THE TOWN OF WARWICK
2013 MULTI-HAZARD MITIGATION PLAN

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Photos showing damage on Winchester Road from Tropical Storm Floyd on 9/19/99 courtesy of Town of Warwick Highway Department.

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1 - INTRODUCTION

HAZARD MITIGATION

The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, and other disasters. Mitigation efforts undertaken by communities will help to minimize damage to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Warwick and the Franklin Regional Council of Governments, make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential hazards that may threaten a community.

Preparing a local Multi-Hazard Mitigation Plan before a disaster occurs can save the community money and will facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the Plan. Many disaster assistance agencies and programs, including FEMA, require that a community adopt a pre-disaster mitigation plan as a condition for both mitigation funding and disaster relief funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA) and the Community Rating System (CRS), are programs with this requirement.

PLANNING PROCESS

The multi- hazard mitigation planning process for the Town of Warwick included the following tasks:

- Identification of the hazards that may impact the community, and past occurrences of hazards at the local or regional level.
- Conduct a Vulnerability/Risk Assessment to identify the infrastructure (i.e., critical facilities, public buildings, roads, homes, businesses, etc.) at the highest risk for being damaged by the identified hazards, particularly flooding.
- Identification and assessment of the policies, programs, and regulations a community is currently implementing to protect against future disaster damages. Examples of such strategies include:
    - Preventing or limiting development in hazard areas like floodplains, wetlands, drinking water recharge areas, and conservation land;

- Implementing recommendations in existing planning documents including Stormwater Management Plans, Master Plans, Open Space and Recreation Plans, and Emergency/Evacuation Plans that address the impacts of hazards;
- Requiring or encouraging the use of specific structural requirements for new buildings such as buried utilities, flood-proofed structures, and lightning grounding systems; and
- Cleaning up contaminated soils to prevent migration during floods and rain events.

- Identification of deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Identification of specific projects that will mitigate the risk to public safety and damages to infrastructure from hazards.
- Adoption and implementation the final Warwick Multi-Hazard Mitigation Plan.

The planning process for the Town of Warwick also incorporated the following procedures:

- Providing an opportunity for the public to comment on the plan during the drafting and prior to the approval of the plan. Publicity was done with a press release in the Warwick Community Newsletter in October 2012, as well as through flyers posted in town throughout the planning process. A copy of the draft plan was available to the public at the Town Hall, at the Town library, and on the Town website at www.warwickma.org. Two Public Meetings were held: on October 25, 2012 and April 3, 2013.
- Providing an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities and agencies that have the authority to regulate development, and businesses, academia and other private and nonprofit organizations to be involved in the planning process by publicizing the planning process. In addition, relevant information that was gathered by the staff of the FRCOG Planning Department in the course of updating the hazard mitigation plans from surrounding towns in Franklin County was also incorporated into this plan.
- Reviewing and incorporating, if appropriate, existing plans, studies, reports and technical information. Plans reviewed and incorporated include the 2013 Warwick Comprehensive Emergency Management Plan; the 2010 Warwick Open Space and Recreation Plan; the Warwick Reconnaissance Report, part of the Upper Quaboag Watershed and North Quabbin Region Landscape Inventory;, Town Annual Reports from 1994, 1999, 2000, 2003, 2004, and 2011; and data sources cited in footnotes throughout this Plan.
- Documenting the planning process, including how it was prepared, and how the public was involved.

Much of this work was carried out by the staff of the FRCOG Planning Department with the assistance of the Warwick Multi-Hazard Mitigation Planning Committee, which includes representatives of the Board of Selectmen, Highway Department, Planning Board, and the

Conservation Commission. Meeting agendas, sign in sheets, press releases and other correspondence are located in Appendix A of this document, Public Involvement Process.

2 – LOCAL PROFILE[1]

COMMUNITY SETTING

The Town of Warwick is located in north central Massachusetts, in the eastern part of Franklin County. With 32.6 square miles, it is the largest town in Franklin County. It is bordered by Royalston on the east, Orange on the south and southeast, Northfield and Erving on the west and southwest, and Winchester and Richmond, New Hampshire on the north. Bisecting the Town in a north-south direction, Route 78 is the principal highway serving Warwick. It provides access to State Route 2 via State Route 2A through West Orange. Route 2 is the major east-west transportation route across northern Massachusetts.

Warwick's geographic location has influenced its development and land use since its establishment in the 1760s. Its steep, forested hills and high-gradient fast running streams provided waterpower for all types of mills, but especially those that manufactured wood products. The town's extensive forest resources attracted entrepreneurs interested in establishing tanneries and saw, box, glass, and brick mills.

Despite limitations in its agricultural potential (very poor soils), low land prices attracted growing numbers of farmers to Warwick through the first half of the 19th Century. Clearing forests for conversion to agriculture and to generate much needed cash proceeded rapidly. In 1845 some million board feet of timber were sent to the mills from Warwick and by mid-century most of the land in town had been cleared for agriculture. Farms produced modest quantities of field-crops for local consumption with most land devoted to unimproved pasture for raising livestock. Cattle were favored over sheep (a reversal of the trend in many of the surrounding hill towns) and were sent to market for meat, milked for butter and cheese production and supplied hides to local tanneries. However, Warwick's distance from commercial centers in the Connecticut River Valley and limited agricultural potential hampered commercial ventures.

In the mid-1830s, the town's mountainous terrain proved too much for the railroad, which located on more level land along the narrow Millers River flood plain. Additionally, residents left Warwick for vast acres of prime farm land that opened in the mid-west and centralized manufacturing centers located along the region's large rivers near reliable transportation routes. This resulted in a swift decline in population that continued into the late Twentieth Century when the automobile enabled people to move to rural areas like Warwick and easily commute to work in the surrounding towns of Orange, Athol, and Greenfield.

Vast acres of nearly worthless abandoned farmland characterized the landscape in the late 19th and early 20th Centuries. Much of this land was purchased by the State at rock bottom prices. Now reforested, the Warwick State Forest is the core of the Commonwealth's many holdings in Warwick and one of the Town's most important open space assets.

[1] The majority of the information for this section and the following section was obtained from the Town of Warwick's 2010 Open Space and Recreation Plan, prepared by the Warwick Open Space and Recreation Planning Committee with the assistance of the FRCOG Planning Department.

According to the 2005 MassGIS land use data, the total land area of Warwick is approximately 24,082 acres, with approximately 447, or less than 2% of those acres developed for residential use. There are no commercial or industrial uses identified in the data. The remaining land is classified as undeveloped, with forest as the largest category with 21,307 acres or 88% of Warwick's total land area. Wetlands and open water represent the second largest amount of undeveloped land in the Town with a total of 1,442 acres (6% of the town's land area). Agricultural uses (cropland, pastureland, orchard, and nursery) represent a total of 616 acres (2.5% of the town's land area).

INFRASTRUCTURE

Transportation

The principal highway serving the Town of Warwick is secondary Route 78. Route 78, which passes through Warwick Center, is the major north-south route running through town. It intersects with State Route 2A at its southern terminus; Route 2A connects to State Route 2 which is the major highway through northern Massachusetts. At its northern terminus Route 78 intersects with Route 10 in Winchester, New Hampshire. Also passing through Warwick Center is the east-west route of Northfield, Gale and Athol Roads. These east/west routes connect Warwick to the neighboring towns of Northfield, Orange, and Athol. About 36 percent (20 miles) of Warwick's roads are gravel.

There are also no public transportation systems in Warwick. However, the elderly and people with disabilities may access Demand Response transportation services through the Franklin Regional Transit Authority (FRTA).

Drinking Water Supply

The Town of Warwick is served almost entirely by private wells. Most residences rely on deep wells; approximately one third to one quarter have shallow wells; and a small number depend on springs. The exceptions are the Town Hall and the Library which are served by a water system that originates from a spring on Mount Grace.

Flooding and other natural disasters have the potential to contaminate both public and private wells. Private wells are not state-regulated, but owners can contact the Town's Board of Health.

Septic Systems

In Warwick, all sewage is disposed of via private systems. The effectiveness of septic systems is variable and depends on topography, water table, and soils. Dependence on private sewage disposal requires that housing be restricted to soils and slopes that can reasonably be expected to handle on-site sewage systems. Soil types are critical for determining this capacity, and many soils in Warwick are wet, shallow-to-bedrock, or are coarse and stony which provide very little filtration to septic leachate since water passes through soils very quickly. While not precluding development in Warwick, the density and total amount of new development in the near future will in large part be determined by soils and their ability to pass percolation tests.

In many communities across the region, development follows infrastructure improvements. Given Warwick's lack of a community sewer collection system, the relationship between development and infrastructure appears to be a conditional one. If the soil, drainage, and topographical characteristics of the land are favorable, development will occur. If technology remains static, development may be limited to those areas that are already developed. As population increases and the land most able to accommodate development becomes scarce, developers may adopt new and/or alternative septic technologies that would allow for the construction of homes in areas once thought to be unsuitable for development.

Schools

Public schools serving Warwick include the Warwick Elementary School (pre-K through 6th grade) and the Pioneer Regional High School (grades 7-12), located in Northfield.

NATURAL RESOURCES

Warwick is in the Upper Worcester Plateau Ecoregion of Massachusetts; a landscape of hills and valleys dissected by small, high-gradient, headwater streams. The Warwick Dome, a gneiss dome of the Devonian age[2] with Mt. Grace at its center, is the central geologic feature of the town.

One of the main landscape features separating Warwick from surrounding communities is that many of its roads are on ridges and hills that run north to south and offer fantastic views of the dominant hills, mountains, and features in the region. The Quabbin Reservoir can be viewed from Mount Grace. Mount Monadnock may be viewed from many places in town including Hasting Heights, Old Winchester Road, and Chase Hill Road. Both the Millers River and the Tully River valleys can be viewed from Chase Hill Road. From Moores Pond Beach one can see Mt. Grace. The views south from Route 78, on top of Barber Hill, and north from Flower Hill Road are fine as well. Despite being a predominantly forested town, Warwick contains an extraordinary number of spectacular views.

Overall, Warwick's landscape is overwhelmingly forested, has exceptionally low road density and is very lightly developed. The conservation of large blocks of high quality, unfragmented forest has become a priority for regional conservation planners. The Nature Conservancy identified and mapped the best remaining matrix forest blocks in the Eastern Region as part of their Ecoregional Planning Program. The Warwick Matrix Forest Block covers the entire town and received the highest possible ranking.

[2] The Devonian Age was 416 to 359.2 million years ago when the mountains of western Massachusetts were being formed.

Water Resources

Watersheds

The Town of Warwick lies in the Connecticut River watershed[3] which encompasses the Millers River, Ashuelot River, and Mill Brook Basins (sub-watersheds). The Connecticut is nationally significant. In 1991, Congress established the Silvio O. Conte National Fish and Wildlife Refuge, the only refuge in the country to encompass an entire watershed – the Connecticut River watershed in New Hampshire, Vermont, Massachusetts and Connecticut. Seven years later, in 1998, the Connecticut River became one of only fourteen rivers in the country to earn Presidential designation as an American Heritage River.

Surface Water

The Town of Warwick has approximately 212 acres of fresh open water, which includes tributaries to the Millers, Ashuelot and Connecticut Rivers, [4] and all or parts of fourteen ponds, lakes and reservoirs – Laurel Lake, Richards and Wheeler Reservoirs, and Lily, Hastings, Moores, Hubbards, and Johnsonian Ponds. Both the Millers River and Ashuelot River in New Hampshire are large rivers of statewide importance and historical significance.

The northwestern quadrant of the Town drains to the Ashuelot River – Lovers Retreat, Black, Mirey, Kidder, and Mountain Brooks – while all the other brooks except Mill Brook, which is a tributary to the Connecticut River, drain to the Millers River.

Warwick has five natural ponds: Moores Pond, Hastings Pond, Laurel Lake, Bent Pond, and Lily Pond. All the remaining ponds in Warwick are artificial, including Sheomet Lake (known locally as Clubhouse Pond). Dams were built throughout the 19th Century to store water for mills. Many were restored or rebuilt by the Civilian Conservation Corps (CCC) in the 1930s. Warwick's small headwater streams typically experience periods of zero-flow in the summer, so to store enough water for summer operation, a series of impoundments were often created upstream from the mills. Several historic impoundments have been lost as dams failed, however some of these have been partially restored in recent years by beaver dams. Some of Warwick's finest wetlands are on the sites of former impoundments (e.g. Stevens Swamp, Harris Swamp, Black and Bass Swamps).

Aquifers

An aquifer is an underground body of water that is typically found in layers of sand deposited during the glacial period. According to MassGIS, Warwick contains five major and six minor low-yield aquifers. A low-yield aquifer is said to provide a potential yield of between 0 and 50 gallons per minute. The major low-yield aquifers are found in soils surrounding the wetlands associated with Grace and Darling Brooks, Mountain and Kidder Brooks, Gales and Orcutt Brooks, Mill Brook and Bass Swamp, and Tully Brook and Sheomet Lake. The six minor low-

[3] The Connecticut is New England's largest watershed (11,260 square miles) and longest river (410 miles).
[4] According to the US Fish and Wildlife Service, the Millers and Ashuelot Rivers are two of 38 major tributaries to the Connecticut River.

yield aquifers are scattered about in the northwestern and northeastern corners of Town, within Steven's Swamp, and around the headwaters of Moss Brook.

Flood Hazard Areas

Flooding along rivers is a natural occurrence. Floods happen when the flow in the river exceeds the carrying capacity of the channel. Some areas along rivers flood every year during the spring, while other areas flood during years when spring runoff is especially high, or following severe storm events. The term "floodplain" refers to the land affected by flooding from a storm predicted to occur at a particular interval. For example, the "100-year floodplain" is the area predicted to flood as the result of a very severe storm that has a one percent chance of occurring in any given year. Similarly, the 500-year floodplain is the area predicted to flood in a catastrophic storm with a 1 in 500 chance of occurring in any year.

The Warwick Flood Hazard Boundary Map (FHBM), dated January 24, 1975 identifies the Special Flood Hazard Areas in Warwick, shown as Zone A. These include areas along Mountain Brook, Gales Brook, Darling Brook, and Moss Brook. There are areas in Warwick that are likely to flood, and indeed have flooded during high water. In major storms, Route 78 and Chestnut Hill Road have washed out. The Flood Plain Overlay District Bylaw was adopted in 2011 to help ensure an adequate quality and quantity of water, regulating land uses in all special flood hazard areas designated as Zone A on the Warwick FHBM.

According to 2005 MassGIS land use data, there are 10 dwellings located on 6 acres of Warwick's 259 total acres of floodplain.

Forests

Forest areas are considered the Town of Warwick's most important natural resource. As of 2005, according to MassGIS, forests comprised nearly 90 percent of the Town's total land area. Forests in Warwick are classified as transition hardwoods-white pine forest (USDA; 1992). Within this forest type, northern hardwoods such as yellow and paper birch (*Betula alleghaniensis* and *B. papyrifera*), American beech (*Fagus grandifolia*), and sugar and red maple (*Acer saccharum* and *A. rubrum*) are the major species. On the dryer sites, red oak (*Quercus rubra*) is the most abundant deciduous species. Hemlock (*Tsuga canadensis*) occurs in the moist cool valleys, north and east slopes, and sides of ravines of Warwick. White pine (*Pinus strobus*) is characteristic of the well-drained sandy sites. The transition hardwood-white pine forest type commonly occurs up to an elevation of 1,500 ft. above sea level in upland central Massachusetts and southern New Hampshire, northward through the Connecticut Valley.

Forests provide for many of Warwick's available recreational opportunities including walking, hiking, fishing, skiing, snowshoeing, hunting, snowmobiling, picnicking, and nature study. Access to the forests is primarily from Warwick State Forest, Mount Grace State Forest, Warwick Town Forest, Warwick Wildlife Management Area, Arthur Iverson Conservation Area, and from woodland roads.

Outside of state forests and the more prominent privately protected lands, the remaining forestlands in Warwick fit into a category called non-industrial private forestlands, or NIPF's. A 1998 article in the Journal of Forestry, "Ecosystem Management: Capturing the Concept for

Woodland Owners," described the results of a survey of Franklin County NIPF owners. The results of the survey included the top five reasons for forestland ownership: privacy, personal use of wood products, aesthetics and beauty, part of residence, and recreation. The survey also provides selective information on a sample of woodland owners: most live less than a mile from the land; 60 percent have owned the land for at least fifteen years; 60 percent own less than fifty acres; 62 percent have annual household incomes of less than $55,000; and 48 percent are over fifty-five years of age. The main results of the study show that Franklin County NIPF owners may hold attitudes that are favorable towards three concepts of ecosystem management: one's land fits into a larger ecosystem; one's land has smaller parts important to their own property and the larger landscape; and, one's land should be managed for today's uses and for future generations. The results of this study also suggests that Warwick NIPF owners may be open to participating in cooperative conservation measures that would seek to protect natural resources that cross property lines including drinking water supplies and biodiversity.

Two potentially unique stands of forest trees include an old growth stand on the steep western slope of Mt. Grace and a small pure beech stand on Town land near the town dump. (See NHESP maps of rare natural communities in Warwick.)

CULTURAL AND HISTORIC RESOURCES

The importance of integrating cultural resource and historic property considerations into hazard mitigation planning is demonstrated by disasters that have occurred in recent years, such as the Northridge earthquake in California, Hurricane Katrina in New Orleans, or floods in the Midwest. Closer to home, the June 1, 2011 tornado, which ripped through Springfield, Monson and other towns in Hamden and Worcester Counties, caused injuries, loss of life and widespread damages to historic properties. See page 22 for details and photos of this storm's aftermath. The effects of a disaster can be extensive—from human casualty to property and crop damage to the disruption of governmental, social, and economic activity. Often not measured, however, are the possibly devastating impacts of disasters on historic properties and cultural resources. Historic structures, artwork, monuments, family heirlooms, and historic documents are often irreplaceable, and may be lost forever in a disaster if not considered in the mitigation planning process. The loss of these resources is all the more painful and ironic considering how often residents rely on their presence after a disaster, to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster.[5]

Historic properties and cultural resources can be important economic assets, often increasing property values and attracting businesses and tourists to a community. While preservation of historic and cultural assets can require funding, it can also stimulate economic development and revitalization. Hazard mitigation planning can help forecast and plan for the protection of historic properties and cultural resources.

Cultural and historic resources help define the character of a community and reflect its past. These resources may be vulnerable to hazards due to their location in a potential hazard area, such as a river corridor, or because of old or unstable structures. The Warwick Comprehensive

[5] Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning, State and Local Mitigation Planning How-To Guide, FEMA 386-6 / May 2005.

Emergency Management Plan (eCEMP) identifies cultural resources in Warwick, some of which contain historic documents and cultural artifacts. The resources listed in the eCEMP include: the Warwick Free Public Library and the Warwick Historical Society.

The Massachusetts Cultural Resource Information System (MACRIS)[6] lists a total of 53 areas, buildings, burial grounds, objects, and structures of cultural and/or historic significance in Warwick.

Table 2-1: Significant Historical Structures and Sites in Warwick

MHC #	STREET NAME	HISTORIC NAME	COMMON NAME	YEAR
4	14 Hotel Rd	Warwick Inn – Shlomet House – Putnam's Hotel	Mount Grace Inn	1828
5	24 Athol Rd	Cobb, William House and Post Office	Atherton, Capt. Arlin S. House	1828
9	49 Athol Rd	Hedge, Rev. Lemuel – Reed, Rev. Samuel House	Green, Leslie W. – Francis, Howard House	1768
10	44 Athol Rd	Goldsbury, Capt. James House		1826
11	32 Athol Rd	Smith, Rev. Preserved House	Metcalf Memorial Chapel	1827
13	17 Athol Rd	Wheelock, Col. Lemuel – Lincoln, Frederick A. Hse	"Wheelock House"	1820
14	9 Athol Rd	Wheelock, Col. Lemuel Double House	Cook, Rhoda House	1836
23	348 Athol Rd	Mayo, Caleb and Edward House	Morse, Arthur – Bailey House; "Bower's House at Mayo's Corner"	
29	6 Athol Rd	Wheelock, Col. Lemuel – Wright House	Morse, Gillman – Cook, George S. House; "McKim Cottage"; Warwick Historical Society	1835
30	12 Athol Rd	Warwick Town Hall		1894
15	247 Flower Hill Rd	Whitney, Daniel – Child, Phineas House	Barber, Dea. Harvey House; "Barber Childs House"	
16	209 Flower Hill Rd	Hanson, C. – Maynard, Nelson House	New England Box Company – Shepardson, Detroit Hse; "Whitney Knudston House"	
17	142 Flower Hill Rd	Simonds, William – Daniels, Moses House	Hardin, Moses – Goddard, David House	
18	347 Flower Hill Rd	Bowman, Samuel – Gale, Jacob R. House	Ellis, Ezekiel House; "Bowman Homestead"	1773
3	245 Gale Rd	Rich, Lt. Thomas – Conant, Josiah House	Gale, Appleton – Green, Frank House; "Conant-Gale House"	1770
24	456 Gale Rd	Stow, Amos and Thomas House	Johnson, Daniel House; "Freitag House"	1804
902	Hastings Pond Rd	Warbeek – Wawbee Rock		
904	Laurel Lake Rd	Erving State Forest – Laurel Lake		
905	Laurel Lake Rd	Erving State Forest – Laurel Lake Dam and Bridge		1933
906	Laurel Lake Rd	Erving State Forest – Laurel Lake Beach Stonework		1933
21	585 Old Winchester Rd	Shearman, Abner – Bancroft, Ebenezer House	Kidder, Aaron – Hatch, Irving H. House; "Bancroft Farm"	1775
22	512 Old Winchester Rd	Lawrence, William Jr. – Forbes, Sabin House	Ladd, E. – Brown, R. House; "William Lawrence House"	1860
6	35 Orange Rd	Sanger, Joshua T. House	Hatch, Rev. Roger – Conant, James A. House	1827
8	50 Orange Rd	Franklin Glass Company Showroom and Storehouse	Smith, Capt. Daniel N. – Wheelock House	1813
12	65 Orange Rd	Franklin Glass Company Superintendent House	Synes, James – Taylor, Dr. Amos House; "Bass Residence	1812
25	Orange Rd	Wheaton, Reuben – Wheeler, James House	Jennings, N. House	
27	9 Orange Rd	Atwood, H. House		
28	11 Orange Rd	Williams, Charles House	Tyler, Mary A. House	1895
31	1 Orange Rd		House with store	

[6] http://mhc-macris.net/towns.aspx

MHC #	STREET NAME	HISTORIC NAME	COMMON NAME	YEAR
32	5 Orange Rd	Warwick General Store and Post Office		1894
33	Orange Rd		"Old Miner Place"	
34	Mt. Grace Ave.	Trinitarian Congregational Church Parsonage	Moore, Dea. George – Dresser, Lee J. House; First Parish Religious Society	1856
35	Orange Rd	Warwick Unitarian Church		1836
801	Orange Rd	Warwick Center Cemetery		
1	160 Richmond Rd	Stearns, Capt. Nathaniel House		1772
907	Rte. 78	Mount Grace State Forest – Council Ring		1936
908	Rte. 78	Mount Grace State Forest – Adirondack Shelter		1936
909	Rte. 78	Mount Grace State Forest – Gulf Brook Stonework		1933
910	Rte. 78	Mount Grace State Forest – Gulf Brook Dam		1933
911	Rte. 78	Mount Grace State Forest – Gulf Brook Fireplaces		1933
2	99 Northfield Rd	Fifth Massachusetts Turnpike Tollhouse	Sawyer, Eliakin – Williams, Melzer House	
26	111 Northfield Rd	Williams, Melzar – Nelson House	Hastings – Bass, Dwight House; "Gilmore Gracemont"	
900	Wendell Rd	Wendell Road Bridge over Moss Brook		1925
7	2 Winchester Rd	Morse, Nathan – Procter, Laban House	Cobb, William – Fisher, Rueban House; "J.J. Bowers House"	1809
19	678 Winchester Rd	Bancroft, Ebenezer House – Warwick Poor Farm	Anderson, Augustus G. House; "Asa Bancroft Homestead"	1785
20	505 Winchester Rd	Russell, Justus House	Bicknell, Margaret House	1800
36	4 Hotel Rd	Warwick Baptist Church – Warwick Public Library		1844
901	Winchester Rd	Warwick Grist Stones		
A		Warwick Center		
B		Erving State Forest – Laurel Lake Area		
C		Mount Grace State Forest – Ohlson Field Area		
D		Mount Grace State Forest – Gulf Brook Picnic Area		

Source: Massachusetts Historical Commission, Massachusetts Cultural Resources Information System (MACRIS) Database, : http://mhc-macris.net/towns.aspx 2013; Warwick eCEMP; Warwick Historical Commission, 2013; and Warwick Local Multi-Hazard Mitigation Planning Committee input.

Note 1: Highlighted properties were identified by the Local Planning Committee as being potentially located in the floodplain.

Note 2: Common names in quotes are local references to particular properties used by community members; according to Ed Lemon, curator of the Warwick Historical Society Museum, and David Young, Town Coordinator.

3 – HAZARD IDENTIFICATION & ANALYSIS

HAZARD IDENTIFICATION

Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to identify the hazards which are most likely to have an impact on the Town of Warwick. It should be noted that because different sources of data are used for various hazards, the year of most recent information available may vary from one hazard to another. In all cases the most recent information available at the time that data collection began for this update (October 2012) was used.

Floods

General Description

The average annual precipitation for Warwick and surrounding areas in northwestern Massachusetts is 44 inches.[7] There are three major types of storms that bring precipitation to Warwick. Continental storms that originate from the west continually move across the region. These storms are typically low-pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. The second major storm type are coastal storms. There are two kinds that bring major precipitation and wind – nor'easters and hurricanes. Nor'easters bring heavy rain, high winds, ice storms or blizzards into New England from the coast of Maine and Canada. In late summer or early fall, hurricanes may reach Massachusetts from the south and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods are classified as either *flash floods*, which are the product of heavy, localized precipitation in a short time period over a given location or *general floods*, which are caused by precipitation over a longer time period in a particular river basin. There are several local factors that determine the severity of a flood event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Floods occur more frequently and are one of the most costly natural hazards in the United States.

Flash flood events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area.

[7] Massachusetts Department of Conservation and Recreation 2009 precipitation data, http://www.mass.gov/dcr/watersupply/rainfall/index.htm.

In contrast, *general flood* events may last for several days. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large "sponges" to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River Valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

Fluvial erosion hazard (FEH) zones are areas along rivers and streams that are susceptible to bank erosion caused by flash flooding. Any area within a mapped FEH zone is considered susceptible to bank erosion during a single severe flood or after many years of slow channel migration. While the areas of the FEH zones often overlap with areas mapped within the 100-year floodplain on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) or Flood Hazard Boundary Maps (FHBMs), the FIRMs or FHBMs only show areas that are likely to be inundated by floodwaters that overtop the riverbanks during a severe flood. However, much flood-related property damage and injuries is the result of bank erosion that can undermine roads, bridges, building foundations and other infrastructure. Consequently, FEH zones are sometimes outside of the 100-year floodplain shown on FIRMs or FHBMs. FEH zones can be mapped using fluvial geomorphic assessment data as well as historic data on past flood events. Both the FIRMs and FEH maps should be used in concert to understand and avoid both inundation and erosion hazards, respectively.[8]

Location and Extent

Franklin County has several major rivers and numerous tributaries which are susceptible to flood events. The major rivers in the region include the Connecticut, the Deerfield, and the Millers. Some of the tributaries to these rivers which are prone to flooding include the Green River and the Sawmill River. Flooding poses a significant threat to life and public health and can cause severe property damage. Table 3-1 shows occurrences of flooding in Franklin County since 1993 through August 2012, taken from NOAA data. The NOAA database does not include specific flood events in the Town of Warwick during this period. Information regarding historical flood events in Warwick was provided by the Committee and can be found in this section and throughout the plan.

[8] *Ammonoosuc River Fluvial Erosion Hazard Map for Littleton, NH*. Field Geology Services, 2010.

Table 3-1: Flood Events in Franklin County Since 1993

Year	# of Flood Events	Annual Property Damage	Annual Crop Damage
2012	1	$0	$0
2011	8	$22,275,000	$0
2010	1	$150,000	$0
2009	0	$0	$0
2008	3	$38,000	$0
2007	1	$250,000	$0
2006	0	$0	$0
2005	5	$11,435,000	$0
2004	2	$10,000	$0
2003	1	$10,000	$0
2002	0	$0	$0
2001	1	$0	$0
2000	1	$0	$0
1999	0	$0	$0
1998	4	$75,000	$0
1997	0	$0	$0
1996	11	$1,800,000	$0
1995	3	$0	$0
1994	2	$0	$0
1993	5	$0	$0
Total # of Years	**Total # of Flood Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
20	**49**	**$1,802,150**	**$0**

Source: http://www.ncdc.noaa.gov/stormevents/

According to the Local Planning Committee, Tropical Storm Floyd on September 17, 1999 caused major flooding on Winchester Road when a tree stump let go and clogged a pipe in a culvert. Other roads in town also affected by flooding during this storm included White and Leland Roads. Following Tropical Storm Floyd, the Town of Warwick received disaster relief funds from MEMA in the amount of $69,290.59.

Damage and flooding on Winchester Road from Tropical Storm Floyd on 9/17/99. Photos courtesy the Warwick Highway Department.

In October 2005, rains from Tropical Storm Tammy and a subtropical depression caused severe flooding in New England, with Massachusetts sustaining $6.5 million in damages. A trailer park in Greenfield was destroyed, leaving 70 people homeless. Roads were washed out as more than 20 inches of rain fell on some areas of the region.

On August 27 and 28 2011, Tropical Storm Irene brought heavy rain to the region, causing extensive and long term damage to a number of Franklin County towns. According to the National Weather Service, up to 9.92 inches of rain fell during the storm, though amounts varied significantly across Franklin County. Rivers, streams, and brooks throughout the county reached and surpassed flood levels. Rising water gathered debris that clogged culverts, roads and bridges were washed out, and homes and businesses were flooded, and in some cases, literally washed downriver. After the storm, Franklin, Berkshire, Hampshire and Hampden Counties were declared a disaster area by President Obama, freeing up federal funds to assist towns with emergency work and road, bridge, and facility repairs. Up to 75 percent of repair costs can be covered by federal funds, as well as the cost of approved hazard mitigation efforts.

While Warwick was largely spared the worst effects of the storm, impacts from Tropical Storm Irene to other towns in Franklin County were severe, particularly in Shelburne Falls, Colrain, Hawley, Conway and Charlemont. A section of Route 2 west of Charlemont washed out and the road was closed until mid-December. Total projected losses for Franklin County from the storm are estimated to be approximately $25,325,000. FEMA preliminary damage assessment (PDA) from the storm totals a cost of $27,713,911 statewide for municipal public damage, not including damage incurred by state-owned infrastructure. Franklin County's PDA estimates a total of $22,816,077 in damages, or 82% of ages, or 82% of the cost of all local public damage statewide.

In Warwick the 100-year floodplain covers about 259 acres, or approximately 1% percent of the town. In addition to the 100-year floodplain, there are a number of rivers and feeder brooks in Warwick with the potential to cause localized and/or chronic flooding. Members of the Planning Committee expressed the opinion that flooding events have been growing more serious and extending in duration in recent years. Key areas of concern include:

- Winchester Road
- Wendell Road/Moss Brook
- Hockanum Road (box culvert)
- Gale Meadows on Athol and Gale Roads
- Kidder Brook on Robbins and Old Winchester Roads

Potential Mitigation Measures for Floods

Potential projects to help mitigate the effects of flooding in areas of high hazard potential include: (Both of these projects are located on land owned by the Department of Conservation and Recreation and the Town of Warwick.)

- Winchester Road—replace culvert across Mountain Brook, stabilize the brook banking along Winchester Road from Garage Road down to where Mountain Brook crosses Winchester Road and install new guardrail. The culvert is 42 inches at the inlet but

narrows down to 38-inch wide concrete poured walls on the outlet side, creating a pressure point. This portion of Route 78 washed out during Tropical Storm Floyd in 1999 due to the culvert plugging up. Since that time only emergency repairs have been made, consisting largely of adding more riprap.

- Wendell Road—either re-align road away from Moss Brook or do bank stabilization including guard rail installation and deal with drainage issues of water permeating under pavement going to Moss Brook. This would include dealing with a poor base and sub-base under the existing roadway beginning at Moss Brook bridge going to the Orange Town Line.

Potential projects to help mitigate the effects of flooding in areas of significant hazard potential include:

- Hockanum Road—replace concrete slab over granite stone side wall box culvert that is not big enough to handle water flow of Darling Brook during high flow event with a bottomless box culvert. The problems are partially due to beaver issues above and below the box culvert on private property.
- Robbins Road—Five-foot metal culvert with Kidder Brook flowing through has had problems in the past during high water events. The culvert also receives water from Old Winchester Road culvert crossing that includes two pipes, one of which is 5-foot and the other is 4.5-foot. In 2007 the Conservation Commission indicated that a bridge was needed in this area according to stream crossing regulations.
- Old Winchester Road—The two culverts mentioned above in the discussion of Robbins Road are at different elevations, with the 5-foot culvert at a lower elevation than the 4.5 foot culvert. The 5-foot culvert directs the flow of the Kidder Brook down toward the Robbins Road culvert crossing. The 4.5-foot culvert only flows during high water events. Because of their interconnected nature, mitigation efforts on the culverts on Old Winchester and the one on Robbins Road would need to be coordinated so that they were either both done at the same time or the Robbins Road work done first.

Potential projects to help mitigate the effects of flooding in areas of low hazard potential include:

- Bass Road—Replace the 6-foot culvert that Bass Swamp flows through to Mill Brook. The biggest issues are beaver problems on private property above the culvert and the beaver dams along Northfield Road below the culvert along the Mill Brook.
- Gale Road—A wood plank bridge mounted on a combination of steel and wooden trees setting on stone abutments which allows the Gale Pond to flow under Gale Road going into Gale Brook. A private dam located on Gale Brook could cause flooding onto the Route 78 floodplain in the event of a breach.

Severe Winter Storms

General Description

Severe winter storms can pose a significant risk to property and human life because the rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can disrupt utility service, phone service and make roadways extremely hazardous. Severe winter storms can be deceptive killers. The types of deaths that can occur as a result of a severe winter storm include: traffic accidents on icy or snow-covered roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold temperatures. Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt. Power and telephone lines, trees, and telecommunications structures can be damaged by ice, wind, snow, and falling trees and tree limbs. Icy road conditions or roads blocked by fallen trees may make it difficult to respond promptly to medical emergencies or fires. Prolonged, extremely cold temperatures can also cause inadequately insulated potable water lines and fire sprinkler pipes to rupture and disrupt the delivery of drinking water and cause extensive property damage.

Severe winter storms can include blizzards, heavy snow, sleet, freezing rain and ice storms. A blizzard is a severe snowstorm characterized by strong winds and low temperatures. The difference between a blizzard and a snowstorm is the strength of the wind. To be a blizzard, a snow storm must have sustained winds or frequent gusts that are greater than or equal to 56 km/h (35 mph) with blowing or drifting snow which reduces visibility to 400 meters or a quarter mile or less and must last for a prolonged period of time — typically three hours or more.[9] Snowfall amounts do not have to be significant. A severe blizzard has winds over 72 km/h (45 mph), near zero visibility, and temperatures of −12 °C (10 °F) or lower. A ground blizzard has snowdrifts and blowing snow near the ground, but no falling snow.[10] Blizzards can bring near-whiteout conditions, and can paralyze regions for days at a time, particularly where snowfall is unusual or rare. Freezing Rain is rain that falls as a liquid but freezes into glaze upon contact with the ground.[11] Heavy Snow generally means snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.[12] Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of approximately ½" or more.[13] The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of approximately ¼" or greater.[14]

[9] http://w1.weather.gov/glossary/index.php?letter=b
[10] http://www.britannica.com/EBchecked/topic/69478/blizzard
[11] http://w1.weather.gov/glossary/index.php?letter=f
[12] http://w1.weather.gov/glossary/index.php?letter=h
[13] http://w1.weather.gov/glossary/index.php?letter=s
[14] http://w1.weather.gov/glossary/index.php?letter=i

Location and Extent

Franklin County regularly experiences severe winter storm events between the months of December and April. According to the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website, there have been a total of 111 snow and ice events reported in Franklin County between February 1, 1993 and February 26, 2010, including heavy snow, snow, ice storms, snow squalls, freezing rain and winter storms.[15] The NCDC web site has more detailed information about each of the listed storms. Seven out of the 111 snow and ice events that impacted Franklin County (as well as other areas of Massachusetts) resulted in Presidential Disaster Declarations or Emergency Declarations, which then made the state, residents and businesses eligible for federal disaster relief funds. Table 3-2 lists the 10 recent severe winter disasters that have led to Presidential Disaster or Emergency Declarations in Massachusetts.

Table 3-2: Major Disaster and Emergency Declarations in Massachusetts, 1993 - 2011

Disaster Name	Date of Event	Declared Areas	Disaster #/ Type of Assistance	Federal Share Disbursed	Non-Federal Share Disbursed	Total Disburse-ment
Blizzards, High Winds and Record Snowfall	March 1993	All 14 Counties	FEMA-3103-EM (PA)	$1,284,873	$183,649	$1,468,522
Blizzard	January 1996	All 14 Counties	FEMA-1090-EM (PA)	$16,177,860		$16,177,860
Snowstorm	March 2001	Counties of Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, and Worcester. The cost share is 75% federal and 25% local.	FEMA-3165-EM (PA)	$21,065,441		$21,065,441
Snowstorm	February 2003	All 14 Counties. The cost share is 75% federal and 25% local.	FEMA-3175-EM (PA)	$28,868,815		$28,868,815
Snowstorm	December 2003	Counties of Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, and Worcester	FEMA-3191-EM (PA)	$35,683,865		$35,683,865
Snowstorm	January 2005	All 14 Counties	FEMA-3201-EM (PA)	$49,945,087		$49,945,087
Severe Winter Storm	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, and Worcester *(Figure as of 9/8/2009)	FEMA-3296-EM-MA	$66,509,713		
Severe Storms and Flooding	December 2008	5 counties (Berkshire, Franklin, Hampden, Hampshire, and Worcester	FEMA-1813-DR-MA(PA)	$32,058,172		$30,671,617

[15] http://www.ncdc.noaa.gov/stormevents/

Disaster Name	Date of Event	Declared Areas	Disaster #/ Type of Assistance	Federal Share Disbursed	Non-Federal Share Disbursed	Total Disburse-ment
		Counties)				
Severe Winter Storm and Snowstorm	January 2011	Berkshire, Essex, Hampshire, Middlesex, Norfolk, Suffolk and Hampden Counties	FEMA-1959-DR (PA)	$1,050,102		$1,050,102
Severe Storm and Snowstorm	October 2011	Berkshire, Franklin, Hampden, Hampshire, Middlesex, and Worcester Counties	FEMA-4051-DR (PA)	N/A		

Notes: **Public Assistance (PA) Project grants.** Supplemental disaster assistance to states, local governments, certain private non-profit organizations resulting from declared major disasters or emergencies.

The 1994 Warwick Town Report indicates that the winter of 1993-94 was a particularly hard one and that keeping roads passable in Town was a challenge.

Although ice storms occur much less frequently than snow storms (4 out of 111 in the NCDC database), the effects can be devastating. On December 11, 2008, Franklin County residents awoke to a landscape coated with ice. Half an inch of ice accumulated on exposed surfaces across Franklin County. This major ice storm affected interior Massachusetts and southern New Hampshire as well as much of northern New England. The ice buildup on exposed surfaces combined with breezy conditions resulted in numerous downed trees, branches, and power lines, which resulted in widespread power outages. More than 300,000 customers were reportedly without power in Massachusetts and an additional 300,000 were without power in the state of New Hampshire. Because of the breadth of this storm (from Pennsylvania to Maine), extra crews to reinstate power were harder to come by. Power crews from states as far away as South Carolina, as well as local National Guard teams, were called out to help with power restoration and clean up. While most people had their power restored within a week, others were still without power at Christmas (nearly 2 weeks later).

Ice storm effects in Warwick included damage on the following roads in town: Flower Hill, Shepardson, and Old Winchester Roads, as well as the roads in Warwick Center. Mount Grace lost a lot of downed trees. The Town received 100% reimbursement for the costs associated with the storm from FEMA (75%) and MEMA (25%), for a total of $91,048.

During this period in 2008, temperatures were mostly below normal and at least one major snowstorm affected the same area. At the time of the December 19th snowstorm, which dumped 7–12 inches of snow in eastern Franklin County and 9–14 inches of snow in western part of the county, over 100,000 customers were still without power in the two states combined. Two days later, on December 21, 5–7 inches of new snow blanketed eastern Franklin County.

The severe winter storm that hit Franklin County on October 29, 2011 was a rare and historic nor'easter that brought very heavy snow to portions of southern New England and is sometimes referred to as the "Snowtober" storm. Snowfall accumulations of one to two feet were common in the Monadnocks, Berkshires, Connecticut Valley, and higher elevations in central Massachusetts. Snowfall rates reached 3 inches per hour for several hours during the storm. The

accumulation of the heavy wet snow on trees that still had their leaves and on power lines resulted in widespread tree damage and power outages across many communities in central and western Massachusetts. At the peak, 665,000 customers in Massachusetts were without power. Seventy-seven shelters were opened and sheltered 2,000 residents across the state. A state of emergency was declared on October 29, officially ending on November 6.

The Town of Warwick suffered similar effects from the October 2011 snowstorm as those described above. Some residents were without power for up to 12 days. The Town has received reimbursement from FEMA for its costs associated with the storm in the amount of $18,995.61, which represents 75% of its costs, and is still awaiting an additional $6331.86 from MEMA, representing the remaining 25% of the Town's costs.

Potential Mitigation Measures for Severe Winter Storms

A potential project relating to mitigating the effects of snow and ice events (and all hazards where shelters could be utilized) is:

- Assess the need for and locate a shelter in an area of town located further away from the primary existing shelters, which are located nearby one another. If these shelters were rendered unusable due to a hazard occurring in the immediate area, a backup shelter in a separate location would be valuable.
- Work with other Franklin County towns to implement the Franklin County Regional Sheltering Plan and participate in a regional sheltering effort if appropriate and necessary in a given hazard event.

Hurricanes and Tropical Storms

General Description

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. August, September, and the first half of October are when most hurricanes occur in New England. In Massachusetts, major hurricanes occurred in 1904, 1938, 1954, 1955, 1960 and 1976, 1985, 1991 and 2010. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.[16] Hurricane Bob, a weak category 2 hurricane, made landfall in New England in August 1991. In Franklin County, Hurricane Bob caused roughly $5,555,556 in property and crop damages.[17]

Tropical storms, defined as having sustained winds from 34-73 mph, have also resulted in high winds and damages in Franklin County. Between 1990 and 2008, 16 tropical storms impacted the County, causing almost $600,000 in property damages.[18] Tropical Storm Irene hit Franklin

[16] National Weather Service National Hurricane Center: http://www.nhc.noaa.gov/aboutsshws.php.
[17] Spatial Hazard Events and Losses Database (SHELDUS), http://webra.cas.sc.edu/hvri/.
[18] Ibid.

County on August 28, 2011, resulting in over $22 million in property damages from flooding and an additional $3,050,000 in other, mostly wind-related, damage.[19]

Location and Extent

Tropical Storm Floyd hit Massachusetts in September 1999, causing major damage in the Town of Warwick. The Highway Department documented major damage to the following roads in Town: Winchester, White, and Leland Roads. The Town received reimbursement from MEMA in the amount of $69,290.59 for its costs related to Floyd. Warwick was spared any major damage when Tropical Storm Irene passed through the region in August 2011, with the eye of the storm passing right over the town.

