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APPENDIX A

HAZARD DEFINITIONS[1]

A. Flooding

Flooding is a temporary overflow of water onto lands not normally covered by water producing measurable property damage or forcing evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business. Hazards of fire, health and transportation accidents and contamination of water supplies are likely effects of flooding situations.

There are several types of hazards that are related to flooding:

1. Hurricanes

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. The dangers of the storm include torrential rains, high winds and storm surges. It produces measurable damage from heavy rainfalls, winds, and floods.

High winds are a primary cause of hurricane-inflicted loss of life and property damage. Another cause is the flooding resulting from the coastal storm surge of the ocean and the torrential rains, both of which accompany the storm. A hurricane watch is issued when there is a threat of hurricane conditions within 24-36 hours. A hurricane warning is issued when hurricane conditions (winds greater than 74 mph/119 kph or dangerously high water and rough seas) are expected in 24 hours or less.

All areas of Pelham are potentially at risk if a hurricane reaches Hillsborough County. Hurricanes are known to create widespread inland small stream and river flooding from torrential rains.

2. 100-year Floodplain events

Properties within the 100-year floodplain (the area inundated by a 100-year flood)[2] are at an increased risk during a natural disaster or event related to flooding. Steep topography and restricted riparian basin areas preclude large floodplains.

The areas that are most susceptible to the 100-year flood in Pelham are depicted in Map 5. The structures that are located within this area are at a greater risk than structures located upland of these areas. However, even people who do not live near water are susceptible to flooding.

3. Debris-Impacted Infrastructure

Debris carried by floodwaters can significantly compromise the effectiveness of otherwise adequately designed bridges, dams, culverts, diverting structures, etc. Storm debris, and structures such as poorly designed snowmobile bridges, carried by floodwaters, may exacerbate a given flooding hazard by becoming obstructions to normal storm water flow[3]. Pelham has a seres of bridges on the Beaver Brook that have the potential for damage in a one hundred year or five hundred flood event.

All bridges, culverts and related roadways are vulnerable to this kind of hazard.

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[1] Except where otherwise noted, The Northeast States Emergency Consortium (http://www.nesec.org/hazards/) was referenced for all of the definitions of the hazards common in Hillsborough County and New Hampshire.
[2] "Water in Environmental Planning." Thomas Dunne and Luna B. Leopold, 1978. pg. 428.
[3] John J. Shaughnessy, *State of New Hampshire Natural Hazards Mitigation Plan*.

4. Landslides

A landslide is the downward or outward movement of slope forming materials reacting under the force of gravity including: mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Areas of particular landslide hazard are found where steep hillsides intersect thin, permeable layers of earth that overlay impermeable (dense, silty, or clayey) sediment. These areas are commonly adjacent to old riverbeds or lakebeds[4]. Streambank erosion may also eventually result in landslides.

Much of the development in New Hampshire is along rivers or in these particularly senstive areas, making landslide events more likely. The banks of the Merrimack River are generally considered to be conducive to landslide activity[5]. Sites for potential steep slope erosion in Pelham are generally in the western side of Town and on portions of Beaver Brook.

5. Rapid Snow Pack Melt

The climate, mountainous terrain and riverine watersheds are susceptible to flooding which may be accelerated by moderate temperatures and moderate to heavy rains leading to seasonal rapid melting of snow pack. The upland areas may be exposed to flash flood incidents with associated erosion and deposition issues in, or near streambeds. Lower lying areas may experience either flash flooding or inundation events accelerated by the rapid melting of the snow pack[6].

Structures and improvements located on, along, or at the base of steep slopes are most vulnerable, as are structures in the 100-year and 500-year floodplains.

6. River Ice Jams

Ice forming in riverbeds and against structures presents significant hazardous conditions. Storm waters encounter these ice formations which may create temporary dams. These dams may create flooding conditions where none previously existed (*i.e.*, as a consequence of elevation in relation to normal floodplains). Additionally, the impact of the ice itself on structures such as highway and railroad bridges may apply pressure laterally and/or may lift these structures which may not be designed for such impacts[5].

Bridges, culverts, and related roadways, such as identified in the Critical Facilities Database and Map 4 are most vulnerable.

7. Dam Breach and Failure

Dams function to serve the needs of flood control, recreation, wildlife enhancement and water resources management[5]. During severe weather events, such as a flood, a dam's ability to serve as a flood control mechanism may be challenged and could breach or fail. In this event, anything downstream of a dam is in danger. Pelham had a small dam failure during the 2004 April Fools Day rains and flood.

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[4] "Water in Environmental Planning." Thomas Dunne and Luna B. Leopold, 1978. pg. 19.
[5] New Hampshire Office of Emergency Management:
http://www.nhoem.state.nh.us/mitigation/hillsborough_county_risk_analysi.htm
[6] John J. Shaughnessy, *State of New Hampshire Natural Hazards Mitigation Plan*

B. Wind

The following kinds of hazards are related to wind:

1. Hurricanes

The definition of a Hurricane was discussed above. As it relates to wind hazards, damage resulting from hurrican gusts can be substantial, especially considering the duration of the event which may last for many hours[5]. In New England, hurricane season begins on June 1 and continues through the end of November. August and September are peak months during hurricane season.

Hillsborough County has experienced high winds associated with hurricane events, but is at a more significant risk to flooding resulting from the rainfalls from hurricanes[7]. All areas of Pelham are potentially at risk if a hurricane reaches Hillsborough County.

2. Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. These events are spawned by thunderstorms and, occasionally by hurricanes, and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction[8].

Risk from Tornadoes is considered to be high in Hillsborough County. The county has experienced 18 tornadic events between July 27, 1956 and June 16, 1986[7]. Pelham hashad two recorded Tornadoes as detailte in Table: 5.

3. "Nor'-easters"

A Nor'easter is a large weather system traveling from South to North, passing along, or near the seacoast. As the storm approaches New England, and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas form a Northeasterly direction. The sustained winds may meet or exceed hurricane force.

New Hampshire generally experiences at least one or two of these events each year with varying degrees of severity. These storms have the potential to inflict more damage than many hurricanes because high winds can last from 12 hours to 3 days, while the duration of hurricanes ranges from 6 to 12 hours. Infrastructure, including critical facilities, may be impacted by these events, and power outages and transportation disruptions (*i.e.* snow and/or debris impacted roads, as well as hazards to navigation and aviation) are often associated with the event.

Severe winter storms typically occur during January and February, however, winter storms do occur from late September through late April. All areas of Pelham are potentially at risk for property damage and loss of life due to Nor'-easters.

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[7] New Hampshire Office of Emergency Management:
http://www.nhoem.state.nh.us/mitigation/hillsborough_county_risk_analysi.htm
[8] John J. Shaughnessy, *State of New Hampshire Natural Hazards Mitigation Plan*

4. Downbursts

A downburst is a severe localized wind blasting down from a thunderstorm. These 'straight line' winds are distinguishable from tornadic activity by the pattern of destruction and debris. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories. Microbursts cover an area less than 2.5 miles in diameter, and macrobursts cover an area at least 2.5 miles in diameter.

