flood for the area. This is the flood of record for

many waterways in the Prospect area and was calculated to have a recurrence interval ranging from 100 to 500 years on streams in Prospect. The rainfall gauge in South Cheshire recorded a 4-day rainfall of 13.0 inches from June 4 to June 7, and the runoff from this non-tropical storm was compounded by the heavy rains that had fallen the previous week. The damage of this storm event prompted a massive reconstruction effort of the Town's drainage system.

The following are descriptions of additional, more recent examples of floods in and around the Town of Prospect as described in the NCDC Storm Events Database, and based on correspondence with municipal officials.

- September 16, 1999: Torrential record rainfall (five to ten inches) produced by Tropical Storm Floyd caused widespread urban, small stream, and river flooding. 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.

- 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 Prospect. Town personnel reported that no roads needed to be closed during this extended rain event.

- 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 of

approximately five inches occurred in nearby Cheshire, and stream stages were believed to approximate the ten-year recurrence interval.

- June 2, 2006: Torrential rainfall from slow-moving thunderstorms caused flash flooding across parts of northern New Haven County during the late afternoon and early evening. Up to eight inches of rainfall in three hours was recorded in northwestern Prospect, causing Raudis Pond to overtop Clark Hill Road. Town personnel reported that this pond had not flooded the road in over 50 years. The 36-inch pipes downstream of Raudis Pond near the intersection of Route 68 and Clark Hill Road backed up and water flooded the road to a depth greater than the top of the nearby fire hydrant. Firefighters rescued two people from two vehicles that became stuck in the flood. Marks Brook also washed out part of Straitsville Road in southwestern Prospect. This storm caused an estimated four million dollars in damage to nearby Waterbury.

An investigation into the complaint files stored at the Office of the Mayor revealed that approximately one to two complaints per month are related to drainage. Flooding due to inadequate drainage is a minor problem in the Town of Prospect due to the oversized drainage culverts.

3.4 Existing Programs, Policies, and Mitigation Measures

The Town of Prospect has in place a number of measures to prevent flood damage. These include regulations, codes, and ordinances preventing encroachment and development near floodways. Structural flood protection measures existing in Prospect include oversized culverts and the absence of headwalls. All new subdivisions must use box culverts, as twin culverts are no longer allowed. According to the Town of Prospect FIS, there are no major structural flood protection measures existing in Prospect, and none are planned for the future.

In general, developments in floodplains are regulated during the zoning and land subdivision application processes. The Town has several regulations, codes, and ordinances preventing encroachment and development near floodways. Regulations, codes, and ordinances that apply to flood hazard mitigation include:

- ***Earth Excavation Standards*** (Section 3.7.6 of Prospect Zoning Regulations). This regulates excavation and fill that occurs in floodplains.

- ***Planned Congregate Elderly Housing*** (Section 4.2 of Prospect Zoning Regulations). Subsection 2.3.8 outlines that drainage systems in such developments will be designed to avoid downstream flooding.

- ***Earth Excavation, Deposition, and Re-grading Standards*** (Section 4.11.3 of Prospect Zoning Regulations). This section notes that no excavation, deposition, and re-grading shall be made that would reduce the final elevation below floodplain, change the area of the floodplain, or expose groundwater unless it is determined that no pollution or silting of existing watercourses will result and any necessary permits have been obtained from the Prospect Inland Wetlands Commission.

- ***Floodplains And Flood Hazard Areas*** (Section 4.13 of Prospect Zoning Regulations). These regulations prohibit filling or other encroachment in floodways that would impair its ability to carry and discharge floodwaters except where such activity is fully offset by stream improvements. This section also outlines permitted uses and floodplain uses requiring a special permit.

- ***Site Plan Elements*** (Section 11.5 of Prospect Zoning Regulations). These regulations note that site plans must show specifications and materials proposed for flood-proofing, where applicable, and the location of the regulatory flood protection elevation, established wetland boundaries and boundaries of other flood-prone areas.

- ***General Regulations*** (Section IV of Prospect Subdivision Regulations). Subsection 5 of these regulations note that no existing watercourse may be altered or relocated except where channel alterations area necessary for protective flood control or proper road design. Subsection 26 of these regulations note that all subdivision proposals must be consistent with the need to minimize flood damage; all public utilities serving subdivisions must be constructed and located to minimize flood damage; all subdivision proposals must have adequate drainage provided to reduce exposure to flood hazards; and all subdivision proposals must show base flood elevation and boundaries in Zone A Flood Hazard Areas.

- ***Inland Wetlands and Watercourses Regulations***. This document defines in detail the Town of Prospect's regulations regarding development near wetlands, watercourses, and water bodies that are sometimes coincident with flood management zones.

In terms of new developments, the Town of Prospect primarily mitigates flood damage and flood hazards by restricting building activities inside flood-prone areas. All existing watercourses are to be impacted minimally or not at all while maintaining the existing flood carrying capacity. These regulations rely primarily on the FEMA defined 100-year flood elevations to determine flood areas. Any development which may potentially impact a watercourse, as defined as being a "significant impact activity" in Section 2 of the Inland Wetlands and Watercourses Regulations, must be approved by the Inland Wetlands and Watercourses Agency before being approved by the zoning board.

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 Town of Prospect 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; and
- Ensure the continued eligibility of owners of property in Prospect for participation in the National Flood Insurance Program.

The Town of Prospect uses the 100-year flood delineations from the FIRM and FIS delineated by FEMA as the official maps and report for determining special flood hazard areas. Except for certain agricultural and open space uses, a special permit must be issued for any development located in flood hazard areas. No fill or encroachment is permitted in the floodway which would impair its ability to convey floodwaters unless such activity is fully offset by stream improvements. Special permit uses include public and private beaches, docks, boat launching areas, and golf courses, provided no accessory uses except for sanitary facilities are located in the flood hazard area. Permeable surfaces must be used for all parking areas in flood hazard areas.

There are also provisions for public service corporation use and municipal land use, and for single family lots which are partially within the flood hazard area. The lowest floor of all dwellings and subsurface sewage disposal facilities must be elevated to above the 100-year flood elevation and drainage from such facilities must be away from the flood hazard area. The Prospect Inland Wetlands Commission also reviews new developments and existing land uses on and near wetlands and watercourses.

The Prospect Department of Public Works is in charge of the maintenance of the Town's drainage systems, and performs clearing of bridges and culverts and other maintenance as needed. The Town currently has a Storm Water Management Program in accordance with the National Pollution Discharge Elimination System (NPDES) storm water regulations and the Connecticut DEP Phase II Storm Water Program. The Town policy since the 1982 flood event is to oversize all culverts and bridges in order to pass greater storm events than projects require. This policy has greatly reduced the occurrence of flooding throughout the Town. The Town 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 Prospect Plan of Conservation and Development Update summarizes several goals used by the Town in approving changes in land use. The following guidelines all promote flood hazard mitigation:

- Continue to regulate designated inland wetlands and waterways to prevent their filling or degradation;
- Monitor the potential disposition or reuse of water supply lands and advocate their maintenance as public or utility company lands, and cooperate with land trusts and other advocacy groups to maintain these areas as woodlands;
- Review and revise the zoning ordinance to increase the minimum lot size on undeveloped lands within a public water supply watershed to two acres;
- Ensure stormwater management practices in new developments that include minimizing the use of impervious surfaces and encourage infiltration as a means to control run-off;
- Continue requirement of Soil Erosion and Sedimentation Plans; and
- Continue restriction of development within floodplains and flood hazard areas as identified by the FEMA mapping.

The Town of Prospect Emergency Operations Plan notes that floods can occur during any season of the year and that a stock of sandbags is kept by the Town as a mitigation measure. The plan outlines steps to be taken by Town personnel to mitigate further flood damage and conduct recovery operations. This plan also covers any other disasters which may affect the Town of Prospect.

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 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. The Town of Prospect 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.

3.5 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to flooding within the Town. Major land use classes and critical facilities within these areas are identified. According to the FEMA FIRMs, 411 acres of land in Prospect are located within the 100-year flood boundary. In addition, indirect flooding occurs near streams and rivers throughout Prospect due to inadequate drainage and other factors. Specific areas susceptible to flooding were identified by Town personnel and observed by Milone & MacBroom, Inc. staff during a field visit on June 28, 2006.

There are no major waterways in the Town. The waterways in Prospect are mostly small streams and brooks significant for water supply and conservation purposes, but are not recreational resources. There are no widespread floodplains associated with the relatively small waterways in Prospect. The principal flood hazard zones tend to be associated with wetlands and water bodies at headwater locations. Despite the Town policy of over-

sizing drainage culverts, there are still some areas of Town prone to roadway flooding. These areas are described below.

Boulder Brook – A detention basin in a new subdivision was breached during the spring 2006 storms and has since been repaired.

Clark Hill Road – According to Town personnel, the June 2, 2006 storm caused Raudis Pond to overtop Clark Hill Road for the first time in fifty years. The outflow from this pond contributed to flooding downstream at Route 68.

Corrine Drive – Drainage pipes on this road where overwhelmed during the spring 2006 storms due to the channelization of overland flow in ATV paths. The Town plans to perform riprap work on the unnamed streams in the Corinne Drive area and attempt to restrict ATV access to Town property to prevent further erosion.

Plank Road – Three brooks surround the Town landfill in the northeastern part of Prospect and drain to Cheshire. Downstream of the landfill, the streams combine to form Mountain Brook and it continues east towards Plank Road. The culvert for Mountain Brook under Plank Road is undersized and flooding has impacted nearby septic fields. While the backups have never been severe enough to flood the upstream landfill, the Town plans to increase the culvert size to accommodate higher flows.

Roaring Brook Road – The culvert for Roaring Brook under Roaring Brook Road near Norm's Pony Farm is too small and often floods the road. The Town of Prospect is currently in negotiations to obtain property in the surrounding area to increase the culvert size. This area of Roaring Brook is a protected water company land belonging to the Regional Water Authority.

Route 68 – A culvert flowing under Route 68 between the Public Works garage and Plank Road is undersized. This tributary to Ten Mile River flows over the road two to three times per year.

Route 68 near Spring Road – The June 2, 2006 storm caused the 36-inch pipe to be overwhelmed and flood Route 68. Town personnel reported that the flooding was deep enough to submerge a nearby fire hydrant. The Town plans to petition the state to increase the size of this culvert to be able to withstand a greater than 100-year flood event.

Salem Road – The 36-inch pipe located approximately 800 feet west of Pondview Drive occasionally backs up due to beavers damming the culvert. The resultant flooding reaches four septic fields near Connecticut Water Company Lands. The Town regularly pulls down the beaver dams (without harming the beavers) to prevent leachate from reaching protected water company lands.

Terry Road – The 15-inch pipe carrying flow from Turkey Hill to the Waterbury Reservoir was overwhelmed in the spring 2006 storms. The Town replaced the 15-inch pipe with a 30-inch pipe set at a lower elevation and set riprap in the surrounding area. The riprap embankment is designed to provide 0.5 acres of additional storage should the 30-inch pipe ever be overwhelmed.

Critical Facilities and Emergency Services

No critical facilities are regularly impacted by flooding in the Town of Prospect. In terms of critical infrastructure, Route 68, a major west-east thoroughfare, and Straitsville Road, a well-utilized southwest to central Prospect thoroughfare, have both been inundated by occasional flooding.

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.*

3.6.1 *Prevention*

Prevention of damage from flood losses often takes the form of floodplain regulations and redevelopment policies. 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.

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.

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. Reductions in floodplain area can only be accomplished through revised FEMA-sponsored engineering studies or Letters of

Map Change (LOMC). 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.

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 elevated location, Prospect is situated in the headwaters and upper reaches of its associated 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 would 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 Town of Prospect Inland Wetlands Commission (IWC) administers the wetland regulations and the Prospect Planning and Zoning Commission (PZC) administers the Zoning and Subdivision regulations. The wetlands regulations are not really used to regulate floodplain development; this mainly occurs as part of the PZC review. The Zoning Enforcement Officer is charged with ensuring that development follows the floodplain management regulations.

Based on the above guidelines and the existing roles of the IWC, the PZC, and the Zoning Enforcement Officer, as a *preventive* mitigation measure a checklist should be developed that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to the proposed project. This will streamline the permitting process and ensure maximum education of a developer or applicant. This list could be provided to an applicant at any Town department. The list of regulations and ordinances in Section 3.4 can be used as a starting point for a checklist.

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. 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. Wet floodproofing refers to intentionally letting floodwater into a building to equalize interior and exterior water pressures. Furniture and electrical appliances should be moved away from advancing floodwaters.

All of the above *property protection* mitigation measures may be useful for Town of Prospect residents to prevent damage from inland and nuisance flooding. The Planning and Zoning Commission should consider outreach and education in these areas.

3.6.3 Emergency Services

A pre-disaster natural hazard 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; and
- 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 flood-water control.
- 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.

Based on the above guidelines, a number of specific proposals for improved *emergency services* 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.

3.6.4 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 flood waters, 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.

Measures for restoring diminished or destroyed resources and functions provide for re-establishment of an environment in which these functions can again operate. Measures that involve improving the natural condition of areas or restoring them to their previous natural state include 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, including the protection of riparian zones.

- 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 property by raising structures, and by 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:

- Continue to restrict vehicular access to Town property to prevent ATV use.
- Increase the size of the Plank Road culvert to prevent the flooding of nearby septic fields.
- Increase the size of the culvert for Roaring Brook on Roaring Brook road. If necessary, consider raising the elevation of the road to accommodate the larger culvert.
- Petition the state to increase the size of the culvert under Route 68 near the Public Works Garage.
- Petition the state to increase the size of the 36-inch culvert under Route 68 near Spring Road to pass a greater than 100-year flood event.

- Perform a Master Drainage Study for the Town, including a full-scale inventory of culvert conditions.
- Institute a comprehensive catch basin maintenance program.
- Continue participating in the Connecticut DEP Stormwater Management Program.
- Continue over-sizing culverts and drainage structures.

3.7 *Summary of Recommended Mitigation Measures, Strategies, and Alternatives*

The proposed mitigation strategies for addressing inland flooding are listed below.