While the frequency of occurrence of hurricane or tropical storm events in Warwick is projected to be low, the Committee estimates a hurricane could have a large area of occurrence (more than 50% of the town) and could have a critical impact with multiple deaths and injuries possible and a potential for more than 25% of property in the affected area damaged or destroyed. A potential complete shutdown of facilities for more than one week is also possible. The category of hurricanes and tropical storms was rated by the Committee as the most significant hazard event potentially threatening the Town of Warwick.

Tornados, Microbursts and Thunderstorms

General Description

The category of Tornados and Microbursts includes thunderstorm events, and associated storm effects including hail and lightning. Tornados are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width.[20] The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornados have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Franklin County.

High wind speeds, hail, and debris generated by tornados can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.). Since the 1950s, there have been over twenty tornados in Franklin County. In the last fifteen years, three tornados have been reported in Franklin County, in the towns of Heath, Charlemont, and Wendell. The July 2006 tornado in Wendell was rated F2 (Strong) on the Fujita Scale with winds estimated near 155 mph, and causing $200,000 in property damage.[21] There was no impact to the Town of Warwick from this or any other tornado during the reporting period.

[19] Hazards & Vulnerability Research Institute (2012). The Spatial Hazard Events and Losses Database for the United States, Version 10.0 [Online Database]. Columbia, SC: University of South Carolina. Available from http://www.sheldus.org.

[20] The intensity of a tornado is measured by the Fujita Scale of Tornado Intensity. More information on the Fujita Scale can be found at: http://www.spc.noaa.gov/faq/tornado/f-scale.html.

[21] NOAA National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

While the likelihood of a tornado touching down in Warwick is low, an occurrence could cause damage along a path, including damage to the built and natural environment and potential injury to citizens.

On June 1, 2011, just such a tornado ripped through western and central Massachusetts, killing one person and injuring four others. In an area where tornados are rare, this event was a reminder that tornados do, in fact, impact the region. The fearsome storm downed trees, ripped roofs from hundreds of homes, and damaged many historic properties, causing property damage in excess of $24 million in towns such as Westfield, Springfield, and Monson. On June 15, President Obama signed a disaster declaration for Hampden and Worcester counties which provided federal funds for affected residents and properties. In August, the Department of Energy Resources (DOER) announced more than $8 million to help building owners affected by the June 1 tornados rebuild using energy efficiency practices and renewable energy technologies. Administered in partnership with the Massachusetts Clean Energy Center (MassCEC), the program—known as ReBuild Western Massachusetts—is designed to assist home and building owners who sustained documented structural damage as a result of the June 1 storms. For building owners, the incentives include energy efficiency financing, energy efficiency improvement grants, and renewable energy grants.

Preservation groups—including Preservation Massachusetts and the Springfield Preservation Trust—have assisted hardest hit communities, especially Springfield and Monson. In part, these preservation groups are helping to inventory properties and to encourage towns not to rush to demolish historic structures. The groups are also offering a list of resources properties owners can consult to assist them in making decisions about repairing historic properties. MEMA also conducted a briefing for historic property owners and encouraged representatives of Historical Commissions, Historical Societies, libraries, museums, and other non-profit organizations dedicated to preserving historic structures communicate with town officials and FEMA and MEMA staff throughout the disaster recovery process.

Historic properties in Monson (left) and Springfield were hard hit by a June 1, 2011 tornado.

This category also includes thunderstorm events, and associated storm effects including strong winds, hail and lightning. Three key ingredients need to be present for a thunderstorm to form:

moisture, rising unstable air, and a surface feature to lift the unstable air, such as a hill or mountain. Hot, humid conditions are very favorable for a thunderstorm occurrence. These conditions help generate the strong updrafts that feed hot, humid air into thunderstorms. The moist, unstable air rises and condenses into a cloud and, when electrical charges build up enough inside the cloud, energy is discharged in the form of a bolt of lightning, causing the sound waves heard as thunder.

A typical thunderstorm produces periods of heavy rain and can last anywhere from 30 minutes to an hour. In cases where air is very unstable, severe thunderstorms can produce damaging winds, lightning, large hail, and sometimes microbursts.

Lightning is always present in thunderstorms and can strike structures, trees, and individuals, potentially causing fire, injury, and even death. Lightning often strikes outside of heavy rain and may occur as far as 10 miles away from a thunderstorm center, increasing its unpredictability and risk to individuals and property.

Other elements that can be present in thunderstorms are hail and microbursts. Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.[22] Hail falls when the thunderstorm's updraft weakens and can no longer support the weight of the ice particles. The stronger the updraft the larger the hailstone can grow. Since 1955, NOAA has reported hailstone sizes between one half and two inches.[23] The Local Planning Committee reported no hail events in the Town of Warwick, other than those of very short duration.
Microbursts are another byproduct of thunderstorms that are of concern. Microbursts often do tornado-like damage and can be mistaken for tornados. In contrast to the upward rush of air in a tornado, a microburst is a small, strong downdraft or downburst of wind descending vertically from a thunderstorm.[24] Both vertical and horizontal wind shears can be present and can be extremely hazardous to aircraft, property, and individuals. Due to their small size, short life span, and the fact that they can occur over areas without surface precipitation, microbursts are not easily detectable using conventional weather radar or wind shear alert systems. These strong horizontal winds occur within a few hundred feet of the ground. [25] Microbursts have been reported as having been associated with four thunderstorm events in Franklin County since 1994, none of which took place in Warwick.[26]

The Committee also reported that small microbursts have been common over the years, also referred to as "straight-line winds." These winds are produced by the downward momentum in the downdraft region of a thunderstorm. Straight-line wind damage pushes debris in the same direction the wind is blowing, as compared to tornado damage, which scatters the debris in a variety of different directions since the winds of a tornado are rotating violently. One of these events occurred on May 29, 2012, when a straight-line wind came through the center of Town by the Fire Station and took down several trees. While Warwick was not directly affected, many

[22] http://www.nssl.noaa.gov/primer/hail/hail_basics.html
[23] http://www.ncdc.noaa.gov/stormevents/
[24] http://www.fs.fed.us/r3/sfe/newsroom/2003/July/07-17-03MediaAdvisoryMicroBursts.html
[25] http://www.nwas.org/committees/avnwxcourse/teachl5.htm
[26] http://www.ncdc.noaa.gov/stormevents/

residents will recall the microburst that hit Northfield in June 2005, with estimated wind gusts of 100 mph that brought down 80-100 trees in a path that stretched for approximately one mile.

Thunderstorm events have been reported in or near Warwick 6 times since 1991, including strong winds with property damage in September 2012, as shown in Table 3-3.[27]

Table 3-3: Tornado, Microburst and Thunderstorm Events in Warwick Since 1991

Date	Time	Type	Property Damage	Crop Damage	Warwick Storm Details
8/18/1991	15:00 PM	Thunderstorm Wind	$0	$0	Wind damage followed a path about 100 yards wide in the southern part of Northfield and then on into Warwick.
6/3/1995	18:34 PM	Thunderstorm Wind	$0	$0	Trees were reported blown down in Warwick.
5/31/1998	4:50 PM	Thunderstorm Wind	$0	$0	A severe thunderstorm moved through Franklin County bringing damaging winds to many communities during the late afternoon. In addition, law enforcement officials reported that trees were blown down between 5:30 PM and 6:10 PM in Shelburne Falls, Shelburne, Conway, Gill, Bernardston, Leyden, Northfield, and Warwick.
7/10/2001	3:30 PM	Thunderstorm Wind	$0	$0	Severe thunderstorms rolled through much of western and central Massachusetts.
12/1/2006	19:20 PM	Thunderstorm Wind	$3,000	$0	Thunderstorm winds downed trees and wires I n Franklin and Hampden Counties, from Northfield, Gill and Greenfield to Granville and Southwick. Trees were brought down on Warwick Avenue in East Northfield.
7/6/2007	13:40 PM	Thunderstorm Wind	$0	$0	Trees down. Cool temperatures aloft spread over Southern New England during the afternoon hours of the 6th. Thunderstorms developed in this airmass ahead of a weak cold front and some became severe.
9/18/2012	16:19 PM	Strong Wind	$30,000	$0	A tree and wires were downed on Wendell Road in Warwick. A tree and wires were downed on Warwick Road in Northfield.

Source: http://www.ncdc.noaa.gov/stormevents/ and NOAA, NNDC Climate Data Online: http://www7.ncdc.noaa.gov/CDO/cdo.

[27] http://www.ncdc.noaa.gov/stormevents/

Berkshire Wireless installing equipment on cell tower in Warwick. Photo courtesy of Ray Lemek.

Downed communication tower in New Hampshire. Photo courtesy Brian Foucher at Wivalley.net.

High winds from tornados and thunderstorms are a concern to Town Officials because of the potential threat to communications and other towers located in the Town of Warwick.

Location and Extent

Compared with other Franklin County towns, damages in general to Warwick due to tornado-type events are relatively low. The Committee ranked the estimated frequency of occurrence of tornados, microbursts and thunderstorms as low, but the potential severity of occurrence as critical, with potential for multiple injuries in isolated areas. As shown above in Table 3-3, microbursts and thunderstorms are common in the region and in the Town of Warwick. In evaluating the possible location and extent of tornados, microbursts and thunderstorms, the Committee estimated that more than 50% of the town could be impacted with multiple injuries and potential damages to more than 25% of property in the affected area. Tornados, microbursts and thunderstorms were classified by the Committee as the second most potentially damaging hazard event that the town might experience (tied with severe winter storms).

Wildfires and Brushfires

General Description

According to FEMA, there are three different classes of wildfires: surface fires, ground fires and crown fires. The most common type of wildfire is a surface fire that burns slowly along the floor of a forest, killing or damaging trees. A ground fire burns on or below the forest floor and is usually started by lightning. Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.[28]

While wildfires have not been a significant problem in Warwick there is always a possibility that changing land use patterns and weather conditions will increase a community's vulnerability. For example, drought conditions can make forests and other open, vegetated areas more vulnerable to ignition. While moderate drought conditions were experienced in the western half

[28] FEMA, "Fact Sheet: Wildland Fires," September 1993.

of the state in July 2011, they were back to normal by October.[29] Historically, drought has not been a problem in the Town of Warwick. Once the fire starts, it will burn hotter and be harder to extinguish. Soils and root systems starved for moisture are also vulnerable to fire. Residential growth in rural, forested areas increases the total area that is vulnerable to fire and places homes and neighborhoods closer to areas where wildfires are more likely to occur.

Location and Extent

Franklin County is at a low fire risk, according to MEMA data, except for drought years when the risk may increase to moderate. Table 3-4 below shows the number of brush fires in Warwick since 2009, as reported by the Fire Department. . Accurate record keeping is available only back to 2009, so it is difficult to make comparisons with other Franklin County towns.

Table 3-4: Warwick Brushfires 2009-2012

YEAR	# BRUSH FIRES
2009	3
2010	4
2011	7
2012	3
TOTALS	**17**

Source: Town of Warwick Fire Department, December 2012 .

Shelburne Control reports issuing 37 burn permits to Warwick residents in 2010 and 94 in 2011. Lightning can also be a cause of wildfires, brush fires, and structural fires. The town has not experienced many structure fires in recent years; there have been only two such fires since 2006. The Fire Dept. is unaware of any fires caused by lightning strikes in the town of Warwick.

Dam Failures

General Description

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is instantly released, oftentimes with catastrophic consequences as the water rushes in a torrent downstream flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built in the 19th Century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

[29] Massachusetts Department of Conservation and Recreation, *Current Water Conditions in Massachusetts*, August 9, 2012 and October 11, 2012, available on-line at www.mass.gov/dcr/watersupply/rainfall/.

The Massachusetts Department of Conservation and Recreation (DCR) is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). The DCR was also responsible for conducting dam inspections until 2002, when state law was changed to place the responsibility and cost of inspections on the owners of the dams. In accordance with the new regulations, which went into effect in 2005, dam owners must register, inspect and maintain dams in good operating condition. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain and update Emergency Action Plans. The state has three hazard classifications for dams:

- *High Hazard Potential*: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard Potential*: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard Potential*: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

Owners of dams are required to hire a qualified engineer to inspect and report results using the following inspection schedule:

- Low Hazard Potential dams – 10 years
- Significant Hazard Potential dams – 5 years
- High Hazard Potential dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. FERC inspections of high and significant hazard projects are conducted on a yearly basis. All other dams are subject to the regulations unless exempted in writing by DCR.

Beaver Dams

Along with manmade dams, failure of beaver dams can cause flooding as well. Alteration of the landscape by beavers is a natural process that creates habitat for shore birds, mammals and rare amphibians. However, beaver ponds can flood structures, roads and utilities, causing costly and potentially dangerous situations. Beaver activity can also pollute drinking water supplies. Mitigation measures suggested by Massachusetts Division of Fish and Wildlife (MassWildlife) and other agencies can help communities and homeowners deal with nature's master builders.

Until 1996, when a ballot initiative passed restricting the practice, Massachusetts residents were permitted to trap beavers. That change in policy caused a spike in the beaver population, which,

in turn, led to a sharp increase in complaints about beaver activity and its effects. The law was modified in 2000 so that town Board of Health members could issue emergency trapping permission outside of the usual trapping season. But an increased beaver population, combined with land development reducing beaver habitat, means that humans and beavers continue to clash. Several mitigation measures, when applied thoughtfully, legally and with maintenance measures in mind, can help with beavers' negative effects, while preserving beavers' positive impact on the land.[30]

State law makes it illegal for any person to disturb or tear open a beaver dam or beaver lodge without written permission from MassWildlife and the local Conservation Commission or Department of Environmental Protection. Permits are needed to disturb a beaver dam for any reason in Massachusetts. Even dams that cause flooding require permits to be breached.[31]

In 2011, a bill is under consideration with the State Legislators which would give individuals and towns an additional option when they are having issues with beavers. Under this new bill, a special permit could be obtained from the State Department of Fisheries and Wildlife. The bill does not aim to repeal the bill that bans trapping but rather allows the issuing of an emergency permit under the provisions allowed within the laws of the State. The proposed bill also calls for the State to begin keeping better records of all permits issued and how many beavers are trapped each year.

While trapping beaver can have short-term benefits, the right conditions for beaver habitat will eventually lure new beavers. It may be best to combine trapping with measures that discourage beaver activity that is bad for humans. Techniques used to mitigate the flooding damage caused by beavers include breaching of beaver dams, protecting road culverts with fences or guards, and controlling water levels with water flow devices. All these techniques require a certain degree of effort and regular maintenance to insure water levels that can be tolerated (thereby preserving the positive aspects of the associated wetland). See the MassWildlife publication *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* for details on these mitigation measures. The following techniques were adapted from that publication.

- Dam breaching is an immediate but very short-term solution to flooding problems caused by beavers. Potato hoes or stone hooks are the best tools for dismantling dams by hand. Shovels and spading forks are ineffective. Good water control is possible if the breach is kept shallow and broad so that the water level falls slowly. Opening a deep breach creates a dangerous situation and may cause serious flooding and erosion downstream. Tractor- or truck-mounted excavators may be used by town, county or state highway employees to remove large amounts of material from beaver dams but care should be taken to avoid downstream flooding. Neighbors should be told where, when, and why a dam excavation is going to be done. If the method is justified and must be used, it is best done in mid-summer when the water level is low.
- Beavers build dams instinctively. When they sense running water, they start to build or repair dams. Culverts, especially ones made out of metal, will amplify the sound of the

[30] *Otsego County* (NY) *All Hazards Mitigation Plan*, 2010.

[31] Langlois, S.A. and T.A. Decker. 2004. *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* (Rev. Ed.). MA Division of Fisheries and Wildlife. 18pp.

water rushing through them. Thus, beavers will commonly block road culverts with sticks, mud and rocks. This can cause flooding upstream. Culverts blocked from the inside are difficult to clean and potentially dangerous. The use of meshes and grills, placed on both the upstream and downstream ends of the culvert, can prevent beavers from entering.

- Water Level Control Devices (WLCDs) keep beavers away from an intake pipe that lowers the water level of the pond. It has been estimated that only 4.5% of beaver problems in Massachusetts will be fixed by these devices. Using and maintaining a WLCD in conjunction with trapping young beavers can allow coexistence for years.

The Committee identified sites where beaver dams are having a notable impact on the landscape (see the Critical Facilities & Infrastructure Map for approximate locations of these dams):

- Athol Rd.
  - Above and below culvert # 6 located East of Gale Rd. along the Rum Brook
  - Above and below culvert # 7 located East of Gale Rd. along the Black Brook
  - Above culvert # 8 located East of house # 321
  - Above and below culverts # 35 and # 36 West of Orange Town Line along West Branch of Tully River
- Bass Rd.
  - Above and below culvert # 1 located South of Northfield Rd. at Bass Swamp
  - Above culvert # 8 located North of State Fire Road
  - End of Bass Rd. has large beaver pond and multiple dams holding back large amount of water at turnaround
- Gale Rd.
  - Above and under bridge located near house # 245 at Gale's Pond
- Hastings Heights Rd.
  - Above culvert # 3 located South of the old Allen Rd.
  - Above culvert # 4 located North of Orange Town Line
- Hastings Pond Rd.
  - Above culvert # 1 located North of house # 73 at Hastings Pond outlet
- Hockanum Rd.
  - Above and below culvert # 8 located East of house # 165 along the Darling Brook
- Northfield Rd.
  - Above and below culverts # 46 thru # 48 located West of house # 575 going into Bass Swamp
  - Along the Mill Brook across from house # 733 by culvert # 51
- Orange Rd.
  - Above culvert # 30 located South of house # 447
  - Above culvert # 45 located South of Hockanum Rd. along the Orcutt Brook
- Richmond Rd.
  - Above and below culverts # 8 and # 9 located at high tension wires North of old prison camp at Richards Reservoir

- Wendell Rd.
    - Above and below culvert # 28 located at outlet of Moore's Pond going into Darling Brook
    - Above and below culvert # 32 located South of house # 633 along Darling Brook
    - Along Darling Brook located North of house # 780 by culvert #33
- West Rum Brook Rd.
    - Above culvert # 2 located at turnaround at end of road coming out of Stevens Swamp
- White Rd.
    - End of White Rd. has large beaver pond and multiple dams holding back large amount of water at turnaround
- Winchester Rd.
    - Above and below culvert # 20 located South of Robbins Rd.
    - Below culvert # 21 located South of Robbins Rd. along the Kidder Brook
    - Various beaver dams located along the Mountain Brook North of the confluence of the Mountain Brook and Kidder Brook along the western edge of Winchester Rd.

Overall, the Committee identified the possible flooding due to beaver dams as extensive. Of particular concern are the 485 culverts in Town that may be subject to blockage as a result of beaver activity, resulting in flooding of the surrounding areas and potentially undermining roadways. The 2011 Warwick Annual Town Report indicated that the Highway Department worked on drainage problems throughout the year, replacing 12 culverts throughout the town.

In determining which culverts to prioritize for replacement, the town could also take into consideration the possibility of lessening the impact of the culverts on the environment. The University of Massachusetts Amherst is working in partnership with the Nature Conservancy and state agencies to complete the Critical Linkages project, a comprehensive analysis of areas in Massachusetts where connections must be protected and restored to support the Commonwealth's wildlife and biodiversity resources, building on the existing Conservation Assessment and Prioritization System (CAPS). In Phase 1 of the Critical Linkages project the scenario testing capabilities of CAPS were used to assess changes in the connectedness and aquatic connectedness metrics for dam removal, culvert/bridge replacement projects and construction of wildlife passage structures on roads and highways. Results of these analyses indicate that a relatively small proportion of culvert replacements or dam removals would result in substantial improvements in aquatic connectivity. The Critical Linkages Map at the end of Section 3 shows the CAPS data for culverts in Warwick. Size of the circles on the map is proportional to the change in "aquatic connectedness" that would be achieved by crossing replacement; the larger the circles the greater the improvement in "aquatic connectedness.

Location and Extent

Massachusetts Emergency Management Agency (MEMA) identifies seven dams in Warwick, all of which are designated as Low Hazard Potential:

- Wheeler Pond Dam
- Laurel Lake Dam
- Moore's Pond Dam
- Gale's Pond Dam
- Richards Reservoir Upper Dam
- Sheomet Lake Dam
- Stevens Swamp Dam

The Committee has also listed the following dams in Warwick, but note that they do not present a threat to persons or property if breached:

- Hastings Pond Dam
- Head of Kidder Falls
- Gale Brook to Orcutt Brook Dam
- Black Brook Dam
- Rum Brook Dam
- Steven's Swamp Dam

The 100-year flood plain covers just over one percent, or roughly 259 acres of the Town, including an estimated six acres of developed residential land. The following critical facilities in Warwick have been identified as being located either within the 100-year floodplain, in a dam inundation area, or in areas prone to localized flooding:

- High tension wires run through the floodplain located behind house # 550 Winchester Rd. (Rt.78) along the Mirey Brook
- Wendell Rd. is on the edge of the floodplain between house # 424 and house # 525
- Wendell Rd. is on the edge of the floodplain just South of house # 585 along the Darling Brook
- Floodplain runs through Orange Rd. (Rt.78) just South of Hockanum Rd. where Orcutt Brook goes through culvert # 45 under Orange Rd. (Rt.78)
- Floodplain is on the edge of Orange Rd. (Rt.78) near Wheeler Pond Dam across from house # 970 Orange Rd.

Potential Mitigation Measures for Dam Failure

A potential action item to help mitigate possible dam failure:

- Identify locations of existing beaver activity and dams. Evaluate areas for potential flooding and explore the feasibility of controlled breaching of dams to limit the potential for accidental breaches

Earthquakes

General Description

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year

although most are not noticed by people.[32] Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.[33]

The Richter Magnitude Scale is used as a common measurements for earthquakes, which are recorded on seismographs around the world. Earthquakes with magnitudes of about 2.0 or less are called microearthquakes and are generally not felt by people and are only recorded on siesmographs near the epicenter. Earthquakes with magnitudes of roughly 4.5 and greater are recorded at seismograph stations around the world. There are several thousand of these shocks recorded each year. Magnitudes do not measure damage, which is dependent on where the shock occurs.[34]

Massachusetts introduced earthquake design requirements into their building code in 1975. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before 1975 may not have been designed to withstand the forces of an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code. Approximately 57% of the 338 housing units in Warwick were built prior to 1970 and may be at risk in the event of an earthquake.

Table 3-5: Northeast Earthquakes with a Magnitude of 4.2 or more 1924 - 2007

Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, ME	October 3, 2006	4.2

Source: Northeast States Emergency Consortium Web site: http://www.nesec.org/hazards/earthquakes.cfm.html.

[32] Northeast States Emergency Consortium Web site: http://www.nesec.org/hazards/earthquakes.cfm.html.
[33] Federal Emergency Management Agency Web site: http://www.fema.gov/earthquake.
[34] United States Geological Survey (USGS) Earthquake Hazards Program: \http://earthquake.usgs/learn/topics/richter.php.

Table 3-6: Northeast States Record of Historic Earthquakes

State	Years of Record	Number Of Earthquakes
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
Total Number of Earthquakes within the Northeast states between 1638 and 2007 = 2,403.		

Source: Northeast States Emergency Consortium Web site: http://www.nesec.org/hazards/earthquakes.cfm.html.

According to the United States Geological Survey, a fault line runs north-south through the Towns of Erving, Montague and Leverett. The fault extends along the entire length of Franklin County, and was originally responsible for the creation of the Connecticut River. On August 23, 2011 an earthquake measuring 5.8 on the Richter scale centered in Virginia was felt throughout the northeast, prompting the evacuation of a number of multi-story buildings in the Franklin County region, but causing no property damage or personal injury.

Location and Extent

While no significant earthquake events have been reported in Warwick, the Committee evaluated the frequency of occurrence to be very low, potential area of impact to be 10% to 50% of town with potential minor to limited impacts on the Town's population and infrastructure. The Committee also expressed concern about the potential effect of earthquake events on the Yankee Nuclear Plant located on the Massachusetts-Vermont border in Vernon, Vermont. Warwick is located within the 10-mile radius evacuation zone for the nuclear plant.

Landslides

General Description

Landslides are geological phenomena that include a wide range of ground movement, such as rock falls, failure of slopes and shallow debris flows. They can occur in coastal, mountain, and river edge environments.

Landslides occur when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. Natural causes of landslides include:

- groundwater pressure acting to destabilize the slope
- loss or absence of vertical vegetative structure, soil nutrients, and soil structure (e.g. after a wildfire)
- erosion of the toe of a slope by rivers

- weakening of a slope through saturation by snowmelt or heavy rains
- earthquakes adding loads to barely-stable slopes
- earthquake-caused liquefaction destabilizing slopes
- volcanic eruptions

Landslides are created by human activities as well, including deforestation, cultivation and construction, which destabilize already fragile slopes. Landslides can also occur due to:

- vibrations from machinery or traffic
- blasting
- earthwork which alters the shape of a slope, or which imposes new loads on an existing slope
- in shallow soils, the removal of deep-rooted vegetation that binds colluvium to bedrock
- construction, agricultural or forestry activities (logging) which change the amount of water which infiltrates the soil.

Location and Extent

The Connecticut River Valley is given a Moderate landslide incidence rating (1.5% to 15% of the area involved) while the remainder of the state is listed as Low landslide incidence (less than 1.5% of the area involved).[35] A typical setting for a landslide might bring to mind the precarious seaside hills in California. However, landslides have occurred much closer to home. According to WWLP News, early in the morning on March 7 of 2011, torrential rains swept away a piece of cemetery into the backyards of homes and nearby streets in Greenfield, MA. The landslide sent silt, mud, and debris slid down from the Green River Cemetery into homes on nearby Meridian Street. Residents did not hear a thing. A passerby called 911 and alerted authorities that part of the Green River Cemetery had slid down onto Meridian Street. Residents of three homes were evacuated. This area of Greenfield has been in the news before due to other landslides.

The aftermath of the mudslide from the Green River Cemetery included cleanup on a nearby street and bridge.

According to the Greenfield Recorder, state geologists estimated that about 1,500 to 3,000 cubic yards of mud and debris came down into the yards but that no graves were involved. Three

[35] U.S. Department of the Interior, U.S. Geological Survey. National Landslide Hazards Mitigation Strategy: A Framework for Loss Reduction. 2000.

inches of rain in Greenfield over a day and a half contributed to the disaster that caused thousands of dollars' worth of damage. The company called in to divert water away from homes below and help clear their yards of some of the mud found that a drainage system that had been installed in 1986 was been plugged and buried by the mudslide. The drainage system was cleaned out and was found to be in good shape and should handle any future rains adequately. The Town indicated that it is the responsibility of the Cemetery board to make sure the system is evaluated and cleared of any silt accumulation on a regular basis.

There are no reported experiences with mudslides in Warwick.

Ice Jams

General Description

Ice jams (or ice dams) occur when water builds up behind a blockage of ice. Ice dams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form an ice dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. Ice jams and flooding usually occur in spring; however, they can happen as winter sets in when the downstream reach of a river freezes first. Where floods threaten, the blockage can be removed mechanically.

Location and Extent

Historical data from the U.S. Army Cold Regions Research and Engineering Laboratory show no ice jams occurrences Warwick. The Local Planning Committee reported that there have been no incidences of ice jams in the town of Warwick. The 2004 Warwick Annual Town Report indicated that beaver dams caused flooding and ice build-up on Northfield Road during the winter and early spring.

Manmade Hazards[36]

Most non-natural or manmade hazards fall into two general categories: intentional acts and accidental events, although these categories can overlap. Some of the hazards included in these two categories, as defined by MEMA, consist of intentional acts such as explosive devices, biological and radiological agents, arson and cyberterrorism and accidental events such as nuclear hazards, invasive species, infrastructure failure, industrial and transportation accidents. Accidental events can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials.

Note: This plan does not address all manmade hazards that could affect Franklin County. A complete hazards vulnerability analysis was not within the scope of this update. For the purposes of the 2013 plan, the Committee has evaluated non-natural hazards that are of an

[36] Content adapted from Commonwealth of Massachusetts State Hazard Mitigation Plan 2010.

accidental nature. These include industrial transportation accidents and industrial accidents in a fixed facility.

Hazardous Materials General Description

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products are shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.

A release may occur at a fixed facility or in transit. Communities with a large industrial base may be more inclined to experience a hazardous materials release due to the number of facilities such materials in their manufacturing process. Communities with several major roadways may be at a greater risk due to the number and frequency of trucks transporting hazardous materials passing through, with similar risks associated with the location of railways in town.

Location and Extent

Industrial Accidents - Transportation

Franklin County transportation systems include road, rail, and air. Accessible and efficient freight transportation plays a vital function in the economy of the region. Most freight and goods being transported to and from Franklin County are by truck; however, a significant amount of freight that moves through the county is being hauled over the three main rail lines. Given that any freight shipped via air needs first to be trucked to an airport outside the region, air transportation is not being evaluated in this plan.

According to the Franklin County Hazardous Material Emergency Plan[37], approximately 13 trucks per hour traveling through the region contain hazardous materials (Table 3-7). Most of these vehicles are on Interstate 91. However, up to one truck per hour may be carrying hazardous materials along Route 78 in Warwick.

Table 3-7: Estimated Levels of Hazardous Material Transported on Area Roadways

Roadway	Number of Tank or Van Trucks Carrying Hazardous Materials per hour
Interstate 91	10
Route 2	2
Other major roadways *(Routes 5/10, 63, 47, 116,202, 8A,* ***78****, 122, 142, and 2A)*	**1 or 0**

The hazardous materials regularly carried on these trucks passing through Warwick include:

- Gasoline
- Fuel oil
- Kerosene

[37] Franklin County Regional Emergency Planning Committee, Franklin County Hazardous Material Emergency Plan and Maps, Adopted 2010; Condensed Franklin County Hazardous Material Emergency Plan, distributed at the February 7, 2012 HMEP Seminar.

- Liquefied petroleum gas
- Propane
- Sodium aluminate
- Sulfuric acid
- NOS liquids 3082

Industrial Accidents – Fixed Facilities

An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. Those facilities using, manufacturing, or storing toxic chemicals are required to report their locations and the quantities of the chemicals stored on-site to state and local governments. The Environmental Protection Agency's Toxics Release Inventory (TRI) contains information about more than 650 toxic chemicals that are being used, manufactured, treated, transported, or released into the environment. It is important to note that inclusion on the Toxics TRI in no way indicates any issues with any of the sites, but rather is an inventory of those facilities meeting TRI reporting requirements. There are no facilities in Warwick that are required to report to the TRI.

The one hazardous facility in Warwick identified in the Town's Comprehensive Emergency Management Plan (eCEMP) is the DPW Highway Barn located on 15 Garage Road. Materials stored at the barn include the following maximum amounts of potentially hazardous materials: 2,000 gallons of diesel fuel stored in an above-ground tank, 250 tons of rock salt/deicing chemicals, and 600 yards of sand.

Hazardous facilities located outside of town boundaries can potentially impact the Town as well. The Vermont Yankee nuclear power plant is located on the Connecticut River in Vernon, Vermont, near the Vermont/Massachusetts border. Portions of Warwick are within the 10-mile radius evacuation zone for the plant; Warwick Town Hall is just over 11 miles from the plant. In January 2010, the facility notified the Vermont Department of Health that samples taken in November 2009 from a ground water monitoring well on site contained tritium. This finding signals an unintended release of radioactive material into the environment. Testing has shown that contaminated groundwater has leaked into the Connecticut River, though tritium levels in the river have remained below the lower limit of detection.[38]

More recently, the 2011 tsunami and earthquake in Japan that damaged a nuclear power plant demonstrates the potential vulnerability of these facilities to natural disasters, and the geographic extent that could be impacted by an accident. The future operation of the Vermont Yankee power plant is currently unclear. The Nuclear Regulatory Commission recently extended the plant's operating license for 20 more years, while the State of Vermont has denied an extension of the current license, which was to have expired in March 2012. Town officials report that they participate in drills four times per year to prepare for a potential accident at the Vermont Yankee nuclear power plant and that this has improved their response capacity for other hazard events.

[38] Vermont Department of Health: http://healthvermont.gov/enviro/rad/vt_yankee.aspx

VULNERABILITY ASSESSMENT

Vulnerability Overview

This section presents exposure, damages, loss estimates, population impacts and data deficiencies for each of the hazards addressed in the Hazard Identification and Analysis Section of the Plan. Additionally, an overall vulnerability assessment is provided for each hazard. This analysis is an in-depth look at each hazard in Warwick. Coupled with the All Hazards Vulnerability Assessment presented in Table 3-27 on page 65 that prioritizes all the hazards that can impact the town based on frequency of occurrence, severity of impact, area of occurrence and preparedness, these findings will support planning efforts based on a better understanding of the potential impacts associated with each hazard and provide a foundation for the mitigation strategy presented in Section 5.

Vulnerability Assessment Methodology

The Vulnerability Assessment is a series of tables that enabled FRCOG staff to determine the vulnerability of Warwick to flooding and to calculate the potenti al costs of flooding to the town.[39] Estimated losses for all other hazard events were also determined, based on damages from past recorded events. The potential implications for vulnerable populations such as senior and low income populations in the event of a hazard are also assessed.

Floods

Hazard Summary

In this section, a vulnerability assessment was prepared to evaluate the potential impact that floods could have on the portions of Warwick located within the 100-year floodplain. Floods were chosen for this detailed evaluation because it is a hazard likely to impact the community and the location of the impact can be determined by mapping of areas inundated during severe flood events. Floods can be caused by severe storms, such as hurricanes, nor'easters, and microbursts, as well as ice jams and snow melt. To determine the vulnerability of the town, data was gathered and calculated for the value of residential, commercial, and industrial properties. The damage estimates presented are rough estimates and likely reflect a worst-case scenario. Computing more detailed damage assessments based on assessor's records is a labor-intensive task and beyond the scope of this project.

Data Collected and Used

National weather databases and Town of Warwick data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the NOAA National Climatic Data Center Storm Events Database website. This data was used to support an evaluation of exposure and potential impacts associated with this hazard.

[39] These tables were developed to provide towns with a template for calculating and estimating potential losses and costs of flooding. They draw from and integrate the work of other Natural Hazard Mitigation Plans, specifically the Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009, but the tables can be linked to the most recent demographic, land use, and infrastructure information (databases) and automatically calculate and estimate the cost of flooding to each town or region.

Available historic data are presented in Tables 3-1 and 3-2. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on flooding.

Impact on the Community

Exposure and Loss Estimation

Floods can cause a wide range of issues, from minor nuisance roadway flooding and basement flooding to major impacts such as roadway closures. Specific damages associated with flooding events include the following primary concerns:

- Blockages of roadways or bridges vital to travel and emergency response
- Breaching of dams
- Damaged or destroyed buildings and vehicles
- Uprooted trees causing power and utility outages
- Drowning, especially people trapped in cars
- Contamination of drinking water
- Dispersion of hazardous materials
- Interruption of communications and/or transportation systems

Property Damage

Of Warwick's total acreage, 259 acres lie within the 100-year floodplain or flood hazard area. Table 3-9 displays the number of dwelling units and the estimated population living in the 100-year floodplain in Warwick. According to 2005 MassGIS Land Use data, there are 10 dwelling units located in the floodplain. Using this number and Warwick's average household size of 2.37 as of the U.S. 2010 Census, it is estimated that 24 people, or 3.0% of Warwick's total population, reside in the floodplain.

Table 3-9: Number of Dwelling Units and Percent of Total Population Residing in Flood Hazard Area

Total Town Population	Average # of people per household	Number of Dwelling Units in Flood Hazard Area	Estimated population in Flood Hazard Area	% of total population that reside in the Flood Hazard Area
780	2.37	10	24	3.0%

Source: U.S. Census Bureau, 2010 Census and 2007-2011 American Community Survey; 2005 MassGIS Land Use data.

There are no commercial or industrial land uses identified by the 2005 data in the Town of Warwick. There are 7.7 acres of public or institutional land uses located in town, none of which are located in the floodplain.

The estimated assessed values of the land uses located within the floodplain are displayed in Table 3-10. The total estimated assessed value for residential land uses in the flood hazard area is $991,217. (Similar calculations were not possible for commercial land uses, as no acres in this use category were identified in the 2005 MassGIS Land Use data, although assessment data for these categories is available from the Massachusetts Department of Revenue.) Should a

catastrophic flooding event befall Warwick, the assessed values of these structures and facilities would likely be significantly reduced, which in turn could impact the town's tax revenues.

Table 3-10: Estimated Assessed Value of Land Use in Flood Hazard Area

Land Use	Total Acres in Town	Total Assessed Value in 2013	Average Assessed Value Per Acre	Acres In Floodplain	Estimated Assessed Value In Flood Hazard Area
Residential	447	$73,600,184	$164,654	6.02	$991,217
Commercial	0	$1,386,470	N/A	0	$0
Industrial	0	$0	$0	0	$0
Totals	447	$74,986,654	$164,654	0	**$991,217**

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section (2013): http://www.mass.gov/dor/local-officials/municipal-data-and-financial-management/data-bank-reports/property-tax-information.html; 2005 MassGIS Land Use data.

The Committee identified several historic properties located in the floodplain in Warwick, all of which are privately owned residences. In addition, there are a number of historic and other infrastructure elements in town that are located in the floodplain, including: Laurel Lake and associated structures located in the Erving State Forest in town on Laurel Lake Road; Brush Valley Bridge on Orange Road over Orcutt Brook; structures along Gulf Brook in Mount Grace State Forest on Route 78; and the Wendell Road Bridge over Moss Brook. Given the nature of the properties and structures, it is not possible to estimate the total building value in the floodplain or the estimated losses if they were impacted by floods for specific properties.

Repetitive Loss Properties

Repetitive loss properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. According to MEMA, there are no repetitive loss structures in Franklin County. See pages 111-114 for more information on NFIP.

Population Impacts

The Town should be aware that senior and low income segments of Warwick's population may be more vulnerable to hazard events due to a number of factors. Senior and low income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. Table 3-11 displays the number of senior and low income residents in Warwick. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-11: Senior and Low Income Populations in Warwick Exposed to Multi-Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (65 years of age and over)	116	14.9%
Low Income (Persons with annual incomes less than $25,000)*	59	7.6%
Total	**175**	**23.3%**

* Low income population was calculated by multiplying U.S. Census 2007-2011 American Community Survey (ACS) Households with Incomes and Benefits of Less than $25,000 (25) by U.S. 2010 Census Average Household Size (2.37).
Source: U.S. Census Bureau, 2010 Census and 2007-2011 American Community Survey.

Overall Vulnerability Assessment

Floods are common in New England, often causing significant impacts to the roads, structures, facilities, utilities, and population of Warwick. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as and the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

Data Deficiencies

In assessing the risks to Warwick from flood hazards, the following data deficiencies were identified:

- Lack of available data on the number of vulnerable populations living in households in the floodplain.
- Lack of digital floodplain data to overlay on zoning to determine number of developable lots in the flood hazard area due to outdated FEMA floodplain maps.
- Records of damages to the built and natural environments due to floods in Warwick is not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Severe Winter Storms

Severe winter storms are common in Warwick, often impacting the Towns' roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Hazard Summary

Severe winter storms cause significant concern because they happen often and can be quite severe; they cost residents money; they require snow and ice removal, which can limit access to facilities and can cause health problems; they can cause utility failure and flooding from ice jams; and they put stress on community resources.

Data Collected and Used

National weather databases and Town of Warwick data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. This data was used to support an evaluation of exposure and potential impacts associated with this hazard. Available historic data are presented in Table 3-12. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on severe winter storm hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

Heavy snowfall coupled with low temperatures often results in increases in traffic accidents; disruptions in transportation, commerce, government, and education; utility outages due to falling trees, branches, and other objects; personal injuries associated with slippery surfaces and freezing temperatures; and numerous other problems. Specific damages associated with severe winter storm (snow) events include the following primary concerns:

- Injuries and fatalities associated with accidents, low temperatures, power loss, falling objects and accidents associated with frozen and slippery surfaces and snow accumulation
- Increases in the frequency and impact of traffic accidents, resulting in personal injuries
- Ice-related damage to trees, building and infrastructure inventory, and utilities (power lines, bridges, substations, etc.)
- Roads damaged through freeze and thaw processes
- Stress on the local shelters and emergency response infrastructure
- Lost productivity that occurs when people cannot go to work, school, or stores due to inclement conditions

New England's climate offers no immunity to the potential damaging effects of severe winter storms. Some minimum damage is anticipated annually, with potential extensive damage occurring about once every 10 years.

Property Damage

As presented in Table 3-12, historic data for severe winter storm (heavy snow) events indicate that between 1993 and 2011, 113 heavy snow events were recorded in Franklin County. An average of 5.9 heavy snow and ice events occur each year, causing an average annual property damage county-wide of just under $4.3 million. Table 3-13 provides data from the Committee on recent severe winter storm events in Warwick.

Table 3-12: Severe Winter Storm Events in Franklin County (Heavy Snow/Ice)

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2011	2	$50,000	
2010	3	$30,000	$0
2009	5	$0	$0
2008	12	$6,020,000	$0

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2007	7	$10,000	$0
2006	0	$0	$0
2005	9	$625,000	$0
2004	3	$0	$0
2003	5	$50,000	$0
2002	7	$1,605,000	$0
2001	7	$11,000,000	$0
2000	7	$0	$0
1999	6	$0	$0
1998	3	$0	$0
1997	6	$10,030,000	$0
1996	10	$47,000,000	$0
1995	6	$0	$0
1994	8	$5,050,000	$0
1993	7	$0	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
19	**113**	**$4,287,895**	**$0**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

Table 3-13: Severe Winter Storm Events in Warwick (Heavy Snow/Ice)

Year	Location of Event	Total Cost to Town
December 2008	Flower Hill, Shepardson, and Old Winchester Roads, roads in Warwick Center, Mount Grace	$91,048
October 2011	Throughout town	$25,327

The entire built environment of Warwick is vulnerable to a severe winter storm. Table 3-14 identifies the assessed value of all residential, commercial, and industrial land uses in Town, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a severe winter storm.

Table 3-14: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value in 2013	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	$73,600,184	$736,002	$3,680,009	$7,360,018
Commercial	$1,386,470	$13,865	$69,324	$138,647
Industrial	$0	$0	$0	$0
Total	**$74,986,654**	**$748,867**	**$3,749,333**	**$7,498,665**

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid, 2013. Section: http://www.mass.gov/dor/local-officials/municipal-data-and-financial-management/data-bank-reports/property-tax-information.html.

Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and in limited cases, deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to severe winter storm impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a severe winter storm.

Overall Vulnerability Assessment

Severe winter storms are common in New England, often causing significant impacts to the roads, structures, facilities, utilities, and population of Warwick. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. The cascade effects of severe winter storms include utility losses, transportation accidents, and flooding. Losses associated with flooding are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

Data Deficiencies

In assessing the risks to Warwick from severe winter storms, the following data deficiencies were identified:

- Records of damages to the built and natural environments due to severe snow and ice storms in Warwick is not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Hurricanes and Tropical Storms

Hazard Summary

Hurricanes and tropical storms are rare in Warwick but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Hurricanes or tropical storms can spin off tornados and bring thunderstorms, and high winds, possibly resulting in loss or damage to property. (See Tornados, Microbursts, and Thunderstorms Section Below.) Primarily, hurricanes and tropical storms bring heavy rains that can cause flooding, as was the case with Tropical Storm Irene in August 2011, although Warwick was

spared major damages from this storm. (See the description of the effects of the storm above in the section on the impacts of flooding on pages 19-20.)

Data Collected and Used

National weather databases and Town of Warwick data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on thunderstorms, hurricanes and tornados hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

High winds and heavy rain associated with hurricanes and tropical storms can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death.