All locations in Pelham are at risk for property damage and loss of life due to downbursts, especially those areas with heavy tree cover. One ocurring nearby is listed in Table: 5

5. Lightning

During the development of a thunderstorm, the rapidly rising air within the cloud, combined with the movement of the precipitation within the cloud, causes electrical charges to build up within the cloud. Generally, positive charges build up near the top of the cloud, while negative charges build up near the bottom. Normally, the Earth's surface has a slight negative charge. However, as the negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud becomes positively charged. As the cloud moves, these induced positive charges on the ground follow the cloud like a shadow. Lightning is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges. However, when the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

All areas of Pelham are potentially at risk for property damage and loss of life due to lightning. Areas that are heavily wooded as well as areas with large open spaces, are susceptible to damage to due lightning strikes. Table: 5 depicts a lightning strike in Pelham injurng eople in 2003.

C. Wildfire

The following kinds of hazards have been identified related to wildfire:

1. Forest Fires and Grass Fires

Historically, large NH wildland fires run in roughly 50 year cycles. The increased incidence of large wildland fire activity in the late 1940s and early 1950s is thought to be associated, in part, with debris from the Hurricane of 1938. Significant woody 'fuel' was deposited in the forests during that event. Present concerns of New Hampshire Department of Resources and Economic Development, Division of Forests & Lands are that the Ice Storm of 1998 has left a significant amount of woody debris in the forests of the region and may fuel future wildfires[9].

Wildfire season usually begins in March in coastal and southern sections, gradually extending to central, western and northern areas. The wildfire season usually ends in late November. The majority of wildfires usually occur in April and May, when the majority of vegetation is void of any appreciable moisture making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced somewhat.

Pelham still haas some significant forested areas susceptible to wildfires.. This area is identified on Map 3, Past Hazards.

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[9] John J. Shaughnessy, *State of New Hampshire Natural Hazards Mitigation Plan*

D. Ice & Snow Events

The following kinds of hazards are related to ice and snow:

1. Heavy Snow Storms

A winter storm can range from moderate snow to blizzard conditions. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given in 1958 by the U.S. Weather Bureau, the winds must exceed 35 miles per hour and the temperature must drop to 20° F (-7° C) or lower. All winter storms make walking and driving extremely dangerous.

All areas of Pelham are susceptible to heavy snow storms.

2. Blizzards

Intense Nor'-easters which occur in the winter months are often referred to as blizzards. A Blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees fahrenheit or colder and potentially life-threatening traveling conditions. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range. Such conditions, when extreme enough, are called 'white outs'.

All areas of Pelham are potentially at risk for property damage and loss of life due to blizzards.

3. Ice Storms

An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages. Ice storms also create treacherous conditions for highway travel and aviation. Debris impacted roads from fallen trees or overhead wires that snapped under the weight of the ice make emergency access, repair and cleanup extremely difficult.

All areas of Pelham are potentially at risk for property damage and loss of life due to ice storms.

4. Nor'-easters

In the winter months, Towns within the State may experience the additional coincidence of blizzard conditions with many of these events as well as the added impact of the masses of snow and/or ice upon infrastructure thus, impacting upon transportation and the delivery of goods and services for extended periods of time, as well as various related impacts upon the economy. The entire area of the State may be impacted by these events. Heavy snow and / or rainfall may be experienced in different areas of the State and the heavy rains may contribute to flood conditions. Nor'-easter events which occur toward the end of a winter season may exacerbate the spring flooding conditions by depositing significant snow pack at a time of the season when spring rains are poised to initiate rapid snow pack melting[10].

All areas of Pelham are potentially at risk for property damage and loss of life due to Nor'-easters.

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[10] New Hampshire Office of Emergency Management:
http://www.nhoem.state.nh.us/mitigation/hillsborough_county_risk_analysi.htm

E. Earthquake

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, and end in vibrations of gradually diminishing force called aftershocks.

Generally, New Hampshire lies in a zone of Moderate seismic vulnerability. Hillsborough County is in an area of particularly high seismicity which is evident in a cresent of historical events beginning in the Ossipee Range and following the general contour of the Merrimack River Valley[10].

Pelham is within close proximity to a number of smaller earthquakes originating in theLowell area. See Table: 5. Though very rare, a moderate to large earthquake would result in property damage, injuries and potentially loss of entire structures and loss of life.

F. Terrorism

Terrorism is the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Terrorists often use threats to create fear among the public, to try to convince citizens that their government is powerless to prevent terrorism, and to get immediate publicity for their causes. Different types of terrorist weapons include explosives, kidnappings, hijackings, arson, shootings, and NBC's (nuclear, biological agents, and chemicals). Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction. International terrorism involves groups or individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside the United States.

Given the proximity to Boston, the Southern New Hampshire region is likely to be affected in the event of a terrorist act.

APPENDIX B

RESOURCES

1. AGENCIES

	PHONE NUMBERS
New Hampshire Office of Emergency Management (Hazard Mitigation Section)	271-2231
Federal Emergency Management Agency	617-223-4175
NH Regional Planning Commissions:	
Central NH Regional Planning Commission	226-6020
Lakes Region Planning Commission	279-8171
Nashua Regional Planning Commission	883-0366
North Country Council	444-6303
Rockingham Planning Commission	778-0885
Southern New Hampshire Planning Commission	669-4664
Southwest Region Planning Commission	357-0557
Strafford Regional Planning Commission	742-2523
Upper Valley Lake Sunapee Regional Planning Commission	448-1680
NH Executive Department	
Governor's Office of Energy and Community Services	271-2611
New Hampshire Office of State Planning	271-2155
NH Department of Cultural Affairs	271-2540
Division of Historical Resources	271-3483
NH Department of Environmental Services	271-3503
Air Resources	271-1370
Waste Management	271-2900
Water Resources	271-3406
Water Supply and Pollution Control	271-3504
Rivers Management and Protection Program	271-1152
NH Fish and Game Department	271-3421
NH Department of Resources and Economic Development	271-2411
Natural Heritage Inventory	271-3623
Division of Forests and Lands	271-2214
Division of Parks and Recreation	271-3255
NH Department of Transportation	271-3734
US Department of Commerce:	
National Oceanic and Atmospheric Administration, National Weather Service, Gray, Maine	207-688-3216
US Department of the Interior:	
US Fish and Wildlife Service	225-1411
US Geologic Survey (USGS)	225-4681
US Department of Agriculture:	
Natural Resource Conservation Service	868-7581

APPENDIX B

2. WEBSITES

Sponsor	Website	Summary of Contents
Natural Hazards Research Center, University of Colorado	www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	www.umbc.edu/ges/Geog480_HurricaneWebPage/IndexHurricanePage.html	Hurricane tracking maps for years 1886-1996.
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; mitigation projects
U.S. State and Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership
National Weather Service	http://www.nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://water.usgs.gov/realtime.html	Provisional hydrological data.
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/geog/floods/	Observations of flooding situations
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.htm	Searchable site for access of Community Status Book
National Lightning Safety Institute	http://lightningsafety.com/	Information and listing of lightning safety publications
Global Hydrology and Climate Center	http://www.ghcc.msfc.nasa.gov	A study of the global water cycle and its effects on the climate
LLNL Geologic and Atmospheric Hazards	http://www.llnl.gov/hmc/	General hazard information developed for DOE.
The Tornado Project Online	http://www.tornadoproject.com	Information on tornadoes
National Severe Storms Laboratory	http://www.nssl.noaa.gov/	Information about tracking severe storms
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state
USDA Forest Service Web	http://www.fs.fed.us/land/	Information on forest fires and land management.
Northeast States Emergency Consortium	http://www.nesec.org	Multi-hazard consortium funded by FEMA
EnviroMapper	http://maps.epa.gov/enviromapper/	Site that allows you to view maps by locality, watershed, EPA region, etc.
Extreme Weather Sourcebook 2001	http://sciencepolicy.colorado.edu/sourcebook/	Economic and societal effects of hazards
NHOEM Database Viewer	http://www.nhoem.state.nh.us/nhoemdb/pChoose_view.asp	Organizational data about emergency services in each NH Community
Interflood	http://www.interflood.com	Online service to over 111,000 FEMA maps and other flood mapping. Fee based.
***Full List of Mitigation Websites compiled by NHOEM**	**http://www.nhoem.state.nh.us/mitigation/Websites%20List.htm**	