Prevention

- Streamline the permitting process and ensure maximum 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 Town department.
- Urge or petition FEMA to more critically evaluate Letter of Map Amendment (LOMA) and LOMC applications that are received such that redevelopments do not potentially cause increased flooding to other properties.
- Consider joining FEMA's community rating system.
- Continue to require Flood Hazard Area, subdivision, and commercial and industrial zoning permit applications to provide needed flood data.
- Consider requiring buildings constructed in floodprone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.
- New buildings should be designed and graded to shunt drainage away from the building.
- When possible, assist with the Map Mod program to ensure an appropriate update to the Flood Insurance Study, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps.

- ❑ 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 objectives listed in the Plan of Conservation and Development, including the protection of riparian zones.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.

Structural Projects

- ❑ Commission a comprehensive Town-wide stormwater management system study. This study should include a culvert and catch basin maintenance and replacement schedule and include mathematical models that developers can use to compare existing to proposed conditions. Update this Study with a minimum frequency of every five years.
- ❑ Continue to restrict vehicular access to Town property to prevent ATV use.
- ❑ Increase the size of the Plank Road culvert to prevent the flooding of nearby septic fields.
- ❑ Increase the size of the culvert for Roaring Brook on Roaring Brook road. If necessary, consider raising the elevation of the road to accommodate the larger culvert.
- ❑ Petition the state to increase the size of the culvert under Route 68 near the Public Works Garage.

- Petition the state to increase the size of the 36-inch culvert under Route 68 near Spring Road to pass a greater than 100-year flood event.
- Continue participating in the Connecticut DEP Stormwater Management Program.
- Continue over-sizing culverts and drainage structures.
- Continue to investigate reports of localized flooding problems to determine the cause and an appropriate solution. Set milestones for eliminating recurring localized flooding areas.

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 a small area of Prospect is susceptible to flooding damage caused by hurricanes, wind damage can occur anywhere in the Town. Hurricanes therefore have the potential to affect any area within the Town of Prospect. A hurricane striking Prospect is considered a possible event in any given year that could cause critical damage to the Town and its infrastructure (Appended Table 2).

4.2 Hazard Assessment

Hurricanes are a class of tropical cyclones which 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).

The geographical 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 most vulnerable to inland flooding along roadways, lakes, and streams during a hurricane.

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 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, and 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, and Hurricane Bob was a Category 2 hurricane when it made landfall in southern New England and New York in August of 1991.

- **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 when it struck

Louisiana, and 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 Town of Prospect, the coastline assumption is not relevant.

According to Connecticut's Natural Hazard Mitigation Plan, 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 heavy 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.

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 dollars (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 hurricane.

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 flood waters caused over 100 deaths, left 86,000 unemployed, and caused an estimated 200 million dollars in damages (1955 USD). For comparison, the total property taxes levied by all Connecticut municipalities in 1954 amounted to 194.1 million dollars.

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 and heavy winds which damaged structures and uprooted trees. Over 500,000 people suffered significant power outages. Hurricane Bob, a Category 2 hurricane making 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 dollars (1991 USD).

The most recent tropical cyclone to hit 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 towns. For example, for towns 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 Prospect is 100 miles per hour.

Tall and older trees and branches may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. The Town has an annual program for private landowners who request tree removal, and performs necessary roadside cutting and tree removal on a case by case basis. CL&P also trims trees near power lines every three years. The Town has a tree company on call to remove trees downed during storms. The Town of Prospect's policy is to remove trees whenever they may be a threat to roadways or aboveground utilities and put 30' cutbacks along new roads to mitigate possible outages. All utilities in new subdivisions must be located underground whenever possible in order to mitigate storm-related damages.

During emergencies, Prospect has two designated emergency shelters, the Fire Department on New Haven Road, and the Senior Center on Center Street. Both facilities have auxiliary generators for emergency power and both are readily accessible from the center of town. The Fire Department facility has an overall capacity of approximately 300, and the Senior Center has an overall capacity of about 175. Both facilities have working kitchens. The Town Offices building can also be considered for sheltering purposes on an as-needed basis. 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.

The Town relies on radio and television to spread information on the location and availability of shelters. Prior to severe storm events, the Town 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. According to the State of Connecticut Natural Hazard Mitigation Plan, a moderate Category II storm is expected to strike the state once per decade. The Town of Prospect

is less vulnerable to hurricane damage than coastal towns in Connecticut because it does not need to deal with the effects of storm surge.

The Town of Prospect 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 3.0, and tornadoes are discussed in Section 5.0. The entire Town is also vulnerable to wind damage. 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 can also start electrical fires, so adequate fire protection is important.

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 which can not be quantitatively estimated.

As the Town of Prospect is not affected by storm surge, hurricane sheltering needs have not been calculated by the Army Corps of Engineers for the Town. It is assumed that sheltering need will be based upon areas damaged within the Town. 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 Prospect will relocate.

The mobile home park on Cook Road is particularly vulnerable to Category 4 & 5 hurricanes because the homes are not anchored. The mobile home park residents also

had trouble getting to the shelters because the state roads in Prospect are a low priority for the CT DOT during winter storms (Section 6.0). As a result, Summit Road was widened to allow for better emergency access.

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 Town-wide tree limb inspection and maintenance programs to ensure that the potential for downed power lines in diminished.
- Continue location of utilities underground in new developments or as related to redevelopment.
- Continue to review the currently enacted Emergency Operations Plan for the Town 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 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 Town of Prospect 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. In addition, Prospect emergency personnel should identify and prepare additional facilities for evacuation and sheltering needs. The Town 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*

Recommendations included in Section 3.6 for the mitigation of inland flooding are also pertinent to mitigating tropical storm or hurricane related flooding. Recommendations for mitigation of hurricane and tropical storm winds include the following:

- Increase tree limb maintenance and inspections, especially along Route 68, Route 69, and other evacuation routes,
- Continue outreach to residents warning of dangerous trees on their properties;
- Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas, and
- Review potential evacuation plans to ensure timely migration of potential shelterees from all areas of Prospect.

In addition, important recommendations that apply to all hazards are listed in Section 11.1.

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 Town of Prospect. 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 Town without harming another. The entire Town of Prospect 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 Town of Prospect 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 each year that could cause significant damage to a small area.

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. 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

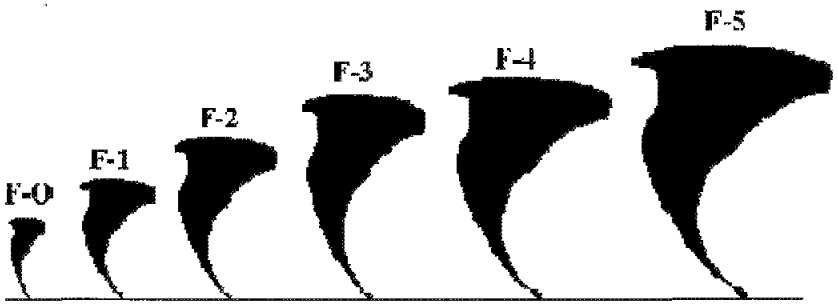


Table 5-1
Fujita Scale

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.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated

Table 5-1 (Continued)
Fujita Scale

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
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.

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. Its 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	
F Number	*Fastest 1/4-mile (mph)*	*3 Second Gust (mph)*	*EF Number*	*3 Second Gust (mph)*	*EF Number*	*3 Second Gust (mph)*
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 DEP Natural Hazard Mitigation Plan (2004). The highest relative risk for tornadoes in the state will continue to be in the Hartford and New Haven Counties. The Town of Prospect, located in New Haven County, is therefore at a relatively higher risk of tornadoes compared to the rest 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. Only 15 lightning-related fatalities occurred in Connecticut between 1959 and 2005. 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.

Thunderstorms occur 18 to 35 days each year in Connecticut. 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 Prospect area is very high during any given thunderstorm, although no one area of the Town 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 Town of

Prospect is believed to be limited for any given year. Downburst activity in New Haven County is believed to have occurred most recently on May 16, 2007.

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. The likelihood of one hailstorm occurring in Prospect 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, and three F2 rated 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

There is only one mention of summer storm damage in Prospect in the NCDC Storm Events database. On July 23, 1995, a small F0 tornado touched down briefly in the Town of Prospect. Large trees were completely uprooted, a wooden shack was destroyed, and a 45-foot semi-trailer was tossed nearly 200 yards.

5.4 Existing Programs, Policies, and Mitigation Measures

Warning is the primary method of existing mitigation for tornadoes and summer storm-related hazards. A ***severe thunderstorm watch*** is issued by the National Weather Service when the weather conditions are such that a severe thunderstorm (damaging winds 58 miles per hour or more, or hail three-fourths of an inch in diameter or greater) is likely to develop. A ***severe thunderstorm warning*** is issued when a severe thunderstorm has been sighted or indicated by weather radar. 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.

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 town 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, tornadoes, lightning, and hail are employed in Prospect. 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. The building codes also address the proper grounding of structures to reduce lightning damage. In addition, specific mitigation measures address debris removal and tree trimming.

In the Town of Prospect, the local electric utility (Connecticut Light & Power) is responsible for tree branch removal and maintenance above and near power lines. The Department of Public Works (DPW) has the responsibility of maintaining trees on municipal property. The DPW is also responsible for trimming over roadways, and DPW staff routinely monitor for downed tree limbs during storms. The Town of Prospect maintains a tree service to remove trees downed during storms. The Town also approaches residents on a case-by-case basis when trees and branches on their property look hazardous.

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.
- Identify and 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. Prospect 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 electrical fires. Such fires can be extremely dangerous during the summer months during dry and drought conditions. Most downed power lines in Prospect 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.

The mobile home park on Cook Road is particularly vulnerable to tornadoes because the homes are not anchored. The existence of this park was one of the reasons Summit Road was recently widened to allow for increased access to the emergency shelters.

5.6 *Potential Mitigation Measures, Strategies, and Alternatives*

Both the FEMA and the NOAA websites contain valuable information regarding preparing for a protecting oneself during a tornado, as well as information on a number of other natural hazards. This information is available at:

FEMA
http://www.fema.gov/library/prepandprev.shtm.

NOAA
http://www.nssl.noaa.gov/NWSTornado/

Available information from FEMA includes:

- Design and construction guidance for community shelters.
- Recommendations to better protect from tornado damage for your business, community, and home. This includes construction and design guidelines for business and homes, as well as guidelines for creating and identifying shelters.
- Ways to better protect property from wind damage.

- Ways to protect property from flooding damage.
- 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 implementation of an emergency notification system would be beneficial in warning residents of an impending tornado. 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 which struck Lake County, Florida on February 2, 2007. This powerful storm included several tornadoes and struck at about 3:15 AM. According to National Public Radio, local broadcast stations had difficultly 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

- 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 along Route 68, Route 69, and other evacuation routes.
- Continue 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 to make literature available during the permitting process regarding appropriate design standards.
- Ensure adequate notification systems exist to provide Cook Road mobile home residents with as much warning of an approaching tornado as possible.

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 Town of Prospect. However, unlike summer storms, winter events and the hazards that result (wind, snow, and ice) have more widespread geographic extent. The entire Town of Prospect is susceptible to winter storms. In general, winter storms are considered highly likely to occur each year, and the hazards that result (nor'easter winds, snow, and blizzard conditions) are expected to have a significant effect over a large area of the Town.

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 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.

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.

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. Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice

pellets, and extreme cold. The National Weather Service defines a blizzard as having winds over 35 mph with snow and blowing snow reducing visibility to near zero.

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 large areas of snowfall 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

According to the NCDC, there have been 87 snow and ice events in the State of Connecticut between 1993 and 2006, 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 31and 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 occurred in January of 1996. These events were recorded for various counties throughout the state.

With regard to major winter nor'easters, seven 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 over two feet of snow and shut down the State of Connecticut for 24 hours. 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.

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 dollars in public sector damages.

6.4 *Existing Programs, Policies, and Mitigation Measures*

Existing programs applicable to inland 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 fiscal resources towards snow management. The Town ensures that all warning/notification and communications systems are ready before a storm, and ensures that appropriate equipment and supplies are in place and in good working order. The Town 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).

Prospect has 11 plow routes, which are reprioritized for fire and emergency access on a case by case basis during storms. The Connecticut Department of Transportation (DOT) plows Routes 68 and 69, but the state plow trucks tend to prioritize Routes 8 and 84. The Town of Prospect has widened Summit and Plank Roads to accommodate fire trucks and other emergency vehicles during winter storms. The Town stores sand and salt mix at Public Works on Route 68 which it rations to the DOT so they don't have to return to Watertown to re-supply (and it keeps them in the Town). The state replenishes any amount of sand/salt mix they take.

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 Town of Prospect 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 ice 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 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 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.

A few areas in the Town of Prospect have been identified by Town personnel as having problems with ice during the winter months. An unnamed tributary flowing under Route 68 near the Public Works Garage sometimes backs up and floods the road, causing icing in winter. This area is locally known as "Accident Alley" due to the road having a sharp turn, a steep grade, and is frequently covered in black ice due to poor drainage on the hillside. Icing has also historically been a problem along Terry Road. The dense pine trees have been cut back to allow more sunlight through, improving the rate of ice melt.

Icing is also a serious problem along Route 69 from the center of Town to the Bethany line. This is the primary road running from Waterbury to New Haven without nearby alternatives. During a recent winter, it had to be completely shut down to clear snow, ice, and accidents.

The altitude of the Town exacerbates the damage caused by ice storms. The ice storm of 2002 broke so many tree limbs in and around Prospect that some subdivisions were without power for three days. Extended power outages are a particular problem for the Boulder Brook Court subdivision as it relies on an electrically driven pumping station to pump local sewage up-gradient to the municipal sewer system. There is no emergency generator at this pumping station, so power outages render the sewer system in this subdivision inoperable.

Drifting snow is not as large a problem in Prospect as other areas, but it still occurs. This problem is mitigated through municipal plowing efforts.

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 Prospect 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, and 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.