Property Damage

As presented in Table 3-15, historic data for hurricane and tropical storm events indicate one hurricane and 16 tropical storms have been recorded in Franklin County. Hurricane Bob in 1991 caused over $5.5 million in property damage in the county, and over $500,000 in crop damage. In 2011, Tropical Storm Irene caused over $25 million in property damage. Overall, tropical storms and hurricanes have caused an average annual property damage of just under $1.5 million over the last 21 years.

Table 3-15: Hurricane and Tropical Storm Events in Franklin County

Year	# of Hurricane/Tropical Storm Events	Annual Property Damage	Annual Crop Damage
2011	1	$25,325,000	$0
2010	0	$0	$0
2009	0	$0	$0
2008	0	$0	$0
2007	0	$0	$0
2006	5	$277,861	$0
2005	1	$33,889	$0
2004	1	$37,778	$0
2003	2	$127,381	$0
2002	0	$0	$0
2001	0	$0	$0
2000	0	$0	$0
1999	1	$7,692	$0
1998	2	$63,269	$0
1997	0	$0	$0
1996	0	$0	$0

Year	# of Hurricane/Tropical Storm Events	Annual Property Damage	Annual Crop Damage
1995	1	$0	$0
1994	1	$35,714	$0
1993	0	$0	$0
1992	0	$0	$0
1991	1	$5,555,556	$555,556
1990	2	$7,142	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
21	**18**	**$1,498,632**	**$26,455**

Source: Spatial Hazard Events and Losses Database for the United States (SHELDUS): http://webra.cas.sc.edu/hvri/products/sheldus.aspx.

Tropical Storm Floyd hit Massachusetts in September 1999, causing major damage in the Town of Warwick. The Highway Department documented major damage to the following roads in Town: Winchester, White, and Leland Roads.

The entire built environment of Warwick is vulnerable to the high winds and/or flooding from a hurricane or tropical storm. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of a hurricane or tropical storm.

Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to hurricane and tropical storm impacts in Warwick are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a hurricane or tropical storm.

Overall Vulnerability Assessment

Hurricanes and tropical storms are uncommon in Franklin County, but can cause significant damage when they do occur. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events. The cascade effects of severe storms include utility losses and transportation accidents and floods Losses associated with the flood hazard are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas, including valuable farm fields, that can be impacted by floods.

Data Deficiencies

In assessing the risks to Warwick from hurricanes and tropical storms, the following data deficiencies were identified:

- Records of damages to the built and natural environment due to hurricanes and tropical storms are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Tornados, Microbursts and Thunderstorms

Hazard Summary

Like hurricanes, tornados and microbursts are relatively rare in Warwick but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events. Thunderstorms are common in western Massachusetts and can cause significant damage. Thunderstorms bring strong winds, rain and, at times, hail, potentially causing damage to property, crops and utilities and injuries or deaths to residents. Persistent rain can also cause flooding. Additional data were available for hail and lightning events, and are included in tables 3-19 and 3-20. Hail and lightning are events generally associated with thunderstorms.

Tornados can have devastating effects on infrastructure, property and human health. Striking at random, their conical winds leave trails of devastation, at times more than a mile wide, in their wake. Small tornados, known as "gustnados," have been known to strike in Franklin County, most recently in Sunderland in 2009. The gustnado does not appear in data compiled on tornados for this report; however, even gustnados can cause damage; the 2009 occurrence destroyed a barn and downed trees in Sunderland.

Data Collected and Used

National weather databases and Town of Warwick data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on tornados and microburst hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

High winds and heavy rain and/or hail associated with tornados and microbursts can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries

and death. Of particular concern to Town officials are the communication and other towers located in town that could be subject to wind damage.

Property Damage

As presented in Table 3-16, historic data for tornado events indicate that between 1991 and 2012, 4 tornados were recorded in Franklin County. Over 22 years, tornados have caused an average of $14,772 in property damages yearly.

Table 3-16: Tornado Events in Franklin County

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
2012	0	$0	$0
2011	0	$0	$0
2010	0	$0	$0
2009	0	$0	$0
2008	0	$0	$0
2007	0	$0	$0
2006	1	$200,000	$0
2005	0	$0	$0
2004	0	$0	$0
2003	0	$0	$0
2002	0	$0	$0
2001	0	$0	$0
2000	0	$0	$0
1999	0	$0	$0
1998	0	$0	$0
1997	2	$100,000	$0
1996	0	$0	$0
1995	0	$0	$0
1994	0	$0	$0
1993	0	$0	$0
1992	1	$25,000	$0
1991	0	$0	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
22	**4**	**$14,772**	**$0**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

Severe thunderstorms, and their associated hail and lightning events brought about significant property wreckage in Franklin County in recent years. However, it is the winds from thunderstorms that consistently cause the worst property damage. Thunderstorms with associated wind damage, 161 of them in the last 23 years, caused an average annual property loss of more than $79,000 and an average annual crop damage of $5,435 (Table 3-17). It is important

to note that each reported thunderstorm wind event is counted in the total, even if they occurred in multiple towns on the same date. Even taking that into consideration, the number of thunderstorms has increased in recent years. In the 1990s, there were an average of 3.8 storms per year, according to NOAA data. From 2000 to 2012, NOAA recorded an average of 9.5 storm events per year, 2.5 times the previous decade. Between 2007 and 2010, 72 storm events were recorded countywide for an average number of 18 storms for those four years. A very strong storm with strong winds moved through the communities of Whately and Sunderland on July 19, 2008, causing a substantial amount of property and crop damage, mostly in the form of fallen trees and downed power lines.

Table 3-17: Thunderstorm Events in Franklin County

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
2012	8	$34,000	$0
2011	9	$77,000	$0
2010	30	$590,500	$0
2009	2	$17,000	$0
2008	21	$602,000	$1,250,000
2007	19	$0	$0
2006	6	$315,000	$0
2005	9	$85,000	$0
2004	4	$30,000	$0
2003	1	$10,000	$0
2002	6	$25,000	$0
2001	5	$0	$0
2000	3	$20,000	$0
1999	5	$0	$0
1998	8	$2,000	$0
1997	7	$10,000	$0
1996	5	$0	$0
1995	3	$0	$0
1994	4	$0	$0
1993	0	$0	$0
1992	2	$0	$0
1991	3	$0	$0
1990	1	$0	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
23	**161**	**$79,022**	**$5,435**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

Four thunderstorms since 1995 produced high winds in Warwick that caused damage to trees and power lines, but no reported property or crop damages. (Table 3-18).

Table 3-18: Severe Thunderstorm Events in Warwick

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
1995	1	$0	$0
1998	1	$0	$0
2001	1	$0	$0
2007	1	$0	$0
23	**4**	**$0**	**$0**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

As Table 3-19 shows, 77 hail storms in Franklin County between 1991 and 2012 have caused an average of approximately $227 in property damage per year, and an average of $2,273 of crop damage. The total amount of crop damage during this period resulted from a single incident on June 16, 2008 that caused $50,000 in damage. Pea to marble size hail fell in a swath from Colrain to Shelburne damaging apple and peach orchards from Colrain to Shelburne to Deerfield. An estimated 45 acres of apples and two to three acres of peaches were damaged by the hail. This storm was also accompanied by lightning and thunderstorm winds. It is important to note that each reported hail event is counted in the total, even if they occurred in multiple towns on the same date.

Table 3-19: Hail Events in Franklin County

Year	# of Hail Events	Annual Property Damage	Annual Crop Damage
2012	2	$0	$0
2011	9	$0	$0
2010	4	$0	$0
2009	2	$0	$0
2008	14	$0	$50,000
2007	15	$0	$0
2006	0	$0	$0
2005	3	$5,000	$0
2004	2	$0	$0
2003	1	$0	$0
2002	0	$0	$0
2001	3	$0	$0
2000	1	$0	$0
1999	0	$0	$0
1998	9	$0	$0
1997	1	$0	$0
1996	3	$0	$0
1995	4	$0	$0
1994	4	$0	$0
1993	0	$0	$0

1992	0	$0	$0
1991	0	$0	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
22	**77**	**$227**	**$2,273**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

Twelve lightning events (Table 3-20) have caused an average of more than $34,000 in property damage per year over the last 19 years in Franklin County. These events include the lightning strike that occurred in Rowe on August 4, 2012 that resulted in the complete destruction of the Rowe Elementary School, for a property loss of $500,000. The average property damage per year during this period excluding that event in 2012 is $8,222.

Table 3-20: Lightning Events in Franklin County

Year	# of Lightning Events	Annual Property Damage	Annual Crop Damage
2012	1	$500,000	$0
2011	0	$0	$0
2010	1	$15,000	$0
2009	0	$0	$0
2008	1	$10,000	$0
2007	0	$0	$0
2006	0	$0	$0
2005	1	$50,000	$0
2004	1	$35,000	$0
2003	0	$0	$0
2002	1	$15,000	$0
2001	1	$20,000	$0
2000	0	$0	$0
1999	0	$0	$0
1998	0	$0	$0
1997	1	$3,000	$0
1996	0	$0	$0
1995	2	$0	$0
1994	2	$0	$0
# of Years	**Total # of Events**	**Average Annual Property Damage**	**Average Annual Crop Damage**
19	**12**	**$34,105**	**$0**

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: http://www.ncdc.noaa.gov/stormevents/.

The entire built environment of Warwick is vulnerable to the high winds and/or flooding from a tornado, microburst, or thunderstorm. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would

result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of an extreme tornado or thunderstorm event.

Population Impacts
As discussed above, some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to tornado, thunderstorm and microburst impacts in Warwick are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a tornado, microburst, or thunderstorm.

Overall Vulnerability Assessment

Thunderstorms are common in New England, and can impact property, crops, utilities and the population of Warwick. Tornados and microbursts are less common, but can cause significant damage when they do occur. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events. The cascade effects of severe storms include utility losses and transportation accidents and flooding. Losses associated with the flood hazard are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding.

Data Deficiencies

In assessing the risks to Warwick from tornados and microbursts and associated storms events such as thunderstorms, hail and lightning, the following data deficiencies were identified:

- Records of damages to the built and natural environment due to tornados and microbursts and associated storms events such as thunderstorms, hail and lightning in Warwick is not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Wildfires and Brushfires

Hazard Summary

According to data from the Warwick Fire Department, they responded to 17 wildfires between 2009 and 2012. Wildfires can damage woodlands, homes, utilities and buildings, and could cause injuries or deaths. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Burn piles that blaze out of control, lightning strikes in forested land, campfires improperly managed, and arson can cause wildfires. Warwick is vulnerable to these conflagrations, especially in times of drought. As indicated in the vulnerability assessment section, dead timber from the 2008 ice storm may have contributed to subsequent wildfires. Fire suppression can be expensive and dangerous for firefighters, and wildfires can threaten wildlife and human habitat and health.

Data Collected and Used

National weather databases and Town of Warwick data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. Data from this website shows no wildfires have occurred in or impacted Franklin County in the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on wildfires and brushfires hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

A major out-of-control wildfire can damage property, utilities and forested land; create smoke that can cause breathing problems; and injure or kill people.

Property Damage

No property damage, injuries or deaths have been recorded for Warwick's 17 fires between 2009 and 2012.

Because Warwick is heavily wooded, has so many historic wooden structures, and has the potential fuel load of dead trees and limbs from the 2008 ice storm, the entire built environment of the Town is vulnerable to a wildfire. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of an extreme tornado or thunderstorm event.

Population Impacts

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a wildfire or brushfire.

Overall Vulnerability Assessment

While wildfires have caused minimal damage, injury and loss of life to date in Warwick, their potential to destroy property and cause injury or death exists. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Wildfires can also cause utility disruption and air-quality problems. Particular areas of vulnerability include low-income and elderly populations.

Data Deficiencies

In assessing the risks to Warwick from wildfire hazards, the following data deficiencies were identified:

- Records of damages to the built and natural environment due to wildfires in Warwick is not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Dam Failures

Hazard Summary

Dams hold back water, and when a dam fails, the potential energy of the stored water behind the dam is instantly released as water rushes in torrent downstream, flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

When a dam fails, huge quantities of water quickly flow downstream. Areas adjacent to a river or stream or on low ground are in danger of being inundated by a large volume of water that could destroy structures, utilities, roadways and bridges, and cause injuries or deaths. Many dams in Massachusetts were built in the 19th century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

Data Collected and Used

Data from the National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no dam failures have occurred in or impacted Franklin County in the last 20 years.

Impact on the Community

Exposure and Loss Estimation

While dam failures are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death.

Property Damage

Historic data for dam failure events indicate that between 1993 and 2012, no events were recorded in Franklin County, causing no property damage or population impacts.

Structures that lie in the inundation area of each of the dams in Warwick are vulnerable to a dam failure. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of a dam failure.

Population Impacts

Populations considered most vulnerable to dam failure are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a dam failure.

Overall Vulnerability Assessment

Dam failures, while rare, can destroy roads, structures, facilities, utilities, and impact the population of Warwick. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, buildings in the floodplain or inundation areas, and infrastructure such as roadways and utilities that can be damaged by such events. According to the members of the Local Multi-Hazard Mitigation Committee, no dam failures have occurred in the last 20 years in Warwick.

Data Deficiencies

In assessing the risks to Warwick from dam failure hazards, the following data deficiencies were identified:

- Up-to-date data for the location and condition of dams within Warwick is difficult to obtain the DCR Office of Dam Safety Legal Department. This plan uses 2011 data. For example, Sheomet Lake Dam is listed as being in poor condition with significant structural, operational, and maintenance deficiencies even though it has recently been completely rebuilt by DCR.

Earthquakes

Hazard Summary

Earthquakes are rare in Franklin County, however temblors are unpredictable and can cause significant damage to roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for earthquakes.

While rare in Franklin County, earthquakes have happened in New England. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.[40] Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as landslides, avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings,

[40] Northeast States Emergency Consortium web site: www.nesec.org/hazards/earthquakes.cfm

buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.[41]

Data Collected and Used

The National Oceanic and Atmospheric Administration recorded no earthquakes for Franklin County in the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on earthquake hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

A major earthquake could cause severe damage to Warwick buildings, including older structures that were built before a 1975 law requiring new buildings to withstand earthquakes.

Property Damage

Historic data for earthquake events indicate that between 1991 and 2012, no earthquakes were recorded in Franklin County during this period, causing no damage to property.[42]

The entire built environment of Warwick is vulnerable to earthquakes. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of an earthquake.

Population Impacts

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of an earthquake.

Overall Vulnerability Assessment

Earthquakes, while rare, could cause significant impacts and losses to the roads, structures, facilities, utilities, and population of Warwick. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes and buildings erected before 1975, and infrastructure such as roadways and utilities that could be damaged by earthquakes. According to members of the Local Multi-Hazard Mitigation Committee, no earthquakes have had a significant impact on Warwick in the last 20 years. However, in August of 2011 an earthquake centered in Virginia was felt in the Franklin County region, including Warwick.

Data Deficiencies

In assessing the risks to Warwick from earthquakes, no data deficiencies were identified.

[41] Federal Emergency Management Agency web site: www.fema.gov/hazards/earthquakes/quake.shtm.
[42] NOAA National Climactic Data Center. http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms.

Landslides

Hazard Summary

Landslides rarely occur in Franklin County but have occurred in the eastern part of the state: Following heavy rains in March 2010, Walpole and Topsfield experienced landslides that destroyed a storage building and closed a portion of Route 1. The Topsfield slide resulted in a tree land on a passing car, but no injuries were reported. Earlier that month, a mudslide at a construction site brought mud within 12 feet of train tracks at the Wellesley Hills station of the Massachusetts Bay Transportation Authority in Wellesley. Landslides are most often caused by heavy rains destabilizing slopes but can have other causes, including clearing land for development, earthquakes, and vibrations from machinery or blasting. Landslides can be dangerous because they are unexpected and fast. They can bury structures with little warning and rescue efforts can be threatened by new slides.

Data Collected and Used

National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no landslide events in Franklin County for the last 20 years. More recent information was obtained from television and newspaper reports following local landslide incidents in 2011. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on landslide hazard data and mitigation measures.

Impact to the Community

Exposure and Loss Estimation

While landslides are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Continued development, particularly on steep slopes or unstable soils, increases the chances that landslides will be a danger.

Property Damage

Historic data for landslide events indicate that between 1993 and 2012, two landslide events were recorded in Franklin County. Television and newspaper reports detailed the following landslide incidents in Franklin County in 2011: 1) on March 7, 2011 a landslide occurred in Greenfield when torrential rains swept away a piece of the Green River Cemetery into the backyards of homes on nearby Meridian Street; and 2) on November 26, 2011 Routes 5 & 10 in Deerfield had to be closed to clear a blocked culvert that was the result of a slow-moving landslide that was causing significant flooding.

Structures that lie in the area of a landslide in Warwick are vulnerable. Table 3-14 on page 44 identifies the assessed value of all residential and commercial land uses in Warwick as $74,986,654, and the losses that would result from 1% ($748,867), 5% ($3,749,333), and 10% damage ($7,498,665) to this inventory as a result of a landslide.

Population Impacts

Populations considered most vulnerable to landslide impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-11 on page 42, there are

an estimated 175 people in Warwick aged 65 or over and those living in households with an income below $25,000 per year who could be exposed the impacts of a landslide.

Overall Vulnerability Assessment

Landslides, while rare in Franklin County, can destroy roads, structures, facilities, utilities, and impact the population of Warwick. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, and buildings, roadways, and utilities near the foot of slopes, especially when slopes are destabilized.

Data Deficiencies

In assessing the risks to Warwick from landslides, no data deficiencies were identified.

Ice Jams

Hazard Summary

Ice jams (or ice dams) occur when water builds up behind a blockage of ice. Ice jams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form an ice dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. The resulting flow of water when an ice jam is broken can cause flooding downstream, threatening infrastructure, structures, and roadways.

Data Collected and Used

The National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no ice jam events or damage in Warwick over the last 20 years. The Cold Regions Research Laboratory website was consulted and data, by river, was reviewed. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on ice jam hazard data and mitigation measures.

Impact to the Community

Exposure and Loss Estimation

Losses to ice jams include the rising waters along the river or stream that is being dammed, and the rush of water downstream when the dam either melts or is broken up by human intervention. Buildings, roadways and utilities are threatened by ice blockages.

Property Damage

Data on ice jams in Franklin County indicate that no property damage or injuries or deaths occurred as the result of ice jams in the last 20 years.

The structures and people most at risk from an ice jam are those within the floodplain. Table 3-21 provides an estimated assessed value of the land uses in the towns flood hazard areas.

Table 3-21: Estimated Assessed Value of Land Use in Flood Hazard Area

Land Use	Total Acres in Town	Total Assessed Value in 2013	Average Assessed Value Per Acre	Acres In Floodplain	Estimated Assessed Value In Flood Hazard Area
Residential	447	$73,600,184	$164,654	6.02	$991,217
Commercial	0	$1,386,470	N/A	0	$0
Industrial	0	$0	$0	0	$0
Totals	447	$74,986,654	$164,654	0	**$991,217**

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section (2013): http://www.mass.gov/dor/local-officials/municipal-data-and-financial-management/data-bank-reports/property-tax-information.html; 2005 MassGIS Land Use data.

Population Impact

Populations considered most vulnerable to ice jam impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. As shown in Table 3-9 on page 40, an estimated 24 people, or 3.0% of Warwick's total population, reside in the floodplain and could be exposed the impacts of an ice jam.

Overall Vulnerability Assessment

Ice jams occur throughout New England, often causing significant impacts and losses to roads, structures, facilities, utilities, and the population. Existing and future mitigation efforts should continue to be developed and employed that will enable Warwick to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways near rivers and streams and utilities and low-lying areas. According to the members of the Local Multi-Hazard Mitigation Committee, no ice jams have occurred in the last 20 years in Warwick, although the 2004 Warwick Annual Town Report indicated that beaver dams caused flooding and ice build-up on Northfield Road during the winter and early spring.

Data Deficiencies

In assessing the risks to Warwick from ice jams, no data deficiencies were identified.

Manmade Hazards[43]

Hazard Summary

Manmade hazards are being assessed at the local level for the first time in this plan update. A preliminary assessment was made only of those manmade hazards of an accidental nature, such as transportation accidents or fixed facility accidents involving hazardous materials. No formal vulnerability assessment was done on manmade hazards.

[43] Content adapted from Commonwealth of Massachusetts State Hazard Mitigation Plan 2010

HAZARD ANALYSIS METHODOLOGY

In updating Warwick's Hazard Mitigation Plan, the Franklin Regional Council of Governments developed the All Hazards Risk Assessment methodology for assessing the risk of hazards. The All Hazards Risk Assessment is an interactive table that the Warwick Local Multi-Hazard Mitigation Planning Committee completed with the FRCOG staff to evaluate all the hazards that can impact the town based on frequency of occurrence, severity of impacts, area of occurrence and preparedness. The methodology yields a Weighted Hazard Index, which is a measure of the likelihood of future occurrence for each hazard as well as the potential impacts each hazard may have on the built and natural environments, the population and the infrastructure. The completed table also gives the town an overall understanding of the hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Warwick's planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Note that the Assessment does not include manmade hazards, given lack of data assessed for this plan.

In rating the hazards, the committee considered the following issues for each category:

Issues considered when ranking frequency of occurrence:

1) Known risk
2) Historical data (previous occurrences)

Issues considered when ranking severity of impacts (See Table 3-24 for complete definitions):

1) Building stock
2) Critical facilities
3) Transportation systems
4) Lifeline utility systems
5) Communications systems and networks
6) High potential loss facilities
7) Hazardous material facilities
8) Economic elements
9) Special consideration areas
10) Historic, cultural, and natural resource areas
11) Natural resources

Issues considered when ranking preparedness:

1) Status of current plans
2) Training status
3) Availability of backup systems
4) Community resources (equipment, personnel, etc.)

The following rating charts were used to determine the rating for each event:

Table 3-22: Frequency of Occurrence Rating Chart

Classification	#	Frequency of Occurrence
Very High	5	events that occur at least once each year (100% per year)
High	4	events that occur from once in 2 years to once in 4 years (25% to 50% per year)
Medium	3	events that occur from once in 5 years to once in 50 years (2% to 20% per year)
Low	2	events that occur from once in 50 years to once in 100 years (1% to 2% per year)
Very Low	1	events that occur less frequently than once in 100 years (less than 1% per year)

Table 3-23: Severity of Impacts Rating Chart

Classification	#	Severity of Multiple Impacts
Catastrophic	4	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	3	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	2	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	1	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Table 3-24: Severity of Impacts Definitions

Severity of Impact Category	Severity of Impact Category Definitions
Built	Building Stock includes residential, commercial, industrial, and institutional buildings.
Built	Hazardous Material Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.
Built	Historic, Cultural, and Natural Resource Areas may include buildings, structures, objects, sites, national and local historic or significant districts, and historical archival storage facilities.
Infrastructure	Critical Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Since vulnerability is based on service losses as well as building structure integrity and content value, assess the effects on the service function interruption of critical facilities as well as their physical aspects. For purposes of this mitigation planning guidance, critical facilities may include emergency service facilities such as hospitals and other medical facilities, jails and juvenile detention centers, police and fire stations, emergency operations centers, public works facilities, evacuation shelters, schools, and other uses that house special needs populations.
Infrastructure	Transportation Systems include airways (including airports, heliports, etc.), roadways (including highways, bridges, tunnels, roadbeds, overpasses, transfer centers, etc.), railways and public transit (including trackage, tunnels, bridges, rail yards, depots, etc.), and waterways (including canals, locks, seaports, ferries, harbors, dry-docks, piers, etc.).
Infrastructure	Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power, substations, power lines, etc.
Infrastructure	Communications Systems and Networks such as telephones, emergency service radio systems, repeater sites and base stations, television and radio stations, etc.
Natural	Natural Resources include agricultural land, water supply lands, rivers.

Severity of Impact Category	Severity of Impact Category Definitions
Population	High Potential Loss Facilities include facilities that would have a high loss associated with them, such as nuclear power plants or dams.
Population	Economic Elements include major employers, financial centers, and other business or retail districts in the community that could significantly affect the local or regional economy if interrupted.
Population	Special Consideration Areas include areas of high density residential, commercial, institutional, and industrial development that, if damaged, could result in economic and functional losses and in high death tolls and injury rates.

Table 3-25: Area of Occurrence Rating Chart

Classification	#	Percentage of Town Impacted
Large	3	More than 50% of the town affected.
Medium	2	10 to 50% of the town affected.
Isolated	1	Less than 10% of the town affected.

Table 3-26: Preparedness Rating Chart

Classification	#
Poor	3
Fair	2
Good	1

To determine the final hazard index for each hazard, each category was assigned a weight. Frequency of Occurrence was given the most weight (45%), followed by Severity of Impacts (30%), Area of Occurrence (15%), and Preparedness (10%). Ratings were entered into a spreadsheet which calculated the weighted hazard index for each hazard. The Weighted Hazard Index represents the probability of occurrence of future events. Hazards with higher index scores represent the events most in need of organization focus and resources for emergency planning and mitigation projects.

The results of the All Hazards Vulnerability Assessment for the Town of Warwick can be seen in Table 3-27. The hazards receiving a Weighted Hazard Index of 4 or more are—in order of vulnerability—Hurricanes and Tropical Storms (4.75), Severe Winter Storms (4.45), and Tornados, Microbursts and Thunderstorms (4.45). The Committee rated Severe Winter Storms as the hazards most frequently occurring in Warwick and the severity of impact as Limited, with only minor injuries and property damage and shutdown of facilities for more than one day. Hurricanes/Tropical Storms and Tornados/Microbursts/Thunderstorms were rated as having a low frequency of occurrence, but as having a Critical severity of impact, with multiple injuries possible, more than 25% of property in the affected area damaged, and complete shutdown of facilities for more than one week.

For Floods—rated the fourth highest vulnerability—the Committee evaluated the Town's frequency of occurrence as low, but the severity of impacts as Critical. In the Town's hazard mitigation planning, much emphasis has been placed on flooding and yet the Vulnerability Assessment helped to highlight areas in which more hazard mitigation planning might be needed, such as for Hurricanes/Tropical Storms and Tornados/Microbursts/Thunderstorms.

Table 3-27: Warwick All Hazards Vulnerability Assessment

EVENTS	Frequency of Occurrence*	FOC Weighted Value	Severity of Impacts*				SOI Weighted Value	Area of Occurrence*	Add Weighted Value	Preparedness	Prep. Weighted Value	Weighted Hazard Index
ASSIGNED WEIGHTING FACTOR	**45%**		**30%**					**15%**		**10%**		
INDEX VALUE	**1-5**		**Built 1-4***	**Natural 1-4***	**Population 1-4***	**Infrastructure 1-4***		**1-3**		**1-3**		
NATURAL HAZARDS												
Floods	2	0.9	2	2	2	3	2.7	1	0.15	1	0.1	3.85
Severe Winter Storms	4	1.8	1	2	2	2	2.1	3	0.45	1	0.1	4.45
Hurricanes/Tropical Storms	2	0.9	2	3	3	3	3.3	3	0.45	1	0.1	4.75
Tornados/Microbursts/ Thunderstorms	2	0.9	2	3	3	3	3.3	1	0.15	1	0.1	4.45
Wild Fires/Brush Fires	2	0.9	1	2	1	1	1.5	1	0.15	1	0.1	2.65
Dam Failures	2	0.9	1	1	1	2	1.5	2	0.3	1	0.1	2.80
Earthquakes	1	0.45	2	1	1	2	1.8	2	0.3	1	0.1	2.65
Landslides	1	0.45	1	1	1	1	1.2	1	0.15	1	0.1	1.90
Ice Jams	1	0.45	1	1	1	1	1.2	1	0.15	1	0.1	1.90

* See rating charts in Tables 3-22 to 3-26.

DEVELOPMENT TRENDS ANALYSIS

In assessing development trends for the Town of Warwick—and the impact those trends might have on hazard mitigation—the Committee was asked to evaluate the probability of development in town and areas most likely to be targeted for development. The Committee was also asked about changes in industry, proposed housing and retail development, and any major highway or public transit improvements that might change accessibility to parts of town. Additionally, data such as number of construction permits issued, change in population, current zoning bylaws and the acres of developable land was considered.

According to Census data for new privately-owned residential building permits issued in Warwick, a total of 21 permits were issued for the construction of single-family homes between the years 2000 and 2010. Over this period, there has been a marked decline in the number of residential permits issued, with none issued since 2007. From 2000 to 2007, an average of 2.6 permits were issued annually.[44] None of town's 363 housing units counted in the 2010 U.S. Census qualify for the Massachusetts Department of Housing and Community Development's Subsidized Housing Inventory, falling far short of the 10% threshold and leaving the town vulnerable to a proposal for a comprehensive affordable housing development under Chapter 40B.[45]

The Committee felt that future residential development in Warwick is not likely to take place in new subdivisions as there has been little interest expressed by developers since the late 1980s and the town adopted comprehensive Regulations Governing the Subdivision of Land in 2008. In addition, usable road frontage where homes could be built on Approval Not Required (ANR) lots is limited. Future development in town is further limited by the fact that State conservation agencies, the Town of Warwick, and non-profit land trusts and conservation organizations own a significant portion of Warwick's land. Almost all of this land is permanently protected from development. Nearly 12,500 acres of land is protected in this way, representing approximately 50% of the overall land area in town.[46] Private landowners in Warwick have permanently protected another 2,000 acres and several more large parcels are have been permanently protected in recent years, since the publication of the Warwick Open Space and Recreation Plan in 2010. Including land that is temporarily protected under Chapters 61, 61A and 61B, more than 75% of land in Warwick is protected open space.[47] Combined with the unique topography of the Warwick, which is dominated by steep slopes and wetlands, the potential for development in town is limited.

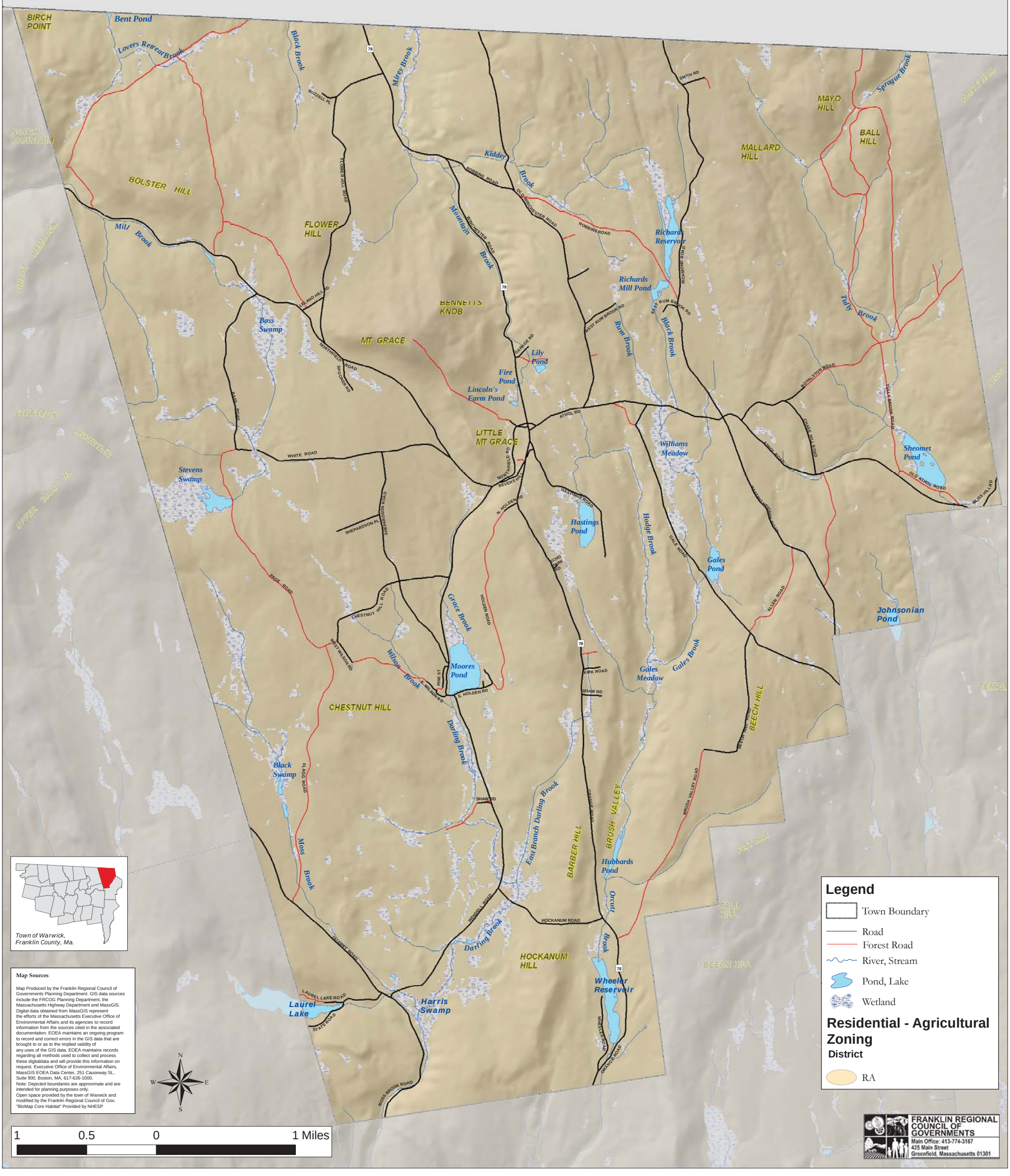
[44] Unites States Census Bureau, CenStats Database: http://censtats.census.gov/bldg/bldgprmt.shtml. Available data is no longer broken out my municipality, so only county information is available after 2010.
[45] http://www.mass.gov/hed/docs/dhcd/hd/shi/shiinventory.pdf.
[46] Town of Warwick Open Space and Recreation Plan 2010-2017, Section 5: Inventory of Lands o Conservation and Recreation Interest, Subsection C: Public and Non-Profit Parcels, pp. 5-11 to 5-20.
[47] Town of Warwick Open Space and Recreation Plan 2010-2017, Section 5: Inventory of Lands o Conservation and Recreation Interest, Table 5-1: Summary of Protected Open Space in Warwick, p. 5-2.

The total population for 2010 in Warwick is 780. The population increase in Warwick between 2000 and 2010, based on 2010 U.S. Census figures, was 30 people or 4%. This is higher than Franklin County as a whole, which saw a decrease of 0.2% countywide over this period, and higher than the increase of 3.1% reported for Massachusetts as a whole.

As discussed in the Vulnerability Assessment Section of this plan, current development in the floodplain includes no land in commercial, public/institutional or industrial use. However, there are over 6.02 acres of residential use in the floodplain. The entire town is zoned Residential-Agricultural. An analysis of the percentage of acres in the floodplain relies on estimations. According to the dimensional requirements in Section Four: Lots and Buildings of Warwick's Zoning Bylaws, the minimum lot size is 87,120 square feet (two acres). Using the approximate floodplain acreage and the minimum lot size, there are approximately 126 potential developable lots in the floodplain. Further GIS analysis beyond the scope of the current project would be necessary to determine the exact number of developable acres in and along the floodplain. (See the Critical Facilities & Infrastructure 2013 Map and the official Zoning Map following this section.)

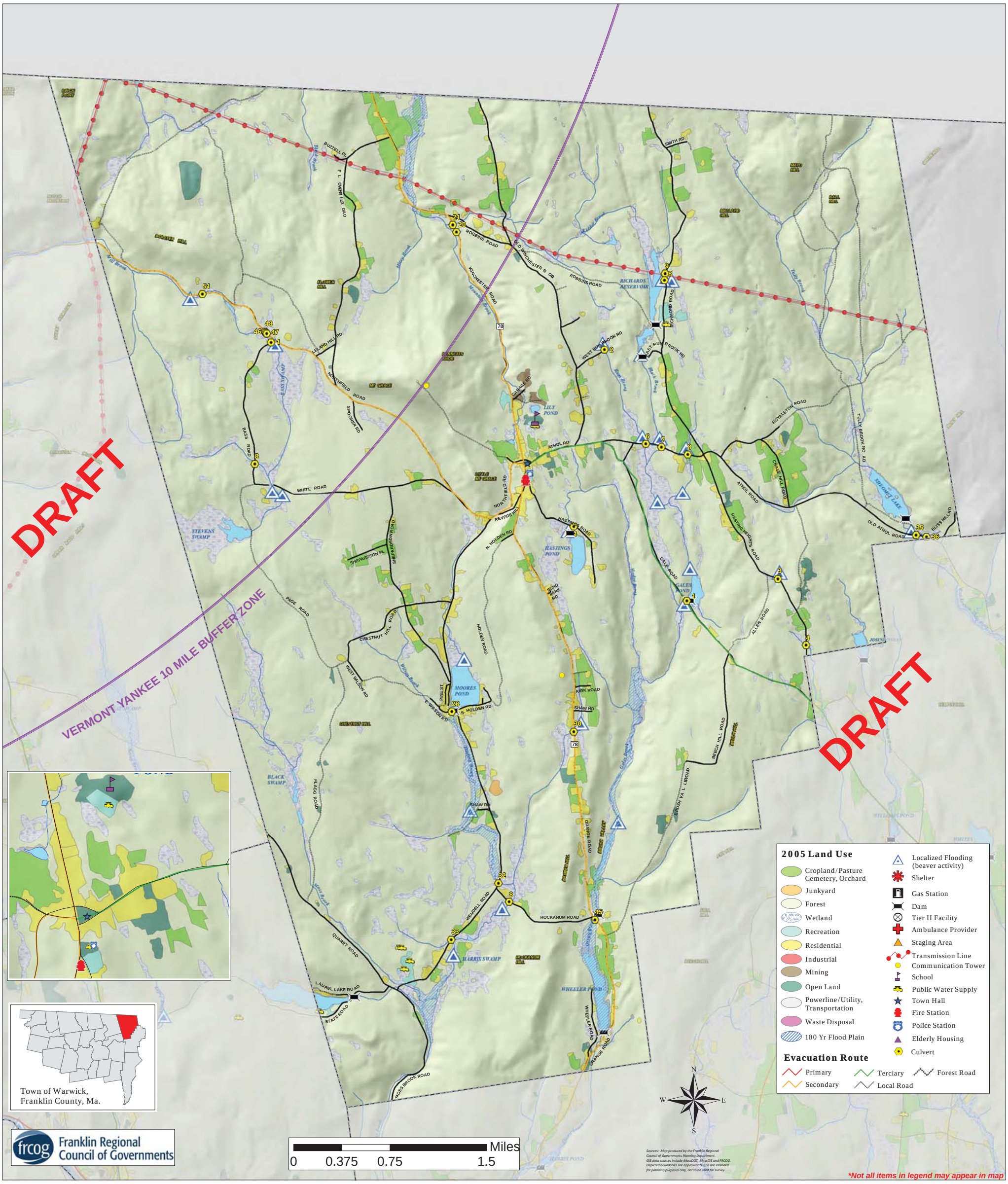
Town of Warwick, Franklin County, MA

Open Space and Recreation Plan
Zoning 2009



Critical Facilities & Infrastructure, 2013

Town of Warwick



Critical Linkages Warwick Ma.

UMass Critical Linkages Project

- Surveyed Crossings
- Unsurveyed Crossings

Size of the circles on the map is proportional to the change in "aquatic connectedness" that would be achieved by crossing replacement. The larger the circles the greater the improvement in "aquatic connectedness."

As part of the Critical Linkages Project, scientists at UMass Amherst used the Conservation Assessment and Prioritization System (CAPS) to model the change in aquatic connectedness that would result from the individual replacement or upgrade of culverts and bridges to meet the MA River and Stream Crossing Standards. Where field assessments were available as part of the River and Stream Continuity Project we used the field-based aquatic crossing scores for those structures; otherwise, we used scores from a model that was derived from data in the Stream Continuity Crossings Database. Impact Scores are an estimate of the improvement in aquatic connectedness based on the CAPS models. These predictions can be used to target field investigations but should be verified in the field before making decisions on culvert or bridge replacement.

The Critical Linkages project is funded by and The Nature Conservancy and the Federal Highway Administration via a contract with the Massachusetts Department of Transportation. Information on this map was prepared in cooperation with the Massachusetts Department of Transportation Office of Transportation Planning and the United States Department of Transportation, Federal Highway Administration. The contents of this map reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Massachusetts Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

4 –MITIGATION STRATEGIES

This section of the Hazard Mitigation Plan is the long-term blueprint for reducing the potential losses identified in the risk assessment.

CURRENT MITIGATION STRATEGIES

Floods

The Critical Facilities & Infrastructure Map for the Town of Warwick shows the 100-year flood zone identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a 1% chance of occurring in any given year.

The major floods recorded in Warwick during the 20th and 21st centuries have been the result of rainfall alone or rainfall combined with snowmelt. One of the goals of this Multi-Hazard Mitigation Plan is to evaluate all of the Town's existing policies and practices related to hazards and identify potential gaps in protection.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Warwick lists the following generic mitigation measures for flood planning:

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Strict adherence should be paid to land use and building codes, (e.g., Wetlands Protection Act), and new construction should not be built in flood prone areas.
- Ensure that flood control works are in good operating condition at all times.
- Natural water storage areas should be preserved.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

The Comprehensive Emergency Management (CEM) Plan for Warwick lists the following generic preparedness and response measures for floods:

- Place emergency operations center (EOC) personnel on standby during stage of flood 'watch' and monitor NWS/New England River Forecast Center reports.
- Ensure that public warning systems are working properly and broadcast any information that is needed at this time.
- Review mutual aid agreements.
- Monitor levels of local bodies of water.
- Arrange for all evacuation and sheltering procedures to be ready for activation when needed.

- Carry out, or assist in carrying out needed flood-proofing measures such as sand bag placement, etc.
- Regulate operation of flood control works such as flood gates.
- Notify all emergency management related groups that will assist with flood response activities to be ready in case of flood 'warning.'
- Broadcast warning/notification of flood emergency.
- Coordinate traffic control and proceed with evacuation of affected populations as appropriate.
- Open and staff shelters and reception centers.
- Undertake, or continue to carry out flood proofing measures.
- Dispatch search and rescue teams and emergency medical teams.

Evacuation Options

The majority of land in the 100-year floodplain in Warwick is along Mountain Brook, Gales Brook, Darling Brook, and Moss Brook. Most of the residential development in Town is located outside the 100-year floodplain. The Warwick eCEMP has recently been updated to reflect the designation of the Warwick Elementary School as a Mass Care Shelter in Town, since it now has a generator large enough to run the critical areas of the facility that would be needed to use it as a shelter, including the kitchen and bathrooms (which have showers). The following are the flood evacuation routes listed in the eCEMP: Route 78 (road bisects town North/South); Northfield Rd (from center of town west to Northfield border); and Athol Rd (from center of town east to Athol border).

The Town of Warwick faces potential flood hazards from the 100-year floodplain, localized flooding, and inundation due to dam failures. Emergency management personnel should assess existing floodplain and dam failure data to determine an appropriate evacuation plan.

Flood Control Structures

FEMA has identified no flood control structures within the Town of Warwick. Floods on the Connecticut River and portions of its major tributaries that are prone to backwater effects are controlled by nine flood control reservoirs located upstream in Massachusetts, New Hampshire, and Vermont.