APPENDIX B

SOURCE	*URL*	*COMMENT*
Weatherbase	http://www.weatherbase.com	Historic Meteorological Data
National Oceanic & Atmospheric Administration (NOAA)	http://www.erh.noaa.gov/box/climate/CONCORD__NH____.html	Historic Meteorological Data
NH Office of State Planning	http://www.state.nh.us/osp/sdc/sdcProj.htm	Population Projections 2005 – 2025 at:
Dr. Daniel J. Leathers, State Climatologist, University of Delaware Center for Climatic Research	http://www.udel.edu/leathers/table.htm	Pelham Tornado data
NH Statewide Notification Association	http://www.geocities.com/nhswna/index.html	Fire & Emergency "call" data
The Free Republic News Forum	http://209.157.64.200/focus/f-news/964655/posts	Report of lightning strike in Pelham w/ injuries

3. MITIGATION FUNDING SOURCES

a. Hazard Mitigation Grant Program (HMGP) through Office of Emergency Management

b. Flood Mitigation Assistance Program (FMAP) through Office of Emergency Management

APPENDIX C

SUMMARY OF HAZARD MITIGATION STRATEGIES

I. RIVERINE MITIGATION

A. Prevention

Prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Future development should not increase flood damage. Building, zoning, planning, and/or code enforcement offices usually administer preventative measures.

1. Planning and Zoning

Land use plans are put in place to guide future development, recommending where, and where not, development should occur. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events, such as parks or wildlife refugees.

A Capital Improvements Program can recommend the setting aside of funds for public acquisition of these designated lands.

The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development, for example by designating floodplain overlay, conservation, or agricultural districts.

2. Open Space Preservation

Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not, however, be limited to the flood plain, since other areas within the watershed may contribute to controlling the runoff that exacerbates flooding.

Land Use and Capital Improvement Plans should identify areas to be preserved by acquisition and other means, such as purchasing easements. Aside from outright purchase, open space can also be protected through maintenance agreements with the landowners, or by requiring developers to dedicate land for flood flow, drainage and storage.

3. Floodplain Development Regulations

Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential.

Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances, which either stand-alone or are contained within a zoning ordinance.

Subdivision Regulations: These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be shown on the plat, and that every lot has a buildable area that is above the base flood elevation.

Building Codes: Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.

Floodplain Ordinances: Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

4. Storm Water Management

Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development.

One technique is to use wet basins as part of the landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration, for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.

5. Drainage System Maintenance

Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering watercourses or storage basins; regrading and filling should also be regulated.

Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading their yard without concern for runoff patterns.

B. Property Protection

Property protection measures are used to modify buildings subject to flood damage, rather than to keep floodwaters away. These may be less expensive to implement, as they are often carried out on a cost-sharing basis. In addition, many of these measures do not affect a building's appearance or use, which makes them particularly suitable for historical sites and landmarks.

1. Relocation

Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, however, so this approach will probably not be used except in extreme circumstances. Communities that have areas subject to severe storm surges, ice jams, etc. might want to consider establishing a relocation program, incorporating available assistance.

2. Acquisition

Acquisition by a governmental entity of land in a floodplain serves two main purposes: (1) it ensures that the problem of structures in the floodplain will be addressed; and (2) it has the potential to convert problem areas into community assets, with accompanying environmental benefits.

Acquisition is more cost effective than relocation in those areas that are subject to storm surges, ice jams, or flash flooding. Acquisition, followed by demolition, is the most appropriate strategy for those buildings that are simply too expensive to move, as well as for dilapidated structures that are not worth saving or protecting. Relocation can be expensive. However, there are government grants and loans that can be applied toward such efforts.

3. Building Elevation

Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits.

This approach is cheaper than relocation, and tends to be less disruptive to a neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain, and is commonly practiced in flood hazard areas nationwide.

4. Floodproofing

If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Flood proofing can be accomplished through barriers to flooding, or by treatment to the structure itself.

Barriers: Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, but only in areas subject to shallow flooding.

Dry Flood proofing: This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings such as doors or windows, can be closed either with removable shields or with sandbags.

Wet Flood proofing: This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

5. Sewer Backup Protection

Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system, whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:

- Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
- Overhead sewer - keeps water in the sewer line during a backup.
- Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

6. Insurance

Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.

National Flood Insurance: When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

Basement Backup Insurance: National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

C. Natural Resource Protection

Preserving or restoring natural areas or the natural functions of floodplain and watershed areas provide the benefits of eliminating or minimizing losses from floods, as well as improve water quality and wildlife habitats. Parks, recreation, or conservation agencies usually implement such activities. Protection can also be provided through various zoning measures that are specifically designed to protect natural resources.

1. Wetlands Protection

Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies.

Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the NH Wetlands Board must approve any project that impacts a wetland. Many communities in New Hampshire also have local wetland ordinances.

Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice, however, since it takes many years for a new wetland to achieve the same level of quality as an existing one.

2. Erosion and Sedimentation Control

Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. Because sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters.

Practices to reduce erosion and sedimentation have two principal components: (1) minimize erosion with vegetation and; (2) capture sediment before it leaves the site. Slowing the runoff increases infiltration into the soil, thereby controlling the loss of topsoil from erosion and the resulting sedimentation. Runoff can be slowed by vegetation, terraces, contour strip farming, no-till farm practices, and impoundments (such as sediment basins, farm ponds, and wetlands).

3. Best Management Practices

Best Management Practices (BMPs) are measures that reduce nonpoint source pollutants that enter waterways. Nonpoint source pollutants are carried by storm water to waterways, and include such things as lawn fertilizers, pesticides, farm chemicals, and oils from street surfaces and industrial sites.

BMPs can be incorporated into many aspects of new developments and ongoing land use practices. In New Hampshire, the Department of Environmental Services has developed best management practices for a range of activities, from farming to earth excavations.

D. Emergency Services

Emergency services protect people during and after a flood. Many communities in New Hampshire have emergency management programs in place, administered by an emergency management director (very often the local police or fire chief).

1. Flood Warning

On large rivers, the National Weather Service handles early recognition. Communities on smaller rivers must develop their own warning systems. Warnings may be disseminated in a variety of ways, such as sirens, radio, television, mobile public address systems, or door-to-door contact. It seems that multiple or redundant systems are the most effective, giving people more than one opportunity to be warned.