Plowing routes should continue to 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, perhaps by posting the general routes on the Town website. 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. 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 nor'easters. These are not repeated in this subsection. The following recommendations are applicable to other aspects of winter storms such as winds, snow, and ice:

- Petition the State Department of Transportation to construct drainage improvements to reduce road icing on Routes 68 and 69.
- 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 evacuation plans to ensure timely migration of potential shelterees from all areas of Prospect.

- Post a list of Town snow-plowing routes and sheltering facilities in the Town Hall and on the Town's website so residents can best plan how to access to critical facilities during a winter storm event.
- Provide education and outreach materials to property owners on how to protect property through the use of shutters and storm windows, the importance of removing snow from flat roofs, and the importance of insulating pipes adequately to protect from freezing and bursting.
- Provide public educational materials that focus on safety tips and reminders to individuals about how to prepare for cold weather.
- Encourage two modes of egress into every neighborhood by the creation of through streets.
- Pursue funding for an emergency generator at the Boulder Brook Court sewer pumping station.

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

7.0 EARTHQUAKES

7.1 Setting

The entire Town of Prospect is susceptible to earthquakes. However, even though earthquakes have the potential to affect any place in the Town, the effects may be felt differently in some areas based on the type of geology. In general, earthquakes are considered a hazard that is unlikely to occur, but that may cause significant effects to a large area of the Town.

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 phone 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 an abbreviated description of the 12 levels of Modified Mercalli intensity from the United States Geological Survey.

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. Rail 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 being 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.

There were 137 recorded earthquakes in Connecticut between 1598 and 1990. 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. In October 1845, an Intensity V earthquake occurred in Bridgeport. An Intensity V earthquake would be a 4.3 on the Richter scale. Another Intensity V earthquake was reported in Stamford in March of 1953. All other seismic activity in Connecticut has ranked less than Intensity V. 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.

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 Town of Prospect. The Town has adopted these codes for new construction and they are enforced by the Town Building Inspector. Due to the infrequent nature of damaging earthquakes, land use policies in the Town of Prospect do not address earthquake hazards.

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, an earthquake impacting the Town of Prospect has a 2% chance of exceeding a peak acceleration of 14-16% of the force of gravity in a 50-year period.

According to the State of Connecticut Department of Emergency Management, the chance that a damaging earthquake of magnitude 5.0 or greater will occur within the state in any one year is 5%. The odds of an earthquake of magnitude 6.0 are about one in 300 each year. Therefore, the Town of Prospect is unlikely to experience a damaging earthquake in any given year. This belief is reinforced by 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 the potential for liquefaction. 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. When liquefaction occurs, the strength of the soil decreases and 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, portions of the Town of Prospect are underlain by sand and gravel. Figure 2-5 depicts surficial materials in the Town. 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 new construction. 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.

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. 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 8.0.

7.6 Potential Mitigation Measures, Strategies, and Alternatives

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

- Consider preventing new residential development in areas prone to collapse.
- As suggested in the Plan of Conservation and Development, continue restricting or preventing residential development on or below steep slopes (slopes exceeding 30%).
- Continue to require adherence to the state building codes.

- Ensure that municipal departments have adequate backup facilities (power generation, heat, water, etc.) in case earthquake damage occurs.

In addition, important recommendations that apply to all hazards are listed in Section 11.1.

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, dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. With nine registered dams and potentially several other minor dams in the Town, dam failure can occur almost anywhere in Prospect. While flooding from a dam failure generally has a limited 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, land 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.

This section deals primarily with the possible effects of failure of Class C dams. Failure of a class C dam has the potential for loss of life and property damage totaling millions of dollars.

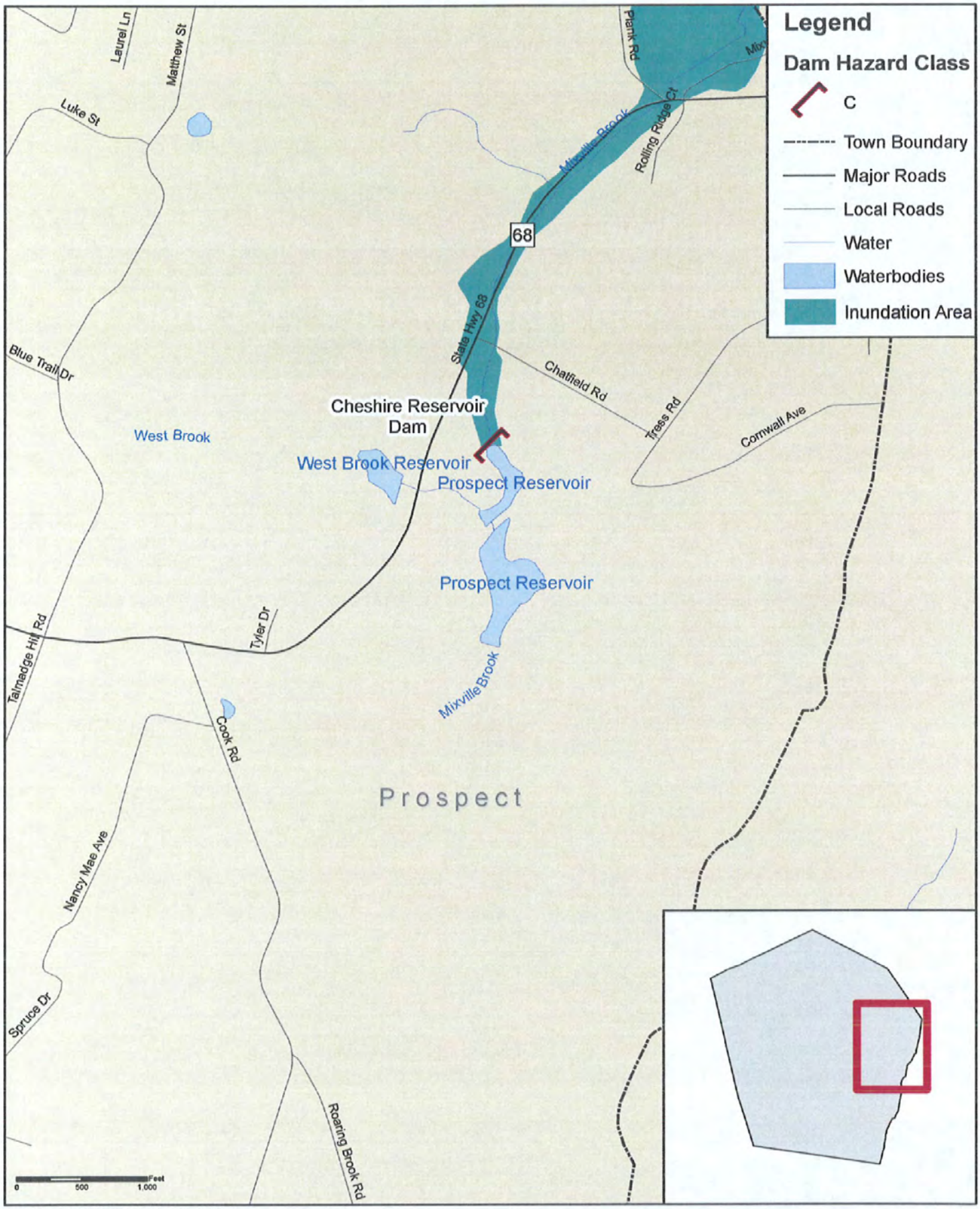
There are nine registered dams (Table 8-1) in the Town of Prospect, of which two are Class A, three are Class B, two are Class C, and two are undefined. The two Class C dams in Prospect are the Cheshire Reservoir Dam in the eastern part of town (Figure 8-1) and the Waterbury Reservoir Dam #2 in the northwestern part of town (Figure 8-2). The Moody Reservoir Dam, a Class B dam, is depicted in Figure 8-3.

Table 8-1
Dams Registered with the DEP in the Town of Prospect

Number	Name	Class
11501	Cheshire Reservoir Dam	C
11502	Waterbury Reservoir Dam #2	C
11503	Moody Reservoir Dam	B
11504	Reilly Pond Dam	BB*
11505	Salem Road Pond Dam	BB*
11506	Brooks Pond Dam	A
11507	Passaro Pond Dam	A
11508	Beer Pond Dam	-
11509	West Brook Reservoir Dam	-

*Formerly Class B, but have been recently reclassified as not being significant hazard dams

Figure 8-1: High Hazard Dams in Prospect



Source: "Roads", c1984 - 2006 Tele Atlas, Rel. 10/06.
"Hydrography", "Dams", "Town Boundary", DEP
"Inundation Area", Dam Failure Analysis – Limits of Potential Flooding – Prospect Dam, New Haven Water Company, 1981
For general planning purposes only. Delineations may not be exact.
January 2008

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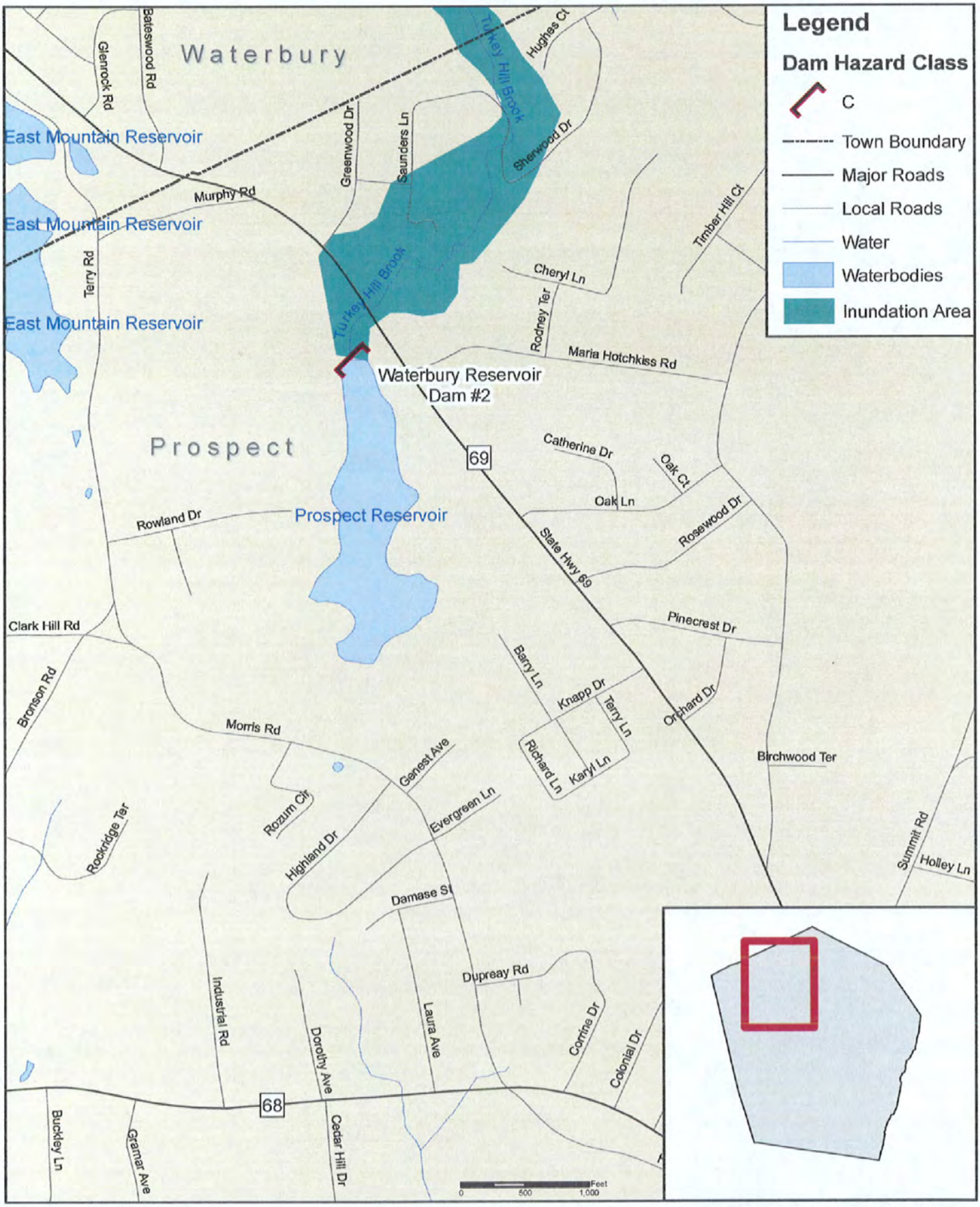
Figure 8-2: High Hazard Dams in Prospect



Source: "Roads", c1984 - 2006 Tele Atlas, Rel. 10/06.
"Hydrography", "Dams", "Town Boundary", DEP
"Inundation Area", Dam Failure Analyses - Limits of Potential Flooding for Waterbury Reservoir No. 2 Dam, City of Waterbury, 1995
For general planning purposes only. Delineations may not be exact.
January 2008

COUNCIL OF GOVERNMENTS
CENTRAL NAUGATUCK VALLEY

Figure 8-3: High Hazard Dams in Prospect

Source: "Roads", GDT
"Hydrography", "Dams", "Town Boundary", DEP
"Inundation Area", Moody Reservoir Dam Emergency Operations Plan, Connecticut Water Company, 1994
For general planning purposes only. Delineations may not be exact.
January 2008

0 500 1,000 Feet

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CENTRAL NAUGATUCK VALLEY

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 are the two most catastrophic dam failures in Connecticut's recent history:

- 1963: Failure of the Spaulding Pond Dam in Norwich caused six deaths and six million dollars in damage.
- 1982: Failure of the Bushy Hill Pond Dam in Deep River caused 50 million dollars in damages.

More recently, the Connecticut DEP reported that the sustained heavy rainfall from October 7 to 15, 2005 caused two dam failures, four partial breaches, and damage to four other dams throughout the State. These are summarized in Table 8-2:

Table 8-2
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 Town of Prospect. Waterbury Reservoir Dam #2 is located on Route 69 in the northwest part of Town and was most recently repaired in 1999. A new cap for the dam wall was installed, the earthen embankment was regraded, and the spillway was lowered. The dam was again lowered in 2005 by six feet

to reduce pressure on the dam. This reservoir is not currently used by the City of Waterbury for water supply, but may be used again in the future.