Land Use Regulations that Mitigate Impacts from Flooding

The Town of Warwick has adopted several land use regulations that serve to limit or regulate development in floodplains, to manage stormwater runoff, and to protect groundwater and wetland resources, the latter of which often provide important flood storage capacity. Relevant sections of these regulations are provided in Appendix B and summarized and evaluated in Table 4-1. The land use regulations related to flooding include:

Regulations Governing the Subdivision of Land in the Town of Warwick, Franklin County, Massachusetts (See Appendix B for complete language of the relevant sections):

- Section 4-3: Definitive Plan
  - Section 4-3.E: Contents
  - Section 4-3.F: Environmental Impact Report

    - Section 4-3.G: Development Impact Statement
    - Section 4-3.H: Compliance with the Wetlands Protection Act
    - Section 4-3.K: Performance Guaranty
- Section 4-4: Subdivision Standards in the Floodplain
- Article V: Design Standards
    - Section 5-4: Protection of Natural Features
    - Section 5-8: Easements
    - Section 5-11: Drainage
- Article VI: Required Improvements for Approved Subdivisions
    - Section 6-4: Curbs and Berms
    - Section 6-11: Utilities
    - Section 6-12: Subdivision Fire Protection
- Appendix A: Development Guidelines by Landscape Type

Zoning By-Laws of the Town of Warwick, Massachusetts (See Appendix B for complete language of the relevant sections):

- Section Two: Permitted and Prohibited Uses
    - Section 2.B: Prohibited Uses
    - Section 2.C: Uses Allowed by Special Permit
- Section Five: Mobile Homes and Temporary Living Facilities
- Section Six: Conservation Development
    - Section 6.A.2: Purpose
    - Section 6.B.2: Contents of Application
    - Section 6.D: Minimum Requirements
- Section Eight: Particular Uses
    - Section 8.A: Erosion Control
    - Section 8.B: Earth Removal
    - Section 8.C: Driveways
- Section Ten: Site Plan Review
    - Section 10.F: Required Contents of a Site Plan
    - Section 10.J: Review Criteria
- Section Twelve: Flood Plain District
    - Section 12.A: Statement of Purpose
    - Section 12.E: Use Regulations

River and Stream Protection

The Town of Warwick follows the standards established by the Wetlands Protection Act (M.G.L. Chapter 131, Section 40).

Warwick Open Space and Recreation Plan

The 2006 Warwick Open Space and Recreation Plan identifies the resources critical to the Town's future welfare and devises procedures to protect them in a Seven-Year Action Plan. People live in Warwick because they like its rural, small town character. According to the 2009 Open Space and Recreation Survey, respondents also highly value the peace and quiet of the

town, open fields, forests and trails, high quality of the air and water, my/our perception of town values, and safety from crime and vandalism. There was a near universal consensus among survey respondents that it was very important or important to conserve forests, maintain the rural character of the town, and protect its clean drinking water, trails and scenic views. An overwhelming majority of respondents believed historic and archeological sites should be identified and protected, and by a 3 to 1 margin, respondents felt the sites should be made more accessible.

National Flood Insurance Program

The Town of Warwick participates in the National Flood Insurance Program, having recently joined in May 2012. As of January 31, 2013, there were not yet any policies in effect in Warwick. The Town's floodplain management program consists of regular enforcement of the relevant sections of the State Building Code (780 CMR) and the Massachusetts Wetlands Protection Regulations (310 CMR 10.00), as well as the required biennial reporting to the NFIP. The Town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps the town has taken to control flood losses. In the next five years, the town should consider joining the Community Rating System, in addition to continuing its ongoing activities associated with membership in the NFIP. See pages 111-114 for more information on NFIP.

Table 4-1: Existing Flood Hazard Mitigation Measures in Warwick

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Floodplain Overlay District				
Zoning Bylaws **Section 12: Floodplain Overlay District** (See also below under Zoning Bylaws)	The Town has a floodplain overlay district adopted in 2011, within which no encroachments (including fill, new construction, substantial improvements to existing structures, or other development) shall be allowed unless it is demonstrated by the applicant that the proposed development, as a result of compensating actions, will not result in any increase in flood levels during the occurrence of a 100-year flood. Residential construction in the floodplain, including accessory uses, is allowed only by Special Permit; commercial and industrial uses are prohibited.	See Flood Hazard Boundary Map (FHBM) dated January 24, 1975	Limited	None
Subdivision Rules and Regulations				
Article IV: Procedure for Submission and Review of Plans		Entire Town	Somewhat effective for controlling impacts from stormwater runoff.	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section 4-3: Definitive Plan Section 4-3.E: Contents of the Definitive Plan	Requires that the plans be prepared by a civil engineer or registered land surveyor. Plans must include the proposed system of drainage, including adjacent existing natural waterways; the location of all natural waterways, wetlands and water bodies within 300 ft. downstream of the subdivision's property boundaries, areas within the 100-year floodplain, areas within the inundation areas of any high or significant-hazard dams.		Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	
Section 4-3.F: Environmental Impact Report	All prospective Class II Subdivisions of between 4 and 9 lots shall be required to submit a detailed environmental impact report. The report would include analysis of stormwater runoff, soil erosion and other land capability effects; identification of surface or subsurface water features within the proposed subdivision and contiguous area; description of special physical conditions such as floodplains.			
Section 4-3.G: Development Impact Statement	All prospective Class I Subdivisions of 10 or more lots and all non-residential subdivisions shall be required to submit a detailed development impact statement. The DIS shall include a detailed assessment of the probable impacts of the proposed action on a wide variety of environmental, fiscal, and socioeconomic elements and factors.			
Section 4-3.H: Compliance with the Wetlands Protection Act	In accordance with MGL C.131, §40, no person shall remove, fill, dredge, or alter any watercourse, pond, floodplain or wetland and buffer areas within the jurisdiction of the Conservation Commission without filing written intention to perform said work with the Commission and the state DEP.			
Section 4-3.K: Performance Guaranty	Before endorsement of a Definitive Plan by the Planning Board the applicant shall agree to complete the required improvements and shall provide a form of performance guaranty. Before the Board shall fully release the interest of the Town in a performance guaranty, it shall require			

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
	written evidence from a registered civil engineer that the streets and drainage patterns, water mains, sanitary sewers, storm sewers and hydrants conform to the definitive plan.			
Section 4-4: Subdivision Standards in the Floodplain	All subdivision proposals shall be reviewed to determine whether they will be reasonably safe from flooding. If any part of a proposed subdivision is in a FEMA-defined Special Flood Hazard Area, it shall be reviewed to make sure that it minimizes flood damage; that all public and private utilities are constructed to minimize or eliminate flood damage; drainage system reduce exposure to flood hazards; and flood elevation data is provided for proposals greater than 5 lots or 5 acres, whichever is the lesser.	See Flood Hazard Boundary Map (FHBM) dated January 24, 1975	Limited	None
Article V: Design Standards Section 5-4: Protection of Natural Features Section 5-8: Easements Section 5-11: Drainage	Requires the preservation of all natural features including water courses, 100-year floodplains, wetlands, ponds and other water bodies, marshes, etc. Where a subdivision is bisected by or adjacent to a watercourse, either natural or manmade the Board may require a stormwater or drainage easement of at least 20 feet in width to conform to the width of the watercourse. The Board may also require an easement for watercourses that are not within the subdivision but may be affected by it. Storm drainage system shall be designed to intercept all stormwater drainage from the particular subdivision or any additional runoff that may be created by the subdivision. Stormwater must be piped underneath the roadway. All new culverts should be placed to maximize stream connectivity. No open water body or wetland shall be filled in. Post-construction stormwater runoff shall be no greater than preconstruction levels.	Entire Town	Somewhat effective	None
Article VI: Required Improvements for Approved Subdivisions		Entire Town	Somewhat effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section 6-4: Curbs and Berms	Curbing required only where the Planning Board determines that special conditions of topography, drainage requirements, steep roadway grade or high traffic density so required. Otherwise, curbing is not required and the adjoining shoulder, grass plot and ditch shall be graded and treated to carry the surface water runoff adequately without erosion.			
Section 6-11: Utilities	All electrical, telephone, fire alarm and other wires and cables shall be installed underground unless such installation is impractical or not in the best interest of the Town.			
Section 6-12: Subdivision Fire Protection	A Class I Subdivision (10 dwelling units or more) shall meet ISO rural fire flows of 500 gallons per minutes for 2 hours. Fire water sources shall be available for general fire fighting outside of the subdivision.			
Appendix A: Development Guidelines by Landscape Type	Categorizes land into 4 landscape types, based on landform, vegetation, and existing development: Open Plain; Wooded Plain; Mountain; and Village. Provides guidelines on development objectives, building siting, road location, vegetative cover, building design, and other considerations.	Entire Town	Somewhat effective	None
Zoning Bylaws				
Section Two: Permitted and Prohibited Uses		Entire Town	Effective	None
Section 2.B: Prohibited Uses	Prohibited uses include mobile homes or mobile home parks, junk yards, commercial waste disposal, hazardous or radioactive waste processing.			
Section 2.C: Uses Allowed by Special Permit	A Special Permit is required for: uses rendering impervious more than 20% of the area of any lot, or 10,000 square feet, whichever is less; uses involving commercial transmission, manufacture or storage of high-tension electrical power, fuel oil, gasoline, natural gas or other liquefied or gaseous petroleum products; construction or alteration of surface features or contours on excessive slopes; and earth removal.			

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section Five: Mobile Homes and Temporary Living Facilities	Mobile homes are allowed only as a temporary residence for 12 months if a home has been destroyed by fire or natural holocaust, or for 6 months while a permanent dwelling is under construction.	Entire Town	Effective	None
Section Six: Conservation Development <u>Section 6.A.2: Purpose</u> <u>Section 6.B.2: Contents of Application</u> <u>Section 6.D: Minimum Requirements</u>	 The purpose of a Conservation Development is to encourage the preservation of common land for conservation, agriculture, open space, forestry and recreational use; to preserve historical or archaeological resources; to protect existing or potential municipal water supplies; to protect the value of real property; to promote more sensitive siting of buildings and better overall site planning; to promote better utilization of land in harmony with its natural features and with the purposes of these By-laws through a greater flexibility in design; and to allow more efficient provision of municipal services. Application must include: A map and analysis of the site, including wetlands, a Forest Type Map prepared by a Licensed Professional Forester, water bodies, slopes greater than twenty-five percent (25%), soil types, areas within the 100 year flood zone, prevailing winds, solar aspect diagram, land prohibited from development by legally enforceable restrictions; a summary of the environmental concerns relating to the proposed plan; measures to prevent soil erosion, increased runoff, and flooding; proposed design features intended to integrate the proposed development into the existing landscape; and fire protection provisions. The maximum density for the Conservation Development under Method 1 shall be calculated by taking the parcel area and subtracting out any acreage that is wetlands, floodplains, existing permanently protected open space, land with slopes greater than 25%, other land	Entire Town	Effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
	prohibited from development by legally enforceable restrictions, easements or covenants, and other constraints dictated by these By-laws with 10% of the total parcel area subtracted for roads and drainage to find the Net Parcel Area. Building lots shall be in harmony with the natural terrain and other features of the land. At least 35 % of the total parcel of land shall be set aside as Protected Open Space.			
Section Eight: Particular Uses <u>Section 8.A: Erosion Control</u> <u>Section 8.B: Earth Removal</u>	The Building Inspector may require for any proposed construction or any proposed alteration of the surface features or contours of any land that site design, building design and construction procedures shall be modified so as to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed. No such construction or alteration of surface features or contours shall take place on slopes in excess of 25% except pursuant to a Special Permit issued by the Zoning Board of Appeals. No removal or relocation of sod, loam, clay, sand or gravel shall take place, except when incidental to and in connection with the construction of a structure, or except when incidental to the grading or developing of contiguous property, or except when pursuant to a Special Permit issued by the Zoning Board of Appeals. The Board may issue such a Special Permit only if it is satisfied that adequate provisions have been made to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are	Entire Town	Effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
	completed, or caused by methods of handling such materials at the site or transporting such materials in the Town. Culverts and Drainage: Existing drainage ditches parallel to public or private roads shall not be obstructed by any driveway. Upon a determination of need by the Highway Supervisor or by a licensed professional engineer hired by the lot owner, culverts of appropriate size and a durable material (such as asphalt-coated galvanized steel) shall be installed at no expense to the Town. Culvert diameter shall be at least 12 inches. Where appropriate in the judgment of the Highway Supervisor, driveways shall be provided with parallel drainage swales and with culverts allowing storm water to cross the driveway without creating erosion or washouts.			
Section 8.C: Driveways				
Section Ten: Site Plan Review Section 10.F: Required Contents of a Site Plan	Required contents of a Site Plan include: • A plan of existing site conditions that shows all site features, including topography, existing natural drainage and stormwater flow paths, wetland resource areas, forested areas, and agricultural areas; • Location of wetlands on site and within 300 feet of the property line; • Location and a description of all proposed septic systems, sewer connections, water supplies, storm drainage systems, utilities and other waste-disposal methods; • Location of water sources, cisterns, hydrants, drinking water pipes, and pipes for fire protection; • Location of areas with slopes greater than or equal to 25%, the 50-foot buffer area, and the boundaries of the land to be protected by the Conservation Restriction. • Surface drainage strategy that prevents increased drainage off-site or pollution; • A complete list of chemicals, pesticides, fuels and other potentially hazardous	Entire Town	Effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section 10.J: Review Criteria	• Materials to be used or stored on the premises in quantities greater than those associated with normal household use; • Provisions to protect against the discharge of hazardous materials or wastes to the environment due to spillage, accidental damage, corrosion, leakage or vandalism, including spill containment and cleanup procedures. Site Plan Review criteria include: • adequacy, arrangement, and safety of vehicular traffic access and circulation, and accessibility for fire, police, and emergency vehicles; • protection of the supply and quality of groundwater and surface water and natural resources and ecosystems; • provision of open spaces and pedestrian amenities; avoidance of erosion or sedimentation; • integration of the project into the existing terrain and surrounding landscape by minimizing impacts on wetlands, steep slopes, and hilltops; protecting visual amenities and scenic views; preserving unique natural or historical features; minimizing tree, vegetation and soil removal; minimizing grade changes, and integrating development with the surrounding neighborhood in a manner that is consistent with the prevailing pattern, design, and scale of development and that protects historic structures and features; • provision of underground utilities or conduits where feasible; • Adequacy of stormwater and drainage facilities, including avoidance of adverse impacts of stormwater runoff from the site. Drainage shall recharge groundwater to the extent practical, and surface waters flowing off-site shall not adversely affect drainage on adjacent properties or roads.			
Section Twelve: Flood Plain District Section 12.A: Statement of Purpose	(See also above at beginning of chart) The purposes of the Floodplain Overlay District are to: 1. Ensure public safety through reducing	See Flood Hazard Boundary Map (FHBM) dated January 24, 1975	Limited	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
	the threats to life and personal injury; 2. Eliminate new hazards to emergency response officials; 3. Prevent the occurrence of public emergencies resulting from a reduction in water quality, contamination, and/or pollution due to flooding; 4. Avoid the loss of utility services which if damaged by flooding could disrupt or shut down the utility network and impact regions of the community beyond the site of flooding; 5. Reduce costs associated with the response and cleanup of flooding conditions; 6. Reduce damage to public and private property resulting from flooding waters.			
Section 12.E: Use Regulations	Prohibited uses include: commercial or industrial uses; mobile homes on a site for longer than 6 months, storage of vehicles or equipment; dumping of trash; construction on slopes greater than 25%. Uses allowed by Special Permit include: single family residence, duplex, or apartment; altering, dumping, filling, or removal of riverine materials or dredging; new impoundments, dams, or other water obstructions.			
Other Protections				
State Building Code	The Town of Warwick has adopted the Massachusetts State Building Code.	Entire Town	Effective	None

Severe Winter Storms

Winter storms can be especially challenging for emergency management personnel even though the duration and amount of expected amount of snowfall has usually been forecast. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected.

Management Plans

The eCEMP for Warwick lists the following generic mitigation measures for severe winter storms:

- Develop and disseminate emergency public information concerning winter storms, especially material that instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.
- As it is almost guaranteed that winter storms will occur annually in Massachusetts, local government bodies should give special consideration to budgeting fiscal resources with snow management in mind.
- Maintain plans for managing all winter storm emergency response activities.

To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 4-1 can also be considered as mitigation measures for severe snowstorms/ice storms.

The eCEMP for Warwick lists the following generic preparedness and response measures for severe winter storms:

- Ensure that warning/notification and communications systems are in readiness.
- Ensure that appropriate equipment and supplies, (especially snow removal equipment), are in place and in good working order.
- Review mutual aid agreements.
- Designate suitable shelters throughout the community and make their locations known to the public.
- Implement public information procedures during storm 'warning' stage.
- Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and special needs).
- Broadcast storm warning/notification information and instructions.
- Conduct evacuation, reception and sheltering activities.
- If appropriate, activate media center. Refer to Resource Manual for media center information.
- Dispatch search and rescue and emergency medical teams.
- Take measures to guard against further danger from power failure, downed trees and utility lines, ice, traffic problems, etc.
- Close roads and/or limit access to certain areas if appropriate.
- Provide assistance to homebound populations needing heat, food and other necessities.
- Provide rescue and sheltering for stranded/lost individuals.

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms. The Town of Warwick Zoning Bylaws provide general regulations for erosion control (Section 8.A, Erosion Control) and its Subdivision Rules and Regulations sets design standards for storm drainage (Section 5-11, Drainage) and required improvements such as curb cuts and berms (Section 6-4: Curbs and Berms) which, although not specified as weather hazard mitigation, can serve to minimize the potential for accidents in the event of severe winter storms. These regulations are included in Appendix B and summarized and evaluated in Table 4-2.

Other Mitigation Measures

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service. Following is a potential mitigation measure to address this problem:
Review and update regulations to facilitate and seek out potential funding sources for undergrounding of utilities along main roads in the Town.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snowloads. The Town of Warwick has its own Building Inspector and is not a member of the Franklin County Cooperative Building Inspection Program.

Table 4-2: Existing Severe Winter Storm Mitigation Measures in Warwick

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Subdivision Rules and Regulations				
Article V: Design Standards Section 5-11: Drainage	Storm drainage system shall be designed to intercept all stormwater drainage from the particular subdivision or any additional runoff that may be created by the subdivision. Stormwater must be piped underneath the roadway. All new culverts should be placed to maximize stream connectivity. No open water body or wetland shall be filled in. Post-construction stormwater runoff shall be no greater than preconstruction levels.	Entire Town	Somewhat effective	None
Article VI: Required Improvements for Approved Subdivisions Section 6-4: Curbs and Berms	Curbing required only where the Planning Board determines that special conditions of topography, drainage requirements, steep roadway grade or high traffic density so required. Otherwise, curbing is not required and the adjoining shoulder, grass plot and ditch shall be graded and treated to carry the surface water runoff adequately without erosion.	Entire Town	Somewhat effective	None
Zoning Bylaws				
Section Eight: Particular Uses		Entire Town	Somewhat effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section 8.A: Erosion Control	The Building Inspector may require for any proposed construction or any proposed alteration of the surface features or contours of any land that site design, building design and construction procedures shall be modified so as to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed. No such construction or alteration of surface features or contours shall take place on slopes in excess of 25% except pursuant to a Special Permit issued by the Zoning Board of Appeals.			
Other Protections				
State Building Code	The Town of Warwick has adopted the Massachusetts State Building Code.	Entire Town	Effective	None

Hurricanes and Tropical Storms

Of all the natural disasters that could potentially impact Warwick, hurricanes and tropical storms provide the most lead warning time because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees north Latitude (Long Island). The flooding associated with hurricanes and tropical storms can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 4-1 can also be considered hurricane mitigation measures. High winds that oftentimes accompany hurricanes can also damage buildings and infrastructure.

Management Plans

The eCEMP for Warwick includes the following generic mitigation measures for hurricane and tropical storms planning and response:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that Warwick is enrolled in the National Flood Insurance Program. See pages 111-114 for more information on NFIP.
- Develop and enforce local building codes to enhance structural resistance to high winds and flooding. Build new construction in areas that are not vulnerable to direct hurricane effects.
- Maintain plans for managing all hurricane emergency response activities.

The eCEMP for Warwick includes the following generic preparedness and response measures for hurricanes and tropical storms:

- Ensure that warning/notification systems and equipment is ready for use at the 'hurricane warning' stage.
- Review mutual aid agreements.
- Designate suitable wind and flood resistant shelters in the community and make their locations known to the public.
- Prepare for coordination of evacuation from potentially impacted areas including alternate transportation systems and locations of special needs facilities.
- Activate warning/notification systems to inform public of protective measures to be taken, including evacuation where appropriate.
- Conduct evacuation of affected populations.
- Open and staff shelters and reception centers.
- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid activities.
- Take measures to guard against further danger from downed trees and utility lines, debris

Evacuation Options

The Warwick eCEMP has recently been updated to reflect the designation of the Warwick Elementary School as a Mass Care Shelter in Town, since it now has a generator large enough to run the critical areas of the facility that would be needed to use it as a shelter, including the kitchen and bathrooms (which have showers). In addition, the Town Hall has had all the necessary electrical hook-ups installed by students at the Franklin County Tech School to run critical areas of the building with a generator, and discussions are ongoing about potentially acquiring a generator and designating the Town Hall as another shelter. Committee members did note that the residents of Warwick are particularly resilient and many of them have generators and wood stoves so they are capable of, and prefer, sheltering in place at home.

Also of concern to the Town are potential damages to communications and other towers located in Town resulting from high winds. These would include the H tower and the Fire Tower on Mount Grace, as well as a cell tower located on Orange Road (Route 78). (See the Critical Facilities & Infrastructure Map for the location of these towers.) These towers are located in the woods away from the road and are anchored with cables to nearby trees, which can decay or themselves be damaged by the winds. In some case, access may be gained to them or to the wires connected to them only with the permission of the Conservation Commission, limiting the opportunity to control surrounding vegetation in order to mitigate damage from a wind storm.

Restrictions on Development

The Town of Warwick's Zoning Bylaws and Subdivision Regulations place few restrictions on developments that are wind-related. The Subdivision Regulations do require the utilities be located underground if feasible. The Town of Warwick does not have zoning bylaws regulating telecommunications, but they do require that uses involving transmission lines are allowed only by Special Permit. According to the Town of Warwick's Zoning Bylaws, mobile home parks are not permitted in the town, and individual mobile homes are permitted only in very limited circumstances and only for specified time periods.

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction according to the State Building Code, which addresses designing buildings to withstand high winds.

Table 4-3: Existing Hurricanes and Tropical Storms Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Subdivision Rules and Regulations				
Article VI: Required Improvements for Approved Subdivisions Section 6-11: Utilities	All electrical, telephone, fire alarm and other wires and cables shall be installed underground unless such installation is impractical or not in the best interest of the Town.	Entire Town	Somewhat effective	None
Zoning Bylaws				
Section Two: Permitted and Prohibited Uses Section 2.B: Prohibited Uses Section 2.C: Uses Allowed by Special Permit	Prohibited uses include mobile homes or mobile home parks. A Special Permit is required for uses involving commercial transmission, manufacture or storage of high-tension electrical power, fuel oil, gasoline, natural gas or other liquefied or gaseous petroleum products; construction or alteration of surface features or contours on excessive slopes.	Entire Town	Effective	None
Section Five: Mobile Homes &Temporary Living Facilities	Mobile homes are allowed only as a temporary residence for 12 months if a home has been destroyed by fire or natural holocaust, or for 6 months while a permanent dwelling is under construction.	Entire Town	Effective	None
Other Protections				
State Building Code	The Town of Warwick has adopted the Massachusetts State Building Code.	Entire Town	Effective	None

Tornados, Microbursts and Thunderstorms

Worcester County and areas just to its west, including portions of Franklin County, have been dubbed the "tornado alley" of the state because the majority of significant tornados in Massachusetts's weather history have occurred in that region. According to the Institute for Business and Home Safety, the wind speeds in most tornados are at or below design speeds that are used in current building codes.[48] Like earthquakes, the location and extent of potential damaging impacts of a tornado are completely unpredictable. Most damage from tornados– and associated storm events including thunderstorms, hail and lightning–comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail. Since the 1950s, there have been over twenty tornados that have touched down in Franklin County.

Management Plans

The eCEMP for Warwick includes the following generic mitigation measures for tornado, thunderstorm, and microburst planning and response:

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.
- Maintain plans for managing tornado response activities. Refer to the non-institutionalized, special needs and transportation resources listed in the *Resource Manual*.

The eCEMP for Warwick includes the following generic preparedness and response measures for tornados and microbursts:

- Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- Periodically test and exercise tornado response plans.
- Put emergency management on standby at tornado 'watch' stage.
- At tornado 'warning' stage, broadcast public warning/notification safety instructions and status reports.
- Conduct evacuation, reception and sheltering services to victims.
- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid agreements.
- Take measures to guard against further injury from such dangers as ruptured gas lines, downed trees and utility lines, debris, etc.
- Acquire needed emergency food, water fuel and medical supplies.
- Take measures relating to the identification and disposition of remains of the deceased.

[48] www.ibhs.org.

Evacuation Plans

The Warwick eCEMP has recently been updated to reflect the designation of the Warwick Elementary School as a Mass Care Shelter in Town, since it now has a generator large enough to run the critical areas of the facility that would be needed to use it as a shelter, including the kitchen and bathrooms (which have showers).

Zoning

See Hurricanes and Tropical Storms, previous section.

State Building Code

See Hurricanes and Tropical Storms, previous section.

Note: Table for Existing Tornado, Microburst and Thunderstorm Mitigation Measures is not shown as it is the same as Table 4-3: Existing Hurricanes and Tropical Storms Hazard Mitigation Measures in previous section.

Wildfires and Brushfires

Franklin County has approximately 356,174 acres of forested land, which accounts for 77% of total land area. Forest fires are therefore a potentially significant issue. Eighty-eight percent of Warwick is forested, so nearly the entire Town is therefore at risk of fire.

Management Plans and Regulatory Measures

The Warwick eCEMP includes the following generic mitigation measures for wildfire planning and response:

- Promote fire safety measures such as fire-safe landscaping and construction practices to the public and business communities.

The Warwick eCEMP includes the following generic preparedness and response measures for wildfires:

- Restrict outside burning etc. based on moisture levels, fuels supply conditions such as drought.
- Identify high vulnerability or problem areas.
- Utilize mutual aid, including the State Fire Mobilization Plan, as needed.

Burn Permits

Shelburne Control reports issuing 37 burn permits to Warwick residents in 2010 and 94 in 2011. Specific burn permit guidelines are established by the state, such as the burning season and the time when a burn may begin on a given day. It may be beneficial for the state to change some of their regulations to prevent wildfires and brushfires. Currently, the burning season extends from January 15th to May 1st. If the burning season were to start in November or December and end in April, this would allow for a longer season during the months found to be, traditionally, the least dry in Massachusetts. Currently, residents may only burn between 10 a.m. and 4 p.m. If state

guidelines were changed to allow for an earlier start time, this would allow for most of the burning to be conducted in the morning before winds traditionally increase.

Subdivision Review

The Subdivision Regulations require that the Definitive Plan include information about the size and location of all fire hydrants, pumps, and water lines between hydrants and pumps, source(s) of water for fire protection and storage cisterns and dry hydrants. In §1-2. Purpose, the Subdivision Regulations state that any subdivision plan filed with the Planning Board may receive the approval of said Board if consistent with the recommendations of the Warwick Fire Chief, among others. In addition, §6-12. Subdivision Fire Protection, addresses the specific requirements for providing adequate protection.

The Warwick Zoning Bylaws require that Conservation Development applications (Section Six) provide information on fire protection provisions, and require that the Fire Chief reviews the application to ensure that the proposal provides adequate emergency vehicle access to all lots.

Restrictions on Development

There are currently no restrictions on development that are based on the need to mitigate the hazards of wildfires/brushfires.

Table 4-4: Existing Wildfire/Brushfire Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Burn Permits				
Public Education/ Outreach	The fire department does not have a public education/outreach program.	Entire town.	Not effective.	Develop and distribute an educational pamphlet on fire safety and prevention.
Subdivision Rules and Regulations				
Article I: Authority and Purpose Section 1-2: Purpose	It is the intent of the Warwick Subdivision Rules and Regulations that any subdivision plan filed with the Planning Board may receive the approval of said Board if consistent with the recommendations of the Warwick Fire Chief, the Warwick Police Chief, Warwick Board of Health, the Warwick Conservation Commission, and the Warwick Highway Superintendent.	Entire Town	Somewhat effective	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Article VI: Required Improvements for Approved Subdivisions Section 6-12: Subdivision Fire Protection	A Class I Subdivision (10 dwelling units or more) shall meet ISO rural fire flows of 500 gallons per minute for 2 hours. It may do this by providing 60,000 gallons of water in one or more cisterns, or by a well with a fire pump and hydrant system, or by a combination of the two. Each cistern shall have a dry hydrant with paved off road parking for the fire truck, a provision for filling the cistern, and access to the cistern for repair and cleaning. The fire chief may provide for the location of the cisterns and other operational details. If the density and number of dwelling units requires a higher flow rate to comply with ISO standards the higher flow rate shall be met and may be met using a mix of cisterns and fire pumps. These fire water sources shall be available for general fire fighting outside of the subdivision unless there is a specific agreement to the contrary.	Entire Town	Somewhat effective	None
Zoning Bylaws				
Section Six: Conservation Development Section 6.B.2: Contents of Application	Application must include fire protection provisions. Upon receipt of the application, the Town Clerk shall transmit copies of the application to the Planning Board, Conservation Commission, the Board of Health, the Historical Commission, the Open Space Committee, the Highway Superintendent, the Fire Chief, the Police Chief, and the Building Inspector. Town Boards and municipal officials other than the Planning Board shall have 45 days from the date the completed application is received by the Town Clerk to report to the Planning Board their findings and recommendations. The Fire and Police Chief will review the application to ensure that the proposal provides adequate emergency vehicle access to all lots.	Entire Town	Somewhat effective	None

Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for. Most buildings and structures in the state were constructed without specific earthquake resistant design features.

Management Plans

The Warwick eCEMP lists the following generic mitigation measures for earthquakes:

- Community leaders in cooperation with Emergency Management Personnel should obtain local geological information and identify and assess structures and land areas that are especially vulnerable to earthquake impact and define methods to minimize the risk.
- Strict adherence should be paid to land use and earthquake resistant building codes for all new construction.
- Periodic evaluation, repair, and/or improvement should be made to older public structures.
- Emergency earthquake public information and instructions should be developed and disseminated.
- Earthquake drills should be held in schools, businesses, special care facilities and other public gathering places.

The Warwick eCEMP lists the following generic preparedness and response measures for earthquakes:

- Earthquake response plans should be maintained and ready for immediate use.
- All equipment, supplies and facilities that would be needed for management of an earthquake occurrence should be maintained for readiness.
- Emergency management personnel should receive periodic training in earthquake response.
- If the designated EOC is in a building that would probably not withstand earthquake impact, another building should be chosen for an earthquake EOC.
- Mass Care shelters for earthquake victims should be pre-designated in structures that would be most likely to withstand earthquake impact.
- It is assumed that all special needs facilities could be affected to some extent by earthquake effects therefore preparedness measures should be in place to address the needs of all facilities listed in the Resource Manual.
- Most likely the entire population of the community will be affected by a seismic event. Estimate the maximum peak population affected, considering peak tourism, special event populations, and work hours.
- EOC will be activated and response will immediately be engaged to address any and all earthquake effects.
- Emergency warning/notification information and instructions will be broadcast to the public.
- Search and rescue and emergency medical teams will be dispatched.
- Firefighters will address fires/explosions and HAZMAT incidents.

- Law enforcement personnel will coordinate evacuation and traffic control as well as protecting critical facilities and conducting surveillance against criminal activities.
- Reception centers will be opened and staffed.
- Animal control measures will be taken.
- Immediate life-threatening hazards will be addressed such as broken gas lines, or downed utility wires.
- Emergency food, water and fuel will be acquired.
- Activate mutual aid.
- Measures will be taken by the chief medical examiner relating to identification and disposition of remains of the deceased.

Evacuation Options

The Warwick eCEMP has recently been updated to reflect the designation of the Warwick Elementary School as a Mass Care Shelter in Town, since it now has a generator large enough to run the critical areas of the facility that would be needed to use it as a shelter, including the kitchen and bathrooms (which have showers).

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current edition of the Massachusetts State Building Code (780 CMR). Given that most structures in Massachusetts were built before 1975, many buildings and structures do not have specific earthquake resistant design features. According to the U.S. Census 2007-2011 American Community Survey, 57% of the housing in Warwick was built before 1970. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

Restrictions on Development

There are no seismic-related restrictions on development.

Table 4-5: Existing Earthquake Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
State Building Code				
	The Town of Warwick has adopted the State Building Code.	Entire Town but applies to new construction only.	Effective for new buildings or substantial renovations of existing buildings only.	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Debris Management Plan				
	A Draft 2009 Regional Debris Management Plan by the FRCOG and the Regional Emergency Planning Committee (REPC).	Entire Town.	Will be effective when completed.	Work with the FRCOG and the REPC in updating and implementing the Draft 2009 Regional Debris Management Plan.

Dam Failures

The only mitigation measures in place are the state regulations that control the construction and inspection of dams. The Warwick eCEMP states that there are three categories of dam failure or overspill and that action should be taken according to hazard rating:

Type 1: Slowly developing condition

- Activate EOC;
- Activate all communication networks and establish 24-hour communications with Command Post.
- Release public information;
- Notify the following:
  - MEMA region headquarters
  - American Red Cross
  - downstream communities;
- Review plans for evacuation and sheltering
  - Evacuation
    - Routes
    - Notification
  - Sheltering
    - Availability and capacity
    - Food, supplies and equipment
    - Shelter owners and managers
    - Other communities (if out of Town sheltering is required)
- Require 'stand by' status of designated emergency response forces.

Type 2: Rapidly developing condition

- Establish 24-hour communication from the damsite to EOC;
- Assemble, brief and assign specific responsibilities to emergency response forces;
- Release public information;
- Obtain and prepare required vehicles/equipment for movement; and,
- Prepare to issue warning.

Type 3: Practically instantaneous failure

- Issue warning;
- Commence immediate evacuation;
- Commit required resources to support evacuation;
- Activate shelters or coordinate activation of shelters located outside the community;
- Notify:
  - MEMA region headquarters
  - American Red Cross
- Initiate other measures as required to protect lives and property.

Management Plans and Regulatory Measures

The Warwick eCEMP contains the following generic mitigation measures for dam failure:

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam overspill or failure.
- Emergency management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams that impact Warwick. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.
- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.
- Determine minimum notification time for downstream areas.

The Warwick eCEMP contains the following generic preparedness and response measures for dam failure:

- Pre-place adequate warning/notification systems in areas potentially vulnerable to dam failure effects.
- Develop procedures for monitoring dam site conditions at first sign of any irregularity that could precipitate dam failure.
- Identify special needs populations, evacuation routes and shelters for dam failure response.
- Have sandbags, sand and other items to reinforce dam structure or flood proof flood prone areas.
- Disseminate warning/notification of imminent or occurring dam failure.
- Coordinate evacuation and sheltering of affected populations.
- Dispatch search and rescue teams.
- Coordinate evacuation and sheltering of affected populations.
- Activate mutual aid if needed.
- Acquire additional needed supplies not already in place, such as earthmoving machinery.
- Establish incident command post as close to affected area as safely possible.
- Provide security for evacuated public and private property.

Massachusetts Emergency Management Agency (MEMA) identifies seven dams in Warwick, all of which are designated as Low Hazard Potential:

- Wheeler Pond Dam
- Laurel Lake Dam
- Moore's Pond Dam
- Gale's Pond Dam
- Richards Reservoir Upper Dam
- Sheomet Lake Dam
- Stevens Swamp Dam

Permits Required for New Dam Construction

Massachusetts State Law (M.G.L. Chapter 253 Section 45) regulates the construction of new dams. A permit must be obtained from the Department of Conservation and Recreation (DCR) before construction can begin. One of the permit requirements is that all local approvals or permits must be obtained.

Dam Inspections

The DCR requires that dams rated as Low Hazard Potential be inspected every ten (10) years, dams rated as Significant Hazard Potential be inspected every five (5) years, and dams rated as High Hazard Potential be inspected every two (2) years. Owners of dams are responsible for hiring a qualified engineer to inspect their dams and report the results to the DCR. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain, and update Emergency Action Plans. Potential problems may arise if the ownership of a dam is unknown or contested. Additionally, the cost of hiring an engineer to inspect a dam or to prepare an Emergency Action Plan may be prohibitive for some owners.

Zoning

There is no mention made regarding the construction of new dams in the Town of Warwick's Zoning or subdivision regulations.

Restrictions on Development

There are no Town restrictions on dam locations. The DCR issues permits for new dams and does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable.

Table 4-6: Existing Dam Failure Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Permits				
	State law requires a permit for the construction of any dam.	Entire Town	Effective. Ensures dams are adequately designed.	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Inspections				
	DCR has an inspection schedule that is based on the hazard rating of the dam (low, significant, high hazard). FERC requires Emergency Action Plans for all high hazard dams it oversees.	Entire Town	Effective. Owners of High Hazard Potential and certain Significant Hazard Potential dams are also responsible for preparing Emergency Action Plans.	Map dams and inundation areas
Evacuation Plans				
	Comprehensive evacuation plans would ensure the safety of the citizens in the event of dam failure.	Inundation areas in Town.	Not Effective. The preparation of inundation mapping and evacuation plans is expensive for owners of dams.	Owners of High Hazard Potential dams should prepare inundation area mapping and up to date evacuation plans in cooperation with the Town.
Subdivision Regulations				
Article IV: Procedure for Submission and Review of Plans **Section 4-3: Definitive Plan** Section 4-3.E: Contents of the Definitive Plan Appendix C: Development Impact Statement	The Definitive Plan shall contain the location of all areas within the proposed development within the inundation areas of any high or significant-hazard dams. The DIS must include a discussion of the location of the project area in relation to the inundation areas of any upstream high or significant-hazard dams.	Entire Town	Effective for identifying areas of development requiring evacuation.	None
Zoning Bylaws				
Section Twelve: Flood Plain District		See Flood Hazard Boundary Map (FHBM) dated	Limited	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	2013 Potential Action Items
Section 12.B: Floodplain District Boundaries And Base Flood Elevation And Floodway Data Section 12.E: Use Regulations	Mapping of High and Significant Hazard Dam Inundation Areas is required for subdivision proposals or other developments greater than 3 lots or 5 acres, where a portion of the development activity would be located within Zone A. In order to issue a Special Permit, the ZBA shall find that the proposed use and any associated public utilities or facilities in the Floodplain District must be located outside of the Inundation Areas of any High and Significant Hazard Potential Dams in the region.	January 24, 1975		

See also Table 4-1: Existing Flood Hazard Mitigation Measures.

Landslides

Regulating land use and development to avoid construction on steep slopes and ensuring that construction does not reduce slope stability is one way to mitigate the hazard potential of landslides. The mitigation measures for landslides were found to be the same as for Floods. Please see Table 4-1: Existing Flood Hazard Mitigation Measures for a summary of the above Land Use Regulations and Appendix B for relevant sections of the Land Use Regulations.

Ice Jams

The most common hazard associated with ice jams is flooding upstream of the ice jam. Therefore strategies to mitigate flooding are also appropriate for mitigating the impacts of ice jams. Please see the Current Mitigation Strategies for Flooding section above and refer to Table 4-1: Existing Flood Hazard Mitigation Measures, as well as Appendix B for the relevant sections of the Town's land use regulations.

Manmade Hazards

Timely, informative and accurate notification of a hazardous material emergency is critical for an effective emergency response and for the safety and protection of Warwick's citizens. With the frequency of transportation of hazardous materials via local roadways and Route 78, the possibility exists of a catastrophic accident or spill. Strategies to plan for the evacuation of residents and for the cleanup of any chemical spill are key to hazard mitigation.

Management Plans and Regulatory Measures

The following are generic preparedness and response measures for manmade hazards listed in the Warwick eCEMP, specifically hazardous materials emergencies:

- The immediate notification of the community emergency coordinator and the State is required when a release of an extremely hazardous substance or hazardous chemical in an amount above the Reportable Quantity (RQ) occurs. Specific information is required by the notification such as chemical name, method of release, health effects, medical attention and protective actions.
- The Hazardous Materials Release Report Form must be used in the event of the release of a hazardous substance
- Both local and State response personnel, including the DEP must be notified immediately of a release. The local point of contact is the local fire department through the 911 dispatch Center.

Evacuation Options

Evacuation of an incident site could be required upon the recommendation of the on-scene commander. The routes of evacuation and staging areas for the evacuees will be determined by the Incident Commander. Once the incident site has been evacuated, law enforcement officials will support expanded evacuation if required. The necessity for additional evacuation will be determined by the Incident Commander.

FUTURE MITIGATION STRATEGIES

Hazard Mitigation Goal Statements and Action Plan

As part of the multi-hazards mitigation planning process undertaken by the Warwick Multi-Hazards Mitigation Planning Committee, existing gaps in protection and possible deficiencies were identified and discussed. The committee then developed general goal statements and action items that, when implemented, will help to reduce risks and future damages from multiple hazards. The goal statements, action items, Town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of hazard are described below. There are also several general action items that were developed.

2013 Action Plan

Prioritization of Goals and Action Items

As part of the multi-hazards mitigation planning process undertaken by the Committee, existing gaps in protection and possible deficiencies were identified and discussed. The committee then developed general goal statements and action items that, when implemented, will help to reduce risks and future damages from multiple hazards. The goal statements, action items, Town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of hazard is located in Table 4-9: 2013 Warwick Local Multi-Hazard Mitigation Prioritized Action Plan.

The Committee prioritized Mitigation Action Items by examining the results of the All Hazards Risk Assessment completed by the Committee (see Section 3, pages 61 through 65). The All Hazards Risk Assessment is an interactive table that the Committee completed with the FRCOG staff to evaluate all the natural hazards that can impact the town based on frequency of occurrence, severity of impacts, area of occurrence and preparedness. The completed table gives the town an overall understanding of the natural hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Warwick's planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Those hazards receiving the highest Weighted Hazard Index number were assigned the highest priority as shown in Tables 4-7 and 4-8.

Table 4-7: Weighted Hazard Index Priority Level

Weighted Hazard Index	Priority Level
> 4.00	High
2.50 – 4.00	Medium
< 2.50	Low

Table 4-8: Hazard Priority Level Rating

Natural Hazard	Weighted Hazard Index	Priority Level
Hurricanes/Tropical Storms	4.75	High
Severe Winter Storms/Ice Storms	4.45	High
Tornados, Microbursts, Thunderstorms	4.45	High
Floods	3.85	Medium
Dam Failures	2.80	Medium
Wild Fires/Brush Fires	2.65	Medium
Earthquake	2.65	Medium
Landslides	1.90	Low
Ice Jams	1.90	Low

Because the ranking of priorities was based on the results of the All Hazards Risk Assessment, factors such as local knowledge of the frequency of occurrence of hazard events, the severity of impacts to the population, infrastructure, and the built and natural environments, the location and extent of impacts of the hazard events, and the town's preparedness to respond to hazard events were included in the prioritization process. The Committee's process also considered the anticipated benefits from the implementation of each Action Item to the population, the town's infrastructure, and to the built and natural environment. For most of the Action Items, project costs are not specifically known but there was consideration of whether or not the town currently had the technical and administrative capability to carry out the mitigation measures. Even when the political will exists to implement the Action Items, the fact remains that Warwick is a small town that relies heavily on a small number of paid staff, many of whom have multiple responsibilities, and a dedicated group of volunteers who serve on town boards. The town has limited funds to hire consultants and engineers to assist them with implementation of Action Items. Limited technical assistance is available from the Franklin Regional Council of Governments. However, the availability of FRCOG staff can be constrained by the availability of grant funding.

The final 2013 Warwick Multi-Hazard Mitigation Prioritized Action Plan is shown in Table 4-9. Some Action Items were evaluated as being associated with several hazards and were labeled "Multiple Hazard". Multiple Hazard Action Items were assigned a high priority given their association with more than one hazard. Potential funding sources to assist the town with implementation of the Action Item were listed. Finally, each Action Item was given an estimated completion date and assigned a responsible department or board.