2. Flood Response

Flood response refers to actions that are designed to prevent or reduce damage or injury once a flood threat is recognized. Such actions and the appropriate parties include:

- activating the emergency operations center (emergency director)
- sandbagging designated areas (public works department)
- closing streets and bridges (police department)
- shutting off power to threatened areas (public service)
- releasing children from school (school district)
- ordering an evacuation (selectmen/city council/emergency director)
- opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

These actions should be part of a flood response plan, which should be developed in coordination with the persons and agencies that share the responsibilities. Drills and exercises should be conducted so that the key participants know what actions to take.

3. Critical Facilities Protection

Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Critical facilities fall into two categories:

Buildings or locations vital to the flood response effort:

- emergency operations centers
- police and fire stations
- hospitals
- highway garages
- selected roads and bridges
- evacuation routes

Buildings or locations that, if flooded, would create secondary disasters

- hazardous materials facilities
- water/wastewater treatment plants
- schools
- nursing homes

All such facilities should have their own flood response plan that is coordinated with the community's plan. Nursing homes, other public health facilities, and schools will typically be required by the state to have emergency response plans in place.

4. Health and Safety Maintenance

The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:

- Patrolling evacuated areas to prevent looting.
- Providing safe drinking water.
- Vaccinating residents for tetanus.
- Clearing streets.
- Cleaning up debris.

The plan should also identify which agencies will be responsible for carrying out the identified measures. A public information program can be helpful to educate residents on the benefits of taking health and safety precautions.

E. Structural Projects

Structural projects are used to prevent floodwaters from reaching properties. These are all man-made structures, and can be grouped into six types. Some shortcomings of structural approaches can be as follows:

- They can be very expensive.
- They disturb the land, disrupt natural water flows, and destroy natural habitats.

- They are built to an anticipated flood event, and may be exceeded by a greater-than-expected flood.
- They can create a false sense of security.

1. Reservoirs

Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle.

Reservoirs are suitable for protecting existing development, and they may be the only flood control measure that can protect development close to a watercourse. They are most efficient in deeper valleys or on smaller rivers where there is less water to store. Reservoirs might consist of man-made holes dug to hold the approximate amount of floodwaters, or even abandoned quarries. As with other structural projects, reservoirs:

- are expensive;
- occupy a lot of land;
- require periodic maintenance;
- may fail to prevent damage from floods that exceed their design levels; and
- may eliminate the natural and beneficial functions of the floodplain.

Reservoirs should only be used after a thorough watershed analysis that identifies the most appropriate location, and ensures that they would not cause flooding somewhere else. Because they are so expensive and usually involve more than one community, they are typically implemented with the help of state or federal agencies, such as the Army Corps of Engineers.

2. Levees/Floodwalls

Probably the best know structural flood control measure is either a levee (a barrier of earth) or a floodwall made of steel or concrete erected between the watercourse and the land. If space is a consideration, floodwalls are typically used, since levees need more space. Levees and floodwalls should be set back out of the floodway, so that they will not divert floodwater onto other properties.

3. Diversions

A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river.

Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

4. Channel Modifications

Channel modifications include making a channel wider, deeper, smoother, or straighter. These techniques will result in more water being carried away, but, as with other techniques mentioned, it is important to ensure that the modifications do not create or increase a flooding problem downstream.

***Dredging*:** Dredging is often cost-prohibitive because the dredged material must be disposed of somewhere else, and the stream will usually fill back in with sediment. Dredging is usually undertaken only on larger rivers, and then only to maintain a navigation channel.

***Drainage modifications*:** These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive. These approaches are usually designed to carry the runoff from smaller, more frequent storms.

5. Storm Sewers

Mitigation techniques for storm sewers include installing new sewers, enlarging small pipes, street improvements, and preventing back flow. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving body of water can absorb the increased flows without increased flooding.

In many developments, streets are used as part of the drainage system, to carry or hold water from larger, less frequent storms. The streets collect runoff and convey it to a receiving sewer, ditch, or stream. Allowing water to stand in the streets and then draining it slowly can be a more effective and less expensive measure than enlarging sewers and ditches.

F. Public Information

Public information activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property, ways to protect people and property from these hazards, and the natural and beneficial functions of a floodplain.

1. Map Information

Flood maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is flood-prone. These maps are available from FEMA, the NH Office of Emergency Management, the NH Office of State Planning, or your regional planning commission.

2. Outreach Projects

Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:

- Mass mailings or newsletters to all residents.
- Notices directed to floodplain residents.
- Displays in public buildings, malls, etc.
- Newspaper articles and special sections.
- Radio and TV news releases and interview shows.
- A local flood proofing video for cable TV programs to loan to organizations.
- A detailed property owner handbook tailored for local conditions.
- Presentations at meetings of neighborhood groups.

Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.

3. Real Estate Disclosure

Disclosure of information regarding flood-prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. State laws and local real estate practice can help by making this information available to prospective buyers early in the process.

4. Library

Your local library can serve as a repository for pertinent information on flooding and flood protection. Some libraries also maintain their own public information campaigns, augmenting the activities of the various governmental agencies involved in flood mitigation.

5. Technical Assistance

Certain types of technical assistance are available from the NFIP Coordinator, FEMA, and the Natural Resources Conservation District. Community officials can also set up a service delivery program to provide one-on-one sessions with property owners.

An example of technical assistance is the *flood audit*, in which a specialist visits a property. Following the visit, the owner is provided with a written report, detailing the past and potential flood depths, and recommending alternative protection measures.

6. Environmental Education

Education can be a great mitigating tool, if people can learn what not to do before damage occurs. The sooner the education begins, the better. Environmental education programs for children can be taught in the schools, park and recreation departments, conservation associations, or youth organizations. An activity can be as involved as course curriculum development or as simple as an explanatory sign near a river.

Education programs do not have to be limited to children. Adults can benefit from knowledge of flooding and mitigation measures. Decision-makers, armed with this knowledge, can make a difference in their communities.

II. COASTAL FLOODING

A. Prevention

1. Floodplain Regulations

Many of the same requirements for mitigating flood damage in riverine situations apply to coastal zones, especially more stringent building codes, relocation and acquisition programs, elevations of structures, improved open space preservation and land use planning.

2. Erosion Regulations

Erosion regulations specify setbacks for structures from the water. In Rhode Island, for example, the setbacks are 30 times the annual erosion rate for new or substantially renovated residential structures, and 60 times the annual erosion rate for commercial structures. And, regardless of the erosion rate, setbacks must be at least 50 feet. Setbacks are measured from the top of a bluff, dike or 25 feet inland of a dune crest.

3. Dune and Beach Maintenance

Preventative measures involve either the construction of new or artificial dunes and/or the stabilization of existing dunes. Both of these techniques require an understanding of the biological and physical processes of the coastal zone. Vegetation used for dune construction and for dune stabilization is usually a variety species.

The most effective methods of creating new dunes involve disrupting the airflow to encourage sand deposition through the use of fences made of porous materials. It is important that the fences alter the airflow but do not halt it. Artificial dunes can also build up the planting of vegetation.

Stabilization is aimed at securing bare sand surfaces against deflation. This can be achieved through grading and rapid construction of new dunes; surface fixing, by the addition of chemicals, and by the planting of vegetation, with focuses on grasses, shrubs and trees.