According to the Dam Safety Division of the DEP, the Town of Prospect lowered the water behind the Cheshire Reservoir Dam to perform repairs in October 2006. The repairs were performed to improve the safety and reliability of the structure, to remove the abandoned treatment building, and to make the structure easier to maintain. The spillway walls and steps were reconstructed, and erosion protection was installed to safely pass one-half the probable maximum flood. This reservoir is not currently used by the Town of Prospect for water supply, but may be again in the future.

8.4 Existing Programs, Policies, and Mitigation Measures

The dam safety statues 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.

Owners of Class C dams are required to maintain emergency operations plans. The Town of Prospect is responsible for maintaining the plan for Cheshire Reservoir, and the City of Waterbury is responsible for maintaining the plan for Waterbury Reservoir #2. Neither reservoir is currently used as a water supply. In addition, the Connecticut Water Company maintains an Emergency Operations Plan for the Moody Reservoir Dam.

8.5 Vulnerabilities and Risk Assessment

By definition, failure of Class C dams may cause catastrophic loss of life and property. Of the two Class C dams in the Town of Prospect, the failure of Waterbury Reservoir Dam #2 would have a higher impact on the residents and infrastructure of the Town of Prospect. However, the failure of either dam would also have significant impacts downstream beyond the Town of Prospect. These impacts are described below for the two Class C dams. Inundation areas associated with dam failures are included on Figure 8-1, Figure 8-2, and Figure 8-3.

Cheshire Reservoir Dam

Cheshire Reservoir is owned and operated by the Town of Prospect. It covers a surface area of approximately 6.9 acres. The outflow from Cheshire Reservoir is the headwaters for the Ten Mile River. The area downstream of Cheshire Reservoir slopes steeply to the northeast and is primarily undeveloped. The stream passes the Department of Public Works and the Veterans of Foreign Wars along Route 68 before reaching a residential area at the bottom of Plank Road. The Ten Mile River is then impounded as Mixville Pond in Cheshire.

A dam failure at Cheshire Reservoir would send a torrent of water down the Ten Mile River. No critical facilities in Prospect lie within the inundation area (Figure 2-9 and Figure 8-1). Significant erosion would occur along the river channel that follows Route 68 and the bridges over the river at Chatfield Road, the nearby unnamed road, and the

VFW would likely be undermined. Peak flood depths would likely overtop the unnamed road, Chatfield Road, and portions of Route 68. The Ten Mile River culvert under Route 68 near Plank Road would likely only sustain minor damage. The sudden increase in water levels could cause Mixville Pond Dam, another Class C dam, to fail. A subsequent failure of Mixville Pond Dam would cause a significant amount of additional damage to infrastructure and residential and industrial properties downstream in the Towns of Cheshire and Southington, including possible damage to critical facilities.

Waterbury Reservoir Dam #2

Waterbury Reservoir #2 is owned by the City of Waterbury. It is the headwaters of Turkey Hill Brook, a tributary of Beaver Pond Brook in Waterbury. The area downstream of Waterbury Reservoir Dam #2 in Prospect is lightly developed, consisting of some commercial buildings along Route 69 and primarily of single-family residential houses along Sherwood Road. Turkey Hill Brook drains north down a steep gradient into the City of Waterbury before entering Beaver Pond Brook and eventually the Mad River. No critical facilities in Prospect lie within this area (Figure 2-9 and Figure 8-2).

According to the DEP Dam Safety Division, the 1998 Dam Failure Analysis states that a dam failure at Waterbury Reservoir Dam #2 at the top of the dam elevation would flood Route 69 to a depth of eight feet. Turkey Hill Brook downstream of Route 69 to Beaver Hill Brook would experience flood depths of five to ten feet. In Waterbury, the commercial areas nearby the confluence of Turkey Hill Brook and Beaver Hill Brook and local streets along Beaver Pond Brook would be inundated between two and nine feet. Downstream of Interstate 84, flood depths would be between one and nine feet. Flooding would not overtop Interstate 84. A failure of the Waterbury Reservoir has the potential to cause widespread flooding damage to the infrastructure and residential, commercial, and industrial areas in the Town of Prospect and the City of Waterbury. Some critical facilities in Waterbury may also be affected by the failure of this dam.

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.

With regard to the Cheshire Reservoir Dam, the Town of Prospect should work with the South Central Connecticut Regional Water Authority to update the Emergency Operations Plan for the dam, and prepare a new dam failure analysis if appropriate. The Town of Prospect should work with the City of Waterbury to ensure that proper maintenance is being performed on Waterbury Reservoir Dam #2, and that the Emergency Operations Plan and Dam Failure Analysis are up to date. The Town should continue to encourage the owners of the dams and the Connecticut DEP to conduct regular inspections, with maintenance performed as required to keep the dams in safe and functional order. The Town should also consider implementing an inspection program of any low and minor hazard dams it owns.

The Town of Prospect should also consider implementing an emergency notification system. Such a system would combine database and GIS mapping technologies to deliver outbound emergency notifications to geographic areas or specific groups of people such as emergency responder teams. This technology could be used to warn downstream residents of an impending dam failure.

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, shrubby, or grassland areas of Prospect, along with low-density suburban type development found at the margins of these areas known as the wildland interface. Structural fires in higher density areas of the Town are not considered.

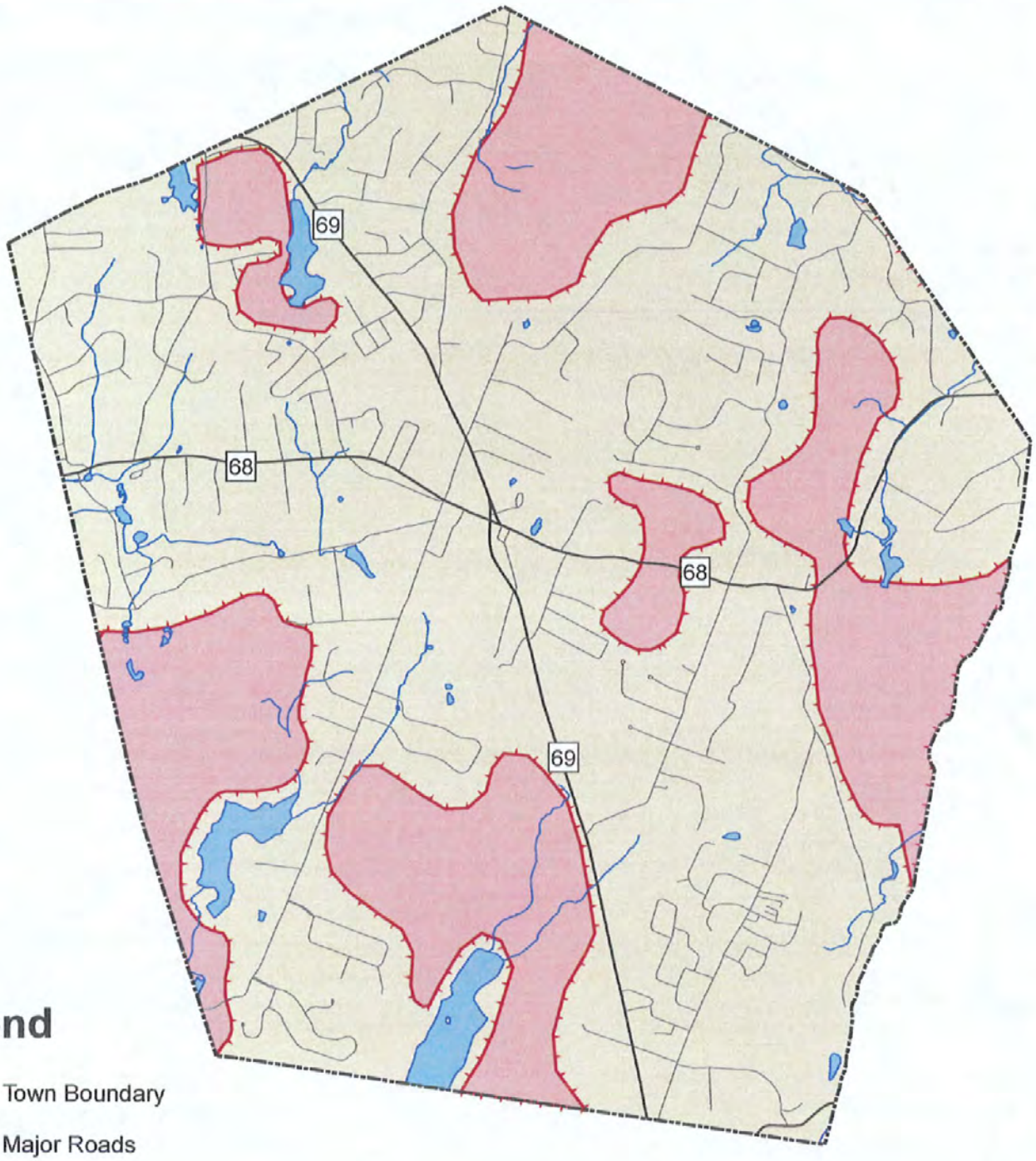
The Town of Prospect is a low-risk area for wildfires. Wildfires are of particular concern in wooded areas and other areas with poor access for fire-fighting equipment. Figure 9-1 presents a wildfire risk area with associated acreages for the Town of Prospect. Hazards associated with wildfires include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

9.2 Hazard Assessment

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: Prospect Wildfire Risk Areas



Legend

- Town Boundary
- Major Roads
- Local Roads
- Waterbodies
- Water
- Wildfire Risk Area

Source: "Roads", c1984 - 2006 Tele Atlas, Rel. 10/06
"Town Boundary", "Hydrography", DEP
"Wildfire Areas", COGCNV
For general planning purposes only. Delineations may not be exact.
January 2008

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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

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.

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.

According to the USDA Forest Service Annual Wildfire Summary Report for 1994 through 2003, an average of 600 acres per year in the United States was burned by wildfires. In general, the fires are small and detected quickly, with most wildfires being contained to less than 10 acres in size. The number one cause of wildfires is arson, with about half of all wildfires being intentionally set.

Traditionally, the highest forest fire danger in Connecticut occurs in the spring from mid-March to mid-May. The worst wildfire year in Connecticut since 1994 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.

9.4 Existing Programs, Policies, and Mitigation Measures

Existing mitigation for wildland fire control is typically focused on Fire Department training and maintaining an adequate supply of equipment. The Town of Prospect has a four-wheel drive brush truck capable of accessing remote fires, and several pumpers can carry extra lines of hose to supplement the range of this truck.

Unlike wildfires on the west coast of the United States where the fires are allowed to burn toward development and then stopped, the Prospect Fire Department goes to the fires. This proactive approach is believed to be effective for controlling wildfires. The fire department has some water storage capability, but primarily relies on the Connecticut Water Company's (CWC) water service or other water sources. Most of the area of

Prospect has water service that includes fire protection hydrants. Other areas use dry hydrants and fire ponds. The availability of fire-fighting water speeds the containment time for most fires occurring in the Town.

The Town of Prospect encourages developers to extend water mains as part of their construction process. Three major water main projects occurred during 2007. The Town extended an eight-inch water main 4,000 feet along Cambridge Drive and Ivy Terrace. A private developer extended a 12-inch water main 6,196 feet along Scott Road and Oak Lane, and the Connecticut Water Company extended a 12-inch water main 6,660 feet along Straitsville Road and Salem Road. In addition, two new dry hydrants were installed.

Education is also an important element of existing mitigation. The Prospect Fire Department website (http://www.prospectfire.org) provides links to other websites that promote education on fire prevention and safety.

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 Town of Prospect to monitor the drier areas of the state in an effort to reduce forest fire risk.

9.5 Vulnerabilities and Risk Assessment

Wildfires can occur anywhere and at any time in undeveloped or 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. 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.

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 to the most extreme wildfire recorded in the past 20 years that burned 300 acres. Given the availability of fire-fighting water in the Town, including the use of dry hydrants and fire ponds, and long-standing mutual aid assurances the Town Fire Department has with neighboring communities, it is believed that these average and severe values are applicable to the Town as well.

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. These areas are generally associated with wooded water company lands and each area borders residential sections of the Town. Therefore, residents on the outskirts of these risk areas are the most vulnerable to fire, heat, and smoke effects of wildfires.

Despite having a large amount of forest/urban interface, the overall risk of wildfires occurring in the Town of Prospect is also considered to be low. Such fires fail to spread far due speed of detection and strong fire response. As most of the Town has fire-fighting water available nearby, a large amount of water can be made readily available for fire fighting equipment. The Town also has the support of the local water companies to provide access to their extensive watershed lands in case of a wildfire.

Recall from Figure 2-7, Figure 2-8, and Figure 2-9 that elderly, linguistically isolated, and disabled populations reside in the Town of Prospect. In comparing these figures with the wildfire risk areas presented in Figure 9-1, it is possible that several hundred of the population impacted by a wildfire could consist of the elderly, up to 40 could consist of linguistically isolated households, and several hundred with disabilities could reside near wildfire impact areas. Thus, it is important for the Prospect Fire Department to be prepared to assist these special populations during a wildfire emergency.

Water company lands are considered at greatest risk for developing a larger wildfire due to their undeveloped nature and limited access for fire-fighting equipment. 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 watershed lands, it is estimated that up to 200 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 Town.

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 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 Town should continue to encourage the CWC to extend the public water supply systems into areas within growth boundaries that require water for fire protection.
- The Town should continue to assist the CWC in identifying and upgrading those portions of the public water supply systems that are substandard from the standpoint of adequate pressure and volume for fire-fighting purposes.
- Innovative solutions to fire protection should be explored where it is not feasible to extend a conventional water system. One example of a fire protection solution would be the use of fire ponds and dry hydrants. This task would be best designated to the Department of Public Works.