No formal vulnerability assessment was done for manmade hazards due to the lack of available data to use in an appropriate assessment model. Because of the potential for these types of manmade hazards to occur; the unknown impact of such accidents on the town's population, infrastructure, and the natural and built environments; and the lack of available and well-analyzed data, the Committee suggested a number of Action Items relating to this hazard that are included on the Action Plan, although it was not assigned a Hazard Priority Level Rating.

Table 4-9: 2013 Warwick Multi-Hazard Mitigation Prioritized Action Plan

Note: Action Items highlighted in light green are considered to have a relatively small cost compared to the benefit realized from implementation. Funding will be sought to implement other Action Items.

GOAL STATEMENT: ***To provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.***

Action Item	Responsible Department/ Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
HIGH PRIORITY (> 4.00 Weighted Hazard Index)					
MULTIPLE HAZARDS					
Identify existing shelters that are equipped with an auxiliary power supply or are earthquake resistant as well as outside of the floodplain and inundation areas. Disseminate this information to appropriate Town departments.	Building Inspector, Emergency Management Director, Fire Department	P,I	Town, Volunteers	2012	New Action Item.
Identify potential locations for new shelters, in particular, buildings that are equipped with an auxiliary power supply and/or are earthquake resistant and are outside of the floodplain and inundation areas. Disseminate this information to appropriate Town departments.	Building Inspector, Emergency Management Director, Fire Department	P,I	Town, Volunteers	Ongoing from 2013-2017	New Action Item..
Inventory supplies at existing shelters and develop a needs list and storage requirements. Establish arrangements with local or neighboring vendors for supplying shelters with potable water, food and first aid supplies in the event of a natural or other disaster.	Highway Department, Planning Board, Fire Departments, Police Department, Emergency Management Director	P,I	Town, Volunteers	Ongoing from 2013-2017	New Action Item. Regional shelter trailers with necessary supplies are available in Greenfield and North Adams.
Examine current notification system including feasibility of a reverse notification system, such as Reverse 911 or Code Red. Develop a preliminary project proposal and cost estimate.	Police Department, Franklin County Fire Chiefs, Schools, Emergency Management Director	P,I	Town, Volunteers, REPC, FRCOG, WRHSAC, MEMA/FEMA	Ongoing from 2013-2017	New Action Item.
Collect, periodically update, and disseminate information on which local radio stations provide emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.	Emergency Management Director, Fire Department, Administrative Assistant	B,P,I	Town, Volunteers	Ongoing from 2013-2017	New Action Item.
Work with the Regional Emergency Planning Committee (REPC) and the FRCOG to identify regional shelters for use as backup when shelter facilities in Warwick are inaccessible or overwhelmed.	Building Inspector, Emergency Management Director, Fire Departments	P,I	Town, Volunteers, REPC, FRCOG	2013	New Action Item.
Work with the REPC and the FRCOG to identify shelter(s) that will accommodate residents with small animals.	Building Inspector, Emergency Management Director, Fire Departments	P,I	Town, Volunteers, REPC, FRCOG	Ongoing from 2013-2017	New Action Item.
Work with the REPC and the FRCOG to identify a regional shelter for large animals (such as the Franklin County Fairgrounds in Greenfield) and establish a protocol for evacuating large animals in advance of a disaster.	Police Department, Emergency Management Director, Fire Departments	P,I	Town, Volunteers, REPC, FRCOG	Ongoing from 2013-2017	New Action Item.

Action Item	Responsible Department/ Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
Work with the REPC and the FRCOG to develop a regional and local disaster recovery plan.	Highway Department, Planning Board, Fire Departments, Police Department, Emergency Management Director	P,I	Town, Volunteers, REPC, FRCOG	Ongoing from 2013-2017	New Action Item.
Work with the FRCOG and the REPC in updating and implementing the Draft 2009 Regional Debris Management Plan.	Emergency Management Director	B, N, P, I	Town, Volunteers, REPC, FRCOG, WRHSAC, MEMA/FEMA	2013	New Action Item.
Records of damages to the built and natural environment due to hazard events are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. The town should consider implementing a formal system of data collection and maintenance which would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.	Administrative Assistant, Highway Department, Fire Department, Emergency Management Director	B, N, P, I	Town	2013	New Action Item.
HURRICANES AND TROPICAL STORMS (The Action Items listed under Floods below address the flooding that can result from a hurricane or tropical storm. Listed below are Action Items to address the potential damage from the high winds associated with hurricanes and tropical storms.)					
Request information from project proponents about roads and utilities located in fall zone area for wireless communication facilities.	Planning Board	B, P, I	Town, Volunteers	2014	New Action Item.
Ensure that communications and other towers located in Town are properly secured with cables bolted into permanent structures (such as bedrock) to protect them from damages resulting from high winds.	Administrative Assistant, Highway Department, Fire Department, Conservation Commission, Emergency Management Director	B, P, I	Town, Volunteers	2015	New Action Item.
Work with the Conservation Commission, DCR, and other property owners to gain regular access to communications and other towers located in Town and/or to the wires connected to them to control surrounding vegetation in order to mitigate damage from a wind storm.	Administrative Assistant, Highway Department, Fire Department, Conservation Commission, Emergency Management Director, Tree Warden	B, P, I	Town, Volunteers	2016	New Action Item.
SEVERE WINTER STORMS/ICE STORMS					
Review and update regulations to facilitate and seek out potential funding sources for undergrounding of utilities along main roads in the Town.	Planning Board, Emergency Management Director, Highway Department, Police Department, Fire Department	B, N, P, I	Town, National Grid	Ongoing from 2013-2017	New Action Item.
Encourage forest stewardship practices that produce more stable, successional forested landscapes and which reduce the risk of damage from winter storms.	Conservation Commission, Planning Board, Fire Department, Tree Warden	N, P, I	Town	Ongoing from 2013-2017	New Action Item.

Action Item	Responsible Department/ Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
TORNADOS, MICROBURSTS, & THUNDERSTORMS (See also Action Items for Hurricanes and Tropical Storms, and Floods)					
Consider adopting a Zoning Bylaw that regulates wireless communication facilities and provides for the prevention of wind-related damage.	Planning Board	B, P	Town	2014	New Action Item.
Enforce the State Building Code to ensure new buildings are designed to withstand high winds.	Building Inspector	B, P	Town	Ongoing from 2013-2017	New Action Item.
Coordinate with state and regional agencies to update the Draft 2009 Regional Debris Management Plan and identify a location(s) for the temporary storage of contaminated/ hazardous flood debris.	Highway Department, Planning Board, Franklin County REPC	N, P, I	Town, Volunteers, REPC, FRCOG, WRHSAC, MEMA/FEMA	Ongoing from 2013-2017	New Action Item.
MEDIUM PRIORITY (2.50 – 4.00 Weighted Hazard Index)					
FLOODS					
Using Assessors' data and other available information, expand and update the Vulnerability Assessment for properties located within the 100-year floodplain.	Planning Board, Board of Assessors	B, P	Town, Volunteers	2013	New Action Item.
Upgrade or replace culverts and bridges throughout town to minimize or repair damage from hazard events and beaver activity.	Highway Department,	B,N,P,I	Town, MEMA/FEMA	Ongoing from 2013-2017	New Action Item.
Coordinate with state and regional agencies to update the Draft 2009 Regional Debris Management Plan and identify a location(s) for the temporary storage of contaminated/ hazardous flood debris.	Highway Department, Planning Board, Franklin County REPC	N, P, I	Town, Volunteers, REPC, FRCOG, WRHSAC, MEMA/FEMA	Ongoing from 2013-2017	New Action Item.
Support local and regional, watershed-wide open space protection efforts, particularly in floodplain areas.	Planning Board, Select Board	N, P	Town, Volunteers, FRCOG	Ongoing from 2013-2017	New Action Item.
Consider becoming a part of FEMA's Community Rating System.	Emergency Management Director, Select Board, Administrative Assistant	B, N, P, I	Town, MEMA/FEMA	2015	New Action Item.
DAM FAILURES (See also Action Items for Floods)					
Adequate staff and resources should be given to DCR – including adequate funding – to ensure inspection schedules are maintained.	Franklin County Regional Emergency Planning Committee (REPC), Select Board	B, N, P, I	Town	Ongoing from 2013-2017	New Action Item.
Identify locations for emergency shelters and evacuation routes for people who live in an inundation area.	Administrative Assistant, Police, Fire, Planning Board, Emergency Management Director	P, I	Town	2013	New Action Item.

Action Item	Responsible Department/ Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
Identify locations of existing beaver activity and dams.	Administrative Assistant, Highway Department, Emergency Management Director	B, N, P, I	Town	Ongoing from 2013-2017	New Action Item.
WILDFIRES AND BRUSH FIRES					
Assess water supply for fire prevention and in areas without access to the public water lines. Strategize methods for increasing storage capacity for fire prevention.	Fire Department, Emergency Management Director	B, N, P, I	Town	Ongoing from 2013-2017	New Action Item.
Encourage forest stewardship practices that produce more stable, successional forested landscapes and which reduce the risk of fire hazards.	Conservation Commission, Planning Board, Fire Departments, Tree Warden	N, P, I	Town	Ongoing from 2013-2017	New Action Item.
Educate homeowners about general fire safety.	Fire Department	B, N, P	Town	Ongoing from 2013-2017	New Action Item.
Seek funding to increase the staff of the Fire Department's inspection and safety unit.	Town Coordinator, Fire Departments	B, N, P, I	Town	2015	New Action Item.
EARTHQUAKES					
Ensure Compliance with the Massachusetts State Building Code: The Building Inspector should ensure that all new construction complies with the appropriate seismic requirements of the State Building Code.	Building Inspector	B, P, I	Town	Ongoing from 2013-2017	New Action Item.
LOW PRIORITY (< 2.5 Weighted Hazard Index)					
LANDSLIDES					
Ensure compliance with existing land use regulations (zoning bylaws, subdivision regulations, building codes) that direct development to stable slopes and soils. Protect existing development from potential landslides by ensuring that surface water and groundwater are properly managed.	Building Inspector, Conservation Commission, Planning Board, Zoning Board of Appeals	B, N, P, I	Town, Volunteers	Ongoing from 2013-2017	New Action Item.
Encourage forest stewardship practices that produce more stable, successional forested landscapes and that reduce the risk of landslides.	Conservation Commission, Planning Board, Fire Department	B, N, P, I	Town, Volunteers	Ongoing from 2013-2017	New Action Item.
ICE JAMS (See also Action Items for Floods above)					
Monitor local streams and waterways for potential ice buildup and ice jams.	Emergency Management Director, Fire Department, Highway Department	B, N, P, I	Town	Ongoing from 2013-2017	New Action Item.
NO PRIORITY LEVEL ASSIGNED					
MANMADE HAZARDS					
Maintain contact with officials at the Vermont Yankee Atomic Nuclear Electric Company's nuclear power plant located just across the border in Vernon, VT and conduct regular drills to prepare for a release of hazardous materials from the site.	Emergency Management Director, Fire Department	B,N,P	Town, Volunteers	Ongoing from 2013-2017	New Action Item. Drills already occur on an biennial basis.

NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

The U.S. Congress established the National Flood Insurance Program (NFIP) in 1968, with the passage of the National Flood Insurance Act of 1968. "For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, seawalls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses, nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

"In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection."[49]

The State of Massachusetts, through its local communities,[50] complies with the NFIP in part by enforcing the Wetlands Protection Act (WPA), which helps restrict development in flood-prone areas, enforcing the State Building Code, which regulates building specifications and additional related zoning bylaws, such as a floodplain overlay district. At the local level, Warwick's compliance with the NFIP is enforced through the building inspector and building code, the Conservation Commission and wetland and floodplain regulations, and the zoning bylaws and subdivision regulations related to flooding. While the local building code cannot be more restrictive than the state building code, the local Conservation Commission can restrict development above and beyond the requirements in the WPA. The ability of the Conservation Commission to further regulate development in flood prone areas could be a crucial tool in flood mitigation. In additional, the ability of the Select Board to adopt further bylaws such as a floodplain overlay district could also mitigate flooding.

The Town of Warwick is listed by FEMA as a participant in the National Flood Insurance Program, having just been approved by FEMA in May 2012.[51] However, as of January 31, 2013, there were no policies in effect in Warwick and no claims have been paid.[52]

NFIP Community Rating System (CRS)[53]

The town is not a member of the NFIP Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The Community Rating System is a part of NFIP and provides incentives and tools to further these goals. The goals of the CRS are to recognize,

[49] http://www.fema.gov/library/viewRecord.do?id=1404
[50] Massachusetts is a Home Rule state, the local communities have significant power and authority to implement state regulations and many towns adopt their own wetland and floodplain regulations that are more stringent than state requirements.
[51] FEMA Community Status Book Report: http://www.fema.gov/cis/MA.html, as of 2/11/2013.
[52] FEMA Policy & Claim Statistics for Flood Insurance: http://www.fema.gov/policy-claim-statistics-flood-insurance/policy-claim-statistics-flood-insurance/policy-claim-13.
[53] http://training.fema.gov/EMIWeb/CRS/

encourage, and reward, by the use of flood insurance premium adjustments, community and state activities beyond the minimum required by the NFIP that:

- Reduce flood damage to insurable property,
- Strengthen and support the insurance aspects of the NFIP, and
- Encourage a comprehensive approach to floodplain management.

The Community Rating System reduces flood insurance premiums to reflect what a community does above and beyond the National Flood Insurance Program's (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for what they are doing, as well as to provide an incentive for new flood protection activities. It provides lower insurance premiums under the National Flood Insurance Program. The premium reduction is in the form of a CRS Class, similar to the classifications used for fire insurance. For example, a Class 1 provides a 45% premium reduction while a Class 10 provides no reduction. The CRS Class is based on the floodplain management activities a community implements. In many cases, these are activities already implemented by the community, the state, or a regional agency. The more activities implemented, the better the CRS class.

Benefits of participating in the Community Rating System:

- Money stays in the community instead of being spent on insurance premiums.
- Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.
- The activities credited by the CRS provide direct benefits to the community, including:
    - Enhanced public safety,
    - Reduction in damage to property and public infrastructure,
    - Avoidance of economic disruption and losses,
    - Reduction of human suffering, and
    - Protection of the environment.
- Local flood programs will be better organized and more formal.
- The community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.
- Technical assistance in designing and implementing some activities is available at no charge.
- The community will have an added incentive to maintain its flood programs over the years.
- The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

Costs to the local government to participate in the Community Rating System:

- The community must designate a CRS Coordinator who prepares the application papers and works with FEMA and the Insurance Services Office (ISO) during the verification visit.
- Each year the community must recertify that it is continuing to implement its activities. It must provide copies of relevant materials (e.g., permit records).

- The community must maintain elevation certificates, permit records, and old Flood Insurance Rate Maps forever.
- The community must maintain other records of its activities for five years, or until the next ISO verification visit, whichever comes sooner.

Community Rating System Process

One of the actions that Warwick could take to improve their CRS rating (and subsequently lower their premiums) is to develop a CRS plan. The CRS 10-step planning process provides additional points for activities that communities can take during their planning process that go above the minimum described below, thus possibly lowering insurance rates. At a minimum, an *approved* multi-hazard mitigation plan that addresses floods could qualify for CRS credit. Although communities are not required to participate in CRS in order to receive approval of a Local Multi-Hazard Mitigation Plan, FEMA encourages jurisdictions to integrate the CRS planning steps into their multi-hazard mitigation plans.

Credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan or repetitive loss area analyses. The Community Rating System does not specify what must be in a plan, but it only credits plans that have been prepared and kept updated according to CRS standard planning process. Credit is also provided for implementing a habitat conservation plan.

Community Rating System Credit Points[54]

A total of up to 359 points are provided for three elements. Up to 294 points are provided for adopting and implementing a floodplain management plan (FMP) that was developed using the following standard planning process. There must be some credit for each of the 10 planning steps:

Table 4-11: CRSC Standard Planning Process Steps

Step	Maximum Points
• Organize to prepare the plan	10
• Involve the public	85
• Coordinate with other agencies	25
• Assess the hazard	20
• Assess the problem	35
• Set goals	2
• Review possible activities	30
• Draft an action plan	70
• Adopt the plan	2
• Implement, evaluate, and revise	15

Up to 50 additional points are provided for conducting repetitive loss area analyses (RLAA) and up to additional 15 points are provided for adopting and implementing a Habitat Conservation Plan (HCP).

[54] FEMA Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008.

More information is available at http://www.fema.gov/business/nfip/crs.shtm. A copy of the "Local Official's Guide to Saving Lives, Preventing Property Damage, and Reducing the Cost of Flood Insurance" can be downloaded at http://www.fema.gov/library.

5 – PLAN ADOPTION & MAINTENANCE

PLAN ADOPTION

The Franklin Regional Council of Governments (FRCOG) provided support to the Warwick Local Multi-Hazard Mitigation Planning Committee as they underwent the planning process. Town officials such as the Emergency Management Director and Administrative Assistant were invaluable resources to the FRCOG and provided background and policy information and municipal documents, which were crucial to facilitating completion of the plan.

When the preliminary draft of the Warwick Multi-Hazard Mitigation Plan was completed, copies were disseminated to the Warwick Local Multi-Hazard Mitigation Planning Committee for comment and approval. The Committee was comprised of representatives of Town boards and departments who bear the responsibility for implementing the action items and recommendations of the completed plan (see the list of committee members on the front cover).

Copies of the Final Review Draft of the Multi-Hazard Mitigation Plan for the Town of Warwick were distributed to Town boards and officials, Planning Boards and EMDs in surrounding towns, public school committees and superintendents, large landowners in town, and other stakeholders. Copies were made available at the Town Hall and the Warwick Free Public Library and a copy of the plan was also posted on the town website for public review. Once reviewed and approved by MEMA, the plan was sent to the Federal Emergency Management Agency (FEMA) for their approval. FEMA approved the plan on [INSERT DATE] and on [INSERT DATE] the Warwick Board of Selectmen voted to adopt the plan (see Appendix C).

PLAN MAINTENANCE PROCESS

The implementation of the Warwick Multi-Hazard Mitigation Plan will begin following its approval by MEMA and FEMA and formal adoption by the Warwick Board of Selectmen. Specific Town departments and boards will be responsible for ensuring the development of policies, bylaw revisions, and programs as described in Table 4-9: 2013 Warwick Multi-Hazard Mitigation Prioritized Action Plan. The Warwick Multi-Hazard Mitigation Planning Committee will oversee the implementation of the plan.

Monitoring, Evaluating, and Updating the Plan

The measure of success of the Warwick Multi-Hazard Mitigation Plan will be the number of identified mitigation strategies implemented. In order for the Town to become more disaster resilient and better equipped to respond to natural disasters, there must be a coordinated effort between elected officials, appointed bodies, Town employees, regional and state agencies involved in disaster mitigation, and the general public.

The Warwick Multi-Hazard Planning Committee will meet on an annual basis or as needed (i.e., following a natural or other disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee

may decide to reassign the roles and responsibilities for implementing mitigation strategies to different Town departments and/or revise the goals and objectives contained in the plan. At a minimum, the committee will review and update the plan every five years, beginning in the fall of 2017. The meetings of the committee will be organized and facilitated by the Warwick Town Coordinator and the Emergency Management Director. Increasing committee membership to include entities such as the Planning Board and the Conservation Commission could help improve the completion rate of action items.

As is the case with many Franklin County towns, Warwick's government relies on few public servants filling many roles, upon citizen volunteers and upon limited budgets. As such, implementation of the recommendations of this plan could be a challenge to the Committee. As the Committee meets regularly to assess progress, it should strive to identify shortfalls in staffing and funding and other issues which may hinder Plan implementation. The Committee should seek technical assistance from the Franklin Regional Council of Governments to help alleviate some of the staffing shortfalls. The Committee could also seek assistance and funding from such sources as are listed in Table 5-1.

Table 5-1: Potential Funding Sources for Hazard Mitigation Plan Implementation

Funding Source	Description	Estimated Annual Funding
Hazard Mitigation Grant Program	Provides post-disaster funds to communities to help implement long-term hazard mitigation strategies.	$15M (from three past Presidential disaster declarations)
Flood Mitigation Assistance Program	Provides pre-disaster funds. There are three types of grants: planning grants, project grants, and technical assistance grants. Requires a 25% non-Federal match and is based on the total number of NFIP policies in the State.	$500,000
Community Development Block Grant	Although this funding comes from HUD, it is made available to communities through the State Economic and Community Development Administration. The grants are used to expand affordable housing and economic opportunities, and to revitalize communities by improving community facilities and services.	$2M
SBA Small Business Administration	Post-disaster low interest, long-term loans given to homeowners, renters, businesses, or private non-profit organizations. Up to 20% of the loan amount can be used for hazard mitigation actions.	$500,000 (based on past disasters)
State Office for Mitigation Funding	This newly created State Office was authorized by a recent act of the State Legislature. This Office will make funds available to local communities for hazard mitigation planning through an increase in the State's gasoline tax.	$5M
Manufactured Homebuilders Association	The State is interested in forming an agreement with this association to develop an earthquake-resistant homes campaign.	In-kind services
National Association of Homebuilders	The State is pursuing a relationship with this association and is discussing how the association can assist the State in promoting construction of safe rooms.	In-kind services

Incorporating the Plan into Existing Planning Mechanisms

Upon approval of the Warwick Multi-Hazard Mitigation Plan by FEMA, the Committee will provide all interested parties and implementing departments with a copy of the plan, with emphasis on Table 4-9: 2013 Warwick Multi-Hazard Mitigation Prioritized Action Plan. The

committee should also consider initiating a discussion with each department on how the plan can be integrated into that department's ongoing work. At a minimum, the plan should be distributed to and reviewed with the following entities:

- Fire Department
- Emergency Management Director
- Police Department
- Public Works / Highway Department
- Planning Board
- Zoning Board of Appeals
- Conservation Commission
- Franklin County Regional Emergency Planning Committee
- Building Inspector
- Select Board

Some possible planning mechanisms for incorporating the Warwick Multi-Hazard Mitigation Plan into existing planning mechanisms to the fullest extent possible could include:

- Incorporation of relevant Hazard Mitigation information into the Open Space and Recreation Plan. There are opportunities to discuss findings of the hazard mitigation plan and incorporate them into Environmental Inventory and Analysis section of the OSRP and to include appropriate action items from the hazard mitigation plan in the OSRP Action Plan.
- Any future development of master plans and scenic byway plans could incorporate relevant material from this plan into sections such as the Natural Resources section and any action plans
- When the Final Draft Multi-Hazard Mitigation Plan for the Town of Warwick is distributed to the Town boards for their review, a letter asking each board to endorse any action item that lists that board as a responsible party would help to encourage completion of action items.
- The Planning Board could include discussions of the Hazard Mitigation Plan Action Items in one meeting annually and assess progress. Current Subdivision Rules and Regulations and Zoning Bylaws should be reviewed and revised by the Committee, Planning Board and Select Board based upon the recommendations of this plan. Model bylaws are available from the FRCOG to help assist in the modification of Warwick's current Bylaws.

Continued Public Involvement

The Town of Warwick is dedicated to continued public involvement in the hazard mitigation planning and review process. During all phases of plan maintenance, the public will have the opportunity to provide feedback. The 2013 Plan will be maintained and available for review on the Town website through 2017. Individuals will have an opportunity to submit comments for the Plan update at any time. Any public meetings of the Committee will be publicized. This will provide the public an opportunity to express their concerns, opinions, or ideas about any updates/changes that are proposed to the Plan.

6 – APPENDICES

Appendix A: Public Participation Process

Appendix B: Relevant Sections of Land Use Regulations

Subdivision Regulations
Zoning Bylaws

Appendix C: FEMA Approval and Board of Selectman Adoption of 2013 Multi-Hazard Mitigation Plan

Appendix A:

Public Participation Process

MONTHLY MUSICIANS CIRCLE -- Wooden Fender

Saturday, October 27 Warwick Town Hall 7:00pm

On the last Saturday of each month, musicians share music with the audience and each other as they play separately and together (everyone can sing along). Passing songs around the circle (no stage and no PA system - all acoustic) It's a fluid, ever changing cast of characters contributing - certain to be spontaneous. So lend your voice, lend an ear or just come to give them a hand!

Town of Warwick

Multi-Hazard Mitigation Plan Development Underway

The Warwick Local Multi-Hazard Mitigation Planning Committee is currently developing a Multi-Hazard Mitigation Plan for Warwick, in partnership with the Franklin Regional Council of Governments (FRCOG) Planning Department. Once the Plan is approved by FEMA and adopted by the Town, the Town will be eligible for state and federal grant monies to fund pre- and post-disaster mitigation projects.

The purpose of this Multi-Hazard Mitigation Plan is to identify natural and other hazards that may impact the community; conduct a risk assessment to identify infrastructure at the highest risk for being damaged by hazards; inventory and assess current Town hazard mitigation policies, programs, and regulations; and identify action steps to prevent damage to property and loss of life.

The Warwick Local Multi-Hazard Mitigation Planning Committee will meet several times to compile the information for the Plan. All meetings of the Committee are open to the public; meeting notices and agendas can be found at the Warwick Town Hall located at 12 Athol Road, Warwick, MA or on the Town website at www.warwickma.org.

To find out more about this project and how you can become involved, please contact David Young, Town Coordinator, at 978-544-6315 or coordinator@town.warwick.ma.us; or Pat Smith, FRCOG Senior Land Use Planner, at (413) 774-1194 x111 or psmith@frcog.org.

RESTAURANT REVIEW – Gloria Varno

Fireside Bar and Grill
435 E Main St Orange, MA 01364 (978) 544-9900

The old Batch's Restaurant of years ago has been many things over the years but never as popular as Batch's. The newest attempt, Fireside Bar and Grill, opened in June and I recently went there after Athol's 250th Anniversary parade. I was impressed with the interior design as they finally got the "diner" look out of it. They have a few booths and some tables to make it look more like a fine dining establishment and dressed up the bar area. However, they did not fix the acoustics. We could hear everyone talking and there was a loud bunch next to us and whenever they talked we had to stop because we could not hear ourselves in our booth. It was not crowded in the late afternoon so I can't image what it will be like if the restaurant is full.

I ordered Chicken Parmigianino with spaghetti and it was just OK; nothing to write home about. My friends ordered Baked Haddock and Fish and Chips. Baked Haddock's comment was OK and didn't finish the dinner; Fish and Chips comment was "good" so I guess they do better at frying than baking. No one raved about their meal.

Our waitress was not very attentive; she never came by to see how everything was and brought us our check before we had a chance to order dessert. When she brought the check, I said, "could we look at a dessert menu" and she brought over a tray of what they had. Two of us ordered apple crisp and the other dessert I cannot remember it was so non-descript. The apple crisp was awful. It had been put into a dessert bowl while it was hot I presume and then put in a very cold refrigerator. The apples were stuck to the bottom of the dish and the whole thing was hard. We had to get another waitress to find ours and she came over. I asked if the crisps could be warmed in the microwave and she took them and brought them back so hot, you burnt your mouth. I left most of mine because there was no flavor.

I was very disappointed in the whole experience; service, entrees and desserts and I don't think they will be a success in Orange. Since the last time I did a bad review and got multiple phone calls from the owners, I

MEETING AGENDA

Town of Warwick
Local Multi-Hazard Mitigation Planning Committee Meeting

Warwick Town Hall
October 25, 2012
2:00 – 4:00 pm

1. Introductions

2. Overview of the Hazard Mitigation planning process from MEMA – Pat Smith, FRCOG

3. All Hazards Vulnerability Assessment for Warwick – Pat Smith, FRCOG

4. Review of Draft 2012 Warwick Multi-Hazard Mitigation Plan – Pat Smith, FRCOG

   a. Hazard identification and analysis

   b. Current and future mitigation strategies

   c. Prioritized Action Plan table

5. Next Steps

Meeting Notice & Agenda - Warwick Hazard Mitigation Ad Hoc Committee

2:00 p.m. Thursday October 25, 2012 at Warwick Town Hall

Call to order

Review Draft Plan

New and Other business

Warwick Local Multi-Hazard Mitigation Planning Committee
October 25, 2012

Sign-in Sheet

Please print clearly

Name	Mailing Address and E-mail Address	Affiliation/Representing
Tim KILHART	12 Athol Rd. - Warwick highway@town.warwick.ma.us	Hwy. Supt.
J DAVID Young	" " " " coordinator@town.warwick.ma.us	Coordinator
Nick Arguimbau	24 Kirk Rd. Warwick narguimbau@town.warwick.ma.us	BOS
PAT SMITH	psmith@frcog.org	FRCOG

Meeting Notice and AGENDA

Town of Warwick
Multi-Hazard Mitigation Planning Committee
Warwick Town Hall
April 3, 2013
2:00 – 4:00 p.m.

1. Introductions

2. Review of revised Draft Warwick Multi-Hazard Mitigation Plan – Committee members and Pat Smith, FRCOG Land Use Planner

3. Review of Section 4: Mitigation Strategies, existing mitigation strategy tables and the 2013 Action Plan – Committee members and Pat Smith, FRCOG Land Use Planner

4. Review of the draft Critical Facilities and Infrastructure Map – Committee members and Pat Smith, FRCOG Land Use Planner

5. Next Steps – Pat Smith, FRCOG Land Use Planner

    a. Final Draft Preparation
    b. Final Draft Review Period
    c. Stakeholder Letter Distribution

Warwick Local Multi-Hazard Mitigation Planning Committee
April 3, 2013

Sign-in Sheet

Please print clearly

Name	Mailing Address and E-mail Address	Affiliation/Representing
Ronald Gates	835 Wendell Rd Warwick	Fire Dept.
Tim Kilhard	12 Athol Rd. - Warwick	HIGHWAY SUPT.
DAVID YOUNG	" "	Selectboard
Nick Arguimbau	24 Pine Rd Warwick narguimbau@earthlink.net	Site Planning Board
William Lyman	211 Orange Rd Warwick	Fire/EMD Deputy
JIM ERVITI	844 ORANGE RD WARWICK	EMD
PAT SMITH		FINCOM

Appendix B:

Relevant Sections of Land Use Regulations

Subdivision Regulations

Price $55

REGULATIONS
GOVERNING THE SUBDIVISION OF LAND
IN THE
TOWN OF WARWICK
FRANKLIN COUNTY, MASSACHUSETTS

Effective Date of Subdivision Control Law in Warwick: November 9, 1987
Revisions Adopted February 21, 2008

(19) Existing building(s) on the lot and on adjoining lots.

(20) Cellar holes.

(21) Any other information the applicant wishes to have considered in demonstrating compliance with these regulations or other requirements of law.

D. Alternative Assessment. For residential subdivisions, when an applicant is not proposing a Conservation Development (cluster), then the Preliminary Plan submission shall include the cluster plan as an alternative concept for developing the parcel(s). When an applicant is proposing a cluster development plan, the Preliminary Plan submission shall not require an alternate plan.

E. Action by the Board

(1) Within forty-five (45) days of submission of the preliminary plan, the Board shall act to:

(a) Approve the plan as presented;

(b) Approve the plan with modifications; or

(c) Disapprove the plan.

The Planning Board must file its decision with the Town Clerk and submit its decision to the applicant by certified mail within forty-five (45) days of submission of the preliminary plan.

(2) In the case of disapproval, the reasons why shall be stated. Approval of the plan does not constitute the approval of a subdivision, and no Register of Deeds shall record a preliminary plan.

§ 4-3. Definitive Plan.

A. General.

(1) A definitive plan shall be governed by the Subdivision Regulations in effect at the time of submission of such plan or in effect at the time of submission of a Preliminary Plan, provided that a definitive plan evolved therefrom shall have been submitted to the Planning Board within seven

(7) months from the date of submission of the Preliminary Plan.

(2) A definitive plan shall also be governed by the zoning bylaws in effect at the time of submission of such plan or a preliminary plan from which a definitive plan is evolved, in accordance with the provisions of MGL C. 40A, § 6, as amended.

(3) All filings for any action under these regulations must be accompanied by both paper copies and electronic copies. Electronic copies must be in accordance with the most up to date version of the "MassGIS Standard for Digital Plan Submission to Municipalities" meeting the requirements for Level I submission standards. Electronic copies must be submitted on a CD-Rom or other appropriate media approved by the Planning Board and must be accompanied by the completed checklist required in the MassGIS standard.

B. Filing procedure.

(1) Any person who submits a definitive plan shall do so by delivery to the Planning Board at a meeting of said Board or by certified or registered mail to the Planning Board c/o the Town Clerk. Receipt of such plan by the Planning Board, or the Town Clerk on behalf of the Planning Board, shall constitute the date of submission. Such plan shall be accompanied by the completed Form C and a filing fee per Appendix D. in the form of a certified check or money order made payable to the Town of Warwick. In addition, any person who submits a definitive plan shall also submit the plan to the Board of Health at the same time (see 4-2.B. (2)).

(2) The applicant shall file with the Planning Board the following:

(a) An original reproducible drawing of the definitive plan and five (5) contact prints thereof. The original drawing will be returned to the applicant after a decision on the plan by the Board.

(b) One (1) properly executed application including Form C.

(c) Filing fees shall follow the schedule defined in § Appendix D. The filing fee shall be in the form of a certified check or money order made payable to the Town of Warwick. Any additional expenses for professional assistance related to the application including the review of the plans, survey or inspections shall also be paid by the applicant prior to any determination by the Board.

(d) A certified list of abutters.

(e) Four (4) copies of easement agreements for each easement shown on the definitive plan on file with the Registry of Deeds and four (4) copies of any conservation restrictions or covenants or any other documents relevant to ownership or use of the land on file with the Registry of Deeds, or certified as to what will be filed

(3) The applicant shall file with the Board of Health and the Conservation Commission the following:

(a) At the time of the filing of the definitive plan with the Planning Board, two (2) copies shall also be filed with the Board of Health, and two (2) copies shall also be filed with the Conservation Commission.

(b) Two (2) copies of the application with the properly executed Form C.

C. Board of Health Review

The Board of Health shall report, in writing, to the Planning Board and subdivider its approval or disapproval of said Plan. In the event of disapproval, it shall make specific findings as to which, if any, of the lots shown on said plan cannot be used as building sites without injury to the public health. The Board of Health shall include specific findings and the reasons therefore in such report, and, where possible, it shall make recommendations for adjustments necessary for the Plan's approval. Any approval by the Planning Board shall be on the condition that lots deemed injurious to the public health shall not be built upon without prior consent of the Board of Health. The Planning Board shall endorse on the Plan such conditions, specifying the lots to which said conditions apply. Failure by the Board of Health to report on the proposed subdivision within forty-five (45) days after the filing of the plan shall be deemed approval of the Plan by the Board of Health.

D. Review by other Town Officials

The Planning Board within ten days of the date of submission of a Definitive Plan shall transmit two (2) copies to the Board of Selectmen for review of the layout of the proposed improvements shown on the plans. The Board of Selectmen shall, within 45 days after filing of the plan, report in what respect, if any, the proposed streets and improvements would fail to comply with the standards for design, construction and acceptance by the Town, and may also make recommendations and suggestions to the Planning Board which in their opinion would improve the subdivision and its future development as an integral part of the entire town. If the Board of Selectmen fails to report to the Planning

Board within 45 days after the filing of the plan, the plan shall be deemed as approved by the Board of Selectmen.

The Planning Board within ten days of the date of submission of a Definitive Plan shall transmit two (2) copies to the Conservation Commission for review of the layout of the proposed improvements shown on the plans to determine if the proposed subdivision or parts thereof are subject to the provisions of the Wetlands Protection Act. The Conservation Commission shall, within 45 days after filing of the plan, report in what respect, if any, the proposed subdivision or parts thereof, fails to comply with the Wetlands Protection Act, and may also make recommendations and suggestions to the Planning Board which in their opinion would improve the subdivision and its future development so as to be in compliance with the Wetlands Protection Act. If the Conservation Commission fails to report to the Planning Board within 45 days after the filing of the plan, the plan shall be deemed as approved by the Conservation Commission.

E. Contents of the Definitive Plan

(1) The definitive plan shall be prepared by a registered civil engineer and/or registered land surveyor. It shall be clearly and legibly drawn in black ink upon Mylar. The plan shall be at a scale of one (1) inch to forty (40) feet, unless otherwise specified by the Planning board. Sheet size shall not exceed twenty-four by thirty-six (24 x 36) inches. If multiple sheets are used, they shall be accompanied by an index sheet showing the entire subdivision. The data required below may be on separate sheets as is necessary. One copy of the plan shall be on mylar at the same scale as the Warwick Board of Assessor's map sheet of the area so the Assessors may overlay the mylar on the Zoning Map Sheet.

(2) The definitive plan shall have the following information:

(a) The subdivision name, boundaries, true North arrow, date, scale, legend denoting signs and symbols located on the plan and not otherwise explained, and bench mark. All elevations shall be tied to the United States Geological Survey bench marks if within five hundred (500) feet of the subdivision using the Datum of 1984 (WGS 84). GPS coordinates of each corner shall be noted accurate to a radius of thirty (30) feet or less and the plan legend shall state the accuracy using the Datum of 1984 (WGS 84).

(b) The names, addresses, and phone numbers of the owners of record, the applicant, the engineer and/or surveyor and/or their official seals and certificate numbers.

(c) The names of all abutters, as determined from the most recent tax list.

(d) Existing and proposed lines of streets, rights-of-way, easements and public or common areas, open space and recreation areas, within the subdivision. Proposed names of new streets shall be shown in pencil until they have been approved by the Planning Board.

(e) The location, names and paved widths and layout widths of present street(s) bounding, approaching or within reasonable proximity of the subdivision.

(f) The proposed system of drainage, including adjacent existing natural waterways, in a general manner.

(g) Zoning districts of all the areas shown on the plan.

(h) A locus plan showing the location of the subdivision at a scale of one (1) inch equals one hundred (100) feet and an index plan at a scale of one (1) inch equals two hundred (200) feet.

(i) Existing (broken line) and proposed (solid line) topography at ten-foot contour intervals, including the finished grade of all lots.

(j) A table listing lot numbers with the corresponding lot size and street frontage for every lot.

(k) The boundary lines proposed, with areas and dimensions.

(l) The location of all natural (perennial and intermittent) waterways, wetlands (whether or not jurisdictional) and water bodies within and adjacent to the subdivision and within 300 ft. downstream of the subdivision's property boundaries, areas within the 100-year floodplain, areas within the inundation areas of any high or significant-hazard dams.

(m) The location of significant site features, such as existing stonewalls, fences, buildings, trees exceeding sixteen inches diameter at breast height, floodplains and rock outcroppings.

(n) The boundaries 9including metes and bounds description) and acreage of open space and recreation areas.

(o) The location(s) of all permanent monuments properly identified as to whether proposed or existing. Each lot corner shall have a

permanent monument of a design and material approved by the building inspector. The bounds of roads, easements, and such other infrastructure as the onsite engineer or building inspector specifies, shall have permanent monuments installed according to good engineering practice and of a design and material approved by the building inspector.

(p) The locations of all snowmobile trails, woods roads, all-terrain vehicle trails, cellar holes, and fences.

(q) In the case of a subdivision covering less than all of the land owned by the subdivider, a plan showing, in a general manner, the proposed overall development of remaining land.

(r) The locations of all easements, conservation restrictions or covenants or any other documented agreements relevant to ownership or use of the land on file with the Registry of Deeds, or certified as to what will be filed.

(s) The location and results of all percolation tests to evaluate subsurface conditions for each lot in the prospective subdivision. The tests will be done in accordance with the State Sanitary Code.

(t) If an on-site sewage system is to be used the location(s) and result(s) of soil tests completed to determine what the soil type(s) is/are good for and the layout of the sewage treatment works and sewer system.

(u) Locations of all habitats of species listed under the Massachusetts Endangered Species Act.

(v) Locations of the following unless waived by the Planning Board: sidewalks, curbs, gutters, street lighting standards, and all utilities whether above or below ground.

(w) The size and location of existing and proposed water supply facilities and the required water supply protective radius.

(x) Size and location of all existing and proposed drinking water facilities.

(y) Size and location of all fire hydrants, pumps, and water lines between hydrants and pumps, source(s) of water for fire protection and storage cisterns and dry hydrants.

(z) Sufficient data, including the length, bearings, radii and central angle, to determine the exact location, direction and length of every street, way, lot line and boundary line and to establish these lines on the ground. If the proposed subdivision is within five hundred (500) feet of a monument of the Massachusetts coordinate mapping system, it shall be tied into said system.

(aa) A statement to be signed by the applicant, which is to read "All ways to be owned and maintained by the Homeowners Association, or by the sum of the owners of the lots within the subdivision," unless the ways are accepted by Town Meeting.

(bb) A statement that the plan complies with Warwick Zoning Bylaws and Subdivision Rules and Regulations.

(cc) A statement that lots shall not be further subdivided or a certification signed by the engineer that the roads, water supply, sewage treatment and fire protection are adequate to allow additional subdivision of the lots and stating the allowable extent of additional subdivision. The engineer shall submit documentation to support the certification.

(dd) A civil engineer's stamp and signature on each and every page.

(ee) A registered land surveyor's stamp and signature.

(ff) Typical street cross-sections for each class of street within the subdivision, drawn at 1" = 4', showing location of all elements within the street right-of-way including street sections showing paving, crown, berm, shoulder and distance to the right-of-way line, as well as typical cross-sections of any altered drainage courses or off-street paths shall be drawn.

(gg) Suitable space to record the action of the Board and signatures of Board members.

(hh) Every sheet shall have the date, such as, "Revised dated 01/01/09."

(ii) Any relevant information that the Board identified as necessary in the review of the preliminary plan.

(jj) Street profiles shall be prepared as follows:

[i] A horizontal scale of one (1) inch equals forty (40) feet shall be used.

[ii] A vertical scale of one (1) inch equals four (4) feet shall be used.

[iii] The existing grade of the road center line shall be drawn in a fine black solid line.

[iv] The existing right side line shall be drawn in a fine black dotted line.

[v] The existing left side line shall be drawn in a fine black dashed line.

[vi] All elevations shall refer to the United States Coast and Geodetic Survey bench marks if within five hundred (500) feet of the proposed subdivision.

[vii] Proposed roadway center-line grades shall be drawn in heavy red lines with precise elevations at points of vertical tangency, points of vertical contact high point and low point.

[viii] Rates of roadway gradient shall be shown in percentage.

[ix] The size, location and rates of gradient of proposed stormwater drains, sewer lines, catch basins and manholes, as well as required new waterways and sizes of all pipes shall be shown.

[x] The invert and rim elevations of each manhole or catch basin shall be shown.

[xi] As long as the work is related to the proposed subdivision, profiles shall be shown, even if the new work is outside said subdivision.

[xii] Water mains will be shown in profile to demonstrate sufficient clearance of other structures.

[xiii] The size and location of all other utilities to be placed in the right-of-way shall be shown. These shall be placed so as to minimize flood damage.

[xiv] The location of any intersected public or private way shall be shown.

[xv] The location of all school bus stops and waiting areas.

F. Environmental impact report.

(1) In order to more fully ensure the health, safety and welfare of the Town of Warwick and its inhabitants, all prospective Class II Subdivisions of between four (4) and nine (9) lots shall be required to submit a detailed environmental impact report. Further, the Board may require said report or portions of it for smaller subdivisions where the information contained in such a report would be necessary to evaluate the prospective subdivision's impact upon a particular piece of land. The report would include the following:

(a) A description of the topography, geology and soil characteristics of the proposed subdivision and contiguous area and an analysis of the natural land features to sustain the proposed development; an analysis of stormwater runoff, soil erosion and other potential land capability effects of the proposed subdivision; and a description of the measures planned to protect the natural land features against potential deterioration resulting from the proposed subdivision.

(b) Identification of surface and subsurface water features within the proposed subdivision, as well as those water features potentially affected by it, including underground aquifers, brooks, streams, rivers, lakes and wetlands, and a description of the measures planned to protect those surface and subsurface features against potential deterioration resulting from the proposed subdivision.