Beach nourishment is the artificial replacement and/or addition of sediment to beaches. The effectiveness of this technique depends on the type of sand imported, the slope of the natural beach, cross-shore currents and the frequency of storms. Nourishment is most effective when combined with dune restoration and beach maintenance.

5. Wetlands Protection

Wetland preservation is very important because wetlands play a role in flood control by their ability to store tremendous amounts of water, releasing the water slowly, thereby reducing downstream flows. Wetlands provide important wildlife habitat, support a wide variety of vegetation, and a filter of river-borne material before it enters the coastal waters.

B. Property Protection

1. Structural Measures

- Roads: Realigning roads so that they are parallel to the beachfront rather than perpendicular prevents them from channeling floodwaters inland.

- Seawalls: Vertical walls built on seashores are designed to protect against direct storm wave action. The biggest problem with seawalls is that they can have an adverse impact on neighboring properties and the movement of sand. The wall, often increasing shoreline erosion, disrupts the natural forces that transport sand and replenish beaches.

- Revetments: These are designed to protect the backshore from high tides and surges. Revetments may be constructed out of a number of materials and configurations. Revetments are more successful on lower-energy coasts.

- Bulkheads: Vertical walls on the shoreline are often constructed of wood or steel, and are designed to retain loose fill and sediment behind it. They are usually not good protection from storms or other flooding events.

- Terraces: Terraces are used in cliff areas and involve the insertion of vertical pilings and planks at different levels.

- Breakwaters: Breakwaters protect the shoreline by breaking down incoming waves in order to diffuse and refract the wave fronts.

- Dredging: Involves the modification of a channel by extracting sediment. It usually is only used to maintain navigation in waterways.

- Slope stabilization: Includes a number of methods to prevent landslides, such as slope reduction and adding retention structures.

- Groins: These are wall-like structures, placed perpendicular to the beach to capture materials drifting along the shoreline.

- Jetties: These are wall-like structures built perpendicular to the coast to stabilize channels, inlets and outlets. The primary function is to protect navigation channels; they capture sediments by restricting the movement of materials transported by longshore currents.

2. Emergency Measures

- Sand scraping: A temporary way to reinforce a beach structure by, for example, filling in behind protective seawalls using earth-moving equipment.

- Installing storm shutters to protect exposed glass surfaces.

- Install hurricane straps to structures to secure the roof to the walls and foundation.

- Have your home or business inspected by a building professional to ensure that the

building components are capable of withstanding wind effects.

C. Natural Resource Protection

See the previous sections under Riverine Mitigation, and Paragraph A of this Section.

D. Emergency Services

In the event of severe weather, coastal communities need to have effective evacuation plans for low-lying and remote coastal areas. A major part of an evacuation plan is an effective hurricane/flood early warning system, such as a weather radio distribution program and an awareness of the National Weather Service programs. These plans also need to include the appropriate resources, such as all-terrain vehicles, powerboats and helicopters to reach stranded residents, as well as temporary shelter, food, water, other basic necessities and backup power sources for emergency facilities.

E. Structural Projects

See the previous section on Property Protection.

F. Public Information

1. COBRA

The Coastal Barriers Resources Act of 1982 (COBRA) removed the Federal government from financial involvement associated with building and development in undeveloped portions of coastal areas. These areas were mapped and designated as Coastal Barrier Resources system units or "otherwise protected areas."

COBRA restricts any Federal program that may have the effect of encouraging development on coastal barrier beaches or islands. These include "any form of loan, grant, guarantee, insurance, payment, rebate, subsidy or any other form of direct or indirect Federal assistance" with specific and limited exceptions.

COBRA also banned the sale of NFIP flood insurance for structures built or substantially improved on or after a specified date. For the initial COBRA designations, this date is October 1, 1983. For all subsequent designations, this date is the date the COBRA zone was identified. COBRA zones and their identification dates are shown in the legend of the community's Flood Insurance Rate Map.

III. EARTHQUAKES

A. Preventive

1. Planning/zoning to keep critical facilities away from fault lines.
2. Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction.
3. Building codes to prohibit loose masonry, overhangs, etc.

B. Property Protection

1. Acquire and clear hazard areas.
2. Retrofitting to add braces, remove overhangs.
3. Apply mylar to windows and glass surfaces to protect from shattering glass.
4. Tie down major appliances and provide flexible utility connections.
5. Earthquake insurance riders.

C. Emergency Services

1. Earthquake response plans to account for secondary problems, such as fires and hazardous materials spills.

D. Structural Projects

1. Slope stabilization.

IV. DAM FAILURE

A. Preventive

1. Dam failure inundation maps.
2. Planning/zoning/open space preservation to keep area clear.
3. Building codes with flood elevation based on dam failure.
4. Dam safety inspections.
5. Draining the reservoir when conditions appear unsafe.

B. Property Protection

1. Acquisition of buildings in the path of a dam breach flood.
2. Flood insurance.

C. Emergency Services

1. Dam conditioning monitoring.
2. Warning and evacuation plans based on dam failure.

D. Structural Projects

1. Dam improvements, spillway enlargements.
2. Remove unsafe dams.

V. WILDFIRES

A. Preventive

1. Zoning districts to reflect fire risk zones.
2. Planning and zoning to restrict development in areas near fire protection and water resources.
3. Requiring new subdivisions to space buildings, provide firebreaks, have on-site water storage, wide roads and multiple accesses.
4. Building code standards for roof materials, spark arrestors.
5. Maintenance programs to clear dead and dry bush, trees.
6. Regulation on open fires.

B. Property Protection

1. Retrofitting of roofs and adding spark arrestors.
2. Landscaping to keep bushes and trees away from structures.
3. Insurance rates based on distance from fire protection.

C. Natural Resource Protection

1. Prohibit development in high-risk areas.

D. Emergency Services

1. Fire Fighting

VI. WINTER STORMS

A. Prevention

Building code standards for light frame construction, especially for wind-resistant roofs.

B. Property Protection

1. Storm shutters and windows
2. Hurricane straps on roofs and overhangs
3. Seal outside and inside of storm windows and check seals in spring and fall.
4. Family and/or businesses severe weather action plan & drills:

   - include a **NOAA** weather radio
   - designate a shelter area or location
   - keep a disaster supply kit, including stored food and water
   - keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas
   - know how to turn off water, gas, and electricity at home or work

C. Natural Resource Protection

Maintenance program for trimming tree and shrubs

D. Emergency Services

1. Early warning systems/NOAA Weather Radio
2. Evacuation Plans

APPENDIX D

TECHNICAL AND FINANCIAL ASSISTANCE FOR HAZARD MITIGATION

HAZARD MITIGATION GRANT PROGRAM - "Section 404 Mitigation"

The Hazard Mitigation Grant Program (HMGP) in New Hampshire is administered in accordance with the 404 HMGP Administration Plan that was derived under the authority of Section 404 of the Stafford Act in accordance with Subpart N. of 44 CFR.