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.
- Review subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles.
- Provide outreach programs including tips on how to properly manage burning and campfires on private property.
- Patrol Town-owned open space and parks to prevent unauthorized campfires.
- 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 in the Building Department.
- Enforce regulations and permits for open burning.
- 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 Local Emergency Planning personnel or commission should be charged with the creation and/or dissemination of informational pamphlets and guides to public locations such as the library, post office, senior center, and town hall. One such guide entitled "Are You Ready? An In-Depth Guide to Citizen Preparedness," co-published by the American Red Cross, NOAA, and FEMA provides useful information regarding fire, flooding, heat waves, hurricanes, thunderstorms, tornadoes, and winter storms. Other useful guides should include, at a minimum, the following subjects:

- Food, water, and other disaster supplies
- Creating a family disaster plan
- Disaster preparation for people with disabilities and other special needs
- Helping children cope with disaster
- Helping adults cope with disaster-related stress

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 implementation of an emergency notification system would be beneficial in warning residents of an impending hazard. In addition, the Town Emergency Operations Plan should continue to reviewed and updated regular basis, at least once annually.

In addition, several pages should be added to the Town website regarding emergency planning and shelter locations so that the public can prepare family emergency plans within the framework of the Prospect emergency procedures.

The Public Works Department should develop working intermunicipal agreements with other public works departments in nearby communities. This would allow for sharing of resources when disasters affect one community more than others.

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 specific 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.

Inland Flooding

Prevention

- Streamline the permitting process and ensure maximum 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 Town department.
- Urge or petition FEMA to more critically evaluate LOMA and LOMC applications that are received such that redevelopments do not potentially cause increased flooding to other properties.
- Consider joining FEMA's community rating system.
- Continue to require Flood Hazard Area, subdivision, and commercial and industrial zoning permit applications to provide needed flood data.
- Consider requiring buildings constructed in floodprone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.
- New buildings should be designed and graded to shunt drainage away from the building.
- When possible, assist with the Map Mod program to ensure an appropriate update to the Flood Insurance Study, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps.
- 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 objectives listed in the Plan of Conservation and Development, including the protection of riparian zones.
- Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.

Structural Projects

- Commission a comprehensive Town-wide stormwater management system study. This study should include a culvert and catch basin maintenance and replacement schedule and include mathematical models that developers can use to compare existing to proposed conditions. Update this Study with a minimum frequency of every five years.
- Continue to investigate reports of localized flooding problems to determine the cause and an appropriate solution. Set milestones for eliminating recurring localized flooding areas.
- Continue to restrict vehicular access to Town property to prevent ATV use.
- Increase the size of the Plank Road culvert to prevent the flooding of nearby septic fields.
- Increase the size of the culvert for Roaring Brook on Roaring Brook road. If necessary, consider raising the elevation of the road to accommodate the larger culvert.
- Petition the state to increase the size of the culvert under Route 68 near the Public Works Garage.
- Petition the state to increase the size of the 36-inch culvert under Route 68 near Spring Road to pass a greater than 100-year flood event.

- ❑ Continue participating in the Connecticut DEP Stormwater Management Program.
- ❑ Continue over-sizing culverts and drainage structures.

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

- ❑ Increase tree limb maintenance and inspections, especially along Route 68, Route 69, and other evacuation routes.
- ❑ Continue 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 to make literature available during the permitting process regarding appropriate design standards.
- ❑ Ensure adequate notification systems exist to provide Cook Road mobile home residents with as much warning of an approaching tornado as possible.

Winter Storms

- ❑ Petition the State Department of Transportation to construct drainage improvements to reduce road icing on Routes 68 and 69.
- ❑ Post a list of Town snow-plowing routes and sheltering facilities in the Town Hall and on the Town's website so residents can best plan how to access to critical facilities during a winter storm event.
- ❑ Review evacuation plans to ensure timely migration of potential shelterees from all areas of Prospect.
- ❑ Provide education and outreach materials to property owners on how to protect property through the use of shutters and storm windows, the importance of removing snow from flat roofs, and the importance of insulating pipes adequately to protect from freezing and bursting.

- Provide public educational materials that focus on safety tips and reminders to individuals about how to prepare for cold weather.
- Encourage two modes of egress into every neighborhood by the creation of through streets.
- Fund the purchase of an emergency generator at the Boulder Brook Court sewer pumping station.

Earthquakes

- Consider preventing new residential development in areas prone to collapse.
- As suggested in the Plan of Conservation and Development, continue restricting or preventing residential development on or below steep slopes (slopes exceeding 30%).
- Continue to require adherence to the state building codes.
- Ensure that municipal departments have adequate backup facilities (power generation, heat, water, etc.) in case earthquake damage occurs.

Dam Failure

- Continue to encourage DEP and dam owners to conduct regular inspections of all Class C dams, and recommend upkeep and maintenance as required for keeping such dams in safe and functional order.
- Consider implementing Town inspections of municipally-owned Class A, AA, and BB dams.
- Work with the Connecticut DEP to ensure that the owners of Class C dams have up to date Emergency Operations Plans and Dam Failure Analyses. Copies of these documents should be made available at the Town Hall for reference and public viewing.
- Ensure that all Class C dams have up to date Operation and Maintenance Manuals.

Wildfires

- The Town should continue to encourage the CWC should continue to extend the public water supply systems into areas within growth boundaries that require water for fire protection.
- The Town should continue to assist the CWC 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.
- Innovative solutions to fire protection should be explored where it is not feasible to extend a conventional water system. One example of a fire protection solution would be the use of fire ponds.
- 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;
- 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 in the Building Department;
- Review subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles;
- Provide outreach programs including tips on how to properly manage burning on private property;
- Patrol Town-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. Funding requirements and contact information is given in Section 11.0.

Flood Mitigation

- FEMA Flood Mitigation Assistance Program – *grants for pre-disaster flood hazard mitigation planning and projects.*
- U.S. Army Corps of Engineers – *50/50 match funding for floodproofing 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

- FEMA Pre-Disaster Mitigation Grant Program (PDM) – *funding for hazard mitigation projects on a nationally competitive basis.*
- 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.*

Wildfire Mitigation

- Assistance to Firefighters Grant Program – *Provides pre-disaster grants to organizations such as fire departments that are recognized for expertise in fire prevention and safety programs.*

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 hazard mitigation plan as needed, coordinate its adoption with the Town of Prospect, and guide it through the FEMA approval process.

As individual recommendations of the hazard mitigation plan are implemented, they must be implemented by the municipal departments that oversee these activities. The Office of the Mayor and the Public Works Department in the Town of Prospect will primarily be responsible for developing and implementing selected projects, although other departments such as Office of the Land Use Inspector and the Fire Department will oversee or jointly oversee some projects. 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 Town departments and agencies as a planning tool to be used in conjunction with existing documents. It is expected that revisions to other Town 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 Town 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 Town 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 the Plan in the Town'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 Town Public Works Department.

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 COG regarding certain projects, meetings, site visits, and telephone calls as befits the project being implemented. The Council of Governments of the Central Naugatuck Valley will coordinate an annual meeting for review and evaluation of the plan. Participants in this review may include representatives of the departments listed in Section 11.1.

Matters to be reviewed at this meeting will include a review of the goals and objectives of the original plan, a review of hazards or disasters that occurred during the preceding year, a review of the 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 meeting will be conducted in October or November, at least two months before the annual application cycle for pre-disaster grants (applications are typically due in January of any given year). This will enable a list of

possible projects to be circulated for Town 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 Town of Prospect.

11.3 Updating the Plan

The Council of Governments of the Central Naugatuck Valley will update the hazard mitigation plan if a consensus to do so is reached by the Town Council of Prospect and a request is presented to the Council of Governments of the Central Naugatuck Valley, or at least once every five years. A 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 four 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;
- Quinnipiac River Watershed Association;
- Town of Cheshire Public Works Department and Planning Department;
- Town of Bethany;
- Town of Naugatuck (key department to be determined; hazard mitigation plan development is scheduled for 2008);
- City of Waterbury Public Works Department, Fire Department, and Mayor's Office.

Updates may include deleting recommendations as projects are completed, adding recommendations as new hazard impacts 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
(877) 336-2734
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
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
360 Rainbow Boulevard South, 3rd Floor
Niagara Falls, NY 14303
800-659-2955
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, floodproofing, 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) 424-3706
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.

- *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.

- *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.

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

- *Stream Channel Encroachment Line Program*: Similar 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.

- *Dam Safety Program*: Charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. Permits the construction, repair or alteration of dams, dikes or similar structures and maintains a registration database of all known dams statewide. This 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) 685-8441
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
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. ASFMP 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 floodproofing 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	0	2	5
Wildfires	1	2	1	4

Location

1 = small	isolated to specific area during one event
2 = medium	mulitple 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 ilnesses 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 no'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
Thunderstorm and Tornado Winds	2	2	2	6
Flooding from Dam Failure	1	1	4	6
Flooding from Poor Drainage	1	3	1	5
Shaking	3	0	2	5
Lightning	1	3	1	5
Inland Flooding	1	2	1	4
Falling Trees/Branches	1	2	1	4
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	mulitple 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 ilnesses 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

APPENDIX A
STAPLEE MATRIX

Strategies Listed by Primary Report Section for Prospect	Responsible Department[1]	Schedule A. Ongoing B. 2007-2012 C. 2012-2017 D. 2017-2022	Associated Report Sections							Category 1. Prevention 2. Property Protection 3. Natural Resource Prot. 4. Structural Projects 5. Public Information	STAPLEE Criteria *Good = 3, Average =2, and Poor = 1*							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	**STAPLEE Sum of Scores**
ALL HAZARDS																		
Dissemination of informational pamphlets regarding natural hazards to public locations	Mayor	B	x	x	x	x	x	x	x	1,2,5	3	3	3	3	3	3	3	**21**
Implementation of an emergency notification system	Mayor	B	x	x	x	x	x	x	x	1,2,5	3	3	3	2	3	2	3	**19**
Continue to review and update Emergency Operations Plan, at least once annually	Mayor	B,C,D	x	x	x	x	x	x	x	1	3	3	3	3	3	3	3	**21**
INLAND FLOODING																		
Prevention																		
Streamline the permitting process to ensure maximum education of developer or applicant	Land Use Inspector	B	x	x	x	x	x		x	1	3	2	2	3	3	3	3	**19**
Petition FEMA to more critically evaluate Letters of Map Amendment and Letters of Map Change Applications to prevent flooding increases	Mayor	B,C,D	x	x	x	x		x		1	3	2	3	3	3	3	1	**18**
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 Flood Hazard Area, subdivision, and commercial and industrial permits applications to provide needed flood data	Land Use Inspector	A	x	x	x	x		x		1	2	3	2	2	3	3	2	**17**
Require new buildings constructed in flood prone areas to be protected to the highest recorded flood level regardless of SFHA	Land Use Inspector	B	x	x	x	x				1,2	2	2	2	2	3	3	1	**15**
Require that new buildings be designed and graded to shunt drainage away from the building	Land Use Inspector	B	x	x	x	x				1,2	2	2	3	3	3	3	1	**17**
Assist with the Map Mod Program	Mayor	B	x	x	x	x		x		1	3	3	3	3	3	3	2	**20**
Use the Town two-foot contour maps to develop more exact regulatory flood maps using FEMA flood elevations	Public Works	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, including the protection of riparian zones	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	Land Use Inspector	A	x	x	x	x	x	x	x	3	2	3	3	2	3	2	3	**18**
Structural Projects																		
Commission a Town-wide stormwater management system study, including mathematical models for developers. Update every five years.	Mayor	B	x	x	x	x		x		1,4	3	3	3	3	3	2	2	**19**
Investigate reports of localized flooding problems to determine cause and appropriate solution. Set goals for eliminating recurring localized flood areas	Public Works	B,C,D	x	x	x	x				4	3	3	2	3	3	3	1	**18**
Continue to restrict vehicular access to Town property to prevent ATV use	Public Works	A	x	x	x	x			x	2,3,4	2	2	3	3	3	2	3	**18**
Increase the size of the Plank Road culvert to prevent the flooding of nearby septic fields	Public Works	B	x	x	x	x				2,4	3	3	3	3	3	2	2	**19**
Increase the size fo the culvert for Roaring brook on Roaring Brook road. If necessary, raise the level of the road to accommodate	Public Works	B	x	x	x	x				2,4	3	3	2	3	2	2	2	**17**
Petition the state to increase the size of the culvert under Route 68 near the Public Works garage to reduce flooding/icing	Mayor	B	x	x	x	x				4	3	2	2	3	3	2	2	**17**
Petition the state to increase the size of the 36-inch culvert under Route 68 near Spring Road to pass a greater than 100-year storm event	Mayor	B	x	x	x	x				4	3	2	2	3	3	2	2	**17**
Continue participating in the Connecticut DEP Stormwater Management Program	Mayor	A	x	x	x	x				3	3	3	3	3	3	2	3	**20**
Continue oversizing culverts and drainage structures	Public Works	B,C,D	x	x	x	x		x		2	2	2	3	3	3	2	2	**17**
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, AND WINTER STORMS																		
Increase tree limb inspections and maintenance, especially along evacuation routes	Public Works	B		x	x	x	x			1,2	3	2	2	3	3	3	2	**18**
Continue outreach regarding dangerous trees on private property	Public Works	A		x	x	x	x			1,2	3	2	3	3	3	2	2	**18**
Continue to require that utilities be placed underground in new developments and pursue funding to move them underground in existing areas	Land Use Inspector	A	x	x	x	x		x	x	2	3	2	2	3	3	3	2	**18**
Continue to require compliance with the amended Connecticut Building Code for wind speeds	Land Use Inspector	A		x	x	x				2	2	3	3	3	3	3	1	**18**
Provide for the Building Department to make literature available during the permitting process regarding appropriate design standards	Land Use Inspector	B		x	x	x				1	3	3	3	3	3	3	1	**19**
Ensure adequate notification systems exist to provide Cook Road mobile home residents with as much warning of an approaching tornado as possible	Mayor	B			x					2,4	3	3	3	3	3	3	1	**19**