(c) A description of special physical conditions existing within the proposed subdivision, (e.g., floodplains, unique landscape features, etc.) and a description of the measures to accommodate these special conditions.

(d) An analysis of airborne emissions to be generated by the proposed subdivision or incident to it, in relation to state and federal air pollution standards and in relation to state and federal regulations for implementing those standards, as well as nearby off-site emission sources potentially affecting air quality of the proposed subdivision.

(e) Identification of any existing or potential on- or off- site sources of noise which might significantly inhibit speech or sleep [above fifty (50) dBA] and a description of the measures to alleviate the problem.

(f) Identification of any notable aesthetic characteristics on or near the proposed subdivision, including features of historical, architectural, archaeological or scenic interest and a description of the measures designed to protect these aesthetic features.

(g) Identification of potential impacts on agricultural and forestry resources.

(2) A biotic study.

(a) Based on a review by a wildlife biologist, a description of the biotic community, listing types of vegetation and animals likely to be found within the proposed subdivision and/or contiguous area including within the sub-watershed and areas downstream of the proposed subdivision.

(b) Identification by a wildlife biologist, of any rare species or rare and endangered species habitat in the vicinity potentially affected by the proposed subdivision, a description of any potential disruption of wildlife populations, habitats, and wildlife movements, which may result from the proposed subdivision and the methods to be taken to limit these disruptions.

(c) Address potential impacts with recommendations to minimize impacts of the proposed subdivision.

(3) A land use study.

(a) An analysis of land use within the proposed subdivision in relation to surrounding land uses and especially as it affects any loss of agricultural or forestry land or decrease in farm or forest production or viability.

(b) An assessment of the economic impact of the proposed subdivision upon education (the number of additional children in the school system), the demand for municipal services and facilities (water, sewage treatment, solid waste management, road maintenance, fire and police protection and recreation), traffic, utilities and streetlights.

G. Development Impact Statement. In order to more fully ensure the health, safety and welfare of the Town of Warwick and its inhabitants, all prospective Class 1 Subdivisions of ten (10) or more lots and all non-residential subdivisions shall be required to submit a detailed development impact statement. Further, the Board

may require said report or portions of it for smaller subdivisions where the information contained in such a report would be necessary to evaluate the prospective subdivision's impact upon a particular piece of land. The Development Impact Statement shall comply with Appendix C and include the following:

(1) Contents. The board shall in the case of a Class I Subdivision or may in the case of a Class II Subdivision require an Applicant for a subdivision to submit a Development Impact Statement (DIS) on the effects the proposed action has or will have on: 1) the immediate neighborhood and land area; 2) surrounding neighborhoods; and 3) the community at large.

The DIS shall include a detailed assessment of the probable impacts of the proposed action on a wide variety of environmental, fiscal, and socioeconomic elements and factors.

Environmental factors shall mean any destruction, damage, or impairment, actual or probable, to any natural resources of the Town and shall include but not be limited to water pollution, air pollution, improper sewage disposal, pesticide pollution, excessive noise, impairment and eutrophication of rivers, streams, floodplains, lakes, ponds, or other surface or subsurface water resources, destruction or degradation of wetlands, open spaces, natural areas, parks, or historic, archaeological districts, buildings and sites.

Fiscal and socioeconomic impacts shall mean the effects on traffic circulation and safety, neighborhood character, school enrollment, public facilities, municipal and community services, associated fiscal expenditures and revenues, and on housing and other development activity.

The DIS shall contain detailed information describing the nature and extent of the proposed work and its potential impacts; any adverse short-term and long-term consequences which cannot be avoided should the work be performed; and all measures to be utilized to minimize adverse consequences, particularly environmental damage.

The DIS shall also develop, describe, and objectively weigh alternatives to the proposed development, which are allowed by the Zoning Bylaw.

(2) Procedure. On submission to the Board of a residential subdivision creating more than ten (10) lots or dwelling units and all nonresidential subdivisions, the applicant is required to submit a DIS (see Appendix C). The Board may require portions of the DIS to be carried out for smaller subdivisions, if in their opinion, the sensitivity of the land warrants an investigation. After a preliminary scoping session to be held between the

applicant and the board with input as appropriate from the public abutters, the Police, Fire and Highway Departments and the Town Finance Committee, or its agent, and upon submission of evidence and a written request from the applicant, the Board may waive any section(s) of the requirements which it deems non-applicable to the proposed project or may require additional information on any aspect of the requirements. The entire cost of the DIS will be the responsibility of the Applicant. The DIS shall be prepared by an interdisciplinary team of professionals qualified, experienced, and where applicable, licensed in their fields. Such team may include a civil engineer, traffic engineer, architect, landscape architect, land use planner, hydro-geologist, hydrologist, biologist, financial planner, and other environmental, financial, and other professionals. The applicant shall consult with the Board as to choice of said professionals, and conflict of interest shall be avoided to the extent possible.

H. Compliance with the Wetlands Protection Act. In accordance with MGL C. 131, § 40, no person shall remove, fill, dredge or alter any watercourse, pond, floodplain or wetland and buffer areas within the jurisdiction of the Conservation Commission without filing written intention to perform said work with the Local Conservation Commission and with the Commonwealth Department of Environmental Protection. Permission for such work must be obtained from the Conservation Commission.

I. Public hearing.

(1) Before approval, modification, or disapproval of the definitive plan is given, a video or audio recorded public hearing shall be held by the Board. Said public hearing shall be held after the Board of Health makes its report and other town agencies have made their reports as applicable, or after the forty-five day period to report expires. Notice of the specific time and place shall be given by the Board at the expense of the applicant by advertisement in a newspaper of general circulation in the Town of Warwick once in each of two (2) successive weeks, the first publication being not less than fourteen (14) days before the date of such hearing. Copies of the definitive plan shall be available to the public through the Town Clerk's office and to each abutting resident, landowner or abutter to a landowner within three hundred (300) feet of the site who has so requested, not less than fourteen (14) days before the date of the public hearing.

(2) A copy of said notice of public hearing shall be mailed by the Board, by registered or certified mail, to all owners of land abutting the proposed subdivision and to the abutters of the abutters within three hundred (300) feet of the site. The Planning Board shall also send notice of a public hearing to the following: the Board of Selectmen, the Board of Health,

the Conservation Commission, the Fire Department, the Superintendent of Schools, the Building Commissioner and the Highway Department. The expense of these notifications shall be borne by the applicant.

J. Approval, approval with conditions, modification or disapproval. After the required public hearing but within ninety days (90) days from the date of submission, in the case of a subdivision where a preliminary plan has been filed, the Planning Board shall take final action upon the definitive plan. It shall approve the plan as submitted, approve the plan with conditions and modifications, disapprove the plan with prejudice, or disapprove the plan without prejudice to its being resubmitted with specific additional information or modifications. If the Board is considering approval of the plan with conditions or modifications, it shall provide notice of such conditions or modifications to the applicant and to the public, and shall provide reasonable opportunities to comment. The Board shall state with its vote reasons for its action and shall summarize the supporting evidence. In the case of a subdivision plan where no preliminary plan has been submitted, the Planning Board shall take final action within one hundred and thirty-five (135) days from the date of submission. Final action is the filing of the Planning Board decision with the Town Clerk and submission of its decision to the applicant by certified mail.

K. Performance guaranty. Before endorsement of the Board's approval upon a definitive plan of a subdivision, the applicant shall agree to complete the required improvements specified in Article VI of these rules and regulations for all lots within the subdivision within a specified period of time. Such construction and installation shall be secured by one method, or in part by one and in part by another, of methods (1), (2) and (4) of the following methods:

(1) by a proper bond, sufficient in the opinion of the Planning Board to secure performance of the construction of ways and the installation of municipal services required for lots in the subdivision shown on the plan, and the Planning Board may require that the applicant specify the time frame within which such construction shall be completed;

(2) by a deposit of money or negotiable securities, sufficient in the opinion of the Planning Board, after consultation with Town Counsel, to secure performance of the construction of ways and the installation of municipal services required for lots in the subdivision shown on the plan, and the Planning Board may require that the applicant specify the time frame within which such construction shall be completed;

(3) by a covenant executed and duly recorded by the owner of record, running with the land, whereby such ways and services shall be provided to serve any lot and that other provisions of the plan as approved or modified and any conditions on approval have been and are being met before such lot may be built upon or conveyed, other than by mortgage

deed; provided that a mortgagee who acquires title to the mortgaged premises by foreclosure or otherwise and any succeeding owner of such premises or part thereof may sell any such lot, subject to that portion of the covenant which provides that no lot shall be built upon until such ways and services have been provided to serve such lot; and provided further, that nothing herein shall be deemed to prohibit a conveyance by a single deed, subject to such covenant, of either the entire parcel of land shown on the subdivision plan or of all lots not previously released by the Planning Board. A deed of any part of the subdivision in violation hereof shall be voidable by the grantee prior to the release of the covenant but not later than three years for the date of such deed; or,

(4) by an agreement between the applicant and the lender executed after the recording of the first mortgage covering the premises shown on the plan or a portion thereof given as security for advances to be made to the applicant by the lender which agreement shall provide for the retention by the lender of funds sufficient in the opinion of the Planning Board to secure the construction of ways and installation of municipal services. Said agreement shall also provide for a schedule of disbursements which may be made to the applicant upon completion of various stages of work, and shall further provide that in the event the work is not completed within the time set forth by the applicant, any funds remaining undisbursed shall be available for completion.

L. Endorsement.

(1) Upon approval or modification of the definitive plan, a majority of the Board shall endorse it as approved or modified. This shall be done following the twenty-day statutory appeals periods, provided that the Town Clerk notifies the Board that no appeal has been filed within this period. After the approved definitive plan has been endorsed, the applicant shall file with the Board one (1) reproducible copy and three (3) contact prints of said definitive plan.

(2) Approval of the definitive plan does not constitute the laying out or acceptance by the Town of Warwick of streets or easements within a subdivision.

(3) A failure by the applicant to request endorsement of the plan or failure by the applicant to provide an adequate performance guaranty within six months of the Planning Board's vote of approval shall result in automatic rescission of the definitive plan approval.

M. Evidence of performance and release of performance guaranty.

(1) Requirements. Before the Board shall fully release the interest of the Town in a performance bond, deposit or covenant, the Board shall require the following:

(a) Written evidence from a registered civil engineer of the Board's choosing, that the streets and drainage pattern conform to the Planning Board's requirements in accordance with the definitive plan.

(b) Written evidence from a registered civil engineer of the Board's choosing that the water mains, sanitary sewers, storm sewers and hydrants conform to specifications and the Board's requirements in accordance with the approved definitive plan.

(c) Written evidence, from a registered land surveyor of the Board's choosing, that all permanent bounds and monuments on all street lines and on the lot or lots within the subdivision are in place and are accurately located in accordance with the approved definitive plan.

(d) Written evidence from a registered civil engineer of the Board's choosing that the streets and drainage system shall have been in use through one (1) full winter and shall have performed as designed.

(e) Written evidence that all fees to cover inspection for release of the performance guaranty have been paid by the applicant.

(f) Written evidence that all provisions of the plan have been and will continue to be complied with.

(2) Upon completion of all said improvements and satisfaction of the above requirements, the applicant shall notify the Board and the Town Clerk, by delivery or by registered or certified mail, requesting release from the performance guaranty. The Board shall act on such request within forty-five (45) days.

(3) The Board may grant partial release from such security for partial completion of improvements, provided that the completed portion provides a reasonable system for circulation and utilities pending completion of the rest.

(4) Full security shall not be released until the integrity of road pavement and drainage has been verified following a full winter of use, until trees and other vegetation have been established, until either the way has been duly

laid out and accepted as a public way or other provisions for their continued maintenance in perpetuity have been accepted by the Board, until the record ("as built") plans have been received and until final clean-up has been completed.

N. Recording of the plan. The applicant shall notify the Planning Board in writing within ten (10) days after the definitive plan, as approved and endorsed, has been recorded at the Franklin County Registry of Deeds and, in the case of registered land, with the recorder of the Land Court, of such recording, noting book, page number and date of recording.

O. Recording of the plan. Failure of the applicant to record the definitive plan at the Franklin County Registry of Deeds within six (6) months of its endorsement or to comply with the construction schedule of the performance agreement shall constitute sufficient cause for rescission of such approval, in accordance with the requirements of MGL C. 41 § 81-W, as amended.

§ 4-4. Subdivision standards in the Floodplain

All subdivision proposals shall be reviewed to determine whether such proposals will be reasonably safe from flooding. If any part of a proposed subdivision is located within the Special Flood Hazard Area as defined by the Federal Insurance Administration (FIA) Flood Hazard Boundary Maps or within the 100-Year Floodplain as defined by the Federal Emergency Management Agency's Flood Insurance Rate (FIRM) maps, it shall be reviewed to assure compliance with the Town of Warwick Zoning Bylaw and the following:

A. The proposed subdivision design is consistent with the need to minimize flood damage.

B. All public and private utilities and facilities, such as ways, sewer, gas, electrical and water systems (as appropriate), shall be located and constructed to minimize or eliminate flood damage, and in particular, shall be located outside the 100-year floodplain.

C. Adequate drainage systems shall be provided to reduce exposure to flood hazards.

D. Base flood elevation (the level of the one-hundred-year flood) data shall be provided for proposals greater than five (5) lots or five (5) acres, whichever is the lesser, for that portion within the Flood Hazard Area or the 100-Year Floodplain.

ARTICLE V
Design Standards

§ 5-1. Basic Requirements

The subdivider shall observe all design standards for land division as hereinafter provided. These standards shall be considered minimum standards and shall be varied from or waived only as provided in Section 7. State Construction Standards shall be followed, and all matters left open or undefined in those Standards shall be specified by the Board on a case by case basis. Specification of matters not covered by the State Construction Standards shall be made by the Board or its engineering consultant on a case by case basis, based wherever possible on the publications of the American Association of State Highway and Transportation Officials (AASHTO) or other publications cited in Section 7 of these regulations.

§ 5-2. Relationship to Town Plans

The design and layout of a proposed subdivision should be guided by the goals and objectives of any existing master plans, open space and recreation plans, village plans, or statements of goals and objectives for the Town of Warwick Subdivision Rules and Regulations and Zoning Bylaw including but not limited to purposes five through eight inclusive of the Zoning Bylaws.

§ 5-3. Lot Size and Frontage

All lots shall be of such size and dimensions as to meet at least the minimum requirements of the Zoning by-law.

§ 5-4. Protection of Natural Features

All natural features such as trees of over sixteen inches diameter at breast height, water courses, one hundred year floodplains, wetlands, ponds and other water bodies, marshes, stonewalls, scenic points, and historic sites shall be preserved to the extent possible.

§ 5-5. Access Through Another Municipality

In case access to a subdivision crosses land in another municipality, the board may require certification, from appropriate authorities, that such access is in accordance with the Master Plan and subdivision requirements of such municipality and that a legally adequate performance bond has been duly posted or that such access is adequately improved to handle prospective traffic. The covenant required under Section 4.3 shall

include the requirement that no lot in the subdivision may be sold or built upon until any access in another jurisdiction has received the necessary approval of such jurisdiction.

§ 5-6. Street Classifications

A. Streets in subdivisions shall be classified as major and minor.

(1) Major Street: A street having the primary purpose of carrying through traffic equal to that generated by ten (10) or more lots and the secondary purpose of providing access to abutting property.

(2) Minor Street: A street having the primary purpose of carrying through traffic equal to that generated by fewer than ten (10) lots.

§ 5-7. Streets

A. The Planning Board may require higher standards than those set forth herein for the design and construction of streets within a subdivision, provided that such requirements are necessary and are intended to benefit a substantial area outside the subdivision.

B. Location.

(1) All streets in the subdivision shall be designed so that they will provide safe vehicular travel and shall provide a convenient system for providing safe vehicular traffic. Due consideration shall also be given by the subdivider to the attractiveness of the street layout, in order to obtain the maximum livability and amenity of the subdivision. Common driveways shall not be used to provide vehicular access to lots within a subdivision if, in the opinion of the Planning Board, they are being used to circumvent the requirements of these Subdivision Regulations.

(2) The design and layout of the proposed subdivision shall conform, so far as is practicable, to the Development Guidelines contained in Appendix A and to the Town Master Plan, Open Space and Recreation Plan, or Community Development Plan, as adopted by the Planning Board or the Town.

(3) A dead-end street (cul-de-sac) shall be permitted as a Minor Street only. Dead-end streets shall not be longer than six hundred (600) feet including the turnaround unless, in the opinion of the Planning Board, a greater length is necessitated. Dead-end streets shall be provided at the closed end with a turnaround having an outside roadway diameter of at least one hundred (100) feet and a property line diameter of at least one hundred

twenty (120) feet. Only one dead end shall be allowed per subdivision and it shall provide access to two (2) or fewer lots. No island within the cul-de-sac shall be allowed.

C. Alignment.

(1) Streets shall be laid out so as to intersect, as near as possible, at right angles. No street shall intersect another street at less than sixty (60°).

(2) Streets entering on opposite sides of another street shall be laid out directly opposite each other or with a minimum offset of one hundred and fifty (150) feet between their respective centerlines.

(3) Minimum centerline radii will be as follows: Major Street, five hundred (500) feet; Minor Street, two hundred (200) feet.

(4) Property lines at street intersections shall be cut back to provide for curb radii.

(5) At three and a half feet above the pavement at the intersection of the subdivision road with the existing street, the minimum sight distances shall be as follows: Major Streets, three hundred fifty (350) feet; Minor Streets, two hundred and fifty (250) feet.

(6) Street jogs with center-line offsets of less than one hundred twenty-five (125) feet should be avoided.

D. Grade. The maximum grades for streets shall be as follows: Major Street, six percent (6%); and Minor Street, eight percent (8%). Roads shall be designed to avoid puddles.

E. Road Width, Right of Way (R.O.W.), and Curb Radius.

(1) The minimum width of a Right-of-Way, Road Width, and Curb Radius shall be as follows:

Right-of-Way and Street Design Standards

Subdivision Classification	**Class II**	**Class III**	**Class I**
Street Classification	**Minor**		**Major**
1. Minimum Right-of-Way Width (feet)	55 (See note 1)		60
2. Minimum Pavement Width (Traveled Way) in feet	20 (See note 1)		24 (See note 2)
3. Minimum Radius of Curves (at Centerline of Traveled Way) in feet	200		500
4. Minimum Property Line Radius at Intersections of Streets and Ways in feet	30		40
5. Minimum Road Crown (in inches)	4		6
6. Minimum Vertical and Horizontal Sight Distance in feet (see note 3)	250		350
7. Minimum Percent Grade	1		1
8. Maximum Percent Grade	8% (See note 4)		6%
9. Roadway Shoulder from Edge of Pavement to Bottom of Slope in Substantial Cut (feet)	4		3 (See note 5)
10. Roadway Shoulder from Edge of Pavement to Top of Slope in a Substantial Fill (feet); with Guard Rail	5		4 (See note 5)

Notes:
1. To be determined by Board at the review of the Preliminary Plan.
2. This includes two 12’ travel lanes and two 8’ paved shoulders.
3. Clear sight distance in travel lane at 3.5 feet above pavement.
4. Ten percent may be allowed for short distances.
5. From outside edge of paved shoulder.
6. Actual width to be determined by Board.

In addition, there must be at least a twenty (20) foot setback from any adjacent owner’s property line to any edge of the right-of-way. Greater road width shall be

required by the Planning Board when deemed necessary for present and future vehicular travel.

(2) The centerline of the roadway shall coincide with the centerline of the right-of-way unless otherwise requested by the Board.

F. Adequate Access from Public Ways.

(1) Where the street system within a subdivision does not connect with or have, in the opinion of the Planning Board, adequate access from a public way, the Planning Board may require, as a condition of approval, that such adequate access be provided by the subdivider, or that the subdivider make physical improvements in accordance with the provision of these regulations from the boundary of the subdivision to a public way.

(2) Where the physical condition or width of the public way from which a subdivision has its access is considered by the Planning Board to be inadequate to carry the traffic expected to be generated by such subdivision, the Planning Board may require the subdivider to dedicate a strip of land for the purpose of widening the abutting way to a width at least commensurate with that required in a subdivision, and to make physical improvements to and within such public way to the same standards required within the subdivision. Any such work performed within such public way shall be made only with the permission of the governmental agency having jurisdiction over such way, and all costs of any such widening or construction shall be borne by the subdivider.

(3) A Class I Subdivision needs to have access from two separate points.

§ 5-8. Easements.

A. Easements for utilities shall be at the side or rear of lots wherever possible. They shall be contiguous from lot to lot. Easements shall be at least twenty (20) feet in width.

B. Where a subdivision is bisected by or adjacent to a watercourse, either natural or man-made, the Board may require that there be a stormwater or drainage easement of at least twenty (20) feet in width to conform to the path of the watercourse and to provide for any construction related to that watercourse.

C. The Board may require an easement for watercourses that are not within a subdivision but may be affected by it.

§ 5-9. Natural features.

Due regard shall be shown for all natural features, such as large trees, watercourses, scenic points, historic spots and similar community assets, which, if preserved, will add attractiveness and value to the subdivision.

§ 5-10. Open spaces.

Before approval of a plan, the Planning Board may also require the plan to show a park or parks suitably located for playground or recreation purposes or for providing light and air. The park or parks shall not be unreasonable in area in relation to the land being subdivided and to the prospective uses of such land. The Board may require that no building be erected upon such area until the land is either purchased by the town or is deeded in gift to the town or to a neighborhood civic association. This land may be held in said status for a period of three (3) years, at which time, if the land is not deeded or purchased, it may be included in a new subdivision proposal.

§ 5-11. Drainage.

A. The storm drainage system shall be designed to intercept all stormwater drainage from the particular subdivision or any additional runoff that may be created by that subdivision.

B. The Rational Method or the Soil Conservation Service Method shall be used in determining the quantity of stormwater to be carried by the system. The system shall be designed for a minimum twenty-five year-storm frequency.

C. Wherever possible, stormwater should be directed into the nearest part of the drainage system. Where storm drainage encroaches on privately owned land, a drainage easement shall be acquired by the developer.

D. Stormwater shall not be permitted to cross the surface of the roadway. It must be piped underneath.

E. Catch basins shall be placed on both sides of the street. They shall be placed at street intersections to intercept stormwater runoff.

F. The maximum distance between catch basins shall be three hundred (300) feet.

G. The minimum diameter of storm drainage pipes shall be twelve (12) inches.

H. All new culverts should be placed so as to maximize stream connectivity. Culvert specifications shall reflect the Massachusetts River and Stream Crossing Standards (http://www.streamcontinuity.org/pdf_files/MA_Crossing_Stds_3-1-06.pdf).

I. The method of construction and the materials used in construction shall conform to the most recent MassHighway Standards and Specifications for Highways, Bridges and Waterways.

J. No open water body or wetland shall be filled unless in compliance with the Massachusetts Wetlands Protection Act.

K. Where a portion of a subdivision lies within an aquifer recharge area, storm drainage shall be directed, when appropriate, to retention basins in order to artificially recharge the groundwater.

L. Leaching catch basins may be required at the option of the Board. These basins shall be at least six (6) feet deep and four (4) feet in diameter (inside measurements), constructed of concrete blocks or precast concrete units. Leaching basins shall be backfilled for at least one (1) foot around all sides with one and one-half (1 ½) inches of washed stone, topped with peastone, and shall be cross-connected with a twelve-inch equalizer drainpipe. Covers on basins shall conform to industry standards. Placement of catch basins shall be such as to prevent the ponding of water.

M. Post construction stormwater runoff shall be no greater than preconstruction levels.

§ 5-12. Sewerage.

If a public sewerage system is available and the connection is feasible the subdivision should be connected according to the requirements of the Sewer District and/or Town. Where a public sewerage system connection is not available or feasible, a private on-site sewerage system shall be designed and constructed in conformity with Title 5 of the State Environmental Code of the Massachusetts Department of Environmental Protection and subject to the approval by and in conformity with the Town of Warwick Board of Health and its rules and regulations.

Where a cluster subdivision is proposed, a shared on-site sewerage system shall be allowed if designed and constructed in conformity with Title 5 of the State Environmental Code of the Massachusetts Department of Environmental Protection and subject to the approval by and in conformity with the Town of Warwick Board of Health and its rules and regulations. A portion of the common land may also be used for the construction of retention and detention facilities and leaching areas, if associated with drainage or septic disposal systems serving the cluster development, and if such use, in

the opinion of the Planning Board, enhances the specific purpose of the cluster development to promote better overall site planning. Easements shall be no larger than reasonably necessary and the Planning Board shall require adequate assurances and covenants that such facilities shall be maintained by the lot owners within the cluster development.

§ 5-13. Water.

Private on-lot water systems shall be located and constructed in accordance with the Board of Health Regulations governing private wells in the Town of Warwick and in accordance with the setback and other requirements of Title 5 for private septic systems Such water systems shall be subject to the approval of the Town of Warwick and the Warwick Board of Health. In addition, a local water supply shall be provided within the subdivision for fire fighting purposes. If twenty-five (25) or more people are to be provided with water a determination shall be made as to whether or not a public water supply should be installed to comply with DEP Safe Drinking water regulations.

ARTICLE VI
Required Improvements for Approved Subdivisions

The improvements required in these Rules and Regulations for the Subdivision of Land must be installed to the satisfaction of the Board of Selectmen. A schedule for the installation of improvements shall be filed with the Board of Selectmen who will provide the developer with a check list of required inspections to be made by the Highway Superintendent or the Board of Selectmen. Failure to file such a schedule, or otherwise to give adequate notice as to when such improvements can be inspected may significantly delay certification of such improvements and subsequent release of bond or covenant.

§ 6-1. Clearing and grubbing of right-of-way.

A. No clearing or excavating shall be started on any part of the street until the Tree Warden has designated, in writing, those trees which are to remain in the tree belt. If the construction of a new subdivision road will impact a road designated as a local scenic road according to Chapter 40, Section 15C, review and approval by the Planning Board to cut or remove trees is required. Such trees to be preserved shall be protected during construction by fenders or boxes, and their root systems shall be disturbed as little as possible.

B. No matter such as stumps, trunks, limbs of trees, brush, boulders or similar material shall be buried or left within the limits of the right-of-way lines.

§ 6-2. Foundation of roadway.

A. Subbase.

(1) Within the roadway area, including driveway aprons, sidewalks and grass strips, all material shall be removed to subgrade, and any unsuitable material below subgrade, in the opinion of the town-appointed engineer, shall be removed and shall be replaced with proper bankrun gravel and brought to proper compaction. The depth of the subgrade will be a minimum of sixteen inches but may be greater based on existing conditions as specified by the town-appointed engineer.

(2) Where fill is required, it shall be placed in uniform lift layers not deeper than eight (8) inches and shall be spread uniformly with the large stones at the bottom.

(3) Any gravel used as fill in the subbase shall be composed of hard, durable stone and coarse sand, practically free from loam and clay and containing no stone having a dimension greater than six (6) inches, and, when spread and compacted, shall present a stable foundation.

(4) Each layer shall be thoroughly compacted to AASHTO (American Association of State Highway and Transportation Officials) standards, and rolling shall continue until a firm, even surface true to line and grade is achieved. Any depressions shall be filled and rerolled, and any soft or unsuitable areas shall be removed and replaced with suitable material and rolled.

(5) The subgrade shall be shaped and finish graded at the required depth below and parallel to the proposed pavement surface, in conformance with the typical street cross section.

(6) Inspections shall be required after completion of the subbase (AASHTO).

B. Gravel base.

(1) The gravel base course shall consist of not less than eighteen (18) inches of well-compacted gravel placed upon the subbase, for the entire width of the roadway, in layers not greater than six (6) inches deep.

(2) When spreading the gravel, care should be taken to rake forward and distribute the largest stones so they will be at the bottom of the gravel base course and evenly distributed.

(3) Each layer shall be thoroughly compacted to the proper density, and rolling shall continue until a firm, even surface true to line and grade is

achieved. Any depression that appears during or after rolling shall be filled with gravel and rerolled.

(4) The gravel used in the base course shall conform to AASHTO standards, except that it shall contain no stones having a dimension greater than three (3) inches.

(5) The gravel base surface shall be shaped and finish graded at the required depth below and parallel to the proposed pavement surface, in conformance with the typical street cross section.

(5) Inspections shall be required before commencement and after completion of the gravel base (AASHTO).

§ 6-3. Surfacing of roadway.

A. The roadway and driveway aprons shall be paved the entire width, including under the berms, and the surface treatment shall be compacted bituminous concrete placed in two (2) layers.

B. The first layer or binder course shall be Class I bituminous concrete pavement, Type I-1, binder course mix, laid at a thickness of two (2) inches, in accordance with Section 460 of MassHighway's Standard Specifications for Highways, Bridges and Waterways, latest edition.

C. The second layer or surface course shall be Class I bituminous concrete pavement, Type I-1, top course mix, laid at a thickness of two (2) inches, in accordance with Section 460 of MassHighway's Standard Specifications for Highways, Bridges and Waterways, latest edition.

D. The plant mix material shall be delivered to the site in a hot and easily workable condition when weather conditions are satisfactory so that it can be properly placed on the appropriate base. Irregularities in the existing foundation material shall be eliminated by the use of extra bituminous material, in accordance with Section 460 of MassHighway's Standard Specifications for Highways, Bridges and Waterways, latest edition.

E. All bituminous concrete shall be spread by an approved mechanical spreader in a uniformly loose layer to the full width required and to such thickness that each course, when compacted, shall have the required thickness and shall conform to grade and the typical street cross section. Hand spreading of bituminous concrete material will be allowed only for special areas which do not permit mechanical spreading and finishing.

F. Each course of bituminous material shall be rolled with a self-propelled, equally balanced, tandem roller weighing not less than five (5) nor more than ten (10) tons. Places inaccessible to the power roller shall be compacted by means of hand or vibratory tampers. Any displacement caused by the roller shall be corrected by raking and adding fresh mixture where required.

G. Traverse joints shall be formed by laying and rolling against a form of the thickness of the compacted mixture placed across the entire width of the pavement. When the laying of the mixture is resumed, the exposed edge of the joint shall be painted with a thin coat of hot asphalt or asphalt cement thinned with naphtha. The fresh mixture shall be raked against the joint and thoroughly tamped with hot tampers and rolled.

H. The final bituminous surface shall show no deviation greater than one-fourth (1/4) inch when tested with a sixteen-foot straightedge placed parallel to the center line of the surface course.

I. Finished roadway and driveway apron surfaces less than the required thickness or containing any soft or imperfect places will not be approved.

J. All roadways shall be brought up to the finish grade as shown on the definitive plan, and all manhole covers, gate boxes, gas drips and other access to underground utilities shall be set flush with the surface of the road, grass strip or sidewalk.

K. Streets and roads shall be constructed with the following minimum widths of traveled surface:
Major Street – 24 feet
Minor Street – 20 feet

L. Inspections shall be required upon completion of the binder and surface courses (AASHTO).

§ 6-4. Curbs and berms.

Curbing will be required only where the Planning Board determines that special conditions of topography, drainage requirements, steep roadway grade or high traffic density so required. Unless these conditions exist, curbing will not be required, and the adjoining shoulder, grass plot and ditch shall be graded and treated to carry the surface water runoff adequately without erosion.

When it is the opinion of the Planning Board that curbs and or berms are required, they shall be constructed using Cape Cod curbing (See Appendix E) along both sides of major roads but curbing may not be required along Minor Streets. Their construction

shall meet requirements set forth by MassHighway in its latest volume of Standard Specifications for Highways and Bridges.

§ 6-5. Sidewalks and School Bus Stops

A. Sidewalks of not less than five (5) feet in width shall be constructed on one (1) or both sides of the street starting at the property line when, in the opinion of the Board, such sidewalks are necessary for public safety or to support pedestrian circulation within the subdivision.

B. Sidewalk construction shall meet requirements set forth by MassHighway in its latest volume of Standard Specifications for Highways and Bridges.

C. All Class I Subdivisions located in an area where school busing is provided or is likely to be provided in the future must provide at least one bus waiting area for school children. This area must be between 30 square feet and 100 square feet as directed by the Planning Board depending on the size of the subdivision (number of students generated). The waiting area shall not include the width necessary to meet the sidewalk.

§ 6-6. Grass strips.

All cleared areas of a right-of-way not to be planted with ground-cover plantings, including all disturbed areas over all culverts in drainage easements, shall be loamed with not less than six (6) inches' compacted depth of good quality loam and seeded with lawn grass seed. Seeding shall be done at appropriate times of the year and in a manner to ensure growth of grass. No utility poles, transformers, signs or similar items shall be placed within the grass plot within three (3) feet of the edge of the pavement.

§ 6-7. Street signs.

Street name signs of a design conforming to the type in general use in the town shall be furnished, set in concrete and erected at all street intersections prior to the occupancy of any house on the street. Signs may be purchased from the Town of Warwick Highway Department.

§ 6-8. Streetlighting.

Streetlighting shall be installed along any street the Board deems appropriate. Light standards to be used shall be subject to the approval of the Planning Board and, when used, be spaced no less than every five hundred (500) feet. Streetlighting shall be designed to avoid unnecessary glare or light pollution.

§ 6-9. Monuments and markers.

A. Granite monuments shall be installed at all street intersections and at all points where, in the opinion of the Board, permanent monuments are necessary. Such monuments shall conform to the standard specifications of the Superintendent of Highways and shall be set according to such specifications.

B. Iron rods or other markers suitable to the Board shall be installed at every corner of each lot within the subdivision. Their locations shall be noted on the definitive plan.

C. No permanent monument or marker shall be installed until all construction, which might disturb or destroy the monument or maker is completed.

D. All monuments and markers shall be installed before final release of the security for the performance guarantee.

§ 6-10. Trees and planting.

A. All landscaping and planting within the rights-of-way will come under the supervision of the Tree Warden. A twelve-foot minimum width will be required on the utility side and a ten-foot minimum width on the opposite side for tree belts. Trees are to be planted no greater than forty (40) feet apart. Trees should be planted in locations, which avoid overhead or underground utilities. The Planning Board recommends that the following trees not be planted*:* all species of willow, catalpa, Norway maple poplar or other tree species considered invasive in Massachusetts. Trees approved by the Planning Board to be planted include: Red Maple, Sugar Maple, Katsura Tree, Green Ash, Ginkgo (male only), Thornless Common Honeylocust, Tupelo, Scarlet Oak, English Oak, Red Oak, London Plane Tree, Littleleaf Linden, Valley Forge Elm, Princeton Elm, 'Allee' Lacebark Elm, and Japanese Zelkova.

B. On the side of the street where overhead wires are present, large and medium growing trees should be planted within the front yard of the individual property owner, away from such wires.

§ 6-11. Utilities.

All electrical, telephone, fire alarm and other wires and cables shall be installed underground unless, in the opinion of the Board and the appropriate utility company, such installation is impractical or not in the best interest of the town. If located within a flood-prone area, as determined by the Board, transformers, switching equipment or

other vital components shall be floodproofed and approved by the Board or a Board-appointed engineer at the subdivider's expense. If the Board determines that undergrounding the utilities is impractical because of ledge, high groundwater or flooding, then the utility poles must be set back at least seven feet from the edge of the road or shoulder if any.

§ 6-12. Subdivision Fire Protection.

A Class I Subdivision (10 dwelling units or more) shall meet ISO rural fire flows of 500 gallons per minute for 2 hours. It may do this by providing 60,000 gallons of water in one or more cisterns, or by a well with a fire pump and hydrant system, or by a combination of the two. Each cistern shall have a dry hydrant with paved off road parking for the fire truck, a provision for filling the cistern, and access to the cistern for repair and cleaning. The fire pump shall be capable of pumping five hundred (500) gallons per minute at a residual pressure of twenty (20) pounds per square inch (psi). If a well is the sole source of fire flows the pump shall be able to provide the required flow for two (2) hours. If a combination of cistern storage and fire pumping from a well is used, the system must be capable of providing a fire flow equivalent to 500 gallons per minute for two (2) hours. For example, if the fire pump can provide 500 gallons per minute for one hour, then the cistern storage shall be thirty thousand (30,000) gallons. A subdivision of less than 10 dwelling units shall provide a pro rata amount of fire flows. For example, a five-unit subdivision shall provide thirty thousand gallons of water storage or have a fire pump capable of pumping 500 gallons per minute for one hour or combination which could provide 500 gallons of fire flow for one hour. The fire chief may provide for the location of the cisterns and other operational details. If the density and number of dwelling units requires a higher flow rate to comply with ISO standards the higher flow rate shall be met and may be met using a mix of cisterns and fire pumps. These fire water sources shall be available for general fire fighting outside of the subdivision unless there is a specific agreement to the contrary.

§ 6-13. As-built plans.

After final approval of all the improvements in the subdivision and before final release of the performance guaranty, the applicant shall furnish the Board with two (2) copies of an as-built plan, showing location and grades of roads, as built, as well as all utilities, as installed, including inverts of drainage and sewerage systems.

§ 6-14. Final cleanup.

After completion of construction and before release of the performance guaranty, the subdivider shall removal all temporary structures, debris, surplus materials and rubbish and shall otherwise leave the area in a neat and orderly appearance. Burning of the rubbish and waste material is prohibited.

ARTICLE VII
Administration

§ 7-1. Inspections.

A. General requirement.

(1) Inspections shall be carried out at appropriate times during the development of the subdivision when the following stages of progress have been reached.

(a) Before clearing and grubbing, the Tree Warden shall designate those trees which are to be preserved in the tree belt.

(b) The roadway shall be inspected at the stages of subbase, gravel base, binder course and surface course.

(c) The sanitary and storm drainage systems shall be inspected before the filling of utility trenches.

(d) Sidewalks shall be inspected upon completion of the subbase, permanent binder and finish courses.

(e) Curbs, loaming and seeding operations may also be inspected by a Board-appointed engineer.

(2) At the completion of all improvements in the subdivision, the Board-appointed engineer shall make an inspection before final release of the performance guaranty.

B. A qualified engineer or surveyor chosen by the Planning Board shall carry out such inspections in behalf of the town. The inspecting engineer will be onsite every day.

C. Construction of streets and installation of utilities may be phased, provided that each section shall not be less than five hundred (500) feet in length.

D. Inspection costs shall be borne by the subdivider (refer to Section 3-4 D Review and Inspection Fees and Appendix D).

E. Each specified construction stage should be completed to the satisfaction of the inspector, in writing, before further work will be done. Further work performed

without this approval will result in returning the construction to the status necessary to perform the required inspection.

F. The developer has the responsibility to ensure that the approved construction plans are implemented and construction criteria are met. Surveillance and field revisions by town officials and inspectors cannot be construed as fulfilling this responsibility.

§ 7-2. Permission required.

No building shall be erected within a subdivision without permission from the Building Inspector.

§ 7-3. Waiver of compliance.

Strict compliance with the requirements of these rules and regulations may be waived when, in the judgment of the Board, such action is in the public interest, consistent with Section 3-7, and not inconsistent with the Subdivision Control Law.

§ 7-4. Fees.

Expenses for advertising, notices, inspections and professional review will be borne by the applicant (refer to Section 3-4 D and Appendix D).

§ 7-5. Severability.

The invalidity of any of the foregoing rules, regulations and requirements shall not affect the validity of the remainder. Any part of these regulations subsequently invalidated by a new commonwealth law or modification of an existing commonwealth law shall automatically be brought into conformity with the new or amended law and shall be deemed to be effective immediately. If modification of any part of these regulations is in the opinion of the subdivider required by law, the necessary modification shall be brought to the attention of the Board by the subdivider at the earliest fewasible time or otherwise may be deemed waived.

§ 7-6. Higher standard to govern.

Whenever these rules and regulations made under the authority hereof differ from those prescribed by any local bylaw or other local regulation, the provision which imposes the greater restriction or the higher standard shall govern.

§ 7-7. Statutory rules and regulations.

For matters not covered by these rules and regulations, reference is made to MGL C. 41, § 81-K to 81-GG, inclusive.

APPENDIX A
Development Guidelines by Landscape Type

The following provides criteria for categorizing land into four (4) landscape types, based on landform, vegetation and existing development. For each landscape type, guidelines are provided for development consistent with town goals and character. The layout and construction of ways within subdivisions should be designed to comply with these guidelines and so as to facilitate vegetative cover and building development consistent with them. Included in these guidelines are considerations beyond subdivision control, such as suggested building materials. These are included here as a reference, for possible implementation at the developer's option.

Developers who believe that alternative guidelines would better meet the general goals being sought are encouraged to state those alternative guidelines as a part of their plan submittal.

Open Plain

IDENTIFICATION -- Flat land generally cleared of trees, now cropland or fields.

OBJECTIVES -- To maintain the open sweep of the land; avoid shapeless suburbia.

BUILDING SITING -- Cluster tightly, avoid scattered structures, repetitive yard dimensions.

ROAD LOCATION -- Lanes in clusters possibly rectilinear, others curving in response to minor land features.

VEGETATIVE COVER -- Protect any existing tree belts, plant street trees within clusters; mow, plow, graze.

BUILDING DESIGN -- Strong colors and textures, wood preferred; variation in basic building designs encouraged.

OTHER CONSIDERATIONS -- Agriculture encouraged.

Wooded Plain

IDENTIFICATION -- Flat land, generally wooded.

OBJECTIVES -- To avoid "suburban" development character, protect forest ecology.

BUILDING SITING -- Cluster preferred; scattered buildings away from or on edges of clearings, screened from roads.

ROAD LOCATION -- Frequent curves, staggered intersections.

VEGETATIVE COVER -- Clear underwood, only selectively clear trees.

BUILDING DESIGN -- Less critical than in other areas.

OTHER CONSIDERATIONS -- Better suited to development than most landscape types.

Mountain

IDENTIFICATION – Mountainous land and associated highlands, predominantly steep and wooded.

OBJECTIVES -- To protect the fragile mountain ecology, protect the visual quality of the town's backdrop.

BUILDING SITING -- Cluster on less steep portions and in land folds, away from crests.

ROAD LOCATION -- Follow contours, minimizing cuts and fills.

VEGETATIVE COVER -- Preserve existing cover to degree possible.

BUILDING DESIGN -- Low structures, slope-following; no large, light surfaces, bright paint or exposed metal; muted color, soft form; wood, earth, weathered silvers, grays, browns.

OTHER CONSIDERATIONS -- Extraordinary care necessary to avoid erosion; development generally undesirable.

Village

IDENTIFICATION -- Land in the vicinity of concentrated development, whose character is established by existing development.

OBJECTIVES -- To continue and provide consistency with the pattern and character of existing development.

BUILDING SITING -- Compact clustering; avoid scattered structures.

ROAD LOCATION -- Short rectilinear segments in clusters, others curving in response to land features.

VEGETATIVE COVER -- Retain or plant street trees, preserve other trees where feasible.

BUILDING DESIGN -- Anything consistent with scale, texture and colors of nearby structures; wood preferred; variety in basic building designs encouraged.

OTHER CONSIDERATIONS -- Better suited to development than most landscape types.