The program receives its funding pursuant to a Notice of Interest submitted by the Governor's Authorized Representative (or GAR, i.e. the Director of NHOEM) to the FEMA Regional Director within 60 days of the date of a Presidentially Declared Disaster. The amount of funding that may be awarded to the State/Grantee under the HMGP may not exceed 15% of (over and above) the overall funds as are awarded to the State pursuant to the Disaster Recovery programs as are listed in 44 CFR Subpart N. Section 206.431 (d) (inclusive of all Public Assistance, Individual Assistance, etc.). Within 15 days of the Disaster Declaration, an Inter-Agency Hazard Mitigation Team is convened consisting of members of various Federal, State, County, Local and Private Agencies with an interest in Disaster Recovery and Mitigation. From this meeting, a Report is produced which evaluates the event and stipulates the State's desired Mitigation initiatives.

Upon the GAR's receipt of the notice of an award of funding by the Regional Director, the State Hazard Mitigation Officer (SHMO) publishes a Notice of Interest (NOI) to all NH communities and State Agencies announcing the availability of funding and solicits applications for grants. The 404 Administrative Plan calls for a State Hazard Mitigation Team to review all applications. The Team is comprised of individuals from various State Agencies.

Eligible Subgrantees include:

- State and Local governments,
- Certain Not for Profit Corporations
- Indian Tribes or authorized tribal organizations and Alaskan corporations not privately owned.

Minimum Project Criteria:

- Must conform with the State's "409" Plan
- Have a beneficial impact on the Declared area
- Must conform with:
  - NFIP Floodplain Regulations
  - Wetlands Protection Regulations
  - Environmental Regulations
  - Historical Protection Regulations
- Be cost effective and substantially reduce the risk of future damage
- Not cost more than the anticipated value of the reduction of both direct damages and subsequent negative impacts to the area if future disasters were to occur i.e., min 1:1 benefit/cost ratio
- Both costs and benefits are to be computed on a "net present value" basis
- Has been determined to be the most practical, effective and environmentally sound alternative after a consideration of a range of options
- Contributes to a long-term solution to the problem it is intended to address
- Considers long-term changes and has manageable future maintenance and modification requirements.

Eligible Projects may be of any nature that will result in the protection to public or private property and include:

- Structural hazard control or protection projects
- Construction activities that will result in protection from hazards
- Retrofitting of facilities
- Certain property acquisitions or relocations
- Development of State and local mitigation standards
- Development of comprehensive hazard mitigation programs with implementation as an essential component
- Development or improvement of warning systems

PUBLIC ASSISTANCE AND HAZARD MITIGATION

Hazard Mitigation Section 406

Hazard Mitigation, as per Section 406 of the Stafford Act, is a funding source for cost-effective measures that would reduce or eliminate the threat of future damage to a facility damaged during the disaster.

The measures must apply only to the damaged elements of a facility rather than to other, undamaged parts of the facility or to the entire system. For example, if flooding inundates a sanitary sewer and blocks the manholes with sediment, mitigation to prevent the blockage of the damaged manholes in a future event may be considered eligible.

Work to improve undamaged manholes using the same method would not be eligible, even though the manholes are part of the same system.

Hazard mitigation measures restore a facility beyond its pre-disaster condition.

Section 406 mitigation measures are considered part of the total eligible cost of repair, restoration, reconstruction, or replacement of a facility. They are limited to measures of permanent work, and the applicant may not apply mitigation funding to alternate projects or improved projects if a new replacement facility is involved.

Upgrades required to meet applicable codes and standards are not "mitigation measures" because such measures are part of eligible restoration work.

406 MITIGATION:

"Hazard Mitigation that is specific to a given Disaster Declaration, specific to a given site, associated with a FEMA Damage Survey Report is referred to a '406 mitigation'." This Authority is derived under Section 406 of the Stafford Act.

The Cost Share associated with this program is the same as with the FEMA Public Assistance Program:

75% FEMA

MITIGATION ASSISTANCE PROGRAM

FEMA's Hazard Mitigation Assistance Program supports Hazard Mitigation planning and implementation activities that reduce long-term hazard vulnerability and risk. Funding is provided pursuant to the Stafford Act. (See 44 CFR, Part 361, Subpart A)

This program supports the Natural Hazards Program at NHOEM and provides funding for State and Local planning, training and administrative support to both the Natural Hazards Program Officer and the State Hazard Mitigation Officer, as well as grants which promote hazard mitigation locally and statewide.

Technical Assistance sessions are provided to communities and State agencies through individual community outreach visits and regional seminars.

Mitigation Assistance Program

- ***Create and maintain comprehensive State Hazard Mitigation Programs i.e., centrally coordinate all State Hazard Mitigation activities for all identified hazards, and provide financial and technical assistance to communities and local governments***
- ***75% FEMA - 25% State in-kind or cash***

Eligible Activities

- ***Preparedness and Response Planning***
- ***Mitigation Planning and Implementation***
- ***Public Awareness and Education***

Past MAP Funded Mitigation Initiatives

MAP funds have been, and are presently being used to support the Natural Hazards Program including:

- Support CEMPS, Hurricane Program and other initiatives of the Natural Hazards Program Office
- Support for Non-Commercial Service Announcements
- Support State and local officials with training and travel expenses
- Support the development of a NH Guide to Local Community Hazard Mitigation Planning
- Bring training in community Hazard Mitigation Planning to members of the nine Regional Planning Commissions throughout the State

Present MAP Funded Mitigation Initiatives

- Support CEMPS, Hurricane Program and other initiatives of the Natural Hazards Program Office
- Support a cooperative effort between NHOEM, NHDES-WRD and NH GRANIT, to digitize the State's Class B and Class C dams including digitization of the inundation pathways in a GIS format
- Support State and local officials with training and travel expenses
- Support continued State and local Hazard Mitigation Planning and Projects
- Support the SHMO with training and travel
- Provide Technical Assistance to State and local officials

Future Initiatives Intended with MAP Funding

- Continued support of the Natural Hazards Officer's program initiatives
- Extend the support for the creation of local community planning
- Continued Support of State and local officials with training and travel expenses
- Provide Technical Assistance to State and local officials

PROJECT IMPACT

New Hampshire began its participation in Project Impact with the nomination of the Town of Peterborough as Project Impact Community for 1998. The Town was awarded a $500,000.00 grant to initiate Hazard Mitigation Planning and projects and to assist in building partnerships with local businesses and other entities interested in reducing the community's losses resulting from various disasters to which the community has been, or may be exposed.

With referrals from the NHOEM Field Reps, the Hazard Mitigation Team Nominated two communities for Project Impact 1999 which have been approved by FEMA. The Grant Award for Project Impact 1999 is $300,000.00.

The State distinguished itself nationally at the Project Impact Summit held in Washington, DC in December 1998 when its selection of three communities for participation in Project Impact 1999 was announced.

The communities of Salem and Plymouth have submitted their respective project lists, which have been reviewed and approved by FEMA. The Town of Holderness (the State's 3rd highest NFIP repetitive loss community) is currently working with the Lakes Region Planning Commission toward the development of a Flood Mitigation Planning Grant application through the FMA program.