Strategies Listed by Primary Report Section for Prospect	Responsible Department[1]	Schedule A. Ongoing B. 2007-2012 C. 2012-2017 D. 2017-2022	Associated Report Sections							Category 1. Prevention 2. Property Protection 3. Natural Resource Prot. 4. Structural Projects 5. Public Information	STAPLEE Criteria *Good = 3, Average =2, and Poor = 1*							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	**STAPLEE Sum of Scores**
WINTER STORMS																		
Petition the State DOT to construct drainage improvements to reduce icing on Routes 68 and 69	Mayor	B	x	x	x	x				1,4	3	3	3	3	3	2	2	**19**
Compile and post a final list of plowing routes, prioritizing egress to shelters and critical facilities	Public Works	B				x				5	3	3	2	3	3	2	**1**	**17**
Complete and disseminate evacuation plan to ensure timely evacuation of shelterees from all areas of Prospect	Mayor	B	x	x	x	x	x	x	x	1,5	3	3	3	3	3	3	**1**	**19**
Provide educational materials to property owners regarding using shutters, storm windows, pipe insulators, and removing snow from flat roofs	Mayor	B		x	x	x				2,5	3	3	3	3	3	3	**1**	**19**
Provide educational materials with safety tips and reminders regarding cold weather	Mayor	B				x				1,5	3	3	3	3	3	3	1	**19**
Encourage two modes of egress into every neighborhood by the creation of through streets	Land Use Inspector	B	x	x	x	x	x	x	x	1	3	2	3	3	3	2	1	**17**
Fund the purchase of an emergency power generator at the Boulder Brook Court sewer pumping station	Public Works	B		x	x	x					2	3	3	3	3	3	3	**20**
EARTHQUAKES																		
Consider preventing new residential development in areas prone to collapse	Land Use Inspector	B					x			1	2	3	3	2	3	2	2	**17**
Consider preventing residential development in areas on or below steep slopes (slopes exceeding 30%) as per the Plan of Conservation & Development	Land Use Inspector	B					x			1	2	3	3	3	3	3	3	**20**
Continue to require adherence to the state building codes	Land Use Inspector	A		x	x	x	x			1	2	3	3	3	3	3	1	**18**
Ensure that municipal departments have adequate backup facilities (power generation, heat, water, etc.) in case earthquake damage occurs	Public Works	B		x	x	x	x			1	3	2	2	3	2	2	1	**15**
DAM FAILURE																		
Continue to encourage DEP and dam owners of Class C dams to inspect their dams and perform or require upkeep and maintenance as needed	Public Works	A	x					x		2,4	3	3	3	3	3	3	3	**21**
Consider implementing Town inspections of municipally owned Class A, AA, and BB dams	Mayor	B	x					x		2,4	2	3	2	2	1	3	3	**16**
Work with the Connecticut DEP to ensure that each Class C dam has an up to date EOP, O&M Manual, and Dam Failure Analyses	Mayor	B	x					x		1	3	3	3	3	3	3	3	**21**
Have copies of the Class C dam EOPs and Dam Failure Analyses on file at the Town Hall for public viewing	Mayor	B						x		5	3	3	3	3	3	1	1	**17**
WILDFIRES																		
Encourage the Connecticut Water Company extend/upgrade the public water supply systems into areas requiring water for fire protection	Mayor	A			x				x	4	3	2	3	3	3	3	2	**19**
Explore other fire protection solutions when water main extensions are not feasible, such as the use of fire ponds	Public Works	A			x				x	4	3	2	3	3	3	3	2	**19**
Continue to promote inter-municipal cooperation in fire-fighting efforts	Mayor	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	Fire Dept.	A							x	5	3	3	3	3	3	3	3	**21**
Distribute copies of "Is Your Home Protected from Wildfire Disaster?" booklet in the Building Department	Land Use Inspector	B							x	2,5	3	3	2	3	3	1	2	**17**
Consider having Police and Fire Departments review subdivision applications to ensure proper access for emergency vehicles	Land Use Inspector	B	x	x	x	x	x	x	x	1	3	3	2	3	3	2	2	**18**
Provide outreach programs that include tips on how to properly manage burning and campfires on private property	Fire Dept.	B							x	5	3	3	3	3	3	3	3	**21**
Patrol Town-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**

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 Town of Prospect, 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 MITIGATION PLANS FOR CHESHIRE, PROSPECT, WATERBURY, AND WOLCOTT

Council of Governments Central Naugatuck Valley
Project Kick-Off Meeting
June 26, 2006

I. Welcome & Introductions

The following individuals attended the project kick-off meeting, and will comprise the steering committee:

- David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- Ken Livingston, AICP, Fitzgerald & Halliday, Inc. (FHI)
- Virginia Mason, Council of Governments Central Naugatuck Valley
- Jeffrey Cormier, Council of Governments Central Naugatuck Valley
- Chet Sergey, Wolcott Local Emergency Planning Commission
- Bob Chatfield, Mayor, Town of Prospect
- George Noewatne, Cheshire Public Works Department
- Jack Casner, Cheshire Fire Department
- Adam Rinko, Waterbury Fire Department

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

David described the Disaster Mitigation Act of 2000 and the desire of FEMA to have hazard mitigation planning occur at the local level. A discussion about the pre-disaster hazard mitigation grant program and eligible types of projects took place at this time, and continued intermittently throughout the meeting. The issue is especially relevant in Waterbury, where FEMA will likely be assisting with response and clean-up after the June 2 events. Although funding for disaster response is allocated differently than funding for hazard mitigation, some of the long-term solutions in Waterbury (and other communities) will require pre-disaster hazard mitigation funding.

III. Project Scope

David described the project scope, organized as follows:

- Task 1 – Project Initiation and Data Collection
- Task 2 – Vulnerability Assessment
- Task 3 – Public Meetings
- Task 4 – Response Planning and Recommendations
- Task 5 – FEMA Review and Plan Adoptions

Unlike most planning projects, this project began before the kick-off meeting because the unusual rainfall events in May and June provided opportunities to observe flooding or near-flooding conditions.

The team had questions about the public meetings and public hearings. One public meeting will be held in each municipality to hear from the public and exchange information. David and Ken will likely lead these meetings. These may be coincident with regularly-scheduled meetings of different commissions, although it is not required. The team discussed the likelihood that members of the public would talk about some issues that are not covered in the plans, such as water in basements, potholes and sinkholes caused by water and sewer main breaks, etc. MMI and FHI will listen to all comments and subsequently determine which will be included in the planning process with the steering committee.

The public hearings to adopt the natural hazard plans will occur at the end of the project. The Board of Selectmen, Board of Alderman, or other executive commission will need to adopt each plan after FEMA's comments are addressed.

IV. Hazards

The COG's grant application included a number of hazards that have been organized as follows:

- ❑ Flooding
- ❑ Hurricanes
- ❑ Winter storms
- ❑ Summer storms and tornadoes
- ❑ Earthquakes
- ❑ Dam failure
- ❑ Wildfires

Over the last month, the following additional hazards have been considered for inclusion in the plans:

- ❑ Mass movement/Landslides (Waterbury)
- ❑ Collapse/Subsidence above Mines (Cheshire)

Virginia raised two points for discussion. First, the mine subsidence issue may not be appropriate for the Cheshire natural hazard plan, depending on other factors. Nevertheless, we are likely to hear about it at the public meeting. Second, significant water main breaks were originally noted in the grant application based on incidents in Waterbury. However, water main breaks and their resulting damage are not really natural hazards, and this will not be included. Although damage resulting from a compromised storm sewer pipe (earth movement, sinkholes, potholes, washed out roads) may be similar, the cause of the damage is natural (heavy rainfall).

V. Data Collection Needs, Availability, and Key Contacts

David explained that the following departments and/or their commissions typically provide an individual to attend the data collection meetings in each municipality:

- Public Works
- Engineering
- Planning & Zoning
- Emergency Management or Fire Department
- Optional: Mayor or Selectman's Office

Each local official in the steering committee should begin to identify the other individuals who should attend the data collection meeting. These meetings will need to occur during the summer, despite the difficulty of working around vacations.

Each municipality will need to provide lists of hazard events such as winter storms, flooding, summer storms, and brush fires, along with descriptions of their results and effects on populations. MMI and FHI can rely on other sources of information (such as the Connecticut Natural Hazard Mitigation Plan) to describe notable hurricanes and earthquakes, although each municipality is free to offer information about these as well.

In the case of Waterbury, Adam indicated that the damage caused by the June 2 storm has been well-documented and organized, and this information will be provided to MMI and FHI. Lists of potential projects have been compiled by the City's engineering consultant.

Bob provided a preliminary list of problem areas in Prospect and marked some of these on a map. It is anticipated that these areas will be field-checked, along with any others that are listed during the meeting in Prospect. Meetings in Wolcott and Cheshire will also yield lists of problem areas that will be field-checked.

A related conversation ensued regarding the erosion damage caused by ATV use in Prospect. Although ATVs are not a natural hazard, the erosion is caused by excessive rainfall. There may be a way to address some of the problem areas in the plan.

VI. Proposed Schedule

The following proposed schedule was modified from the schedule presented in the scope of services. It has been updated to the current status of the project.

Month and Year	*Tasks*
April – May 2006	Preliminary data collection and field reconnaissance.
June 2006	***Project kick-off meeting*** with COGCNV and a representative from each municipality; data collection; field reconnaissance.
July 2006	Meet with municipalities; data collection; field reconnaissance.
August 2006	Meet with municipalities; data collection; field reconnaissance; data review; vulnerability assessments.
September 2006	Data review; vulnerability assessments.
October 2006	Data review; vulnerability assessments; additional data collection and field reconnaissance (if necessary).
November 2006	Additional data collection and field reconnaissance (if necessary); Present findings to the public and collection of comments.
December 2006	Incorporate public comments; develop recommendations.
January 2007	Draft plans to COGCNV.
February 2007	Meet with COGCNV.
March 2007	Edits to plans; final draft plans to municipalities.
April 2007	Meet with municipalities; final edits.
May 2007	Submit final draft plans to FEMA.
June 2007	FEMA review.
July 2007	FEMA review.
August 2007	Incorporate FEMA edits.
September 2007	Adopt plans in municipalities.
October 2007	Submit final plans to FEMA.
November 2007 – March 2008	*Reserve time for delays associated with DEP and FEMA review, etc.*

The next step is for David to contact the steering committee members and schedule the data collection meetings in each municipality.

Meeting Minutes

NATURAL HAZARD MITIGATION PLAN FOR PROSPECT
Council of Governments Central Naugatuck Valley
Initial Data Collection Meeting
July 25, 2006

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)
- Scott Bighinatti, Milone & MacBroom, Inc. (MMI)
- Virginia Mason, Council of Governments Central Naugatuck Valley
- Jeffrey Cormier, Council of Governments Central Naugatuck Valley
- Bob Chatfield, Mayor, Town of Prospect
- Bill Donovan, Land Use Inspector, Town of Prospect

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

Bob had previously given David a list of flooding problem areas within the town. The Town of Prospect has been extremely proactive in its hazard mitigation efforts since 1983.

A. Emergency Response Capabilities & Evacuation Routes

Evacuation Shelters are the Fire House and Senior Center (both have generators).

The mobile home park on Cook Road is vulnerable to tornadoes and category 4 & 5 hurricanes because the homes are not anchored. The mobile home park residents also had trouble getting to the shelters because the state roads in Prospect are a low priority for the CT DOT during bad winter storms. As a result, Summit Road was widened to allow for emergency access (see below).

Prospect has 11 plow routes, which are reprioritized for fire and emergency access on a case by case basis during storms. CT DOT plow trucks tend to get off Routes 68 and 69 and prioritize Routes 8 and 84 instead, so Summit and Plank Roads have been redone (oversized) to accommodate fire trucks and other emergency vehicles during winter storms. The Town stores sand and salt mix at Public Works on Route 68 which it rations to the CT DOT so they don't have to return to Watertown to re-supply (and it keeps them in the Town). The state replenishes any amount of sand/salt mix they take.

B. Zoning and Subdivision Regulations

Cul-de-sacs must be a minimum of 60' wide at the end, and can be as narrow as 24' wide if they can never be elongated. A cul-de-sac must be able to allow a school bus to turn around without it backing up. A maximum of 20 houses are allowed on dead-end streets, and a 50' town right of way must be included at the end. New roads that are not dead ends must be a minimum of 30' wide.

Subdivisions must use box culverts for drainage – no twin culverts are allowed.

The town has been successful in convincing landowners and developers to make improvements.

Utilities must be underground in new developments, depending on depth to bedrock. When the bedrock is too shallow, poles can be used. This is reviewed on a case by case basis.

C. *Roadways*

In 1983, the Prospect experienced heavy flooding due to a rain event of 12" over 3 days. This flood event prompted a massive reconstruction effort of the Town's drainage system, and it is policy for the Town Engineer to oversize all drainage structures in an effort to mitigate flood damage. If the design calls for a 12" pipe, they use a 15" pipe; if the design calls for a 15" pipe, they use an 18" pipe; if the design calls for an 18" pipe, they use a 24" pipe, and so on. As a result, the town drainage system is oversized, and combined with the altitude of the town flooding isn't a major problem for Prospect. A 500,000 bond is obtained every other year for such efforts.

The Town has a Stormwater Management Plan (Phase II?) in effect.

The Town does annual cutbacks for private landowners who request tree removal, and does necessary tree removal on a case by case basis. CL&P only comes around every three years to do trimming near power lines. The Town removes trees and branches along roadways, and has a tree company on call to remove downed trees during storms. A few years ago an ice storm occurred and two subdivisions in town were without power for 3 days! Too many tree limbs broke and the response time of CL&P was slow. Prospect's policy is to take out trees whenever they may be a threat to roadways or aboveground utilities and put 30' cutbacks along new roads to mitigate possible outages.

In October 2005, Prospect had no problems with the 2 weeks of heavy rainfall. No roads had to be closed due to flooding or drainage concerns.

No headwalls in Prospect – they are 99% percent gone.