Appendix B:

Relevant Sections of Land Use Regulations

Zoning Bylaws

ZONING BY-LAWS

OF THE

TOWN OF WARWICK

MASSACHUSETTS

Adopted May 15, 1978
Amended July 11, l988; November 5, 1991; May 17, 2004; May 1, 2006; MAY 14, 2007; October 15, 2007; May 12, 2008, February 7, 2011; September 26, 2011

SECTION ONE: GENERAL PROVISIONS

A. PURPOSE: These By-laws have been enacted and shall be administered to satisfy one or more of the following purposes:

1. To promote the health, safety, financial security and general welfare of residents of the Town;

2. To assure adequate transportation, traffic flow, water supplies, drainage, waste disposal, schools, municipal services, parks, recreational facilities and other amenities of the Town;

3. To encourage the most appropriate use of land and prevent undue concentration of population or other inappropriate use of land;

4. To maintain the character of the Town as a small New England village and maintain the rural character of neighborhoods and natural areas within the Town;

5. To control uses of buildings, structures or land that have an impact on the Town's natural, fiscal and practical capacities;

6. To conserve natural resources, protect open space and preserve the environment;

7. To retain the natural beauty, aesthetic appeal, historic value and scenic attraction of the Town for both residents and tourists;

8. To protect the value of land, buildings and structures in the Town;

9. To promote long-range neighborhood, community and regional planning;

10. To satisfy other lawful needs in accordance with Chapter 40A of the General Laws of the Commonwealth of Massachusetts.

B. DESIGNATION: The entire area of the Town is designated as a primarily residential-agricultural district. In addition, the Town has a Floodplain Overlay District (See Section 12).

C. ADMINISTRATION:

1. Enforcement: These By-laws shall be enforced by the Building Inspector.

2. Penalties: Any violator of any provision of these By-laws may be fined not more than $100.00 per day for each day of each violation commencing ten days after the date upon which the Building Inspector sends a notice of violation to the violator by certified mail

or delivers such a notice to the violator in hand or, if the Building Inspector is not able to identify or locate the violator, posts such a notice at the site of the violation. In addition, the Town may seek injunctive relief in Court against any such violator either with or without prior notice to the violator.

3. Validity: The invalidity of any section or provision of these By -laws shall not invalidate any other section or provision of these By-laws; provided, that if requirements of Section 6 are invalidated such that the overall requirements of Section 6 are substantially modified, a moratorium on approval of conservation developments shall automatically be put into effect for one year for the purpose of permitting the town to consider modification or repeal of Section 6.

SECTION TWO: PERMITTED AND PROHIBITED USES

A. USE OF BUILDINGS, STRUCTURES AND LAND: Any person may construct, alter or use any building, structure or area of land for any lawful purpose which is not injurious, noxious, offensive or detrimental to a neighbor or neighborhood, which does not violate the provisions of any applicable permit and which is not restricted by these By-laws, other Town regulations or By-laws or the laws or regulations of the Commonwealth of Massachusetts.

B. PROHIBITED USES: The following uses are prohibited:

1. The commercial sale of used motor vehicles.

2. Junk yards and motor vehicle junk yards.

3. Mobile home parks, camper parks or accumulations of three or more temporary living facilities on a lot or at a site.

4. Mobile homes, except as stated in Section Five of these By-laws.

5. Drive-in motion picture theaters.

6. Commercial sewage disposal or treatment plants, or commercial dumping sites for waste or refuse, unless operated by the town or mandated by applicable law.

7. The outdoor collection or storage in commercial quantities of salt, de-icing materials, pesticides or herbicides.

8. Commercial wood preserving and furniture dip-stripping operations.

9. The collection, treatment, storage, burial, incineration, or disposal of radioactive waste, including but not limited to matter classified as high-level or low-level radioactive waste under the provisions of any law or regulation of the United States or the Commonwealth of Massachusetts.

10. The collection, treatment, storage, burial, incineration, or disposal of hazardous waste in any amount exceeding the minimum threshold amount requiring compliance with the Massachusetts Department of Environmental Quality Engineering Hazardous Waste Regulations.

11. More than one principal structure or use on a lot except compatible uses as provided in Section 2(C)(3) associated with a dwelling.

12. More than two (2) dwelling units in a principal structure.

C. USES ALLOWED BY SPECIAL PERMIT: The following uses are allowed only by a Special Permit issued by the Zoning Board of Appeals (or, where indicated, by the Planning Board) in accordance with these By-laws and Chapter 40A of the Massachusetts General Laws

1. Uses involving two or more full-time employees or more than 400 employee-hours per month on the premises.

2. Uses involving or requiring parking, either on or off the site, for four or more motor vehicles, unless all of the vehicles involved are registered vehicles parked in connection with a dwelling or dwellings on a lot and are owned or used by residents of that dwelling or dwellings or their family or social guests.

3. Any commercial or industrial use, provided that no Special Permit shall be required for a commercial or industrial use which would otherwise be allowed and that, in the determination of the Building Inspector, is solely agricultural or satisfies all of the following criteria:

(a) Such use is accessory to a dwelling located on the same lot.

(b) The primary use of the lot is residential.

(c) Such use is owned and operated by one or more residents of the dwelling on the lot.

(d) Such use is consistent with the residential use of the lot.

(e) Such use is not detrimental to the neighborhood in which it is located or to the Town.

4. Uses involving the construction or alteration of one or more structure containing a total area of more than 10,000 square feet.

5. Uses rendering impervious by any means more than 20% of the area of any lot, or 10,000 square feet (excluding roads in a subdivision), whichever is less.

6. Uses involving the commercial transmission, manufacture or storage of high-tension electrical power, fuel oil, gasoline, natural gas or other liquefied or gaseous petroleum products or requiring a permit for bulk storage of combustible materials or fuels for resale.

7. The raising of pigs, fur-bearing animals or poultry for commercial purposes (not applicable to parcels of land of more than five acres).

8. The conversion of a single-family dwelling into two dwelling units or the conversion of a portion of a single-family dwelling into an Accessory Apartment or the addition of an Accessory Apartment in a new or existing accessory structure. "Accessory Apartment" is defined in Section Eleven.

9. The use of any lot for two dwelling units in the same principal structure, *except for two-family dwelling units in the Conservation District, which shall conform to the applicable Minimum Requirements of Section Six, D.*

10. The use of any structure as an inn, lodging house, bed-and-breakfast, hotel or motel, provided that no such use shall be allowed unless it is licensed under applicable provisions of the Massachusetts General Laws.

11. The conversion of any preexisting nonconforming seasonal dwelling or camp to a dwelling occupied or intended to be occupied for more than eight months in a calendar year.

12. The creation of a lot having less than the required area or frontage under the provisions of Section 4(F) of these By-laws.

13. The use of a nonconforming dwelling, mobile home or temporary living facility during construction under the provisions of Section 5(A)(3) of these By-laws.

14. The use of a temporary living facility under the provisions of Section 5(B) of these By-laws.

15. At the request of the Applicant, the Planning Board may consider granting a Special Permit allowing the Common Open Land, which includes the Protected Open Space and Environmentally Sensitive Areas under the provisions of Section 6 of these By-laws, to be held by a private individual or a trust owned by private individuals provided that the interests of the residents of the Conservation Development will be protected as outlined in the requirements of the Conservation Restriction (Planning Board is permit granting authority). The Conservation Restriction would be held by the Town, the state, or a land trust.

16. Construction or alteration of surface features or contours on excessive slopes under the provisions Section 8(A)(1) of these By-laws.

17. Earth removal under the provisions of Section 8(B) of these By-laws.

18. Design or construction of a nonconforming new driveway under the provisions of Section 8(C)(9) of these By-laws.

19. Exceeding the allowed number or square footage of signs under the

provisions of Section 8(D)(5) of these By-laws.

20. Displaying directional or identification signs under the provisions of Section 8(D)(7) of these By-laws.

D. **ISSUANCE OF SPECIAL PERMITS:**

1. Criteria: Special permits shall be granted in accordance with these By-laws and Chapter 40A of the Massachusetts General Laws upon a written determination by the Zoning Board of Appeals or other permit granting authority identified in these By-laws that the action or use proposed will not have adverse effects which overbalance its beneficial effects on the town, as measured by the purposes of these By -laws. The determination shall indicate consideration of each of the purposes stated in Section l(A)(l) through 1(A)(10) and any other applicable criteria stated in these By-laws or said Chapter 40A.

2. Procedure: Unless a different procedure is mandated by these By-laws or other applicable laws, the permit granting authority shall (a) approve, (b) approve only upon stated conditions or (c) deny an application for a Special Permit following one or more public hearings held within 65 days after the date upon which the applicant filed his or her application with the permit granting authority, provided that applicant shall have forthwith filed a copy of his or her application with the Town Clerk.

3. Permit Lapse: A Special Permit shall lapse upon the expiration of two years from the date upon which said permit was granted, which shall not include the time required to pursue or await the determination of an appeal from the grant thereof, if a substantial use thereof has not sooner commenced, except for good cause or, in the case of a permit for construction, if construction has not begun by such date, except for good cause.

4. Construction or Operations: Construction or operations under a building or Special Permit shall conform to any subsequent amendment of these By-laws unless the construction or operations are commenced within a period of six months (or any longer period specified in the permit) after the issuance of the permit and, in cases involving construction, unless such construction is continued through to completion as continuously and expeditiously as is reasonable.

SECTION THREE: PREEXISTING USES

A. CONTINUATION AND RESTORATION: The lawful use of any building, structure or land may be continued, provided that such use was properly allowed when it began and has not been discontinued or destroyed by fire or natural cause for a period of two or more consecutive years.

B. **ALTERATION:** Preexisting nonconforming structures or uses may be changed, extended or altered, provided that no such change, extension or alteration shall be permitted unless the

Zoning Board of Appeals finds that such a change, extension or alteration shall not be substantially more detrimental to the neighborhood than the existing nonconforming use and provided that all applicable requirements of Section 6 of Chapter 40A of the Massachusetts General Laws are satisfied.

SECTION FOUR: LOTS AND BUILDINGS

A. APPLICATION: The requirements of this Section shall apply as follows:

1. The requirements of Sections 4(B)(1) and 4(C)(1), except as otherwise provided in this Section, shall apply to lots created or altered after March 20, 1978 and to lots reclassified under the provisions of Section *4(F)(1)* after June 8, 1988.

2. A lot used for no more than one dwelling unit and not held in common ownership with any adjoining land, or a lot qualifying under the provisions of Section 4(A)(6), is exempt from the requirements of Sections 4(B)(1) and 4(C)(1), provided that such lot, at the time of recording or endorsement, must have conformed to the then-existing requirements and provided that such lot must have at least 5,000 square feet of area and 50 feet of frontage, measured along the front lot line as defined in these By-laws, for a building permit to be issued.

3. The requirements of Section 4(C)(2) shall apply to any construction of a new dwelling or dwelling unit without regard to when the lot was created.

4. The requirements of Sections 4(D) and 4(E) shall apply to any lot created or altered after March 20, 1978, to any change of use of an existing lot and to any construction, extension, reconstruction or alteration of a building on a lot performed after March 20, 1978 without regard to when the lot was created.

5. A lot used or intended to be used for more than one dwelling unit must comply with all provisions of this Section, except lots created under Section Six, Conservation Development, without regard to when the lot was created before any building permit for residential construction or any Special Permit authorized by these By-laws may be issued.

6. Notwithstanding any other provision of these By-laws, no lot lawfully in existence on March 20, 1978 shall become an unlawful lot under any provision of this Section solely because said lot has thereafter been conveyed to an abutting landowner. The preceding sentence shall not be effective, however, if any boundary line of any applicable lot that does not conform to this Section has been changed to reduce either the length of the boundary line or the size of the nonconforming lot after the conveyance to said abutting landowner.

B. **LOT AREA:** Soil, drainage and topographical conditions, the lack of any public water or sewer systems and other factors prevalent throughout the Town make necessary the following requirements:

1. No lot shall be created or altered to contain less than 87,120 square feet (two acres) of area, except by Special Permit as provided in this Section or as provided in Section 6.E.1.

2. Lots allowed by Special Permit to be used two dwelling unit*s* shall provide an additional 87,120 square feet (2 acres) of buildable land, except a lesser amount is allowed under the provisions of Section 6.E.1, Conservation Development.

3. The conversion of a Single Family Dwelling built prior to the effective date of this bylaw amendment, May 22, 2006, into two dwelling units shall not require any additional acreage provided the footprint of the building remains the same.

C. LOT FRONTAGE AND ACCESS: Soil, drainage and topographical conditions, the lack of any public water or sewer systems and other factors prevalent throughout the Town make necessary the following requirements

1. No lot shall be created or altered to have less than 300 feet of frontage, measured along the front lot line as defined in these By-laws, except by Special Permit as provided in this Section or as provided in Section 6.E.

2. The Building Inspector shall issue no building permit for the construction of a new dwelling or dwelling unit unless and until the Building Inspector determines that the roads necessary for access to the beginning of the driveway at the boundary of the lot on which construction of a new dwelling or dwelling unit is intended to be performed are either (a) public ways maintained by the Town at the time of application for the permit that provide year-round access to the lot for fire, police and emergency motor vehicles and Town maintenance and snow removal vehicles or (b) private ways approved by the Planning Board under the provisions of the Warwick Subdivision Control By-laws that provide year-round access to the lot for fire, police and emergency motor vehicles and Town maintenance and snow removal vehicles.

D. SETBACK REQUIREMENTS: No lot shall have less than the following front, side and rear yard distances, except for Conservation Development lots as provided in Sections 6.D.8. and 6.E.2.

1. Front Yard: Thirty-five (35) feet between any building and the front lot line.

2. Side Yard: Thirty (30) feet between any building and the side lot line.

3. Rear Yard: Thirty-five (35) feet between any principal building and the rear lot line

E. MAXIMUM BUILDING HEIGHT: No building shall rise more than two and one-half stories above the mean level of the ground surrounding it and no building shall exceed thirty-five (35) feet in building height.

F. SPECIAL PERMITS: The Zoning Board of Appeals may, in its discretion, permit the creation of a lot having less than the required area or frontage as follows:

1. To receive such a Special Permit, the applicant must show that the lot falls within one of the following two classifications:

(a) If the lot has no less than 50,000 square feet of area and no less than 225 feet of frontage measured along the front lot line as defined in these By-laws, then the Zoning Board of Appeals may approve the creation of the lot and approve its use for no more than one single-family dwelling unit. Upon approving the creation of any such lot, the Zoning Board of Appeals shall cause a notice specifying the restriction of the lot to only one dwelling or dwelling unit to be recorded at the expense of the applicant in the Franklin County Registry of Deeds and shall provide a copy of said notice to the Board of Assessors of the Town, who shall cause the information contained in said notice to be recorded on the official map and records of the Town.

(b) Without requiring that the lot have any minimum area or frontage, the Zoning Board of Appeals may approve the creation of the lot as a special lot upon which no new dwelling or dwelling unit shall be constructed or otherwise established. Upon approving the creation of any such special lot, the Zoning Board of Appeals shall cause a notice specifying the number of existing dwellings or dwelling units on the lot and setting forth the prohibition of new dwellings or dwelling units on the lot to be recorded at the expense of the applicant in the Franklin County Registry of Deeds and shall provide a copy of said notice to the Board of Assessors of the Town, who shall cause the information contained in said notice to be recorded on the Town Assessors' map and in the official records of the Town.

2. The applicant shall provide all relevant data and information requested by the Zoning Board of Appeals to determine whether it should grant a Special Permit under the provisions of this Section, including but not limited to a sketch or plan showing, if applicable, the proposed boundaries of the lot, the existing and proposed topography of the lot and the proposed location of any present or proposed building, water supply and sewage disposal system.

3. Before issuing such a Special Permit, the Zoning Board of Appeals must find that the lot satisfies the Special Permit criteria set forth in these By-laws and must further determine that the use of the lot by Special Permit is unlikely to result in soil erosion or any unhealthy or unsafe condition. In making such determination, the Board shall consider the following:

(a) The slope and soil type at the location of any present or proposed principal building and sewage disposal system;

(b) The results of percolation tests of the soils within the area of any present or proposed sewage disposal system;

(c) The depth of the water table during the season when such water table is highest and the depth to bedrock or impermeable soils in the vicinity of any present or proposed sewage disposal system;

(d) The ground slope and horizontal distance between any present or proposed sewage disposal system and any water supply or surface water within the boundaries of both the proposed lot and abutting properties.

4. The Zoning Board of Appeals may then issue a Special Permit under the provisions of this Section. Such Special Permit shall state the classification of the lot under either Section 4(F)(l)(a) or Section 4(F)(1)(b) and may set forth any limitation of use and any other condition or restriction that the Board considers appropriate.

SECTION FIVE: MOBILE HOMES AND TEMPORARY LIVING FACILITIES

A. MOBILE HOMES: No mobile homes shall be permitted on any land for any purpose, including but not limited to use as a dwelling or accessory thereto, use as an occasional or temporary residence, use as an office or place of business or use as a storage facility.

1. All replacements of existing mobile homes permitted under Section 3 of these By-laws must have installed, within thirty days after the home has been placed in location, a skirting which shall extend from the lower edge of the home's siding to grade level, and around the entire periphery of the home, so that the space under the home is completely enclosed.

2. The owner and occupier of a residence which has been destroyed by fire or other natural holocaust may place a mobile home on the site of such residence and reside in such home for a period not to exceed twelve months while the residence is being rebuilt. Any such mobile home shall be subject to the provisions of the state sanitary code.

3. The owner of a lot containing a proposed permanent dwelling under construction pursuant to a valid building permit may, if granted a Special Permit at the discretion of the Zoning Board of Appeals, place a nonconforming dwelling, mobile home or temporary living facility on said lot and reside in that nonconforming dwelling, mobile home or temporary living facility for a period not to exceed six months, subject to any conditions that the Zoning Board of Appeals considers appropriate and subject to such extensions that the Zoning Board of Appeals may grant, with or without further conditions, for periods not to exceed six months per extension. Any such nonconforming dwelling, mobile home or temporary living facility shall be subject to the provisions of the state sanitary code.

B. TEMPORARY **LIVING FACILITIES:** No temporary living facility shall be used as a dwelling or residence for more than fourteen days in a calendar year in any location other than a lawfully licensed campground without a Special Permit which shall be subject to any conditions that the Zoning Board of Appeals considers appropriate. Except as provided in

Section 5(A)(3) of these By-laws, no such Special Permit shall allow the use of a temporary living facility as a dwelling or residence for more than six months in a calendar year.

SECTION SIX: CONSERVATION DEVELOPMENT

A. GENERAL PROVISIONS:

1. Definition: A Conservation Development shall mean a development consisting of single and/or two family dwellings in which the houses are clustered into one or more groups within the development, and separated from adjacent properties and other groups by undeveloped land. This type of development may be utilized for new subdivisions and access to the Conservation Development shall be from a new road constructed for the subdivision. This optional bylaw provides residents and developers of land in Town with an alternative to a standard subdivision development that is often incompatible with agricultural and forested land use and operations. The building lots are of a reduced size and concentrated together, taking up only a portion of the parcel of land. A permanent conservation restriction preventing future development is placed on the open space to be preserved.

2. Purpose: The purpose of a Conservation Development is to encourage the preservation of common land for conservation, agriculture, open space, forestry and recreational use; to preserve historical or archaeological resources; to protect existing or potential municipal water supplies; to protect the value of real property; to promote more sensitive siting of buildings and better overall site planning; to promote better utilization of land in harmony with its natural features and with the purposes of these By-laws through a greater flexibility in design; and to allow more efficient provision of municipal services.

3. Reviewing Authority: The Planning Board may approve a Site Plan for a Conservation Development as provided in this Section and Section Ten Site Plan Review.

4. Common Open Land: For the purposes of Section Six, Common Open Land is defined as Protected Open Space and Environmentaly Sensitive Areas. Protected Open Space is defined as the land area which is at least 35% of the total parcel area that is set aside as permanently protected open space pursuant to Section Six F. The area designated as Protected Open Space will be in addition to any portion of the parcel identified as Environmentally Sensitive Areas, such as wetlands, waterbodies, floodplains, slopes greater than twenty-five percent (25%), and other land prohibited from development by legally enforceable restrictions, easements or covenants, and other constraints dictated by these By-laws, applicable regulations of the Department of Environmental Protection, applicable requirements of the Board of Health, and the provisions of the Wetlands Protection Act.

B. PROCEDURES: A Conservation Development shall follow the application procedures set forth in this Section and those set forth in Section Ten Site Plan Review. The Planning Board may approve a Site Plan for the construction of a Conservation Development in any district,

subject to the regulations and conditions set forth under this section, Section Ten Site Plan Review, and Warwick's Regulations Governing the Subdivision of Land.

1. Filing of Application: Each application for a Conservation Development shall follow the Procedures and Required Contents as identified in this Section and Section Ten Site Plan Review. Applicants are encouraged to meet with the Planning Board prior to submitting a formal application to promote better communication. Applicants are also encouraged to submit a Conceptual Plan for review by the Planning Board prior to the application for Site Plan Review. Materials and information to be submitted with the Conceptual Plan shall be agreed upon by the applicant and the Board.

2. Contents of Application: Applicants for Site Plan approval for a Conservation Development shall submit nine (9) copies of a Site Plan and the narrative required to meet the requirements of this Conservation Development Bylaw, Section Ten Site Plan Review, and the requirements of Warwick's Subdivision Rules and Regulations for a Preliminary Plan. The Preliminary Plan shall show locations of proposed streets, building envelopes, Environmentally Sensitive Areas, and Protected Open Space. The plan shall be prepared by a professional engineer, registered architect, registered landscape architect, or registered land surveyor. In addition, the applicant shall provide the following information:

a. The number of dwellings which could be constructed under this By-law according to Section 6 D.2

b. A map and analysis of the site, including wetlands, a Forest Type Map prepared by a Licensed Professional Forester, water bodies, slopes greater than twenty-five percent (25%), soil types, areas within the 100 year flood zone as shown on the Federal Insurance Administration (FIA) Flood Hazard Boundary Maps for Warwick dated January 24, 1975, prevailing winds, solar aspect diagram, land prohibited from development by legally enforceable restrictions, easements or covenants, and such other natural features as the Planning Board may request.

c. A summary of the environmental concerns relating to the proposed plan.

d. A description of the neighborhood in which the tract lies, including utilities and other public facilities, and the impact of the proposed plan on them.

e. The proposed use (e.g. farming, forestry, etc.), size, shape, location, and natural resource value of the land to be permanently protected within the Conservation Development, and accessibility by residents of the Town or of the Conservation Development.

f. Materials indicating the landowner's interest in the land to be developed, the form of organization proposed to own and maintain the common land, the substance of covenants and grants of easements to be imposed upon the use of land and structures and a development schedule.

g. A preliminary septic system design;

h. Measures to prevent soil erosion, increased runoff, and flooding;

i. Preliminary drainage calculations (definitive calculations to be included with definitive subdivision plan);

j. Projected traffic flow patterns and the total number of building lots;

k. Proposed design features intended to integrate the proposed development into the existing landscape;

l. Preliminary location(s) of the public water supply;

m. Fire protection provisions;

n. If necessary to determine compliance with the requirements or intent of this provision or evaluate complex site conditions, the Planning Board may require further reasonable engineering or environmental analysis to be prepared at the expense of the applicant

o. A "metes and bounds" desciption of the land to be set aside as protected space.

p. A copy of a draft application filed either simultaneously with or prior to the conservation development application, for a conservation restricition on the common land as described in Section 2.C.16, meeting the requirements of MGL Chapter 184 Sections 31 through 33; which application may be contingent upon approval of the conservation development and site plan reviw.

3. Review of Other Boards: Upon receipt of the application, the Town Clerk shall transmit copies of the application to the Planning Board, Conservation Commission, the Board of Health, the Historical Commission, the Open Space Committee, the Highway Superintendent, the Fire Chief, the Police Chief, and the Building Inspector. Town Boards and municipal officials other than the Planning Board shall have 45 days from the date the completed application is received by the Town Clerk to report to the Planning Board their findings and recommendations. The Fire and Police Chief will review the application to ensure that the proposal provides adequate emergency vehicle access to all lots. If necessary to ensure compliance with this section, the Planning Board may require further reasonable engineering or environmental analysis to be conducted at the expense of the applicant.

4. Public Hearing: After the opportunity for a 45 day review by other boards has taken place, the Planning Board shall hold a hearing under this section, in conformity with the provisions of Chapter 40A, Section 11[~~9~~], of the Massachusetts General Laws, the provisions of these By-laws, Section Ten Site Plan Review and the regulations of the Planning Board. 5. Relation to Subdivision Control Act: Planning Board approval of a

Site Plan shall not substitute for compliance with the subdivision control act, nor oblige the Planning Board to approve any related definitive plan for subdivision, nor reduce any time periods for board consideration under that law. However, in order to facilitate processing, the Planning Board may, insofar as practical under existing law, adopt regulations establishing procedures for submission of a combined plan and application which shall satisfy this section and the board's regulations under the subdivision control act. In addition, to the extent permitted by law, the Planning Board shall coordinate the public hearing requirement for a Conservation Development with the Public Hearing required for a Definitive Subdivision Plan.

C. CRITERIA: Approval of a Conservation Development Site Plan shall be granted only if the Planning Board determines that the requirements of the Conservation Development and Site Plan Review bylaws have been complied with.

D. MINIMUM REQUIREMENTS:

1. The minimum area of land required for a Conservation Development shall be ten (10) acres and the parcel shall be held in single ownership or control at the time of application.

2. The maximum density of a Conservation Development shall not exceed the allowed density for a conventional subdivision in any zoning district except as described in Section 6 H. Bonus Incentives. In a Conservation Development, the maximum number of building lots will be determined by one of the following methods at the Applicants option:

a. Method 1 - The maximum density for the Conservation Development under Method 1 shall be calculated by taking the parcel area and subtracting out any acreage that is wetlands, floodplains, existing permanently protected open space, land with slopes greater than 25%, other land prohibited from development by legally enforceable restrictions, easements or covenants, and other constraints dictated by these By-laws with 10% of the total parcel area subtracted for roads and drainage to find the Net Parcel Area. The Net Parcel Area shall be divided by the Minimum Lot Area of the zoning district in which the parcel is located to determine the maximum number of lots allowed. All wetlands shall be defined under the supervision of the Conservation Commission and in accordance with the provisions of the Wetlands Protection Act, M.G.L. Ch. 131, Sec. 40.

b. Method 2 - A preliminary plan for a conventional (non-Conservation Development) subdivision for the site shall be submitted illustrating the number of lots that could be created under a conventional subdivision (2 acre lots and 300 feet of frontage) and the results of deep hole and perc tests indicating how many of these lots would be buildable. The proposed road grade(s) shown on the preliminary plan must meet the standards of Warwick's Subdivision Rules and Regulations. The perc tests shall be conducted under the supervision of the Board

of Health, and in conformance with Title 5, percolation tests. The number of buildable lots will equal the maximum density of the Conservation Development.

3. The development shall include single and/or two-family dwellings only. Only one principal structure is permitted on each building lot.

4. Each lot shall have adequate access on an approved private way. The Planning Board shall determine that each lot shown on the plan has practical access from the way upon which the lot fronts, in that there are no legal or physical impediments which will prevent access particularly for emergency vehicles such as fire engines and ambulances. The road serving the Conservation Development shall be a new road that complies with the Design Standards of Warwick's Subdivision Regulations unless such compliance is waived by the Planning Board pursuant to Section 3.5 of the Subdivision Regulations.

5. Each lot shall comply with the minimum dimensions required in Section Six.

6. Each lot shall be of a size and shape to provide a building site which shall be in harmony with the natural terrain and other features of the land.

7. At least thirty-five percent (35%) of the total parcel of land shall be set aside as Protected Open Space. To the extent possible the preserved land shall form a contiguous tract to maintain or enhance wildlife habitat or enable continued farming or forestry operations. The minimum required Protected Open Space will be in addition to existing permanently protected open space, roadways, accessory uses, Environmentally Sensitive Areas such as wetlands, floodplains, and land with slopes greater than 25%, other land prohibited from development by legally enforceable restrictions, easements or covenants, and other constraints dictated by these By-laws, applicable regulations of the Department of Environmental Protection, applicable requirements of the Board of Health, and the provisions of the Wetlands Protection Act, or the 50 foot buffer required under Section 6. D. 8. except that the portion of the 50 foot buffer which is contiguous to the Protected Open Space may be counted.

8. All residential structures and accessory uses within the development shall be set back from the parcel boundaries by a buffer strip of at least fifty (50) feet in width to be kept in a natural or landscaped condition.

9. There shall be an adequate, safe, and convenient arrangement of pedestrian circulation, facilities, roadways, driveways, and parking. There shall be no parking in the buffer strip.

10. Design of roads, utilities, and drainage shall be functionally equivalent to the standards contained in the Planning Board's Subdivision Control Regulations insofar as reasonably applicable, but the Board may vary those standards to meet the particular needs of the Conservation Development.

11. All structures which require plumbing that may be connected to a public sanitary sewer, if available, or to a communal septic system serving the development or a portion thereof shall be in compliance with Title 5 of the Massachusetts Environmental Code. With the Definitive Subdivision Plan, the applicant shall submit a septic system design for the Conservation Development prepared by a Registered Professional Engineer and approved by the Board of Health, in conformance with Title 5 of the State Environmental Code, and a plan illustrating the location of water supply wells. A Conservation Development may utilize shared septic systems designed, installed and maintained in accordance with the State Environmental Code Title 5, 310 CMR. Septic systems shared or otherwise should be located outside of all agricultural land supporting farming operations to the maximum extent possible.

12. Every Conservation Development shall include a condition that the approved and recorded Definitive Subdivision Plan of said Conservation Development shall have endorsed upon it a statement that the subdivision is an approved Conservation Development and that no land within the subdivision may be further subdivided so as to increase the number of building lots, and shall contain a reference to the approved Site Plan for the Conservation Development.

E. DIMENSIONAL AND DENSITY REQUIREMENTS:

1. Building lot sizes shall not be less than one-half acre for a single dwelling unit in a principal structure or 1 acre for two dwelling units in a principal structure.

2. In no instance shall a building lot have less than 100 feet of frontage on an approved public or private way.

3. The minimum Setbacks for Yard Dimensions for each building lot shall be as follows:

a. Not less than 25 feet for the Front setback;
b. Not less than 10 feet for the Rear setback; and
c. Not less than 10 feet for the Side setback except that two single family dwelling units may be attached on one side having no Side Yard setback (zero setback). The other Side Yard of an attached single family unit (the nonattached side) shall be at least 10 feet. Nonattached single family units shall have a minimum Side Yard setback of 10 feet.

4. The maximum height of dwelling units and structures shall be 35 feet.

F. REQUIRED CONSERVATION LAND:

1. Common Open Land may be used for passive recreation, forestry, conservation, or agricultural uses which preserve the land in essentially its natural condition. In general, natural resource land such as wetlands, or land that is suitable for extensive public recreational use, should be conveyed to the town or to a qualified conservation organization; whereas land which will be principally used by the residents of the Conservation Development should be conveyed to a home owners association. The area to be preserved as Common Open Land shall be made subject to a perpetual restriction of the type described in M.G.L. c.184 (including future amendments thereto and corresponding provisions of future laws) running to or enforceable by the Town of Warwick. To ensure this, a Conservation Restriction in accordance with M.G.L. Chapter 184 Sections 31 to 33 shall be imposed on the Common Open Land and recorded in the Registry of Deeds by the applicant at the time the approved Definitive Plan is submitted to the Registry of Deeds for recording. The applicant shall notify the Planning Board in writing within ten (10) days after the Conservation Restriction and the Definitive Plan, as approved and endorsed, have been recorded at the Franklin County Registry of Deeds and, in the case of registered land, with the recorder of the Land Court, of such recording, noting book, page number and date of recording. The purpose of the Conservation Restriction will be to clearly identify the uses and restrictions which apply to the Common Open Land in order to protect the value of the property within the development. Approval of a Conservation Development will be contingent upon final adoption of the Conservation Restriction, and no building permit shall be granted under the the conservation development until such final adoption.

2. Further subdivision of the Common Open Land or its use for other than the above listed uses, except for easements for underground utilities and septic systems, shall be prohibited. Structures or buildings accessory to recreation, conservation, or agricultural uses may be erected but shall not exceed 5 % coverage of the Protected Open Space or 10,000 square feet, whichever is less.

3. Such Common Open Land shall be conveyed to one or more of the following entities:

a. A corporation or trust owned or to be owned by the owners of lots within the development. If such a corporation or trust is utilized, ownership thereof shall pass with conveyances of the lots in perpetuity;

b. A nonprofit organization, the principal purpose of which is the conservation or preservation of open space;

c. The Town, at no cost, provided that the Town accepts the land for a park or open space use. Such conveyance shall be at the option of the Town and shall require the approval of the voters at a Town Meeting.

d. The Planning Board, at the request of Applicant, may consider granting a Special Permit to have the Protected Open Space or Environmentally Sensitive Areas retained by a private individual or a trust owned by private individuals provided that the interests of the residents of the Conservation Development will be protected as 5utlined in the requirements of the Conservation Restriction. Such Special Permit

shall meet the requirements of Section Two Permitted and Prohibited Uses, paragraphs C.15 and D., of the Zoning Bylaws and other requirements to be determined by the Planning Board.

4. In any case where such land is not conveyed to the Town, a restriction enforceable by the Town shall be recorded to ensure that such land and/or frontage shall be kept in an open or natural state and not be built for residential use or developed for accessory uses such as parking or roadways. Such restrictions shall further provide for maintenance of the Common Open Land in a manner which will ensure its suitability for its function, appearance, cleanliness and proper maintenance of drainage, utilities and the like.

5. If the Common Open Land is to be conveyed to the lot owners within the development, ownership and maintenance of such land shall be permanently assured through an incorporated nonprofit homeowner's association, covenant, or other land agreement through which each lot owner in the development is automatically a member and each lot is subject to a charge for a share of the maintenance expenses or through a comparable arrangement satisfactory to the Planning Board. Such land agreement documents shall be submitted with the Site Plan and shall be subject to approval by the Planning Board and Town Counsel. These covenants shall also include provisions for the maintenance of all common facilities and utilities.

6. Such covenants shall specify how the organization will be governed and how costs will be assessed and that the organization shall remain under the control of the developer until a majority of the lots are conveyed to permanent owners.

7. Such covenants shall provide that in the event that the organization established to own and maintain the Common Open Land or any other commonly owned facilities or utilities or any successor organization fails to maintain the Common Open Land or any other commonly owned facilities or utilities in reasonable order and condition in accordance with the Site Plan, the Town may, after notice to the organization and public hearing, enter upon such land and maintain it in order to preserve the taxable values of the properties within the development and to prevent the Common *Open* Land from becoming a public nuisance. The covenants shall also provide that the cost of such maintenance by the Town shall be assessed proportionately against the properties within the development and shall become a charge on said properties enforceable as a real estate tax and that such charge shall be paid by the property owners within thirty (30) days after receipt of a statement therefor.

8. If land subject to the Conservation Restriction is contiguous to other land which is or might become similarily restricted, or to publicly owned land, or if beneficial for maintenance of town options for future trail development, the Planning Board may request that public easements for hiking or equestrian trails be granted by the applicant within the protected open space for access to existing or potential trails on such adjacent lands, and the applicant shall be awarded 10 bonus points for the grant of such easements.

G. FURTHER REQUIREMENTS:

1. There shall be no amendments or changes to an approved Site Plan without review and approval from the Planning Board.

2. No lot within an approved Conservation Development may be further subdivided so as to increase the number of lots, and a notation to this effect shall be shown on any Definitive Plan of a subdivision and on the approved Site Plan if not a subdivision under the Subdivision Control Law.

3. No use other than residential, agricultural, forestry or passive recreation shall be permitted.

4. The Board may approve a Site Plan hereunder for Conservation Development even if the proposed development is not subject to the Subdivision Control Law.

5. Upon approving the creation of a Conservation Development, the Planning Board shall provide a copy of the Definitive Plan and notice required in Section Six F.1. to the Board of Assessors of the Town, who shall cause the information contained in said notice to be recorded on the Town Assessors' map and in the official records of the Town.

6. Wherever it is feasible, all residential buildings shall be located away from agricultural soils that are classified by the U. S. Natural Resources Conservation Service as prime farmland and soils of state and local importance and placed on soils the least suitable for production of crops and livestock. This provision does not apply to the location of on-site septic disposal systems that must by placed on soils meeting the Massachusetts Environmental Code Title 5.

7. The layout and construction of utilities, drainage systems, and roads shall be located to have the least possible impact on agricultural lands and uses or mature forest stands.

8. To minimize conflict with agricultural operations, all residential lot lines shall be located at least one hundred (100) feet from agricultural activities. This area shall be made up of a buffer strip of trees or open space

9. To the maximum extent possible, residential units should be integrated into the landscape to avoid interrupting the view of agricultural or scenic landscapes from adjacent public ways. Structures should be sited within any woodland contained on the parcel, along the edges of fields, or in locations where structures can be visually screened or absorbed into natural vegetative or topographic features. Vegetative and structural screening, landscaping, grading, and building placement on the lot should be used to minimize visual interference with pre-existing landscape features.

10. Residential units shall, to the maximum extent feasible, have a solar and wind orientation which encourages energy conservation. If all dwelling units are Enegry Star Homes 10 bonus points will be earned.

11. Either modification of the site plan as described or approved deviation from the site plan by the definitive plan shall be approved under the same criteria and with the same required finds as approval of the site plan itself.

H. BONUS INCENTIVES AND DISINCENTIVES: Creating a subdivision development using the Conservation approach is often less expensive for the developer as roads are shorter and utilities are grouped together. Thus, Warwick's provision of a Conservation Development option should be considered an incentive unto itself. However, to further encourage Conservation Development the following "point incentive system" has been developed. A Site Plan that meets any of the following criteria will earn the number of points listed. Depending on the total number of points earned, a developer may earn a bonus in the form of extra building lots allowed within the development. The Planning Board will determine, upon review of the Site Plan, the bonus point total.

A Site Plan that earns at least 40 points will earn a 10% building lot bonus above the basic number of building lots allowed under Section Six D. A Site Plan that earns 60 points or more earns a 20% building lot bonus above the basic number of building lots allowed under Section Six D. If the point total results in a building lot bonus of a fractional number, the bonus building lot total will be rounded down to the next lower whole number. The total number of bonus lots cannot exceed 20% of the maximum number of building lots allowed under Section 6.D. before the addition of bonus lots (e.g., 2 bonus lots for a 10 lot subdivision for a total of 12 lots).

1. Any development that increases the amount of land permanently preserved by 5% above the 35% requirement for Protected Open Space earns 10 points. Each additional 5% increase in preserved land results in an additional 10 points. The bonus points will only be awarded for additional Protected Open Space that is contiguous to the Common Open Land. For example, if a developer permanently protects 40% of the total parcel area as Protected Open Space and the acreage that comprises the additional 5% is contiguous to the 35% required Protected Open Space or other Common Open Land, 10 points would be earned.

2. If a minimum of 5 acres of protected agricultural land is set aside with an Agricultural Management Plan acceptable to the Planning Board that ensures sustainable agricultural production for a 10-year term, 10 points would be earned.

3. If a minimum of 10 acres of protected forestland is set aside with a sustainable Forest Management Plan for a 10-year term that is prepared by a Licensed Professional Forester, 10 points would be earned.

4. A Conservation Development plan that permanently protects land in a tract that is at least 10 acres in size and contiguous to an already protected area so as to increase the area of forestland, wildlife habitat, working agricultural land, or other land approved by the Planning Board as meeting the purposes of Section Six. A. 2. of this bylaw, earns 10 points.

5. A development plan that permanently screens structures from view from a public way as evidenced by cross sections of the definitive plan at a scale of 1 inch = 10 feet earns 10 points.

6. Architectural designs for the single-family or two-family structures that match the historic character of the area earn 10 points. Architectural elevation drawings of the single-family or two-family homes must accompany the site plan to be eligible to receive points in this category.

7. If all houses are certified as Energy Star Homes, 10 points will be earned.

8. If a minimum of 20% of the housing units will be certified to meet MGL Chapter 40B (Affordable Housing) requirements, 10 points will be earned.

9. If the Planning Board requests an easement for hiking or equestrian trails and such an easement is included in the Conservation Restriction as described in Section 6.F.8., 10 bonus points will be earned.

10. Development in prime agricultural land as described in Section 6.G.6 or failure to comply with Section 6.G.8 will result in **subtracting** 10 bonus points.

11. If residential units are not integrated into the landscape to avoid interrupting the view of the agricultural or scenic landscapes from adjacent public ways as described in Section Six G.9., then 10 bonus points will be **subtracted.**

SECTION 7: RATIONAL GROWTH

A. PURPOSES:

- To promote orderly growth consistent with the rate of growth in the Town of Warwick over the previous ten calendar years;
- to avoid straining the community's ability to provide the town, its boards, and its agencies with information, time, and capacity to incorporate such growth in its plans and the regulation of the community;
- to encourage housing accessible to under-served and lower-income residents and potential residents;
- to allow time for the Zoning Task Force and the Planning Board to rewrite the Zoning By-laws and Subdivision Regulations;
- and to further the general purposes set forth in Section 1(A) of these By-Laws.

B. GENERAL PROVISIONS:

1. Issuing Building Permits: The Building Inspector shall issue building permits for construction of new dwellings and for conversion of and/or additions to existing dwellings only if the application complies with the provisions of Section 7 of the Warwick Zoning By-Laws.

2. Applicability: The regulations of this section shall apply to all existing lots except as provided for in MGL Chapter 40A Section 6**,** definitive subdivision plans, and Special

Permits that would result in the creation of a new dwelling unit or units. Dwelling units shall be considered as part of a single development for purposes of Rational Growth if located on either a single parcel or on contiguous parcels of land in the same beneficial ownership or under the same contract for development or that appear to be related at the time an application is submitted. *The Building Inspector shall determine beneficial ownership and relationship.*

3. Time Limit: A building permit expires 6 months from the date of initial issuance unless construction is initiated before the expiration date or an extension is granted as specified in State Building Code Paragraph 780 CMR 111.8. **Amending the permit does not extend the expiration date.** An applicant may, however, apply for a new permit.
4. Protection Against Zoning Changes: Protection against zoning changes granted to land in a subdivision under Chapter 40A, Section 7, of the Massachusetts General Laws subsequent to granting an initial permit shall, in the case of development whose completion has been impeded by Town actions taken under this section shall be extended ten years from the date of initial issuance.
5. Termination Date: Section 7 of these By-Laws, entitled "RATIONAL GROWTH," shall expire five years from May 14, 2007
6. Duplexes: A building permit for two dwelling units in one principal structure shall count as one (1) Building Permit for purposes of the town-wide total; in a development, however, each unit of a duplex will count as one (1) dwelling unit toward the town-wide total.

C. RESIDENTIAL LIMITATION:

1. Town-Wide Limit: Except as provided below, a town-wide total of not more than six (6) new dwelling units shall be authorized by the Town within any one calendar year.
2. General Applicants: Not more than two (2) dwelling units shall be authorized via Building Permit for any one applicant within any calendar year, except as provided below.
3. Conservation Development Projects (see Section 6, above): Permits for up to four (4) dwelling units may be issued to an applicant of an approved Conservation Development Project. The four (4) dwelling units or any fraction thereof will count as one (1) unit toward the town-wide limit.
4. Affordable Housing Subdivision: Building permits for up to four (4) dwelling units may be obtained by the same applicant upon receiving final approval for a subdivision project that includes at least twenty percent (20%) affordable housing as defined in Massachusetts General Laws Chapter 40B. Every four (4) such permits, or any fraction thereof, will count as one (1) toward the town-wide limit.
5. Affordable Housing Conservation Development: (See Section 6 of these Zoning By-laws): Building permits for up to twelve (12) dwelling units may be obtained by an applicant of an approved Conservation Development Project that includes a minimum of twenty percent (20%) affordable housing as defined in Massachusetts General Laws Chapter 40B. Every six (6) dwelling units or fraction thereof, will count as one (1) unit toward the town-wide limit.