PROJECT IMPACT

- States nominate communities annually
- Final selection by FEMA
- Hazard Mitigation Planning and Technical Assistance Provided
- Project and Planning Grants Awarded

Project Impact is designed to ***"Build a Disaster Resistant Community"*** by assisting them in the formation of public/private partnerships with "seed" grants. Eligible grant activities include:

- Mitigation for existing structures
- Adoption of policies or practices going to mitigating effects of hazards
- Activities that lead to building and/or sustaining public/private Hazard Mitigation partnerships

Project Impact also provides the States with an administrative budget, which may be used to directly support Project Impact communities and to convene statewide support for comprehensive Hazard Mitigation strategies. Funds may be used for:

- Funding training initiatives
- Support of necessary travel expenses
- Provide related mini-grants to Project Impact Communities
- Fund costs of information development and dissemination in support of Project Impact
- Fund development of training packages for State and local Officials
- Fund expert short-term technical assistance to communities

FLOOD MITIGATION ASSISTANCE PROGRAM

New Hampshire has been a participant in the Flood Mitigation Assistance Program (FMA or FMAP) since 1996/97. In order to be eligible, a community must be a participant in the National Flood Insurance Program.

In 1997, the State was awarded funds to assist communities with Flood Mitigation Planning and Projects. A Planning Grant from the 1996/97 funds was awarded to the City of Keene in 1998. In preparation for the development of the Flood Mitigation Plan, the Planning Department of the City of Keene created a digital database of its floodplain including the digitizing of its tax assessing maps as well as its Special Flood Hazard Areas in GIS layers. The Plan Draft was submitted to FEMA for review and approval in March of 2000. The Plan includes a detailed inventory of projects and a "model" project prioritization approach.

In 1998, the FMAP Planning Grant was awarded to the Town of Salem. Given the complexity of the issues in the Spicket River watershed, the Town of Salem subcontracted a substantial portion of the development of its Flood Mitigation Planning to SFC Engineering Partnership of Manchester, NH, a private engineering firm. Salem submitted a Plan and proposed projects to the State and FEMA in May of 1999 that were approved by FEMA. This made Salem the first community in NH to have a FEMA/NFIP approved Flood Mitigation Plan.

Flood Mitigation Assistance Program

- NFIP Funded by a % of Policy Premiums
- Planning Grants
- Technical Assistance Grants to States (10% of Project Grant)
- Project Grants to communities
- Communities must have FEMA approved Flood Mitigation Plans to receive Project Funds

FEMA expressed its interests in prioritizing "repetitive loss" properties with 1999 project funding. Accordingly, the State made specific outreach to the Towns of Hampton, Rye and Holderness (in that order) as the State's top three repetitive loss communities, to solicit a request for the 1999 FEMA Planning grant.

Eligible Projects

(44 CFR Part 78)

- Elevation of NFIP insured residential structures
- Elevation and dry-proofing of NFIP insured non-residential structures
- Acquisition of NFIP insured structures and underlying real property
- Relocation of NFIP insured structures from acquired or restricted real property to sites not prone to flood hazards
- Demolition of NFIP insured structures on acquired or restricted real property
- Other activities that bring NFIP insured structures into compliance with statutorily authorized floodplain management requirements
- Beach nourishment activities that include planting native dune vegetation and/or the installation of sand fencing.
- Minor physical mitigation projects that do not duplicate the flood prevention activities of other Federal agencies and lessen the frequency of flooding or severity of flooding and decrease the predicted flood damages in localized flood problem areas. These include: modification of existing culverts and bridges, installation or modification of flood gates, stabilization of stream banks, and creation of small debris or flood/storm water retention basins in small watersheds (not dikes, levees, seawalls etc.)

EMERGENCY MANAGEMENT PERFORMANCE GRANT (EMGP)

FEMA and the State co-sponsor the EMPG Program, which supports the development and updating of disaster assistance plans and capabilities and promotes educational opportunities with respect to preparedness and mitigation.

Authority: See Subchapter E. of 44 CFR.

Past EMPG initiatives include:

- Support of the position of Protection Planner/Hazard Mitigation Officer
- Installation of river gauges
- Support of the NH State Environthon School Program
- Coordinate the Voluntary Organizations Active in Disasters (VOAD) Program (See Resource Profile Annex) NHOEM via the EMPG has sponsored annual meetings with training workshops
- Sponsoring Dam Safety Training initiatives and workshops
- Production and distribution of a handbook for small embankment dam owners
- Inventory of the State's Dams
- Review of Dam Plans
- Sponsored extensive statewide, two day workshops for Granite State Incident Stress Debriefing Teams and funded educational materials
- Community visits and production of informational materials
- Assist with Plan Annex update for local Haz Mat planning.
- Funding workshops for NH Road Agents in cooperation with the T2 program of the Technology Transfer Center at the University of New Hampshire

Present EMPG funded Hazard Mitigation initiatives

- Support the position of Protection Planner/Hazard Mitigation Officer
- Continued support of the Environthon Program
- Development of this Plan
- Providing Technical Assistance to State and local officials
- Development of Emergency Operations Plans (EOPs) for Significant and High Hazard dams

Future EMPG funded Hazard Mitigation initiatives

- Continued Support of the position of Protection Planner/Hazard Mitigation Officer
- Continued support of the Environthon Program
- Update and maintenance of this Plan
- Provide Technical Assistance to State and local officials
- Support of other planning, technical assistance and training as indicated
- Digitization of EOPs for the State's "Significant" and "High Hazard" dams to provide rapid access to information in Emergency situations and to facilitate Plan maintenance.

EMERGENCY MANAGEMENT PERFORMANCE GRANT

- ***Evaluate natural hazards on a continuing basis and develop programs and actions required to mitigate such hazards***
- ***Provide Technical Assistance***
- ***(50% State match - cash or in kind)***

Eligible Projects Include:

- Evaluations of Natural Hazards
- Hazard Mitigation activities (i.e. Plan/ policy/program/strategy development
- Plan updates
- Handbooks: publication & distribution
- Creating exercise materials
- Developing Standard Operating Procedures
- Training state employees
- Report of formal analysis of State enabling legislation and authorities
- Update inventory of State/local Critical Facilities
- Develop a tracking system of critical actions to be taken post-event
- Creating Damage Assessment Plans and defining procedures
- Developing Plans for procedures when no Federal Aid is forthcoming
- Creating Plans for Search and Rescue Operations
- Developing Disaster accounting procedures

This list is not all inclusive.

COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

These Federal funds are provided through the U.S. Department of Housing and Urban Development (HUD) and are administered by the CDBG Program of the New Hampshire Office of State Planning.

Some CDBG disaster related funding has been transferred to FEMA recently and the SHMO is scheduled to receive guidance as to the specific funds and new program management criteria.

The specific CDBG funds designated for hazard mitigation purposes are made available to address "unmet needs" pursuant to a given Disaster Declaration to States which request them. For these funds, project selection guidance is provided by NHOEM and NHOSP administers the grant.

Pursuant to Declaration DR-1144-NH, $557,000.00 was made available to the State and pursuant to DR-1199-NH, the grant award is targeted at $1,500,000.00.

In October of 1998, HUD announced the program guidelines for the expenditure of the DR-1144-NH related funding The community of Salem applied for, and has received preliminary approval for funding to acquire a 19-unit trailer park in the Floodplain.

Community Development Block Grant

- **U.S. Dept. of Housing and Urban Development**
- **Funds for a Declared Disaster's "Unmet Needs"**
- **Projects must meet one of three National Objectives**
- **Provide a direct benefit to low and moderate income persons or households**
- **Prevent or eliminate slums and blight**
- **Eliminate conditions which seriously and immediately threaten the public health and welfare**

Additional conditions with respect to the expenditure of these funds includes the provision that at least 50% of the grant award must be expended in a manner which benefits individuals who earn 80% or less than the area's (county's) median income.