D. Noted Problem Areas

a. ATV's – Erosion problems on Corinne Drive and Terry Road are related to ATV use. On Corinne Drive, the drainage pipes were overwhelmed by excessive runoff due to ATV paths channelizing overland flow. Riprap work will be done on a few brooks in the Corinne Drive area, and a detention basin at the park (Mixville?) will be increased in size.
b. Raudis Pond at Clark Hill Road – Despite its proximity to the road, Raudis Pond had not flooded the road in over 50 years. The June 2nd storm of 8" of rain in 3 hours caused the road to flood. This storm was a greater than 100-year storm event (from "Precipitation in Connecticut", Miller et al., 2004):

    i. 100-year, 1-hour storm: 2.4 inches
    ii. 100-year, 6-hour storm: 6.0 inches
    iii. 100-year, 12-hour storm: 7.2 inches
    iv. 100-year, 24-hour storm: 8.4 inches

    The 36" pipe downstream at Route 68 and Spring Road backed up to the point where water was flooded above the fire hydrant located on Route 68 at the end of Clark Hill Road. It was suggested to increase the culvert size at Route 68 to be able to withstand a greater than 100-year rain event.
c. Terry Road – This year, Prospect replaced the old 15" pipe under the road with a larger 30" pipe to carry flow from Turkey Hill to the Waterbury Reservoir after the road washed out. The new pipe is lower in elevation than the old pipe, and the surrounding area has been reinforced with riprap to prevent erosion. Should the pipe back up in the future due to heavy flows, there is now at least 0.5 acres of storage area behind Terry Road to mitigate flood flows.
d. Boulder Brook – There are 39 housing units here, but Bill doesn't think the new development will cause any future drainage problems. The detention basin was breached during the extreme storms this spring but is being fixed.
e. Salem Road – 800 feet west of Pondview Drive, the 36" pipe will sometimes backup due to beavers living in the culvert. When it backs up, it floods four septic fields near CWC lands. The town regularly pulls down the beaver dams (without killing the beavers) to prevent leachate from reaching water company lands.
f. Drain under Route 68 – A tributary to Ten Mile Brook flows under Route 68 between the Public Works and Plank Road. The water flows over the road (or can freeze on the road in winter) 2 to 3 times per year because the pipe here is undersized. The bridge on Route 68 at Plank Road spanning Ten Mile River was replaced a few years ago (1987).
g. The Town Landfill – The landfill in the northeastern part of Prospect is surrounded by three brooks. These brooks drain to Cheshire. Downstream of the landfill, the streams combine and flow in, around, and over ledge which

during flood conditions creates rapid velocities and backups at the culvert under Plank Road. Such backups have flooded nearby septic fields. The culvert under Plank Road should be increased in size to accommodate higher flows. The backups have never been severe enough to affect the upstream landfill, so leachate from the landfill area is not a concern.

h. New Subdivision north of Candee Road – During construction, runoff to Roaring Brook may be increased. No problems are expected to occur after development is completed, as the subdivision will have a detention basin. Some houses nearby are situated on wetland soils.
i. Roaring Brook at Roaring Brook Road – The culvert under Roaring Brook Road near Norm's Pony Farm is too small and often overflows the road. Prospect is currently in negotiations to obtain some land in the area which will enable them to fix the problem, as Roaring Brook is a protected and sensitive watershed area (RWA).

Brush fires do occur, but would not be classified as "wildfires". Such fires never reach into the treetops. Prospect has a brush fire truck equipped with 4WD.

Prospect contacts the local water companies (CWC, RWA) for assistance in regards to maintenance / firefighting activities on their lands. Virginia recommended we contact the water companies to mention this project and get any input they may have.

A new development on Summit Road, west of Pineview Road, was stopped by the Army Corps of Engineers due to it being a "sensitive" area.

A new development on Summit Road has significantly increased detention capacity, so flooding is no longer an issue at that location.

Complaint logs (paper only) are kept in Bob's office and reviewed annually. About 1 to 2 complaints per month are related to drainage.

Dams in the town are generally in good repair. A dam on Route 69 (Waterbury Reservoir?) is slated for major repairs, and one near Waterbury (in Prospect or in Waterbury?) was recently lowered by 6' to reduce pressure on the dam (and has consequently lowered its flood mitigation capacity). Major repairs are also slated for a dam on Route 68 (West Brook Reservoir or Cheshire Reservoir?) on an inactive reservoir. The town also oversized a box culvert on Summit Road in case the upstream dam (unregistered dam?) should fail.

Ice is a greater problem in Prospect than in surrounding towns due to its greater elevation. Severe icing is another reason Prospect has a policy to cut back trees from the road. An example is Terry Road near the Waterbury Reservoir, where pine trees shaded the road creating a cold zone with increased icing along Waterbury property. Waterbury cut back the trees and the situation improved.

IV. Acquisitions

- Zoning Regulations: Adopted September 26, 1962, last amended July 14, 2005
- Subdivision Regulations: Adopted July 1, 2004, last amended June 17, 2005.
- Inland Wetland and Watercourses Regulations: Adopted July 1, 1974, last amended March 13, 2000.
- Emergency Operations Plan: Adopted December 23, 2005.
- Plan of Conservation and Development: Will be sent by Bob or Bill (they were out of copies).
- Five Year Plan of Proposed Capital Projects: Dated February 7, 2006.
- Town of Prospect Budget Sheet: 2004-2005 to 2006-2007.

Meeting Minutes

NATURAL HAZARD MITIGATION PLAN FOR PROSPECT
Council of Governments Central Naugatuck Valley

PUBLIC INFORMATION MEETING – NOVEMBER 20, 2006

I. Welcome & Introductions

The following individuals attended the information meeting:

- David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- Sam Eisenbeiser, Fitzgerald & Halliday, Inc.
- Virginia Mason, Council of Governments Central Naugatuck Valley
- Jodie Mozdzer, Reporter for Waterbury Republican-American
- Nelson Abarzua, Prospect Resident Trooper
- Richard Mortenson, Prospect LEPC and resident of Boulder Brook

Virginia 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, Prospect, Connecticut"

David and Sam presented the power point slideshow *(copy to be appended to notes during Plan compilation).*

III. Discussion

After the presentation, Mr. Mortenson and Mr. Abarzua were able to spend some time discussing their thoughts about natural hazard mitigation.

Mr. Abarzua believes that the presentation mostly touched on the two big winter problem areas: Route 69 from the center of town to the Bethany line, and Route 68 near DPW toward the Cheshire line:

- Route 69 from the center of town to the Bethany line – This area suffers from icing and is a major road from New Haven to Waterbury without any nearby alternatives. During a recent winter, it had to be completely shut down to clear snow, ice, and accidents.

- Route 68 near DPW toward the Cheshire line – This area is known locally as "Accident Alley." The road has a sharp turn, a steep grade, and water comes off the hillside and causes black ice.

Mr. Abarzua agreed with previous characterizations of the CT DOT's lack of response in Prospect.

He agreed that flooding problems were mainly related to streams and ponds being close to roadway elevations, and thought that the presentation hit all the most important areas of flooding. He emphasized the Straitsville Road area, as well.

Communication dead spots include Route 42 and Straitsville Road.

Mr. Abarzua inquired if a FEMA pre-disaster grant could be used to fund a system similar to reverse 911, but that sends text messages to mobile phones. This could be used, for example, to notify residents of a power outage duration.

Mr. Mortenson is a recent resident of Prospect and lives in the new Boulder Brook development off Route 68 near Spring Road. This development is lower than Route 68 and residents sometimes have trouble getting in and out during snow and ice conditions. Power outages have also been a problem in that development, and one resident of the complex is on oxygen. He wondered if there was a way that the Plan could address these types of small site-specific problems.

Mr. Mortenson also is concerned with the affect of power loss on sewer pump stations, including the one that serves Boulder Brook. Although the systems typically have septic tanks that can hold wastewater for a couple days while pumping stations are repaired, the potential for a backup is real. David indicated that the best way to address that type of problem isn't to focus on the repair of the pumping stations, but to focus on maintaining access and protecting electrical systems so the stations can be repaired quickly. Also, the problem should be presented as one that affects every neighborhood served by a pumping station, rather than just Boulder Brook.

COGCNV field notes
Field inspection on June 28, 2006.
Notes typed June 28, 2006.
Scott Bighinatti

Connecticut experienced a heavy storm the morning of June 28, 2006. This event had rainfall intensities reaching one inch per hour during morning rush hour over the western part of the state. The weather station KCTMIDDL8 (www.wunderground.com) in Eastern Middlebury, Connecticut recorded 1.05 inches for this rain event between the hours of 6:30 and 10:00 am. Recent rainfall at this gauge totaled 0.71, 0.92, 0.61, 0.11, and 0.03 inches on June 23, 24, 25, 26, and 27, respectively, so soil conditions were considered saturated. Sites in Prospect were checked for potential flooding during the later part of the storm on June 28, based on recommendations provided by the mayor's office in Prospect.

Photographs:

1. Site 7: Mountain Brook at Plank Road, Upstream
2. Site 7: Mountain Brook at Plank Road, Downstream
3. Site 7: Mountain Brook at Plank Road, Downstream Staff Gauge
4. Site 3: Private Pond at Clark Hill Road (north side of road, high stage)
5. Site 3: Private Pond at Clark Hill Road (rip rap overflow)
6. Site 4: Unnamed Stream at Terry Road, Upstream (new culvert)
7. Site 4: Unnamed Stream at Terry Road, Downstream (new culvert)
8. Site 5: Unnamed Stream at Spring Road near Rt. 68, Downstream
9. Site 5: Unnamed Stream at Spring Road near Rt. 68, Upstream
10. Site 5: Fulling Mill Brook at Spring Road, Downstream
11. Site 5: Fulling Mill Brook at Spring Road, Upstream
12. Site 1: Marks Brook Area of Straitsville Road (no flooding).
13. Site 6: Roaring Brook at Roaring Brook Road, Upstream
14. Site 6: Roaring Brook at Roaring Brook Road, Downstream
15. Site 6: Roaring Brook Road area regularly flooded by Roaring Brook
16. Site 10: Ten Mile River at intersection of Rt. 68 and Plank Road, Upstream flow
17. Site 10: Ten Mile River at intersection of Rt. 68 and Plank Road, Upstream
18. Site 10: Ten Mile River at intersection of Rt. 68 and Plank Road, Downstream

These notes follow the sequence of photography above, including some sites that were not photographed.

Site 7: Mountain Brook at Plank Road – This stream is running rapidly. There is a staff gauge downstream noting that the water was about two feet deep.

Site 8: Summit Road – The areas of Whebey Drive and Holley Lane were inspected. No watercourses were noted on or near these dead end streets. Mountain Brook flows under Juggernaut Road, which intersects with Summit Road. Juggernaut Road may be worth a look during a later field reconnaissance.

Site 2: Corinne Drive – No flooding was observed at this site. There may be an intermittent watercourse present, but it is well hidden by vegetation.

Site 3: Private Pond / Unnamed Stream at Clark Hill Road – A private pond exists onsite, damming an unnamed stream. This pond may be known locally as Raudis Pond. The top of the riprap spillway is either at or slightly above the level of the road. Streamflow through the spillway is slow at the moment. Judging from the landscaping at the edge of the pond near the road, the potential exists for water to flood the road. This unnamed stream flows south to Site 5 (Spring Road).

Site 4: Unnamed Stream at Terry Road – This unnamed stream drains Turkey Hill and flows under Terry Road into East Mountain Reservoir. This stream apparently did severe damage to the road during the previous months, as a new culvert has recently been laid to direct flow under the road (see photo). No wingwalls or guardrails have been installed on the bridge, but the sides are well-reinforced with riprap.

Site 5: Unnamed Stream at Spring Road – This stream is the same as the one in Site 3. It drains under Route 68 at the intersection of Clark Hill Road and into an impoundment before draining under Spring Road and into a smaller impoundment. This impoundment drains west until the unnamed stream empties into Fulling Mill Brook. There is almost no potential for flooding from the small impoundment here as it is an overflow dam, and the larger impoundment has enough surface area to mitigate floods. The culvert where the stream passes under Route 68 at Clark Hill Road was not inspected (it would be categorized as Site 9), but should be inspected in a subsequent reconnaissance.

Fulling Mill Brook at Spring Road – This stream is quite high, as evidenced in the downstream photo (see photo). Streamflow on the east side of the road (upstream) is quite fast.

Site 1: Marks Brook at Straitsville Road – This stream was completely hidden by vegetation. A photo was taken of the area prone to flooding. According to a Town of Prospect Police Officer who stopped while I was inspecting the area, the entire road was washed out recently from the heavy rains, presumably in late April or mid-May.

Site 6: End of Roaring Brook Road – An equestrian facility marks the end of Roaring Brook Road. There is no drainage on Roaring Brook Road at this location, and the steep grade of the road results in flows along the sides of the roadway of one to two inches deep.

Roaring Brook at Roaring Brook Road – The culvert here is much too small to handle flood flows. According to the neighbor on the west side of the road just south of the brook, the culvert regularly overflows and the excess streamflow discharges along the road until it flows off the road across the street from his house. The road likely flooded recently, as there was evidence of soil deposition on the road just south of the gentleman's driveway.

Site 10: Ten Mile River at Route 68 near Plank Road – Ten Mile River flows down a steep grade at this location with the potential for a lot of erosion. A bridge was installed in 1987 at the site and appears suitable for flood flows. Concrete wingwalls were also installed to reduce scour around the 80-degree turn the river takes to flow under Route 68. The area around the Public Works on Route 68 should be observed during a subsequent reconnaissance.

Yankee Clipper

WATERBURY REPUBLICAN-AMERICAN

11/21/06

Prospect eyes plan for disasters

BY JODIE MOZDZER
REPUBLICAN-AMERICAN

Consultant drafts mitigation guide, seeks public input

PROSPECT — Whether it's ice on Route 69 or an overflow of Raudis Pond at Clark Hill Road, the town will soon have a plan of action.

That's because an engineering and environmental science consulting firm is currently drafting a "pre-disaster mitigation" plan for Prospect and three other towns to have a guideline for how to handle an array of natural disasters.

Representatives from Milone & MacBroom of Cheshire presented the project at Town Hall on Monday night. The goal: to receive more resident input on natural disaster concerns here to draft a complete plan.

"A lot of times the individual people know something the town fathers just don't think of," said Virginia Mason, the assistant director of the Council of Governments Central Naugatuck Valley, which is overseeing the project in Prospect plus Waterbury, Cheshire and Wolcott. Each town will have its own plan and its own meeting to get localized input.