D. EXEMPTIONS:

1. Family Lot: A single permit for construction of one dwelling unit or principal structure by and for a family member related by birth, marriage, civil union, or adoption (a child, parent, grandparent, sibling, or spouse) on a lot created when a resident divides land and transfers it to said family member is exempt from the town-wide limit provided for in Section 7.C.1 for ten years from the date of transfer, and the Building Permit will not count against the town wide limit. The grantee may only exercise this option once in a lifetime.
2. Family Conversion: Conversion of a resident-owner's principal structure to provide living quarters for a family member, whether or not the footprint of the structure is altered, is exempt from the town-wide limit, Section 7.C.1, and the Building Permit will not count against the town wide limit.
3. Small-Unit Conversion Exemption: Conversion of a principal structure to contain a dwelling unit of 800 square feet or less, where the footprint of the structure is not changed, is exempt from the town-wide limit, Section 7.C.1, and the Building Permit will not count against the town wide limit.
4. Affordability Exemption: Any individual dwelling unit that meets the affordability criteria of Massachusetts General Laws Chapter 40B, and is not part of a larger project, is exempt from the town-wide limit, Section 7.C.1, and the Building Permit will not count against the town wide limit.
5. Conservation Lot Exemption: A permit for a dwelling unit to be constructed on a lot conforming to the provisions of Section 4 of these By-laws which has been carved out of the unrestricted portion of a parcel of which at least eighty percent (80%) is covered by a Conservation Restriction conforming to the provisions of Massachusetts General Law Chapter 184, Sections 31-33, is exempt from the provisions of Section 7 for a period of ten (10) years from the date the Conservation Restriction is recorded in the Franklin County Registry of Deeds, provided that no more than three such permits may be associated with any one so-restricted parcel. The Building Permit will not count against the town wide limit.

E. ADMINISTRATION

1. Rules and Regulations: The Planning Board may adopt rules and regulations relative to the administration of this Section, and amend them from time to time. Copies of the rules and regulations shall be on file and available for review at the office of the Town Clerk.
2. Affordability Determination: The Planning Board shall be responsible for making affordability determinations as required by Massachusetts General Law 40B.
3. Order of Processing Applications for Building Permits: The Building Inspector shall not record an application as complete and received without verification that the applicant has complied with required development related reviews and approvals by the Conservation Commission, the Zoning Board of Appeals, the Board of Health, the Planning Board, the Highway Superintendent, and others as required by the General Laws of the Commonwealth of Massachusetts and the Bylaws of the Town of Warwick. As each complete application is received, the Building Inspector shall assign it a number in chronological order according to the date the completed application is received and shall grant a Building Permit in accordance with the provisions of this section.
4. Carryover of Applications from the Previous Year: Beginning January 1 of each year, the Building Inspector shall hold over from the previous year, and place at the head of the

chronological list only those completed applications that were received previously but for which no building permit was issued. All other applicants, including those who received building permits for part of a proposed development, shall be assigned a place in chronological order upon submitting a completed application.

SECTION EIGHT: PARTICULAR USES

A. EROSION CONTROL: The Building Inspector may require for any proposed construction or any proposed alteration of the surface features or contours of any land that site design, building design and construction procedures shall be modified so as to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed. In cases where the proposed construction or alteration involves the construction of a new driveway, the Highway Supervisor shall have concurrent jurisdiction with the Building Inspector to require that the site design or construction procedures of the driveway shall be so modified.

1. Excessive Slopes: No such construction or alteration of surface features or contours shall take place on slopes in excess of 25% except pursuant to a Special Permit issued by the Zoning Board of Appeals. The Board shall issue such a Special Permit only if it is satisfied that adequate provisions have been made to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed.

2. Topographic Data: The Building Inspector or the Zoning Board of Appeals may request a permit applicant or affected landowner to provide reasonable topographic data.

B. EARTH REMOVAL: No removal or relocation of sod, loam, clay, sand or gravel shall take place, except when incidental to and in connection with the construction of a structure, or except when incidental to the grading or developing of contiguous property, or except when pursuant to a Special Permit issued by the Zoning Board of Appeals. The Board may issue such a Special Permit only if it is satisfied that adequate provisions have been made to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed, or caused by methods of handling such materials at the site or transporting such materials in the Town.

1. Procedures: Any person removing or relocating sod, loam, clay, sand or gravel, even if permitted by one or more of the exceptions stated above, shall follow appropriate procedures to protect the site, the neighborhood and the Town against erosion, soil instability, uncontrolled surface water runoff, environmental degradation and other permanent or temporary damage caused by conditions which may exist either during operations or after operations are completed..

2. Top Soil: Any top soil removed during any operations must be replaced, regraded and seeded wherever possible upon the completion of operations.

3. Violations: Violators of any of these earth removal provisions shall forthwith correct all violations and, if so ordered, shall restore the land to its original state as it existed prior to their violations.

C. **DRIVEWAYS**:

1. Procedure: The Highway Supervisor of the Town may approve or disapprove new driveway applications in accordance with the following provisions, may require changes is the design or construction of new driveways in accordance with the following provisions and may develop an appropriate form for new driveway applicants. All new driveways accessing public or private roads of the Town shall require a permit from the Highway Supervisor before construction of the driveway and before issuance of any applicable building permit.

2. Turnarounds: All new driveways shall be provided with adequate space for reversing the direction of a standard-sized automobile, so that the automobile may enter the traveled road from the driveway facing forward.

3. Sight Distances: No new driveway may be located where the minimum sight distance at four feet above the traveled road surface in each direction along the public or private road from which it is accessed is less than the following:

a. Minimum 100 feet in a zone where the speed limit is less than 30 miles per hour;

b. Minimum 150 feet in a zone where the speed limit is 30 miles per hour or a zone where there is no posted speed limit;

c. Minimum 200 feet in a zone where the speed limit is greater than 30 miles per hour.

4. Obstructions: No wall or other obstruction shall be maintained at the intersection of any driveway with a traveled road which causes danger to traffic on the road or to users of the driveway by unreasonably obscuring a view.

5. Gradients: The first six feet of any new driveway, measured from the edge of the traveled road surface, must have a minimum gradient of 2%, or 1/4 inches per foot, downgrade from the road and a maximum gradient of 8%, or one inch per foot, downgrade from the road. The next fourteen feet of the driveway must have a maximum gradient of 8%, or one inch per foot, downgrade or upgrade. The remaining length of the driveway must have a maximum gradient of 20%, or 2 1/2 inches per foot, downgrade or upgrade.

6. Entrances: The first 20 feet of any new driveway, measured from the edge of the traveled road surface, shall be at least 12 feet wide. The angle of entrance to the traveled road surface must be between 60° and 120° The radius of entrance to the traveled road surface must be at least ten feet.

7. Surfaces: Within the first six feet of the entrance to the traveled road surface of any new driveway, the driveway material shall at least match that of the existing road. On slopes of between 10% and 20% within 35 feet upgrade of the edge of the road, the driveway shall be adequately constructed and stabilized to prevent surface water or loose driveway material from washing out onto the road.

8. Culverts and Drainage: Existing drainage ditches parallel to public or private roads shall not be obstructed by any driveway. Upon a determination of need by the Highway Supervisor or by a licensed professional engineer hired by the lot owner, culverts of appropriate size and a durable material (such as asphalt-coated galvanized steel) shall be installed at no expense to the Town. Culvert diameter shall be at least 12 inches. Where appropriate in the judgment of the Highway Supervisor, driveways shall be provided with parallel drainage swales and with culverts allowing storm water to cross the driveway without creating erosion or washouts.

9. Special Permits: The Zoning Board of Appeals may issue a Special Permit granting relief at a particular site from one or more of the foregoing provisions regarding driveways. Before it issues such a Special Permit, the Board shall consider any recommendation submitted at the Special Permit hearing by the Highway Supervisor, Chief of Police or any other interested Town official and shall determine that adequate provisions have been made for the safety of traffic on the road and users of the driveway and for the drainage and structural integrity of the driveway.

D. SIGNS:

1. No sign shall project over or into any pedestrian or vehicular way customarily used by the public.

2. No sign shall incorporate, or be illuminated by, flashing or blinking lights, nor shall any sign be designed to attract attention by a change in light intensity or by repeated motion, nor shall any sign be illuminated at any time of day when the business or other use advertised is not operating.

3. No sign shall constitute a nuisance or hazard to pedestrian or vehicular traffic by intensity or direction of illumination, by placement or by any other reason.

4. No billboard or other sign shall be erected or maintained on which the principal product or service advertised is not regularly produced or available on the premises where the billboard or other sign is located, except that political "lawn signs" that comply with Sections 8(D)(1), 8(D)(2) and 8(D)(3) may be erected and maintained for a reasonable time before any election or caucus.

5. In the case of a use allowed by these By-laws or by a Special Permit obtained under the provisions of these By-laws, or in the case of a proposed sale or lease of the premises upon which a sign is located, signs pertaining to such use, sale or lease are allowed, provided that such signs comply with Sections 8(D)(1) through 8(D)(4) and provided that

the number of signs clearly visible from any point not on the premises shall not exceed two and the total area of all such signs shall not exceed eight square feet unless a Special Permit allowing more signs or more square feet has been issued by the Zoning Board of Appeals.

6. Signs legally existing on May 15, 1978 (the date of adoption of these provisions) may continue as preexisting nonconforming uses. Any nonconforming sign which has not been maintained for 12 consecutive months shall be removed within 60 days after notice from the Building Inspector.

7. A directional or identification sign not allowed under the provisions of 8(D)(5) or 8(D)(6) may be erected and maintained with a Special Permit issued by the Zoning Board of Appeals upon a finding by that Board that the sign for which a permit is requested will serve the public convenience, will not endanger the public safety and will be of such size, location, and design as will not be detrimental to the site, the neighborhood or the Town.

8. Nothing in these provisions shall affect signs required by law to be posted, signs which only direct traffic or indicate parking areas, or signs posted by or under the lawful authority of the Town.

E. INCOMPLETE MOTOR VEHICLES: No accumulation of two or more inoperable motor vehicles shall be permitted to accumulate at any outdoor location unless that location is completely screened from all public ways and all land or buildings owned by others.

SECTION NINE: ZONING BOARD OF APPEALS.

A. MEMBERSHIP: The Board of Selectmen shall appoint a Zoning Board of Appeals of three members, at least two of whom shall be real property owners in the Town of Warwick, and two associate members, at least one of whom shall be a real property owner in the Town of Warwick, and all five shall be residents of the Town of Warwick.

B. OPERATION: The Zoning Board of Appeals shall be the Special Permit granting authority, except in situations where these By-laws designate another Special Permit granting authority, and shall act on all matters within its jurisdiction under these By-laws in the manner prescribed in Chapter 40A of the General Laws. The members of the Board shall serve without remuneration.

C. POWERS: The Zoning Board of Appeals may grant special permits and variances to these By-laws, may set appropriate conditions or limitations before granting such special permits and variances and shall decide appeals brought under this By-law. The Board may charge reasonable fees to applicants for such special permits, variances and appeals. The Board may require the applicant to pay for, or reimburse the Town for, all costs incurred, without limitation for professional assistance in reviewing an application, including, but not limited to engineering, planning, legal and technical services. The board may require performance bonds or escrow

accounts as part of the application approval. (As amended by the vote of Annual Town Meeting, May 17, 2004, and approved by the Attorney General.)

D. NOTICES BEFORE HEARINGS: In addition to any other notice required by applicable law, the Zoning Board of Appeals shall provide written notice of any hearing held on any application for a Special Permit, variance or appeal to the Chairmen of the Board of Selectmen, Planning Board, Board of Health and Conservation Commission and to the Highway Supervisor, Chief of Police and Tree Warden no later than three (3) days after the date of publication of the official notice of such hearing, but such notice may be waived in writing at any time before or after the hearing by a majority vote of the Board or Commission to whom such notice should have been sent.

E. NOTICES AFTER HEARINGS: Within a reasonable time after it grants a Special Permit or Variance, the Zoning Board of Appeals shall cause a notice of the Special Permit or Variance that it granted to be recorded at the expense of the applicant in the Franklin County Registry of Deeds.

SECTION TEN: SITE PLAN REVIEW

A. PURPOSE: The purpose of Site Plan Review is to ensure that new development is designed in a manner which protects the environmental and scenic qualities of the neighborhood and the Town and is consistent with Section One A. 4, 5, 6, and 7.

B. SITE PLAN REVIEW PROCESS: The Site Plan Review process will be conducted by the Planning Board.

C. APPLICABILITY: Site Plan Review shall be required for:

1. Conservation Developments (see Section Six).

D. PROCEDURES: An applicant for Site Plan Review shall file a completed application meeting all requirements of the application process, in paper and electronic format, with the Town Clerk. The Town Clerk shall acknowledge receipt of the plans by signing and dating the application form. The application submitted to the Town Clerk shall include nine (9) copies each of an application form, Site Plan and any narrative documents as outlined in the submittal requirements. The Town Clerk shall transmit copies of the application to the Planning Board, the Conservation Commission, the Board of Health, the Historical Commission, the Open Space Committee, the Highway Superintendent, the Fire Chief, the Police Chief, and the Building Inspector. These Town Boards and municipal officials shall have 45 days from the date the completed application is received by the Town Clerk to report to the Planning Board their findings and recommendations, and failure to respond or provide comments within 45 days shall be deemed to constitute no objection to the application No building permits for projects requiring Site Plan Review shall be issued until the Planning Board has approved the Site Plan or unless the required time period for taking action on a Site Plan has lapsed without action from the Planning Board.

The concurring vote of a majority of the membership of the approving board shall be required for any decision pursuant to Section Ten G. on a use requiring Site Plan Review only. Conditions or modifications that may be imposed include, but are not limited to the following:

1. Controls on location and type of access to the site.
2. Requirements to screen or relocate buildings and parking/loading areas and provide buffers to protect adjoining property.
3. Requirements to reduce the traffic impact of the proposed project.
4. Requirements to minimize impacts on the capacity of infrastructure serving the site.
5. Requirements to minimize environmental degradation during construction.
6. Modifications to the proposed size and scale of the project.
7. Other reasonable conditions designed to mitigate a project's impacts and ensure compliance with applicable review criteria, including the installation of on-site and off-site improvements.

For the purpose of securing the installation of required site improvements, including landscaping and on-site and off-site improvements, the approving board may require a performance bond, deposit of money, letter of credit, or other security in an amount determined by the board to be sufficient to cover the cost of all or any part of improvements required in a form acceptable to Town Counsel and consistent with the Town of Warwick's Regulations Governing the Subdivision of Land.

Any site plan approved under this bylaw shall lapse in two years if construction has not begun, or is not carried forward to completion as continuously and expeditiously as is reasonable.

Decisions of the approving board regarding Site Plan Approval may be appealed as set forth in M.G.L., Chapter 40A, Section 17.

E. PUBLIC HEARING: The Planning Board shall hold a recorded (videotaped and/or audiotaped) public hearing within 65 days after the filing of a completed application and shall take final action on an application for Site Plan approval within 90 days of the close of the public hearing. Notice and posting of the public hearing shall comply with the provisions of M.G.L. Chapter 40A, Section 11, regarding notice for public hearings. To the extent permitted by law, the public hearing should be coordinated with any other public hearing required for a Definitive Subdivision Plan.

F. REQUIRED CONTENTS OF A SITE PLAN: All Site Plans shall be prepared by a registered architect, registered land surveyor, registered landscape architect, or professional engineer. The Site Plans shall be consistent with the map requirements from Section Six, B.2. A locus map at a scale of 1" = 100 feet shall be provided showing parcels and roads within 300 feet of the property line. The Site Plans shall be on standard sheets of 24 inches by 36 inches and prepared at a scale of 1"=40 feet or finer. Each sheet shall be signed and stamped by a registered architect, registered land surveyor, registered landscape architect,and/or professional engineer, as applicable. The Site Plan and accompanying narrative shall contain the following:

1. Name of project, boundaries, locus map(s) showing the site's location in Town, date, north arrow and scale of plan;

2. Name(s) and address(es) of the owner(s) of the land, the developer (if applicable), and/or their designee;
3. Name, title, and address of person(s) who prepared the plan;
4. Names and addresses of all owners of record of abutting lots and those within 300 feet of the property line;
5. All existing lot lines, easements and rights of way;
6. A plan of existing site conditions that shows all site features, including topography, existing natural drainage and stormwater flow paths, wetland resource areas, forested areas, and agricultural areas.
7. Location and use of buildings, structures, and roads within 300 feet of the site;
8. Location and use of all existing and proposed buildings and structures, including approximate height and floor area;
9. Location of wetlands on site and within 300 feet of the property line;
10. Location and a description of all proposed septic systems, sewer connections, water supplies, storm drainage systems, utilities and other waste-disposal methods;
11. Location of water sources, cisterns, hydrants, drinking water pipes, and pipes for fire protection;
12. Location and date of all registered "perc" tests on the site;
13. Location of all proposed new lot lines;
14. Existing and proposed topography at a two-foot contour interval for the proposed grading and landscape plan;
15. Location of proposed public and private ways on the site;
16. Location and size of proposed parking and loading areas, driveways, walkways, pedestrian safety measures, and access and egress points;
17. Location and a description of proposed open space or recreation areas;
18. Location of areas with slopes greater than or equal to 25%, the 50-foot buffer area, and the boundaries of the land to be protected by the Conservation Restriction.
19. Size and location of existing and proposed sign(s);
20. Surface drainage strategy that prevents increased drainage off-site or pollution;
21. Existing vegetation that will be left undisturbed and proposed landscape features, including the location and a description of screening, fencing and plantings using non-invasive species;
22. Design features which will integrate the proposed development into the existing landscape, maintain neighborhood character, and screen objectionable features from neighbors and roadways;
23. A complete list of chemicals, pesticides, fuels and other potentially hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use;
24. Provisions to protect against the discharge of hazardous materials or wastes to the environmentdue to spillage, accidental damage, corrosion, leakage or vandalism, including spill containment and cleanup procedures;
25. Provisions for indoor, secured storage of hazardous materials and wastes with impervious floor surfaces;
26. Estimated average daily and peak-hour vehicle trips to be generated by the site and

traffic flow patterns for both vehicles and pedestrians, showing adequate access to and from the site, adequate circulation within the site, and pedestrian safety measures.

27. Information necessary to determine compliance with paragraphs 4, 5, 6, and 7 of thePurpose Section (Section One. A.) of this bylaw.
28. Information necessary to review the plan under Section Ten, paragraph J.

G. DECISION: The Planning Board's action shall consist of one of the following:

1. Approval of the site plan based upon the determination that the proposed project is in compliance and consistent with the criteria set forth in this By-law;

2. Approval of the site plan subject to conditions, modifications, and restrictions as the Planning Board may deem necessary; or

3. Denial of the site plan based upon specific findings such as a determination that there was insufficient information submitted with the proposal to allow for adequate review it or that the project is inconsistent with the purposes or requirements of these Zoning By-laws.

The decision of the Planning Board shall be filed with the Town Clerk within 90 days of the close of the Public Hearing and the written record of the decision including any approved Site Plan shall be filed wih the Town Clerk within 14 days of the final vote or sooner to meet the 90 day maximum time frame. A copy of any approved Site Plan and the decision of the Planning Board shall be sent by the Town Clerk to the Building Inspector and to the Registry of Deeds. The subsequent Definitive Plan submitted under Warwick's Subdivision Rules and Regulations must be in complete accordance with the approved Site Plan. Any deviation from the approved Site Plan will require approval from the Planning Board. Any modifications to the Site Plan approved by the Planning Board during the Definitive Plan process must also be sent to the Town Clerk, the Building Inspector and to the Registry of Deeds.

H. ADMINISTRATION AND WAIVERS. The Planning Board may adopt and from time to time amend regulations for the submission and approval of site plans. The Planning Board may waive any of the requirements for site plan submittal and approval if the simplicity or scale of the project warrants such action. The Planning Board may also request any additional information it should need to render a decision. For large or complex projects, the Planning Board shall have the right to retain a registered professional engineer, planner, designer or other professional to advise the Board regarding any or all aspects of the Site Plan. The applicant shall be responsible for the costs of such advice.

I. COMPLIANCE WITH OTHER BYLAWS: The site plan shall comply with any zoning by-laws for parking, loading, dimensions, environmental controls and all other provisions of the Zoning By-law. Before approval of a site plan, the Planning Board may request that the applicant make modifications in the proposed design of the project to ensure that the above criteria are met.

J. REVIEW CRITERIA: The Planning Board's evaluation of the proposed Site Plan shall include, when applicable, the following critera:

1. Compliance with all applicable provisions and requirements of these bylaws.
2. Avoidance of excessive noice, dust, odors, solid waste, glare, electrical interference, or any other nuisances.
3. Screening or location of unsightly features so as to be unobtrusive from neighboring properties and public roadways.
4. Adequacy, arrangement, and safety of vehicular traffic access and circulation, and accessibility for fire, police, and emergency vehicles, including intersections, road widths, pavement surfaces, dividers and traffic controls.
5. Adequacy and arrangement of pedestrian traffic access and circulation, pedestrian walkways, control of intersections with vehicular traffic and overall pedestrian safety and convenience.
6. Protection of the supply and quality of groundwater and surface water and natural resources and ecosystems.
7. Provision of open spaces and pedestrian amenities available to the public.
8. Avoidance of erosion or sedimentation.
9. Integration of the project into the existing terrain and surrounding landscape by minimizing impacts on wetlands, steep slopes, and hilltops; protecting visual amenities and scenic views; preserving unique natural or historical features; minimizing tree, vegetation and soil removal; minimizing grade changes, and integrating development with the surrounding neighborhood in a manner that is consistent with the prevailing pattern, design, and scale of development and that protects historic structures and features.
10. Provision of underground utilities or conduits where feasible.
11. Location, arrangement, appearance and sufficiency of off-street parking and loading.
12. Location, arrangement, size, design and general site compatibility of buildings, lighting and signs in relation to the terrain and to the use, scale, and proportions of existing and proposed buildings in the vicinity.
13. Provision of open spaces and pedestrian amenities available to the public.
14. Location of buildings to provide a solar and wind orientation which encourages energy conservation.
15. Adequacy of stormwater and drainage facilities, including avoidance of adverse impacts of stormwater runoff from the site. Drainage shall recharge groundwater to the extent practical, and surface waters flowing off-site shall not adversely affect drainage on adjacent properties or roads.

SECTION ELEVEN: DEFINITIONS

ACCESSORY APARTMENT: An additional dwelling unit in an existing dwelling. An accessory apartment may also be located in a new or existing structure accessory to a dwelling, such as a garage, guest house or barn. The size of the apartment shall not exceed 800 square feet. The owner of the property shall occupy the principal dwelling unit or the accessory apartment. Adequate off-street parking shall be provided, and parking shall be to the side and rear of the principal structure to the maximum extent possible.

ALTERATION: A change in external form, shape or size of a building or structure.

BUILDING: Any roofed structure permanently located on land, used or usable for housing or enclosing persons, animals or materials.

BUILDING INSPECTOR: The Inspector of Buildings or Building Commissioner appointed by the Selectmen pursuant to the Massachusetts Building Code, or his or her duly appointed agent.

BUILDING HEIGHT: The vertical measurement of a building from the mean level above the ground surrounding it to the highest point of the roof, excluding chimneys, antennae, etc.

BUILDABLE LAND - considering the whole parcel, all land exclusive of areas jurisdictionally under the Massachusetts Wetlands Protection Act and regulations, slopes greater than twenty-five percent (25%), and land prohibited from development by legally enforceable restrictions, easements, or covenants, and other constraints dictated by these by-laws, applicable regulations of the Massachusetts Department of Environmental Protection, applicable requirements of The Board of Health, and all other applicable laws, Town bylaws, regulations or requirements.

DRIVE-IN MOTION PICTURE THEATER: Premises designed to be used for the outdoor commercial display of motion pictures while customers remain in their automobiles.

DRIVEWAY: A portion of land permanently used or intended to be used by motor vehicles as an access to or egress from a street. A newly created driveway, or a driveway, whenever created, serving a new dwelling unit, shall be considered a new driveway.

DWELLING: A building or structure or portion thereof used or intended to be used by one or more persons as a permanent, seasonal or occasional residence.

DWELLING UNIT: The living quarters for a single family with cooking, living, sanitary and sleeping facilities substantially independent of those of any other unit. Each two guest units in a motel or hotel, every four beds in a hospital, nursing home or convalescent home, or accommodations for four persons in a boarding house, rooming house, guest house, dormitory or other group living arrangement, shall be considered equivalent to a dwelling unit.

FAMILY: One or more persons, all of whom are related by birth, marriage or adoption, living as a unit, or no more than six individuals living together.

FRONTAGE: The length of the front lot line.

INOPERABLE MOTOR VEHICLE: Any motor vehicle that either (a) is not capable of motion under its own power or (b) does not display a license plate with an unexpired motor vehicle registration tag.

JUNK YARD: Land or structures used commercially for the collection, storage or sale of wastepaper, rags, scrap metal, or discarded materials, or for collecting, dismantling, storing, salvaging, or selling inoperative machinery, vehicles, or parts thereof.

LOT: All contiguous land in the same ownership. Land touching other land on any boundary and land separated from other land only by a public or private way shall be considered to be contiguous.

LOT LINE: A division line between adjoining lots, or a division line between a lot and a street, or a division line between individual lots established by a plan approved by the Planning Board under the provisions of the Warwick Subdivision Control Bylaws.

LOT LINE (FRONT): The lot line fronting on one side of one public way not discontinued or abandoned that is not a private way and that is maintained by the Town, or on one side of one private way shown on a plan approved by the Planning Board under the provisions of the Warwick Subdivision Control Bylaws, measured continuously between the intersection of the side lines with the front lot line.

LOT LINE (REAR): The lot line opposite and most distant from the front lot line.

LOT LINE (SIDE): Any lot line not a front or rear lot line.

MOBILE HOME: A structure built on a chassis, usually containing electrical, plumbing and sanitary facilities, designed to be installed on a temporary or a permanent foundation for use as a dwelling or for any other permanent purpose.

MOBILE HOME PARK: A lot, or a series of adjoining and connected lots, upon which more than two mobile homes are located, regardless of whether or not a charge is made for such accommodations.

MOTOR VEHICLE JUNK YARD: Any business or place of collection, storage or deposit, whether in connection with another business or not, where four or more inoperable motor vehicles or substantial parts thereof are displayed for sale.

NON -CONFORMING USE OR STRUCTURE: A lawfully existing use or structure which does not conform to the requirements of these By-laws.

PRINCIPAL USE OR STRUCTURE: The primary purpose for which land or a building is designed, arranged, maintained or occupied.

SIGN: Any permanent or temporary structure, device, object, symbol, letter, word, display, pennant, insignia or trade flat, which is used as an announcement, direction, or advertisement for any person, premises or activity and which is visible from any public way or from any abutting property.

SPECIAL PERMIT: An authorization that the permit granting authority identified in these By-laws may issue in its discretion, subject to whatever conditions it considers appropriate.

STREET: A public way not discontinued or abandoned that is not a private way and that is maintained by the Town, or a private way shown on a plan approved by the Planning Board under the provisions of the Warwick Subdivision Control By-laws.

STRUCTURE: A combination of materials constructed or erected at a fixed location. Included are buildings, frameworks, sheds, platforms, towers and fences. An underground well, transmission line or sewerage disposal system shall not be considered a structure.

TEMPORARY LIVING FACILITY: Any structure other than a permanent and immobile building or a mobile home, or any motor vehicle, or any portion of such a structure or motor vehicle, used by one or more persons for sleeping and/or other residential purposes for any period of time.

VARIANCE: An authorization that the Zoning Board of Appeals may issue in its discretion under the provisions of Chapter 40A, Section 10 of the Massachusetts General Laws.

SECTION TWELVE: FLOOD PLAIN OVERLAY DISTRICT

A. STATEMENT OF PURPOSE

The purposes of the Floodplain Overlay District are to:

1. Ensure public safety through reducing the threats to life and personal injury;
2. Eliminate new hazards to emergency response officials;
3. Prevent the occurrence of public emergencies resulting from a reduction in water quality, contamination, and/or pollution due to flooding;
4. Avoid the loss of utility services which if damaged by flooding could disrupt or shut down the utility network and impact regions of the community beyond the site of flooding;
5. Reduce costs associated with the response and cleanup of flooding conditions;
6. Reduce damage to public and private property resulting from flooding waters.

B. FLOODPLAIN DISTRICT BOUNDARIES AND BASE FLOOD ELEVATION AND FLOODWAY DATA

1. The Floodplain District is herein established as an overlay district. The Floodplain District includes all special flood hazard areas designated on the Warwick Flood Hazard Boundary Map (FHBP; an official map of a community issued by FEMA where the boundaries of the flood and related erosion areas having special hazards have been designated as Zone A or E) issued by the Federal Emergency Management Agency (FEMA) for the administration of the NFIP dated January 24, 1975 as Zone A, which indicates the 100-year regulatory floodplain. The FHBP is incorporated herein by reference and is on file with the Town Clerk, Zoning Board of Appeals, Planning Board, Building Inspector, and Conservation Commission.

2. Floodway Data: In Zone A, along watercourses that have not had a regulatory floodway designated, the best available Federal, State, local, or other floodway data shall

be used as outlined in the State Building Code to prohibit encroachments in floodways which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.

3. Base Flood Elevation Data: Base flood elevation data is required for subdivision proposals or other developments greater than 3 lots or 5 acres, where a portion of the development activity would be located within Zone A.

4. High and Significant Hazard Potential Dam Inundation Areas: Mapping of High and Significant Hazard Dam Inundation Areas is required for subdivision proposals or other developments greater than 3 lots or 5 acres, where a portion of the development activity would be located within Zone A.

C. DEFINITIONS: The purpose of these definitions is to clarify the intent of the bylaw, but shall be subservient to the Definition Section of Massachusetts Dam Safety Regulations at 302 CMR 10.03.

AREA OF SPECIAL FLOOD HAZARD is the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year (also known as the "100-year flood"). The area is designated as Zone A.

BASE FLOOD means the flood having a one percent chance of being equaled or exceeded in any given year (also known as the "100-year flood").

BASE FLOOD ELEVATION (BFE) means the topographical contour line showing the water surface elevation (in whole feet) of the base or 100-year flood.

DAM BREACH INUNDATION AREA means the area that may be inundated if a dam would be breached or would fail.

DEVELOPMENT means any manmade change to improved or unimproved real estate, including but not limited to building or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) administers the National Flood Insurance Program. FEMA provides a nationwide flood hazard area mapping study program for communities as well as regulatory standards for development in the flood hazard areas.

FLOODWAY means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation.

HIGH HAZARD POTENTIAL DAM refers to dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

MOBILE HOME means a structure built on a chassis, usually containing electrical, plumbing and sanitary facilities, designed to be installed on a temporary or a permanent foundation for use as a dwelling or for any other permanent purpose, and **MOBILE HOME PARK** means a lot, or a series of adjoining and connected lots, upon which more than two mobile homes are located, regardless of whether or not a charge is made for such accommodations.

NEW CONSTRUCTION means, for floodplain management purposes, structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by a community. For the purpose of determining insurance rates, **new construction** means structures for which the "start of construction" commenced on or after the effective date of an initial FIRM (Flood Insurance Rate Map; an official map of a community on which FEMA has delineated both the Areas of Special Flood Hazard and the Risk Premium Zones applicable to the community) or after December 31, 1974, whichever is later.

RIVER means a natural flowing body of water that empties to any ocean, lake, or other river.

SIGNIFICANT HAZARD POTENTIAL DAM refers to dams located where failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities.

STRUCTURE means, for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a mobile home. **Structure**, for insurance coverage purposes, means a walled and roofed building, other than a gas or liquid storage tank that is principally above ground and affixed to a permanent site, as well as a mobile home on foundation. For the latter purpose, the term includes a building in the course of construction, alteration, or repair, but does not include building materials or supplies intended for use in such construction, alteration, or repair, unless such materials or supplies are within an enclosed building on the premises.

SUBSTANTIAL IMPROVEMENT means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either (a) before the improvement or repair is started, or (b) if the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition, "Substantial Improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

ZONE A means the 100-year floodplain area where the base flood elevation (BFE) has not been determined. To determine the BFE, use the best available federal, state, local, or other data as outlined in the State Building Code.

D. NOTIFICATION OF WATERCOURSE ALTERATION

The Warwick Building Inspector shall notify the following of any alteration or relocation of a river, due to other than natural causes:

- Adjacent Communities
- Bordering States
- NFIP State Coordinator

Massachusetts Department of Conservation and Recreation, 251 Causeway Street, Suite 600-700, Boston, MA 02114-2104, NFIP Program Specialist

Federal Emergency Management Agency, Region I, 99 High Street, 6th Floor, Boston, MA 02110

E. USE REGULATIONS

1. Reference To Existing Regulations

All development in the Floodplain District, including structural and non-structural activities, whether permitted by right or by special permit, must be in compliance with Chapter 131, Section 40 of the Massachusetts General Laws (the Wetlands Protection Act) and with the following:

- Section of the Massachusetts State Building Code which addresses floodplain hazard areas (currently 780 CMR 120.G, "Flood Resistant Construction");
- Wetlands Protection Regulations, Department of Environmental Protection (DEP) (currently 310 CMR 10.00);
- Inland Wetlands Restriction, DEP (currently 310 CMR 13.00); and
- Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, DEP (currently 310 CMR 15, Title 5).

Any variances from the provisions and requirements of the above referenced state regulations may only be granted in accordance with the required variance procedures of these state regulations.

2. Permitted Uses

The following uses with low flood damage potential and causing no obstructions to flood flows are allowed provided they are permitted in the underlying district and they do not require structures, fill, or storage of materials or equipment:

a. Agricultural uses such as farming, grazing, truck farming, horticulture, etc.

b. Forestry and nursery uses.

c. Outdoor recreational uses, including fishing, boating, play areas, etc.

d. Conservation of water, plants, wildlife.

e. Wildlife management areas, foot, bicycle, and/or horse paths.

f. Temporary non-residential structures used in connection with fishing, growing, harvesting, storage, or sale of crops raised on the premises.

g. Buildings lawfully existing prior to the adoption of these provisions.
Subsection E.2.a, b and f shall be applied in a manner consistent with the protections accorded to agriculture by MGL Chap. 40A, Section 3 and MGL Chap 128, Section 1A.

Subsection E.2.a, b and f shall be applied in a manner consistent with the protectios accorded to agriculture by MGL Chap. 40A, Section 3 and MGL Chap 128, Section 1A.

3. Prohibited Uses

a. Commercial or industrial uses are prohibited in the Floodplain District.

b. Mobile homes placed on a site for longer than 6 months and mobile home parks are prohibited in the Floodplain District, except as provided in Section 5 of the Zoning Bylaws.

c. Storage of vehicles or equipment within the floodway is prohibited. The Zoning Board of Appeals may consider whether a variance from this prohibition is warranted, where a hardship exists due to lot size or configuration.

d. Dumping of trash, garbage or other materials in the floodway is prohibited.

e. Construction of any kind on slopes of greater than 25% within the Floodplain District is prohibited.

f. Storage or processing of hazardous materials (Hazardous materials are products, wastes, or combination of substances which because of their quantity, concentration, or physical, chemical, toxic, radioactive, or infectious characteristics may reasonably pose a significant, actual, or potential hazard to human health, safety, welfare, or the environment when improperly treated, stored, transported, used, disposed or otherwise managed, and may include acids and alkalis, solvents, thinners and pesticides. Hazardous materials include, without limitation, synthetic organic chemicals, petroleum products, heavy metals, radioactive or infectious materials, and all substances defined as “toxic” or “hazardous under M.G.L. Chapters 21C and 21E, using the Massachusetts Oil and Hazardous Substance List (310 CMR 40.0000)) is prohibited.

g. Residential subdivision structures, except drinking water supply structures and appurtenances, are prohibited.

4. Restricted Uses

a. Any eligible forest management cutting of more than 10 cords or 5 thousand board feet in a floodplain shall require a Forest Cutting Plan pursuant to the requirements of the Forest Cutting Practices Act and Regulations (M.G.L. Chapter 132, Sections 40 to 46 and 304 CMR) without exception. The provisions of 304 CMR 11.05 that the cut shall not exceed 50% of the basal area uniformly distributed over the area and the area shall not be cut again for at least 5 years shall apply to any cutting done in the floodplain as applicable. Skid roads in any cutting done in the floodplain shall be laid out perpendicular to the stream whenever possible to reduce channelization of flood waters and to slow down the flow of flood waters. Nothing in this subsection relieves the applicant of complying with the Wetlands Protection Act.

b. Fenced animal grazing areas must be located at least fifty (50) feet from the floodway, with a naturally vegetated fifty-foot (50-foot) buffer strip to reduce runoff, and a fence to prevent animals from encroaching on the buffer strip. This provision is subject to a waiver by the Agricultural Commission where the grazing activity will be low density with minimal runoff potential.

5. Uses by Special Permit

a. No structure or building in the Floodplain District shall be erected, constructed, substantially improved, reconstructed, or otherwise created or moved; no earth or other materials dumped, filled, excavated, or transferred, unless a Special Permit is granted by the Zoning Board of Appeals.

b. The following uses may be allowed by Special Permit in accordance with the Special Permit regulations of this Zoning Bylaw, and additional restriction and criteria contained herein:

i. A single family residence, duplex, or apartment Residential accessory uses including garages, driveways, private roads, utility rights-of-way and on-site waste-water disposal systems.

ii. Mobile homes for not more than six months in a calendar year.

iii. Animal feedlots (confined, fenced areas designed for intensive feeding of livestock), in conformance with Best Management Practices established by the Natural Resource Conservation Service (NRCS).

iv. Aquaculture, in conformance with Best Management Practices established by the Natural Resource Conservation Service (NRCS).

v. Altering, dumping, filling, or removal of riverine (relating to or resembling a river, or located beside a river) materials or dredging.

vi, New impoundments, dams, or other water obstructions constructed within the Floodplain District.

Subsection iii and iv shall be applied in a manner consistent with the protection given to agriculture by MGL Chap 40A, Section 3 and subsection vi shall be applied in a manner consistent with MGL Chap 253.

6. Special Permit Regulations and Procedures

a. The following Special Permit Regulations apply in the Floodplain District:

i. Within Zone A, where base flood elevation is not provided on the FHBM, the applicant shall obtain any existing base flood elevation data as outlined in the State Building Code.

ii. No encroachments (including fill, new construction, substantial improvements to existing structures, or other development) shall be allowed unless it is demonstrated by the applicant that the proposed development, as a result of compensating actions, will not result in any increase in flood levels during the occurrence of a 100-year flood in accordance with the Federal Emergency Management Agency's regulation for the National Flood Insurance Program.

iii. Construction on slopes of 10-25% within the Floodplain District shall require the preparation and submittal of an erosion and sediment control plan describing best management practices which will be employed to prevent construction-related impacts to water quality.

iv. Utilities and facilities shall be so located and constructed as to minimize or eliminate flood damage.

v. Adequate methods shall be provided for the periodic disposal of sewage, refuse and other wastes resulting from the uses permitted on the site.

vi. The proposed use shall comply in all respects to the provisions of the underlying district in which the land is located.

vii. The Zoning Board of Appeals may specify such additional requirements and conditions as it finds necessary to protect the health, safety and welfare of the public and the occupants of the proposed use.

viii. There shall be established a "routing procedure" such that within 10 days of the receipt of five (5) copies of the application by the Town Clerk the Zoning Board of Appeals shall transmit one copy of the development plan to the Conservation Commission, one to the Board of Health, one to the Planning Board, and one to the Building Inspector. Final action shall not be taken by the Zoning Board of Appeals until reports have been received from the above Boards or until thirty-five (35) days have elapsed from the date of transmission from the Town Clerk. Failure to respond or provide comments within 35 days shall be deemed to constitute no objection to the application.

ix .Existing and proposed contour intervals of site and elevations of existing and proposed structures must be included on a plan proposal prepared by a registered professional engineer as defined in 302 CMR Section 10,03. To the maximum extent feasible, structures shall be located outside of the Floodplain District and Dam Breach Inundation Areas.

x. All plans submitted for development in the Floodplain District and Dam Breach Inundation Areas must be prepared by a registered professional engineer~~,~~

b. In addition to complying with the provisions of Section 2D of the Warwick Zoning Bylaws, in order to issue a Special Permit, the Zoning Board of Appeals shall find that the proposed use and any associated public utilities or facilities in the Floodplain District must:

i. Not create flood hazards which are detrimental to the public health, safety and welfare.

ii. Comply in all respects to the provisions of the underlying District within which the land is located.

iii. Comply with all applicable State and Federal laws, including the Massachusetts Wetlands Protection Act (M.G.L. Ch. 131, Sec. 40).

iv. Be situated in a portion of the site that will most likely conserve wetland vegetation.

v. Be integrated into the existing landscape through features such as vegetative buffers.

vi. Be located outside of the Floodplain District to the maximum extent feasible.

vii. Be located outside of the Inundation Areas of any High and Significant Hazard Potential Dams in the region.

viii. Not result in erosion or sedimentation.

ix. Not result in water pollution.

x. Not result in increased runoff on site or onto abutting properties.

7. Nonconforming Uses

a. Any lawful use, building, structures, premises, land or parts thereof existing at the effective date of this Bylaw/Ordinance or amendments thereof and not in conformance with the provisions of this bylaw/ordinance shall be considered to be a nonconforming use. Any existing use or structure may continue and may be maintained, repaired, and improved.

b. Preexisting nonconforming structures or uses may be changed, extended or altered, provided that no such change, extension or alteration shall be permitted unless the Zoning Board of Appeals finds that such a change, extension or alteration shall not be substantially more detrimental to the neighborhood than the existing nonconforming use and provided that all applicable requirements of Section 6 of Chapter 40A of the Massachusetts General Laws are satisfied.

F. ENFORCEMENT AND PENALTIES

1. Violations

Any development activity that has commenced or is conducted contrary to this bylaw may be restrained by injunction or otherwise abated in a manner provided by law.

2. Notice of Violation

When the Building Inspector determines that an activity is not being carried out in accordance with the requirements of this bylaw, the Building Inspector shall issue a written notice of violation to the owner of the property. The notice of violation shall contain:

a. the name and address of the owner, applicant; and violator,

b. the address when available or the description of the building, structure, or land upon which the violation is occurring;

c. a statement specifying the nature of the violation;

d. a description of the remedial measures necessary to bring the activity into compliance with this bylaw and a time schedule for the completion of such remedial action;

e. a statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

f. a statement that the determination of violation may be appealed to the municipality by filing a written notice of appeal within fifteen (15) days of service of notice of violation.

3. Stop Work Orders

Persons receiving a notice of violation from the Building Inspector will be required to halt all construction activities. This "stop work order" will be in effect until the Building Inspector confirms that the development activity is in compliance and the violation has been satisfactorily addressed. Failure to address a notice of violation in a timely manner can result in civil, criminal, or monetary penalties in accordance with the enforcement measures authorized in this bylaw.

4. Criminal and Civil Penalties

Any person who violates any provision of this ordinance, valid regulation, or the terms or conditions in any permit or order prescribed or issued thereunder, shall be subject to a fine not to exceed $100 for each day such violation occurs or continues or subject to a civil penalty of up to $100 per day for each violation, which may be assessed in an action brought on behalf of the Town in any court of competent jurisdiction.

5. Non-Criminal Disposition

As an alternative to criminal prosecution or civil action, the Town of Warwick may elect to utilize the non-criminal disposition procedure set forth in the town bylaws. The Building Inspector shall be the enforcing entity. The penalty for each violation shall be $75. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

6. Restoration of Lands

Any violator may be required to restore land to its undisturbed condition. In the event that restoration is not undertaken within a reasonable time after notice, the Town of Warwick may take necessary corrective action and place a lien on the property for the cost pursuant to MGL Chap 40, Section 58.

G. SEVERABILITY

The invalidity of any section or provision of this bylaw/ordinance shall not invalidate any other section or provision thereof.

Appendix C:

FEMA Approval and Board of Selectman Adoption of 2013 Multi-Hazard Mitigation Plan