The following funding sources were found on the site: http://www.nesec.org/resources/grant_results.cfm

CEPP TECHNICAL ASSISTANCE GRANTS PROGRAM

Provide financial assistance to States, Local agencies, and Indian Tribes for chemical accident prevention activities that relate to the Risk Management Program under the Clean Air Act Section 112(r). Provide financial assistance to Tribes for chemical emergency planning, and community right-to-know programs which are established to prevent or eliminate unreasonable risk to the health and environment of communities within the State.

HAZARDOUS WASTE MANAGEMENT STATE PROGRAM SUPPORT

Assist State governments in the development and implementation of an authorized hazardous waste management program for the purpose of controlling the generation, transportation, treatment, storage and disposal of hazardous wastes.

GRANTS-IN-AID FOR RAILROAD SAFETY

Promote safety in all areas of railroad operations; reduce railroad related accidents and casualties; and reduce damage to property caused by accidents involving any carrier of hazardous materials by providing State participation in the enforcement and promotion of safety practices.

HAZARDOUS MATERIALS ASSISTANCE PROGRAM

Provide technical and financial assistance through the States to support State, local and Indian tribal governments in oil and hazardous materials emergency planning and exercising. Enhance State, Tribal and local governments capabilities to inter-operate with the National Response System (NRS). Support the Comprehensive Hazardous Materials (HAZMAT) Emergency Response - Capability Assessment Program (CHER-CAP) Activities.

MOTOR CARRIER SAFETY

Protect the public from risks inherent in commercial vehicle operations on the public highways, and minimize risks involved in moving hazardous materials over public highways.

STATE AND COMMUNITY HIGHWAY SAFETY

Provide a coordinated national highway safety program to reduce traffic accidents, deaths, injuries, and property damage.

NH DEPARTMENT OF TRANSPORTATION

Hazard Mitigation Resource Profile

The Department of Transportation is responsible for the planning, development and maintenance of the state transportation network. This network provides for the safe and convenient movement of people and goods throughout the state by means of a system of highways and railroads, air service, mass transit and other practicable modes of transportation in order to support state growth and economic development and promote the general welfare of the citizens of the state.

To support the mission, the Department must mitigate the factors which impede the successful completion of the assigned transportation related duties. These factors include any hazards which restrict the free flow of traffic, including hurricanes, floods, ice storms and other natural disasters, and emergencies resulting from hazardous spills, nuclear power plant events and other man- caused emergencies. The full resources of the Department, including heavy trucks, loaders, graders, manpower and materials are available to combat any disaster to the state maintained system, as well as to provide preventative mitigation to lessen similar occurrences in the future.

Specific response examples include snow plowing, treating roads with sand and salt, hauling materials such as rock to support dams or roadside slopes, cutting and chipping trees, removing debris from transportation corridors, providing inspection for highways, railroads, bridges and other public facilities, and providing two-way radio communications. The Department assigns personnel to the Emergency Operations Center to coordinate response efforts, and specific duties for Seabrook Station and Vermont Yankee events are assigned to highway maintenance District offices and field personnel.

NEW HAMPSHIRE DRINKING WATER SOURCE PROTECTION PROGRAM

This grant is available to public water suppliers for source water protection. The program, which began in 1997, has a total of $200,000 available to disburse each year to eligible municipalities. Grant amounts vary from $2,000 to $50,000. Past grants have been used for funding a watershed assessment and protection plan; perimeter fencing to protect a wellhead area; and for monitoring wells for groundwater evaluation.

Past recipients include: Conway, Lebanon, Manchester, Rochester, Dover, Keene, and Portsmouth. For further information contact: Sarah Pillsbury at (603) 271-1168 or email swap@des.state.nh.us. Go to: Drinking water source protection for on-line information and applications.

STATE REVOLVING FUND LOANS

State Revolving Fund (SRF) loans are low-interest loans provided by the State to help municipalities with projects such as landfill closures, wastewater projects, public water supply improvements, and brownfields clean up. The money comes from a combination of federal grants (80 percent) and state matching funds (20 percent).

Mitigation Programs of Other NH State Agencies

The following agencies of the State of New Hampshire are directly, or indirectly involved in activities that include Hazard Mitigation Planning and/or program implementation.

NH OSP/NFIP Program
NH OSP Coastal Program
NH DRED Division of Forests and Lands
NH DES Water Resources Division – Dam Safety Program
NH DES Wetlands Program
NH DES Shoreline Protection Program

APPENDIX E

FUJITA TORNADO DAMAGE SCALE

Developed in 1971 by T. Theodore Fujita of the University of Chicago

SCALE	WIND ESTIMATE *** (MPH)	TYPICAL DAMAGE
F0	< 73	**Light damage**. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	**Moderate damage**. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	**Considerable damage**. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	**Severe damage**. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	**Devastating damage**. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

*** IMPORTANT NOTE ABOUT F-SCALE WINDS: **Do not use F-scale winds literally. These precise wind speed numbers are actually guesses and have never been scientifically verified. Different wind speeds may cause similar-looking damage from place to place -- even from building to building.** ***Without a thorough engineering analysis of tornado damage in any event, the actual wind speeds needed to cause that damage are unknown.***

Information depicted above can be found at: http://www.spc.noaa.gov/faq/tornado/f-scale.html

APPENDIX F

SAFFIR/SIMPSON HURRICANE SCALE

Courtesy of National Hurricane Center
This can be used to give an estimate of the potential property damage and flooding expected along the coast with a hurricane.

Category	Definition	Effects
One	Winds 74-95 mph	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal road flooding and minor pier damage
Two	Winds 96-110 mph	Some roofing material, door, and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of center. Small craft in unprotected anchorages break moorings.
Three	Winds 111-130 mph	Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain continuously lower than 5 feet ASL may be flooded inland 8 miles or more.
Four	Winds 131-155 mph	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach. Major damage to lower floors of structures near the shore. Terrain continuously lower than 10 feet ASL may be flooded requiring massive evacuation of residential areas inland as far as 6 miles.
Five	Winds greater than 155 mph	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Major damage to lower floors of all structures located less than 15 feet ASL and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5 to 10 miles of the shoreline may be required.

Above information can be found at: http://www.fema.gov/hazards/hurricanes/saffir.shtm

APPENDIX G

THE RICHTER MAGNITUDE SCALE

Earthquake Severity

Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Information above found at: http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.html

The Richter Magnitude Scale

Seismic waves are the vibrations from earthquakes that travel through the Earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, locations, and magnitude of an earthquake can be determined from the data recorded by seismograph stations.

The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

At first, the Richter Scale could be applied only to the records from instruments of identical manufacture. Now, instruments are carefully calibrated with respect to each other. Thus, magnitude can be computed from the record of any calibrated seismograph.

Earthquakes with magnitude of about 2.0 or less are usually call microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater - there are several thousand such shocks annually - are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year. The Richter Scale has no upper limit. Recently, another scale called the moment magnitude scale has been devised for more precise study of great earthquakes. The Richter Scale is not used to express damage. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten the wildlife. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Above information can be found at: http://neic.usgs.gov/neis/general/handouts/richter.html