Once the town has an emergency plan in place by the spring, it will be eligible for more state and federal emergency grants, Mason said. This is the second round of plans the council is overseeing. Oxford and Woodbury adopted their own pre-disaster plans this year.

The program is funded by the Federal Emergency Management Agency.

David Murphy of Milone & MacBroom presented a list of natural disaster concerns in Prospect, including winter storms causing road troubles on Routes 68 and 69, flooding of brooks and reservoirs in town and wind affecting the mobile home park on Cook Road.

The plan will identify the

See **PLAN**, *Page* **2B**

PLAN: Federal funds will be available

Continued from 1B

natural hazards and address potential ways to prepare for them and alleviate their effects.

After the plan is complete and a public hearing is held, it will be submitted to the FEMA for approval.

From there, any extra mitigation measures outlined in the plan, like a beefed up communications system for emergency responders, will become eligible for grant money.

Only two people attended Prospect's meeting, but Mason said input will be accepted via e-mail until December.

Anyone with specific concerns about the effect that floods, hurricanes, earthquakes, wild fire and winter storms have on Prospect are urged to contact Murphy at davem@miloneandmacbroom.com.

BRIEFLY 11/15/06

Meeting discusses natural emergency

PROSPECT — What types of natural emergencies can a small town like Prospect anticipate?

A meeting will be held at 7 p.m. Monday at the Town Hall Assembly Room to discuss the importance of planning to minimize the effects of natural disasters.

The town will be seeking input from the public about possible local natural hazards such as hurricanes, northeasters, floods, severe thunderstorms, wildfires and earthquakes. The public is invited to attend and participate in the process.

In coming months, consultants will develop a plan identifying actions that can be taken before a disaster to reduce the loss of life and property damages associated with the event. The plan will be submitted to FEMA in accordance with the Disaster Mitigation Act of 2000.

For further information, contact Virginia Mason or Selma Alves at (203) 757-0535.

Natural Hazard Pre-Disaster Mitigation Plan Prospect, Connecticut

Presented by:

David Murphy, P.E. – Associate
Milone & MacBroom, Inc.

Samuel Eisenbeiser, Senior Planner
Fitzgerald & Halliday, Inc.

November 20, 2006

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

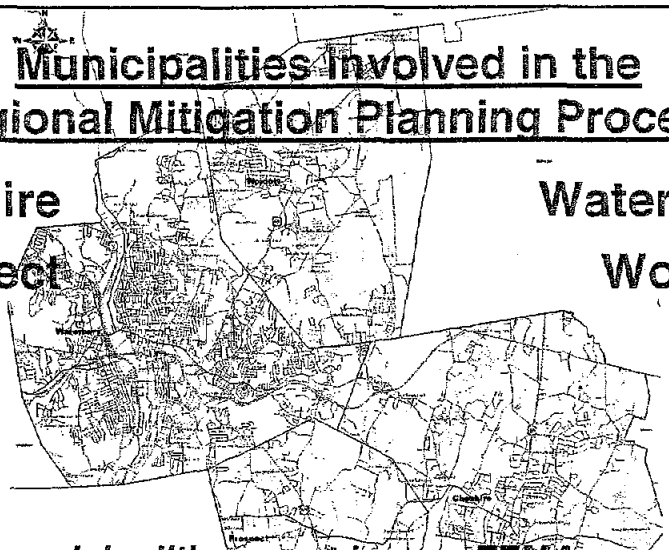
Municipalities Involved in the Regional Mitigation Planning Process

Cheshire

Prospect

Waterbury

Wolcott



Local municipalities must have a FEMA approved Hazard Mitigation Plan in place to receive federal grant funds for hazard mitigation projects.

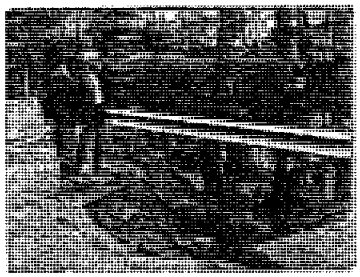
Selection of FEMA Pre-Disaster Mitigation Grants: 2003-2006

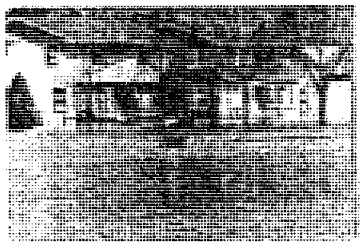
List does not include seismic, wind retrofit, home acquisition, and planning projects

State	*Description*	*Grant*
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 ?

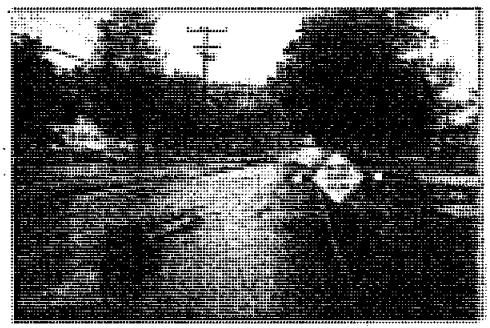
- An extreme natural event that poses a risk to people, infrastructure, and resources





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



Warning Signs on Sandbank Road – 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

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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.)

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Components of Hazard Mitigation Planning Process

- Identify natural hazards that could occur in Prospect
- 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

Prospect's Critical Facilities

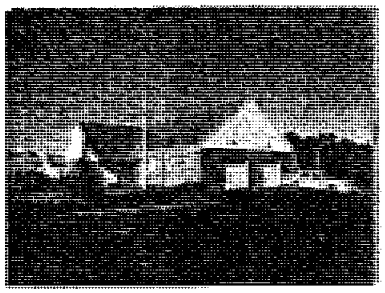
- Emergency Services – Police, Fire, Ambulance
- Municipal Facilities – Town Hall, Municipal Buildings, Department of Public Works
- Shelters – Senior Center and Fire House

Volunteer Fire Department in Prospect

- Health Care and Assisted Living
- Water Utilities – Well, Reservoirs, Pump Stations

Prospect's Critical Facilities

- Wastewater Utilities – Pumping Stations
- Transportation



Resident State Trooper's Office in Prospect

Town of Prospect Public Works Trucks

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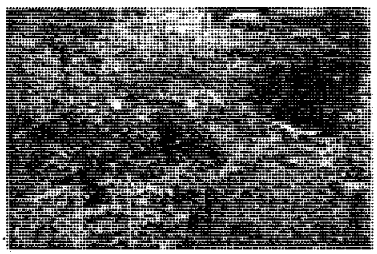
Potential Mitigation Measures

- Develop and implement warning systems
- 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



Box Culvert / Bridge and Walls – Tenmile River at Route 68

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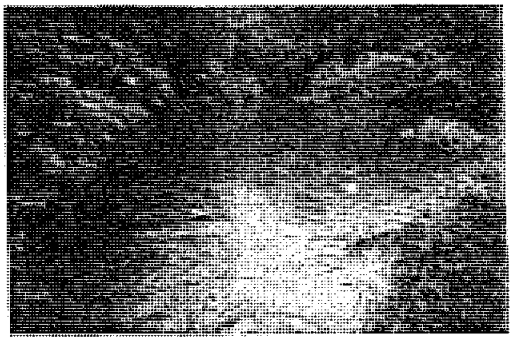
Natural Hazards Facing Prospect

- Inland flooding
- Winter storms, nor'easters, heavy snow, blizzards, ice storms
- Hurricanes
- Summer storms, tornadoes, thunderstorms, hail
- Dam failure
- Wildfires
- Earthquakes



Unnamed Stream at Spring Road near Route 68 (Downstream)

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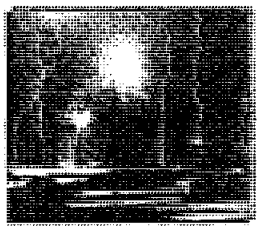
Hurricanes

- Winds
- Heavy rain / flooding

1956 Flooding

MILONE & MACBROOM, INC.

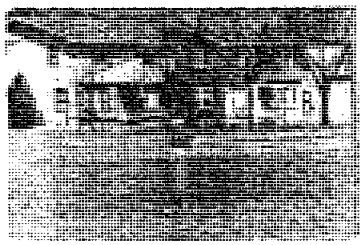
Summer Storms and Tornadoes



Lightning over Boston

Tornado in KS

- Heavy wind / tornadoes / downbursts
- Lightning
- Heavy rain
- Hail



Flooding in MN

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Winter Storms

- Blizzards and nor'easters
- Heavy snow and drifts
- Freezing rain / ice

Blizzard of 1978 - CT

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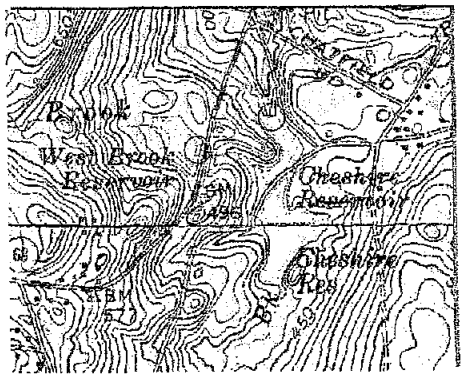
Dam Failure

- Caused by severe rains or earthquakes
- Possibility of loss of life and millions of dollars in property damage



Two Dams in Prospect

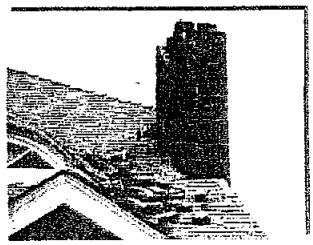
Wildfires

- Prospect has low to moderate risk of wildfires
  - Fire
  - Heat
  - Smoke

Photo courtesy of FEMA

Earthquakes

- Prospect is in an area of minor seismic activity
- Can cause dam failure
  - Shaking
  - Liquefaction
  - Secondary
    (Slides / Slumps)



Photos courtesy of FEMA

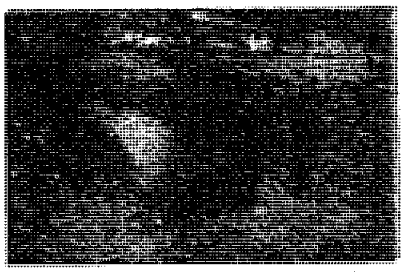
Area-Specific Problems

- Flooding caused by poor drainage and encroachment
- Wind
- Snow and ice

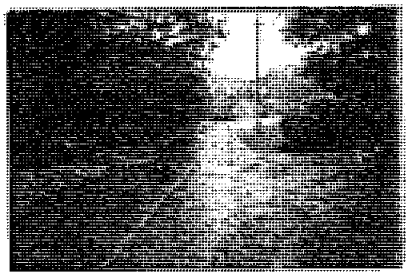
The Town of Prospect has been very proactive in natural hazard mitigation since flooding in 1983

Flooding and Poor Drainage

- Roaring Brook at Roaring Brook Road
- Tributary of Fulling Mill Brook at Spring Road and Route 68
- Fulling Mill Brook at Salem Road
- Tributary of Waterbury Reservoir at Terry Road



Roaring Brook at Roaring Brook Road (upstream)



Roaring Brook Road near Roaring Brook

MILONE & MACBROOM, INC.

Flooding and Poor Drainage

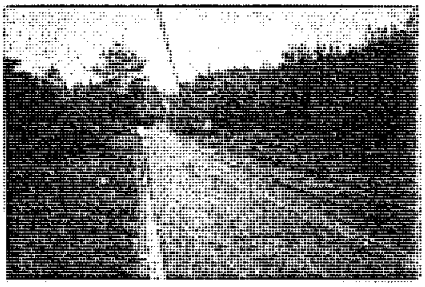
- Mountain Brook near Plank Road and Landfill
- Tributary of Tenmile River at Route 68

Mountain Brook near Plank Road (upstream)

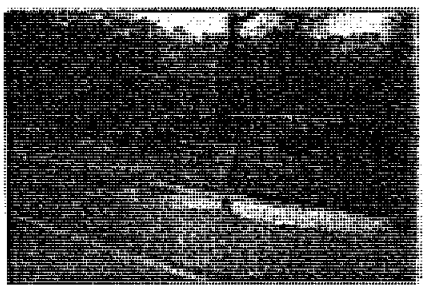
MILONE & MACBROOM, INC.

Flooding and Poor Drainage

- Raudis Pond at Clark Hill Road
- Marks Brook at Straitsville Road



Marks Brook Area of Straitsville Road



Raudis Pond at Clark Hill Road

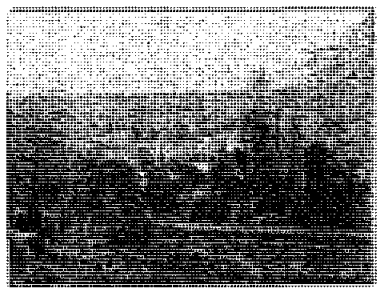
Wind

- Mobile Home Park on Cook Road
  - Homes are not secured
  - Access to shelters can be impaired during storms

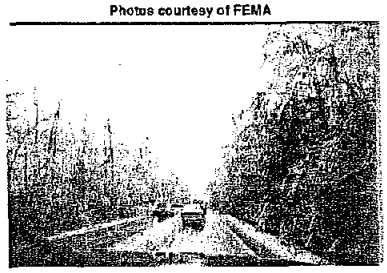
Aerial Photograph of Mobile Home Park

Snow and Ice

- Elevation / temperature
- State slow to plow Routes 68 & 69
- Densely wooded areas such as Terry Road cause cold zones
- Unnamed tributary to Tenmile River near DPW ices on Route 68



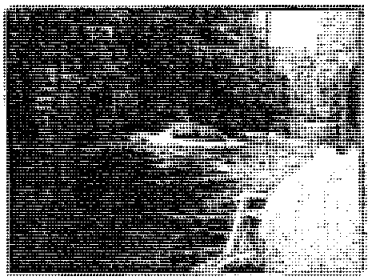
Photos courtesy of FEMA



Next Steps

- Incorporate input from residents
- Rank hazard vulnerability
- Develop a response strategy
- Prepare the draft plan with recommendations for review by the Town and the public
- Adopt and implement the plan

Questions and Additions



APPENDIX C
RECORD OF MUNICIPAL ADOPTION